

# OSAWA

DRILLS & END MILLS



**OSW21** CATALOGUE

| | MATERIALS | HARDNESS/Rm |
|---|---|---|
| P1 | Free cutting steel and structural steel | < 500 N/mm$^2$ |
| P2 | Carbon steel and low alloy steel | 500-700 N/mm$^2$ |
| P3 | Medium alloy steel and heat treated steel | 600-800 N/mm$^2$ |
| P4 | High alloy steel | 800-1000 N/mm$^2$ |
| P5 | Tool steel | 900-1200 N/mm$^2$ |
| P6 | High tensile strength steel | 1200-1480 N/mm$^2$ |
| P7 | Ferritic - Martensitic stainless steel | |
| P8 | PH stainless steel | |
| M1 | Austenitic stainless steel (good machinability) | |
| M2 | Austenitic stainless steel (medium machinability) and Duplex | |
| M3 | Super austenitic stainless steel and super Duplex | |
| K1 | Grey cast iron | 150-250 HB |
| K2 | Nodular cast iron | 150-350 HB |
| K3 | Austenitic cast iron | 120-260 HB |
| K4 | ADI cast iron | 250-500 HB |
| N1 | Aluminium alloys ≤ 12% Si | |
| N2 | Aluminium alloy > 12% Si and Aluminium-Magnesium | |
| N3 | Copper alloy | |
| N4 | Brass alloy and Bronze alloy | |
| N5 | Plastic material | |
| N6 | Carbon fiber and composite | |
| S1 | Heat resistant super alloys (HRSA) Ni base (good machinability) | < 25 HRC |
| S2 | Heat resistant super alloys (HRSA) Ni base (medium machinability) | 25-35 HRC |
| S3 | Heat resistant super alloys (HRSA) Ni base (low machinability) | 35-45 HRC |
| S4 | Low Titanium base alloy (good machinability) | |
| S5 | High Titanium base alloy (medium machinability) | |
| H1 | Hardened steel | 50-56 HRC |
| H2 | Hardened bearing steel | 54-62 HRC |
| H3 | Hardened tool steel | 60-65 HRC |
| H4 | Hardened martensitic stainless steel | 50-56 HRC |
| H5 | Hardened white cast iron | 48-55 HRC |


REFER TO PAGES 15-29 FOR THE COMPLETE LIST OF WORKPIECE MATERIALS.
CONSULTARE PAGG. 15-29 PER LA LISTA COMPLETA DEI MATERIALI
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CONSULTER DE LA PAGE 15 À LA PAGE 29 POUR LA LISTE COMPLÈTE DES MATÉRIAUX
CONSULTAR DESDE PÁG. 15 A PÁG. 29 PARA LA LISTA COMPLETA DE LOS MATERIALES
ПОЛНЫЙ СПИСОК ОБРАБАТЫВАЕМЫХ МАТЕРИАЛОВ СМОТРИ НА СТР. 15-29.

OSW21 CATALOGUE

*Osawa is a trademark owned by Sorma S.p.A. which is on a mission to provide the cutting tool market with solid tools for milling and drilling. Based on the well-established know how of Sorma S.p.A., coming from Japanese and European best technologies, the brand Osawa was launched in 2001 and groups different tools manifacturers located worldwide (Europe, Far East and USA). To keep up with the evolution of production systems and costs, Sorma is increasing its investments in China, Taiwan and Korea, always putting quality first: Osawa producers are strictly selected on the strength of their tools' performances and they are all certified ISO 9001. Such structure makes Osawa able to meet a very wide spectrum of customers' requests, even on most critical applications. Its production flexibility together with the highly qualified direction of Sorma gives Osawa the possibility to have high profile tools in any item of the range.*

*Arturo Sorgato*
*President - Sorma S.p.A.*

*Osawa è un marchio registrato di Sorma S.p.A. che ha la mission di offrire al mercato dell'industria meccanica utensili integrali per foratura e fresatura. Basato sull'esperienza maturata da Sorma con le migliori tecnologie giapponesi ed europee, il marchio Osawa è stato lanciato nel 2001 e raggruppa diversi produttori di utensili collocati in varie parti del mondo (Europa, Estremo Oriente e USA). Per far fronte all'evoluzione dei sistemi e dei costi di produzione, Sorma sta incrementando i propri investimenti in Cina, Taiwan e Corea, facendo sempre della qualità il proprio baluardo: i produttori Osawa sono selezionati severamente sulla base delle prestazioni dei loro utensili e sono tutti certificati ISO 9001. Questa struttura permette ad Osawa di far fronte ad un ampio quadro di richieste da parte dei clienti, anche nelle applicazioni più critiche. La sua flessibilità produttiva, insieme alla direzione altamente qualificata di Sorma, danno la possibilità ad Osawa di offrire utensili di alto profilo in ogni componente della gamma.*

*Arturo Sorgato*
*Presidente - Sorma S.p.A.*

*Osawa ist eine geschützte Handelsmarke der Firma Sorma S.p.A., die als Ziel, ein umfangreiches Angebot von Bohr- und Fräswerkzeugen für den Maschinenbau anbieten soll. Dank der langen Erfahrung, die Sorma während der Jahrzehnte sammeln konnte, und der besten japanischen und europäischen Technologien, wurde im Jahre 2001 die Handelsmarke Osawa gegründet. Osawa enthält hochwertige Werkzeuge von verschiedenen ausgelesenen Herstellern aus aller Welt (Europa, Ferner Osten, USA). Um den Schritt der ständigen Entwicklung der Fertigungsprozesse und Produktionskosten halten zu können, hat Sorma seine Investionen in China, Taiwan und Korea erhöht, ohne selbstverständlich auf die Qualität zu verzichten, die seit immer im Mittelpunkt steht. Die Osawa Lieferanten sind auf sehr sorgfältiger Weise ausgewählt, verfügen alle über eine ISO 9001 Zertifizierung, und müssen die streng angeforderten Leistungsverhältnisse der Werkzeuge einhalten können. Dieser Hintergrund ermöglicht Osawa ein sehr breites Spektrum von Anfragen zu befriedigen, auch für die kritischsten Anwendungsfälle. Seine Flexibilität bei den verschiedenen Fertigungsprozesse, in Verbindung mit einer hochqualifizierten Führung der Firma Sorma, gibt Osawa die Möglichkeit hochwertige Werkzeuge in den verschiedenen Produktsegmente anzubieten.*

*Arturo Sorgato*
*Präsident - Sorma S.p.A.*

*Osawa est une marque déposée par Sorma S.p.A. qui a la mission d'offrir au marché de l'industrie mécanique des outils monobloc pour le perçage et le fraisage. Basée sur l'expérience acquise par Sorma avec les meilleures technologies japonaises et européennes, la marque Osawa a été lancée en 2001 et elle regroupe plusieurs producteurs d'outils qui se trouvent partout dans le monde (Europe, Extrême Orient et USA). Pour faire face à l'évolution des procédés de fabrication et des couts de production, Sorma est en train d'augmenter ses propres investissements en Chine, à Taiwan et en Corée, en faisant toujours de la qualité son point de force : les producteurs Osawa sont sélectionnés sévèrement en fonction de la performance de leurs outils, et sont tous certifiés ISO 9001. Cette structure permet à Osawa de faire face à un large cadre de demandes de la part des clients, aussi dans les applications les plus critiques. Sa flexibilité productive, sous la direction hautement qualifiée de Sorma, donne à Osawa la possibilité d'offrir des outils de haut profil pour chaque composant de la gamme.*

*Arturo Sorgato*
*Président - Sorma S.p.A.*

*Osawa es una marca registrada de Sorma S.p.A. cuya misión es ofrecer al mercado de la industria mecánica herramientas integrales para el taladrado y el fresado. Basada en la experiencia adquirida por Sorma con las mejores tecnologías Japonesas y Europeas, la marca Osawa fue lanzada en el 2001 y reúne a diferentes fabricantes de herramientas ubicados en varias partes del mundo (Europa, Extremo Oriente y EE.UU.). Para hacer frente a la evolución de los sistemas y de los costes de producción, Sorma está aumentando su inversión en China, Taiwán y Corea, haciendo siempre de la calidad el propio baluarte: los productores Osawa se seleccionan basándose en el rendimiento de sus herramientas y son todos certificados ISO 9001. Esta estructura permite a Osawa de hacer frente a un panorama amplio de peticiones por parte de los clientes, incluso en las aplicaciones más críticas. Su flexibilidad productiva, junto a la dirección de profesionales altamente calificados de Sorma, dan la posibilidad a Osawa de ofrecer herramientas de alto perfil en cada componente de la gama.*

*Arturo Sorgato*
*Presidente - Sorma S.p.A.*

*Osawa – это марка зарегистрированная ЗАО «Sorma S.p.A.», которая включает в себя широкую гамму продукции интегрального осевого инструмента для сверления и фрезерования, применяемого в металлообрабатывающей промышленности. Компания «Sorma» обладает передовыми технологиями, накопленными благодаря многолетнему опыту работы с лучшими японскими и европейскими производителями. Марка Osawa появилась в 2001 году и объединила ведущих производителей инструментов, расположенных в разных частях мира (Европе, Дальнем Востоке и США). Следуя требованиям современного рынка по оптимизации стоимости и качества продукции, компания «Sorma» увеличила свои инвестиции в производство в таких странах как Китай, Тайвань и Корея, при условии соблюдения высочайших стандартов качества: все производители Osawa проходят строгий контроль качества продукции и высоких производственных стандартов. Всё производство сертифицировано согласно стандартам ISO 9001. Благодаря этому, продукция Osawa может быть применена для решения широкого спектра даже самых сложных задач и в состоянии удовлетворить требования потребителя возникающих при металлообработке. Гибкое производство Osawa, совместно с высококвалифицированным специалистами компании «Sorma», позволяют предложить качественный инструмент по всем направлениям продукции.*

*Arturo Sorgato*
*Президент ЗАО «Sorma S.p.A.»*

## WARNING

read carefully before using our products

- Tools may chatter if broken. The wearing of eye protection is strongly advised in the vicinity of the working area.
- The correct using condition and handling of our tools is essential to ensure maximum life and hazard-free operation.
- Cutting tools have sharp edges and care must be taken when handling to avoid cuts/lacerations to unprotected hands.
- The wearing of gloves is forbidden as the gloves may entangle with turning tools.
- Tools may hurt the user's feet when falling off. Safety shoes should be put on at all time.
- While fitting the tools to machine spindles and/or sleeves, care should be taken to avoid subjecting them to shock or impact.
- Check that the workpieces are properly seated and securely held in the chuck before switching on machine power.
- Do not use a tool which cutting edges are worn-out or chipped severely.
- Grinding operations may produce potentially hazardous dust particles or vapour. Adequate ventilation equipment should be provided.

## VORSICHT

bitte sorgfältig durchlesen, bevor Sie unsere Produkte gebrauchen

- Beschädigte Werkzeuge können vibrieren, es wird daher dringend empfohlen Schutzbrillen in der Nähe der Arbeitstelle zu tragen.
- Ordnungsgemäße Handhabung und Arbeitsvoraussetzung sind Grundbedingungen für lange Lebensdauer und Sicherheit.
- Die Schneidkanten der Werkzeuge sind sehr scharf und können ungeschützte Hände verletzen. Vorsicht bei der Handhabung.
- Handschuhe können sich mit drehenden Werkzeugen verfangen, sie sind daher verboten.
- Unfallschutzschuhe ständig anziehen: beim Hinunterfallen können die Werkzeuge die Füße verletzten.
- Beim Einsetzen der Werkzeuge auf die Maschinen ist darauf zu achten, Stöße zu vermeiden.
- Prüfen Sie vor Inbetriebnahme der Maschine die genaue Befestigung der Werkstücke.
- Werkzeuge mit beschädigten Schneiden nicht mehr verwenden.
- Beim Schleifen können gefährliche Partikel oder Gase enstehen. Angemessene Entlüftung muß gewährleistet sein.

## ADVERTENCIAS

leer atentamente antes de comenzar a utilizar nuestros productos

- Si las herramientas están rotas, pueden vibrar. Se aconseja absolutamente el uso de gafas de protección cuando se está cerca del área de trabajo.
- El uso correcto de nuestras herramientas es esencial para asegurarse la mayor duración y para evitar operaciones peligrosas.
- Las herramientas de corte poseen bordes muy afilados que pueden causar heridas en las manos si no están debidamente protegidas.
- Está prohibido el uso de guantes. El tejido puede pegarse al filo y ser arrastrado por la herramienta en rotación.
- Las herramientas que caen pueden dañar los pies del operador. El calzado de protección contra accidentes debe usarse en todo momento.
- Si se fija una herramienta a la máquina tener la precaución de no averiarla.
- Controlar el posicionamiento perfecto y la fijación de la pieza a mecanizar antes de accionar la máquina.
- No utilizar herramientas muy gastadas o averiadas.
- Cuando se afila una herramienta pueden formarse polvos y vapores peligrosos. Disponer un sistema de ventilación adecuado.

## AVVERTENZE

leggere attentamente prima dell'utilizzo dei nostri prodotti

- Gli utensili, se rotti, possono vibrare. L'uso di occhiali protettivi è assolutamente consigliato in prossimità dell' area di lavoro.
- Il corretto utilizzo dei nostri utensili è essenziale al fine di assicurarne la miglior durata ed evitare operazioni pericolose.
- Gli utensili da taglio hanno un tagliente molto affilato che può procurare ferite alle mani se non protette adeguatamente.
- L'uso di guanti è vietato. Il tessuto può legarsi al tagliente ed essere trascinato dall'utensile in rotazione.
- Gli utensili che cadono possono danneggiare i piedi dell'operatore. Le scarpe antinfortunistiche devono essere indossate in qualsiasi momento
- Nel fissare l'utensile alla macchina fare sempre attenzione a non danneggiarlo.
- Controllare il perfetto posizionamento e fissaggio del pezzo da lavorare prima di azionare la macchina.
- Non riutilizzare utensili fortemente usurati o danneggiati.
- La riaffilatura può generare polveri e vapori pericolosi. Attrezzarsi con un sistema di ventilazione adeguato.

## AVERTISSEMENT

à lire attentivement avant utilisation de nos produits

- Les outils si cassés peuvent vibrer. Le port de lunettes de sécurité près de la zone de travail est vivement recommandé.
- Des conditions d'emploi correctes de nos produits sont essentielles pour assurer une durée de vie maximum et éviter des accidents.
- Les outils ont des arêtes vives et peuvent blesser les mains non protégées.
- Le port de gants près d'outils en rotation est interdit car ils peuvent être happés par l'outil.
- Des outils tombant à terre peuvent blesser les pieds de l'opérateur : le port de chaussures de sécurité est conseillé.
- En montant les outils sur le porte-outils, veiller à éviter les chocs.
- S'assurer que la pièce soit parfaitement fixée avant de mettre la machine en route.
- Ne pas utiliser des outils usés ou endommagés.
- Le réaffûtage des outils peut provoquer des vapeurs et des poussières dangereuses qui devront être convenablement aspirées.

## ПРЕДУПРЕЖДЕНИЕ

внимательно прочитайте перед использованием нашей продукции

- Повреждённый инструмент подвержен вибрациям. Настоятельно рекомендуется использование средств защиты глаз, в непосредственной близости от рабочей зоны.
- Правильное использование нашего инструмента обеспечит максимальный срок его службы и безопасность работы.
- Режущий инструмент, имеет острые кромки, поэтому необходимо соблюдать осторожность при его использовании.
- Использование перчаток запрещено, так как ткань перчатки может зацепиться за части инструмента, что может привести к травмам при вращении инструмента.
- При падении инструмент может повредить ноги пользователя. Во время работы с инструментом должна быть использована специальная защитная обувь.
- Устанавливать инструмент в станок необходимо с осторожностью, во избежание его повреждения.
- Необходимо проверить надёжность крепления заготовки до включения станка.
- Не использовать повторно повреждённый или пришедший в негодность инструмент.
- Переточка инструмента может привести к образованию опасных испарений и пыли. Строго рекомендуется использование соответствующих вентиляционных систем.

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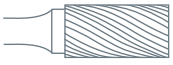
193 ..... LFTA high performance
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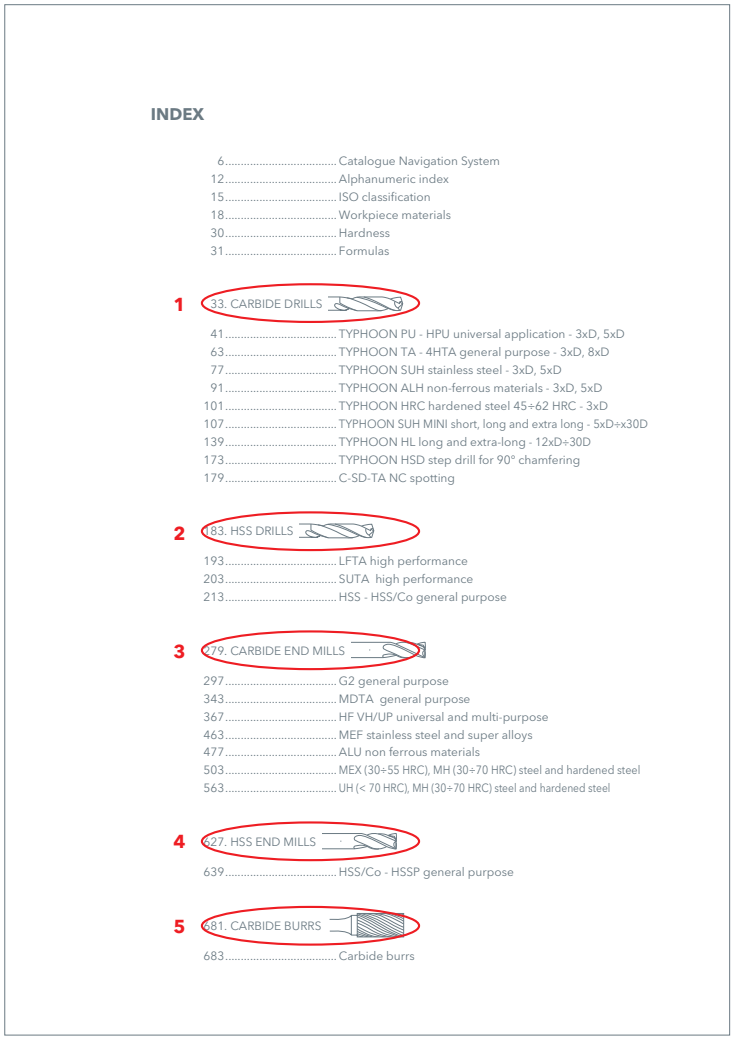
639 ..... HSS/Co - HSSP general purpose

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**5 MAIN SECTIONS**
1 carbide drills
2 HSS drills
3 micrograin carbide end mills
4 HSS end mills
5 carbide burrs

**5 MACRO SEZIONI**
1 punte in metallo duro
2 punte in HSS
3 frese in metallo duro micrograna
4 frese in HSSCo e HSSP
5 lime rotative in metallo duro

**5 HAUBTABSCHNITTE**
1 VHM Bohrer
2 HSS Bohrer
3 VHM Fräser Mikrokörnung
4 Fräser aus HSSCo und HSSP
5 Hartmetall-Rotierfräser

**5 CHAPITRES**
1 forets en carbure
2 forets en HSS
3 fraises en carbure micrograin
4 fraises en HSSCo et HSSP
5 limes rotatives en carbure

**5 MACRO SECCIONES**
1 brocas en metal duro
2 brocas en HSS
3 fresas en metal duro micrograno
4 fresas en HSS/Co y HSSP
5 limas rotativas en metal duro

**5 ПОДРАЗДЕЛОВ**
1 твёрдосплавные свёрла
2 свёрла из быстрорежущей стали
3 фрезы из мелкозернистого твёрдого сплава
4 фрезы из порошковой и легированной Co быстрорежущей стали
5 борфрезы твёрдосплавные

# PRODUCT SEARCH

RICERCA PRODOTTI
PRODUKTSUCHE
RECHERCHE PRODUITS
BÚSQUEDA PRODUCTOS
ПОДБОР ИНСТРУМЕНТА

## 1

## Alphanumeric index

Indice alfanumerico · Alphanumerischer I

| ITEM No. | PAGE | ITEM |
|---|---|---|
| 118N | 214 | G2250 |
| 134N (234NVA) | 252 | G2251 |
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| 1386STI | 223 | G2311 |
| 1386STI SET | 226 | G2312 |
| 138HB | 234 | G2410 |

**ALPHANUMERIC INDEX**
If product code (e.g. ITEM No. 118N) is known, check the alphanumeric index at page 12.

**INDICE ALFANUMERICO**
Conoscendo il codice prodotto (es. ITEM No. 118N), consultare l'indice alfanumerico a pag. 12.

**ALPHANUMERISCHER INDEX**
Wenn Sie die Art.Nr kennen (z.B. ART.Nr 118N), können Sie die entsprechende Seite durch den Alphanumerischen Index – Seite 12 - finden.

**INDEX ALPHANUMÉRIQUE**
En connaissant le code produit (ex. ITEM No. 118N), consulter l'index alphanumérique à la page 12.

**ÍNDICE ALFANUMÉRICO**
Conociendo el producto (ej. ITEM No. 118N), consultar el índice alfanumérico en pág. 12.

**АЛФАВИТНЫЙ УКАЗАТЕЛЬ**
Если артикул (т.е. код № 118n) известен, смотрите алфавитный указатель на стр. 12.

## 2




**GENERAL AND THUMB INDEX**
If product series (e.g. Carbide End-Mills G2) is known, check general index at page 5 or follow the thumb index.

**INDICE E RUBRICATURA**
Conoscendo la serie prodotto (es. Carbide End-Mills G2), consultare l'indice generale a pag. 5 o seguire la rubricatura.

**INDEX UND DAUMEN INDEX**
Wenn die Produktgruppe bekannt ist (z.B Carbide End-Mills G2), schlagen Sie im Index -Seite 5- nach, oder folgend Sie dem Daumen Index.

**INDEX ET RUBRIQUE**
En connaissant la référence du produit (ex. Carbide End-Mills G2), consulter l'index général à la page 5 ou suivre la rubrique.

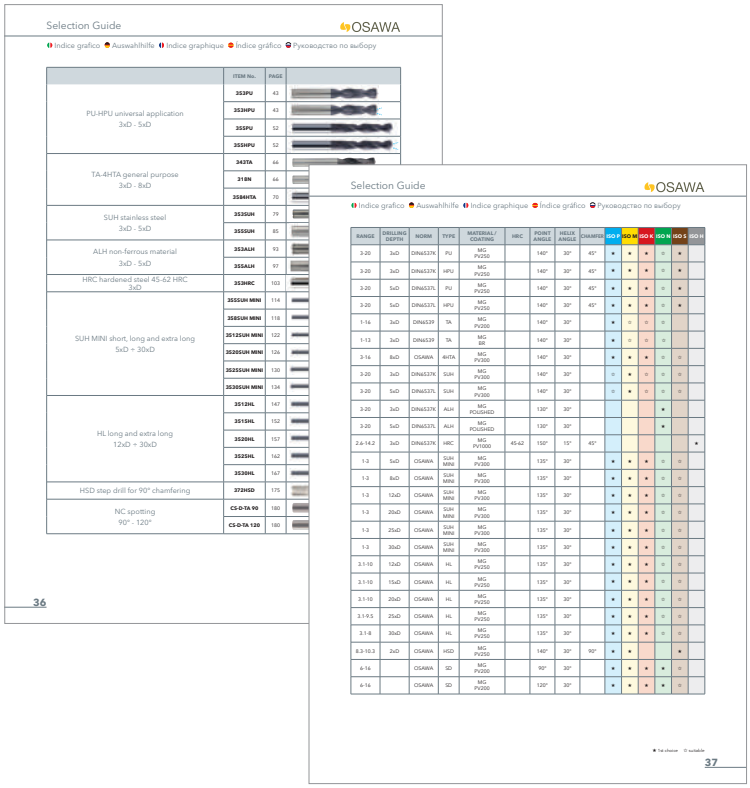
**ÍNDICE Y DIRECTORIO**
Conociendo la serie de producto (ej. Carbide End-Mills G2), consultar el índice general en pág. 5 o seguir el directorio.

**ОГЛАВЛЕНИЕ И РУБРИКАТОР**
Если известна серия продукции (т.е. Carbide End-Mills g2), смотри общее оглавление на стр. 5 или используйте рубрикатор.

# PRODUCT SEARCH

RICERCA PRODOTTI
PRODUKTSUCHE
RECHERCHE PRODUITS
BÚSQUEDA PRODUCTOS
ПОДБОР ИНСТРУМЕНТА

**3**




**SELECTION GUIDE**
An easy graphic index with tool and application information is available at the beginning of each section.

**GUIDA ALLA SELEZIONE**
All'inizio di ogni macro sezione è disponibile un indice grafico con informazioni relative all'utensile e alle sue applicazioni.

**AUSWAHLHILFE**
Am Anfang von jedem Hauptabschnitt ist ein grafischer Index, mit Infos bezüglich des Werkzeugs und seinem Anwendungsfeld, vorhanden.

**GUIDE DE SÉLECTION**
Un index graphique avec les informations relatives à l'outil et à ses applications est disponible au début de chaque chapitre.

**GUÍA DE SELECCIÓN**
Al inicio de cada macro sección está disponible un índice gráfico con informaciones relativas a la herramienta y a sus aplicaciones.

**ПОМОЩНИК ПО ПОДБОРУ**
В начале каждого подраздела находиться простой графический индекс инструмента, который даёт информацию об инструменте и его применении.

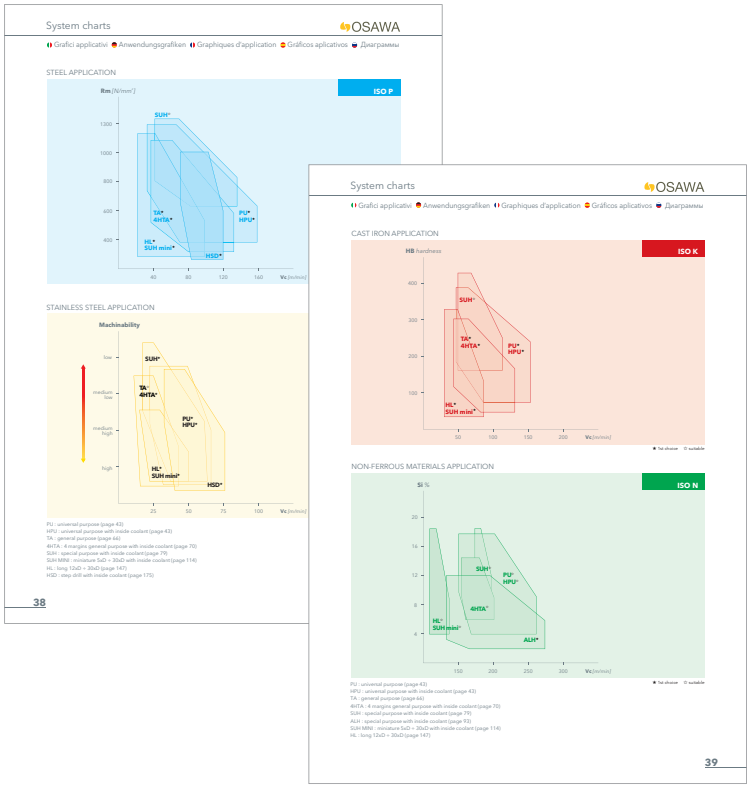
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# PRODUCT SEARCH

RICERCA PRODOTTI
PRODUKTSUCHE
RECHERCHE PRODUITS
BÚSQUEDA PRODUCTOS
ПОДБОР ИНСТРУМЕНТА

**4**




**SYSTEM CHART**
An easy guide to the application range by work-piece material, for each tool series is available at the beginning of each section.

**SYSTEM CHART**
All'inizio di ogni macro sezione per ogni famiglia di utensili è disponibile un sistema di grafici applicativi in base al materiale da lavorare.

**SYSTEM CHART**
Am Anfang von jedem Hauptabschnitt stehen Diagramme für die verschiedenen Werkzeuge, die je nach zu bearbeitendem Material erstellt sind, zur Verfügung.

**SYSTEM CHART**
Au début de chaque chapitre, pour chaque famille d'outils, un système graphique d'application est disponible sur la base de la matière à usiner.

**SYSTEM CHART**
Al inicio de cada macro sección para cada família de herramientas está disponible un sistema de tablas aplicativas en base al material a mecanizar.

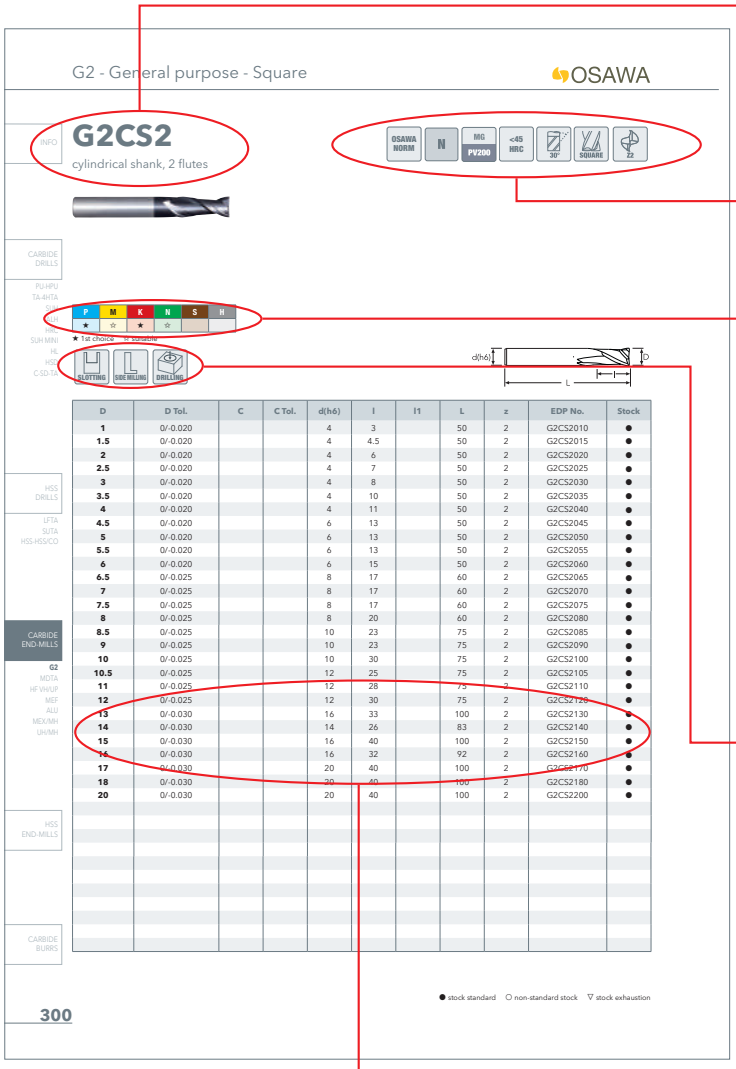
**SYSTEM CHART**
В начале каждого подраздела, для каждой группы инструмента находиться система графических диаграмм соответствующих типу обрабатываемого материала.

**SYSTEM CHART INDEX**

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# PRODUCT PAGE

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Codice prodotto o ITEM No.
Name des Produkts oder Artikelnummer
Code produit ou ITEM No.
Código producto o ITEM No.
Артикул или КОД №

Icons
Icone descrittive
Beschreibende Symbole
Icônes descriptives
Iconos descriptivos
Икона

ISO Materials table with black or white stars to indicate applicability
Tabella materiali ISO con stellina nera o bianca per indicazione applicabilità
ISO Materialtabelle, mit weissem oder schwarzem Stern je nach Anwendbarkeit
Tableau des matières ISO avec étoile noire ou blanche pour indiquer l'application
Tabla materiales ISO con estrella negra y blanca para indicar aplicabilidad
Таблица материалов ISO с чёрными или белыми звёздочками обозначающие применяемость

Machining icons available also in the parameters tables (Only for milling)
Icone di lavorazione, riportate anche nelle tabelle parametri (solo per fresatura)
Bearbeitungssymbole, sind auch bei der Tabelle der Parameter vorhanden (nur für Fräsen)
Icônes d'usinage, reportées également dans le tableau des paramètres (seulement pour le fraisage).
Iconos de mecanizado, indicados también en la tabla de parámetros (solo para fresado)
Иконки обработки обозначенные также в таблицах с рабочими параметрами (Только для фрезерования)

Dimensions table with EDP Nr. and stock classification
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Tabelle mit Abmessungen, Art.Nummer (EDP Nr.), Verfügbarkeit
Tableau des dimensions avec code produit (EDP No.) et classification du stock
Tabla de dimensiones con código producto (EDP No.) y clasificación de stock
Таблица размеров с кодом артикула и складской классификацией

# PRODUCT PAGE

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## PARAMETERS TABLE

Cutting parameters table is available next to each product page for easier and faster consultation.

## TABELLA PARAMETRI

La tabella dei parametri di lavorazione è riportata di seguito ad ogni pagina prodotto per una consultazione più semplice e rapida.

## TABELLE DER PARAMETER

Die Tabelle der Parameter folgt nach jeder Seite der Produkte, um auf dieser Weise sofort griffbereit zu sein.

## TABLEAU DES PARAMÈTRES

Le tableau des paramètres d'usinage se trouve après chaque page produit pour une consultation plus facile et rapide.

## TABLA DE PARÁMETROS

La tabla de parámetros de corte está disponible al lado de cada página producto para una consulta más rápida y simple.

## ТАБЛИЦА РАБОЧИХ ПАРАМЕТРОВ

Для лёгкого и быстрого поиска рабочих параметров обработки таблица с их указанием находится на следующей странице соответствующего артикула.

Indice alfanumerico · Alphanumerischer Index · Index alphanumérique · Índice alfanumérico · Алфавитный указатель


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# INFO

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| | MATERIALS | | HARDNESS/Rm |
|---|---|---|---|
| **P1** | Free cutting steel and structural steel<br>Acciai automatici e acciai strutturali<br>Automatenstähle und Baustähle | Aciers pour décolletage et aciers structurels<br>Aceros de fácil mecanización y aceros de construcción<br>Автоматные и конструкционные стали | < 500 N/mm² |
| **P2** | Carbon steel and low alloy steel<br>Acciai al carbonio e acciai basso legati<br>Kohlenstoff-Stähle und niedriglegierte Stähle | Aciers au carbone et aciers faiblement alliés<br>Aceros al carbono y aceros de baja aleación<br>Углеродистые и низколегированные стали | 500 ÷ 700 N/mm² |
| **P3** | Medium alloy steel and heat treated steel<br>Acciai medio legati e acciai di bonifica<br>Mittellegierte Stähle und Vergütungsstähle | Aciers moyennement alliés et aciers trempés et recuits<br>Aceros de media aleación y aceros bonificados<br>Среднелегированные и отоженные стали | 600 ÷ 800 N/mm² |
| **P4** | High alloy steel<br>Acciai alto legati<br>Hochlegierte Stähle | Aciers fortement alliés<br>Aceros de alta aleación<br>Высоколегированные стали | 800 ÷ 1000 N/mm² |
| **P5** | Tool steel<br>Acciai per utensili<br>Werkzeugstähle | Aciers pour outils<br>Aceros para herramientas<br>Инструментальные стали | 900 ÷ 1200 N/mm² |
| **P6** | High tensile strength steel<br>Acciai ad alta resistenza<br>HSLA-Stähle | Aciers haute résistance<br>Aceros de alta resistencia<br>Высокопрочная сталь | 1200 ÷ 1480 N/mm²<br>38 ÷ 45 HRC |
| **P7** | Ferritic - Martensitic stainless steel<br>Acciai inossidabili ferritici e martensitici<br>Ferritische-Martensitische Stähle | Aciers inoxydables ferritiques-martensitiques<br>Aceros inoxidables ferríticos-martensíticos<br>Ферритно-мартенситная нержавеющая сталь | |
| **P8** | PH stainless steel<br>Acciai inossidabili PH - indurenti per precipitazione<br>Ausscheidungshartbare Edelstahle | Aciers inoxydables à durcissement par précipitation<br>Aceros inoxidables PH<br>Дисперсионно-твердеющая нержавеющая сталь | |
| **M1** | Austenitic stainless steel (good machinability)<br>Acciai inossidabili austenitici (buona lavorabilità)<br>Austenitische Edelstähle (niedriglegiert) | Aciers inoxydables austénitiques (faiblement allié)<br>Aceros inoxidables Austeníticos (fácil mecanizado)<br>Аустенитная нержавеющая сталь | |
| **M2** | Austenitic stainless steel (medium machinability) and Duplex<br>Acciai inossidabili austenitici (buona lavorabilità)<br>Austenitische Edelstähle (niedriglegiert) | Aciers inoxydables austénitiques (faiblement allié)<br>Aceros inoxidables Austeníticos (fácil mecanizado)<br>Аустенитная нержавеющая сталь | |
| **M3** | Super austenitic stainless steel and super Duplex<br>Acciai inossidabili austenitici (media lavorabilità) e Duplex<br>Austenitische Edelstähle (mittel-legiert) und Duplex | Aciers inoxydables austénitiques (moyennement allié) et Duplex<br>Aceros inoxidables Austeníticos (medio mecanizado) y Duplex<br>Аустенитная и дуплексная нержавеющая сталь | |

| | MATERIALS | | HARDNESS/Rm |
|---|---|---|---|
| **K1** | Grey cast iron<br>Ghise grigie<br>Grauguss | Fonte grise<br>Fundición gris<br>Серый чугун | 150 ÷ 250 HB |
| **K2** | Nodular cast iron<br>Ghise sferoidali<br>Sphäroguss | Fonte nodulaire<br>Fundición nodular<br>Чугун с шаровидным графитом | 150 ÷ 350 HB |
| **K3** | Austenitic cast iron<br>Ghise austenitiche<br>Austenitischer Guss | Fonte austénitique<br>Fundición austenítica<br>Аустенитный чугун | 120 ÷ 260 HB |
| **K4** | ADI cast iron<br>Ghise ADI<br>ADI Guss | Fonte ADI<br>Fundición ADI<br>Отпущенный ковкий чугун | 250 ÷ 500 HB |
| **N1** | Aluminium alloys ≤ 12% Si<br>Leghe di alluminio ≤ 12% Si<br>Aluminiumlegierungen ≤ 12% Si | Alliages d'aluminium ≤ 12 % Si<br>Aleación de aluminio ≤ 12% Si<br>Алюминиевое литье ≤ 12% Si | |
| **N2** | Aluminium alloy > 12% Si and Aluminium-Magnesium<br>Leghe di alluminio > 12% Si e alluminio-magnesio<br>Aluminiumlegierungen > 12% Si und Aluminium-Magnesium | Alliages d'aluminium > 12 % Si et Aluminium-Magnesium<br>Aleación de aluminio > 12% Si y Aluminio-Magnesio<br>Алюминиевые сплавы с содержанием Si<12% и алюмо-магниевые сплавы | |
| **N3** | Copper alloy<br>Leghe di rame<br>Kupferlegierungen | Alliages de cuivre<br>Aleación de cobre<br>Медные сплавы | |
| **N4** | Brass alloy and Bronze alloy<br>Leghe di ottone e leghe di bronzo<br>Bronze- und Messinglegierungen | Alliages de bronze et de laiton<br>Aleación de Latón y Aleación de Bronce<br>Латуни и бронзы | |
| **N5** | Plastic material<br>Polimeri<br>Polymere | Polymères<br>Material plástico<br>Пластики | |
| **N6** | Carbon fiber and composite<br>Fibra di carbonio e compositi<br>Faserwerkstoffe und Verbundwerkstoffe | Fibres et composites<br>Fibra de carbonio y compositos<br>Углеволокно и композиты | |

| | MATERIALS | | HARDNESS/Rm |
|---|---|---|---|
| **S1** | Heat resistant super alloys (HRSA) Ni base (good machinability)<br>Leghe a base di nichel resistenti al calore (buona lavorabilità)<br>Warmfeste Superlegierungen (HRSA) Nickel-Legierungen (einfach zu bearbeiten) | Base Ni de superalliages résistants à la chaleur (HRSA) (bonne usinabilité)<br>Super aleaciones resistentes al calor (HRSA) base Nickel (fácil mecanizado)<br>Жаропрочные сплавы (HRSA) Ni(легкообрабатываемые) | < 25 HRC |
| **S2** | Heat resistant super alloys (HRSA) Ni base (medium machinability)<br>Leghe a base di nichel resistenti al calore (media lavorabilità)<br>Warmfeste Superlegierungen (HRSA) Nickel-Legierungen (mittlere Bearbeitbarkeit) | Superalliages résistants à la chaleur (HRSA) Ni base (usinabilité moyenne)<br>Super aleaciones resistentes al calor (HRSA) base Nickel (medio mecanizado)<br>Жаропрочные сплавы (HRSA) Ni(среднеобрабатываемые) | 25 ÷ 35 HRC |
| **S3** | Heat resistant super alloys (HRSA) Ni base (low machinability)<br>Leghe a base di nichel resistenti al calore (difficile lavorabilità)<br>Warmfeste Superlegierungen (HRSA) Nickel-Legierungen (schwierig zu bearbeiten) | Superalliages résistants à la chaleur (HRSA) Ni base (faible usinabilité)<br>Super aleaciones resistentes al calor (HRSA) base Nickel (difícil mecanizado)<br>Жаропрочные сплавы (HRSA) Ni(труднообрабатываемые) | 35 ÷ 45 HRC |
| **S4** | Low Titanium base alloy (good machinability)<br>Leghe di titanio basso legate (buona lavorabilità)<br>Titanlegierung (gut Bearbeitbarkeit) | Alliages de base à faible teneur en titane (bonne usinabilité)<br>Aleaciones a bajo contenido Titanio (fácil mecanizado)<br>Сплавы с низким содержанием Ti(легкообрабатываемые) | |
| **S5** | High Titanium base alloy (medium machinability)<br>Leghe di titanio alto legate (media lavorabilità)<br>Hochfeste Titanlegierung (mittlere Bearbeitbarkeit) | Alliages à base de titane élevé (usinabilité moyenne)<br>Aleaciones a alto contenido Titanio (medio mecanizado)<br>Сплавы с высоким содержанием Ti (среднеобрабатываемые) | |

| | | | |
|---|---|---|---|
| **H1** | Hardened steel<br>Acciai temprati generali<br>Allgemeine gehärtete Stähle | Aciers trempés<br>Aceros templados<br>Закаленные стали | 50 ÷ 56 HRC |
| **H2** | Hardened bearing steel<br>Acciai temprati per cuscinetti<br>Gehärtete Kugellagerstähle | Aciers trempés pour roulements<br>Aceros templados para rodamientos<br>Закаленные подшипниковые стали | 54 ÷ 62 HRC |
| **H3** | Hardened tool steel<br>Acciai temprati per utensili<br>Gehärtete Werkzeugstähle | Aciers trempés pour outils<br>Aceros templados para herramientas<br>Закаленные инструментальные стали | 60 ÷ 65 HRC |
| **H4** | Hardened martensitic stainless steel<br>Acciai inossidabili martensitici temprati<br>Gehärtete martensitische Edelstähle | Aciers inoxydables martensitiques trempés<br>Aceros inoxidables martensíticos templados<br>Закаленные мартенситные нержавеющие стали | 50 ÷ 56 HRC |
| **H5** | Hardened white cast iron<br>Ghise bianche temprate<br>Gehärteter Weißguss | Fonte blanche trempée<br>Fundición blanca templada<br>Закаленный белый чугун | 48 ÷ 55 HRC |

| Gr. | Materials | W.-Nr | DIN | EN-Nr. | EN | UNI | BS | JIS | AFNOR |
|---|---|---|---|---|---|---|---|---|---|
| P1 | Free cutting steel and structural steel<br>Rm < 500 N/mm² | 1.0037 | St 37-2 | 1.0037 | S235JR | Fe 360 B | | STKM 12 C | E 24-2 |
| | | 1.0116 | St 37-3 | 1.0038 | S235JRG2 | Fe 360 D FF | 4360-40 C | | E 24-3, E 24-4 |
| | | 1.0144 | St 44-3 N | 1.0144 | S275J2G3 | Fe 430 D FF | 4360-43 C | SM 41 C | E 28-3, E 28-4 |
| | | 1.0301 | C 10 | 1.0301 | C 10 | C 10 | 045 M 10 | S 10 C | 34 C 10, XC 10 |
| | | 1.0401 | C 15 | | | C 15, C 16 | 080 M 15 | | 37 C 12, XC 18 |
| | | 1.0402 | C 22 | 1.0402 | C 22 | C 20, C 21 | 050 A 20 | | C 20 |
| | | 1.0570 | St 52-3 | 1.0570 | S355JR | Fe 510 B | 4360-50 C | SM 50 YA | E 36-3, E 36-4 |
| | | 1.0715 | 9 SMn 28 | 1.0715 | 11 SMn 30 | CF 9 SMn 28 | 230 M 07 | SUM 22 | S 250 |
| | | 1.0718 | 9 SMnPb 28 | 1.0718 | 11 SMnPb 30 | CF 9 SMnPb 28 | | SUM 22 L | S 250 Pb |
| | | 1.0721 | 10 S 20 | 1.0721 | 10 S 20 | CF 10 S 20 | 210 M 15 | | 10 F 1 |
| | | 1.0722 | 10 SPb 20 | | | CF 10 SPb 20 | | | 10 PbF 2 |
| | | 1.0723 | 15 S 20 | 1.0725 | 15 SMn 13 | | 210 A 15 | SUM 32 | |
| | | 1.0726 | 35 S 20 | 1.0726 | 35 S20 | | 212 M 36 | | 35 MF 4 |
| | | 1.0727 | 46 S 20 | 1.0727 | 46 S20 | | 212 M 44 | | 45 MF 4 |
| | | 1.0736 | 9 SMn 36 | 1.0736 | 11 SMn 37 | CF 9 SMn 36 | 240 M 07 | | S 300 |
| | | 1.0765 | 36 SMnPb 14 | | 36 SMnPb 14 | CF 35 SMnPb 10 | 216 M 36 | | 35 MF 6 Pb |
| | | 1.1141 | Ck 15 | 1.1141 | C 15R | C 15, C 16 | 080 M 15 | S 15 C, S 15 CK | XC 15, XC 18 |
| | | | Ck 25 | | | C 25 | 060 A 25 | S 25 C | XC 25 |
| P2 | Carbon steel and low alloy steel<br>Rm 500÷700 N/mm² | 1.0501 | C 35 | | C 35 | C 35 | 060 A 35 | | 55 C 35 |
| | | 1.0503 | C 45 | 1.0503 | E 335 | C 45 | 80 M 46 | S 45 C | 65 C 45 |
| | | 1.0511 | C 40 | | C 40 | C 40 | 080 M 40 | S 40 C | 60 C 40 |
| | | 1.0535 | St 70-2 | 1.0070 | E 360 | Fe 690 | | | A 70-2 |
| | | 1.0601 | C 60 | 1.0601 | C60 | C 60 | 080 A 62 | | CC 55 |
| | | 1.1157 | 40 Mn 4 | | | | 150 M 36 | | 35 M 5 |
| | | 1.1165 | 30 Mn 5 | 1.1165 | G 28 Mn6 | | 120 M 36 | SMn 1 H, SCMn 2 | |
| | | 1.1181 | Ck 35 | 1.1181 | C 35E | C 35 | 080 M 36 | S 35 C | XC 38 H1 |
| | | 1.1191 | Ck 45 | 1.1191 | C 45E | C 45 | 080 M 46 | S 45 C | XC 42 |
| | | 1.1221 | Ck 60 | 1.1221 | C 60E | C 60 | 080 A 62 | S 58 C | XC 60 |
| | | 1.1740 | C 60 W | | | | | SK 7 | Y3 55 |
| | | 1.2162 | 21 MnCr 5 | | | | | SCR 420 H | 20 NC 5 |
| | | 1.5415 | 15 Mo 3 | 1.5415 | 16 Mo 3 | 16 Mo 3 | 1501-240 | | 15 D 3 |
| | | 1.5423 | 16 Mo 5 | | | 16 Mo 5 | 1503-245-420 | SB 450 M | |
| | | 1.5752 | 14 NiCr 14 | 1.5752 | 14 NiCr 14 | | 655 M 13 | SNC 815 (H) | 12 NC 15 |
| | | 1.5919 | 15 CrNi 6 | | | 16 CrNi 4 | S 107 | | 16 NC 6 |
| | | 1.6587 | 18 CrNiMo 7 6 | 1.6587 | 18 NiCrMo 7 6 | 18 NiCrMo 7 | 820 A 16 | | 18 NCD 6 |
| | | 1.7131 | 16 MnCr 5 | 1.7131 | 16 MnCr 5 | 16 MnCr 5 | 527 M 17 | SCR 415 | 16 MC 5 |
| | | 1.7139 | 16 MnCrS 5 | 1.7139 | 16 MnCrS 5 | | | | |
| | | 1.7147 | 20 MnCr 5 | 1.7147 | 20 MnCr 5 | 20 MnCr 5 | | SMnC 420 (H) | 20 MC 5 |
| | | 1.7149 | 20 MnCrS 5 | 1.7149 | 20 MnCrS 5 | | | SMnC 21 H | 20 MnCrS 5 |
| | | 1.7335 | 13 CrMo 4 4 | 1.7335 | 13 CrMo 4 5 | 14 CrMo 4 5 | 1501-620 Gr. 27 | | 15 CD 3.5 |
| | | 1.7337 | 16 CrMo 4 4 | | | 14 CrMo 4 5 | 1501-620 Gr. 27 | | 15 CD 4.5 |
| | | 1.7380 | 10 CrMo 9 10 | 1.7380 | 10 CrMo 9 10 | 12 CrMo 9 10 | 1501-622 Gr. 31 | | 10 CD 9.10 |
| P3 | Medium alloy steel<br>Rm 600÷800 N/mm² | 1.0904 | 55 Si 7 | 1.7100 | 55 SiCr7 | 55 Si 8 | 250 A 53 | | 55 S 7 |
| | | 1.2330 | 35 CrMo 4 | | | 35 CrMo 4 | 708 A 37 | | 34 CD 4 |
| | | 1.2542 | 45 WCrV 7 | | | 45 WCrV 8 KU | BS 1 | | |
| | | 1.2714 | 56 NiCrMoV 7 | 1.2714 | | 56 NiCrMoV7-KU | BH 224-5 | SKT 4 | |
| | | 1.5121 | 46 MnSi 4 | | | | | | |
| | | 1.5710 | 36 NiCr 6 | | | | 640 A 35 | SNC 236 | 35 NC 6 |
| | | 1.5736 | 36 NiCr 10 | | | 35 NiCr 9 | | SNC 631 (H) | 35 NC 11 |
| | | 1.6511 | 36 CrNiMo 4 | | 36 CrNiMo 4 | 38 NiCrMo 4 (KB) | 816 M 40 | | 40 NCD 3 |
| | | 1.6582 | 34 CrNiMo 6 | 1.6582 | 34 CrNiMo 6 | 35 NiCrMo 6 (KW) | 817 M 40 | SNCM 447 | 35 NCD 6 |
| | | 1.7033 | 34 Cr 4 | 1.7033 | 34 Cr 4 | 34 Cr 4 (KB) | 530 A 32 | SCR 430 (H) | 32 C 4 |
| | | 1.7035 | 41 Cr 4 | 1.7035 | 41 Cr 4 | 41 Cr 4 | 530 M 40 | SCR 440 (H) | 42 C 4 |
| | | 1.7218 | 25 CrMo 4 | 1.7218 | 25 CrMo 4 | 25 CrMo 4 (KB) | 708 M 25 | SCM 425 | 25 CD 4 S |
| | | 1.7225 | 42 CrMo 4 | 1.7225 | 42 CrMo 4 | 42 CrMo 4 | 708 M 40 | SCM 440 (H) | 42 CD 4 |
| | | 1.7361 | 32 CrMo 12 | | | 32 CrMo 12 | 722 M 24 | | 30 CD 12 |
| | | 1.8159 | 50 CrV 4 | 1.8159 | 50 CrV 4 | 51 CrV 4 | 735 A 50 | SUP 10 | 50 CV 4 |
| | | 1.8509 | 41 CrAlMo 7 | 1.8509 | 41 CrAlMo 7 10 | 41 CrAlMo 7 | 905 M 39 | SACM 645 | 40 CAD 6.12 |

Materiali Werkstoffmaterialien Matériaux Materiales Материалы

| SS | UNS | U.N.E. / I.H.A. | AISI-ASTM | GOST | ČSN | Trade Mark | Structure |
|---|---|---|---|---|---|---|---|
| 1311 | | | | 16D | | | |
| 1312, 1313 | | | A573 Grade 58 | 18kp | 11 378 | | |
| 1412, 1414 | | | A573 Grade 70 | St14kP | 11 448 | | |
| | G10100 | | 1010 | 10 | | | |
| 1350 | G10170 | F.1110 | 1015 | 15 | | | |
| 1450 | G10200 | | 1020, 1023 | 20 | 12 024 | | |
| 2172, 2132 | | | | 17G1S | 11 523 | | |
| 1912 | G12130 | | 1213 | | | AVP | |
| 1914 | G12134 | | 12 L 13 | | | | |
| | | | 1108 | | | | |
| | | | 11 L 08 | | | | |
| 1922 | | | | | | | |
| 1957 | G11400 | | 1140 | 40 | | | |
| 1973 | G11460 | | 1146 | | | | |
| | G12150 | | 12 L14 | | | AVZ | |
| | | | 11 L 37 | AS35G2 | | PR80 | |
| 1370 | G10170 | F.1511 | 1015 | 15 | | | |
| | G10250 | F.1120 | 1025 | 25 | | | |
| 1550 | G10350 | F.1130 | 1035 | 35 | 12 040 | | |
| 1650 | G10430 | F.5110 | 1045 | 45 | 12 050 | | |
| | | | 1040 | 40 | 12 041 | | |
| 1655 | | F.1150 | 1055 | 55 | | | |
| | G10600 | | 1060 | 60 | 12 061 | | |
| | G10390 | | 1039 | 40G | | | |
| | G13300 | | 1330 | 30G2 | | | |
| 1572 | G10340 | F.1135 | 1035 | 35 | | | |
| 1672 | G10420 | F.1140 | 1045 | 45 | 12 050 | | |
| 1665, 1678 | G10640 | F.1150 | 1064 | 60 | | | |
| | | | 1060 | 60 | | | |
| | | | | | | | |
| 2912 | | | A204 Grade A | | 15 020 | | |
| | G45200 | | 4520 | | | | |
| | G33106 | | 3310, 9314 | 20X2H4A | 16 420 | | |
| | | | 4320 | | 16 220 | | |
| | | | | | | | |
| 2511 | G51170 | F.1516 | 5115 | 12KHN2 | 14 220 | | |
| | | | | 18HG | | | |
| | G51200 | | 5120 | 20KH | 14 221 | | |
| | | | 5120 H | 20KH | | | |
| 2216 | | | A182-F11, A182-F12 | 12KHM | 15 121 | | |
| 2216 | | | A387 Grade 12 Cl. 2 | | | | |
| 2218 | J21890 | F.155 | A182-F22 | 12KH8 | 15 313 | | |
| 2085, 2090 | | F.144 | 9255 | 55S2 | | | |
| 2234 | T51620 | F.1250 | 4135 | 35KHM | | | |
| 2710 | T41901 | F.5241 | S1 | 5KHV2S | | | |
| | T61206 | | L6 | 5KHNV | | | |
| | | | 5045 | | | | |
| | | | 3135 | | | | |
| | | | 3435 | | | | |
| | G98400 | | 9840 | | | | |
| 2541 | G43400 | F.1280 | 4340 | 38H2N2MA | 16 343 | | |
| | G51320 | | 5132 | 35KH | | | |
| | G51400 | | 5140 | 40H | 14 140 | | |
| 2225 | G41300 | F.1251 | 4130 | 20KHM | 15 130 | | |
| 2244 | G41400 | F.1252 | 4142, 4140 | 38HM | 15 142 | | |
| 2240 | | | | | | | |
| 2230 | H61500 | F.143 | 6150 | 50KHFA | 15 260 | | |
| 2940 | K24065 | F.1740 | A355 Cl. A | | | | |

| Gr. | Materials | W.-Nr | DIN | EN-Nr. | EN | UNI | BS | JIS | AFNOR |
|---|---|---|---|---|---|---|---|---|---|
| P4 | High alloy steel<br>Rm 800÷1000 N/mm² | 1.1231 | Ck 67 | 1.1231 | C 67S | C 70 | 060 A 67 | | XC 68 |
| | | 1.1274 | Ck 101 | 1.1274 | C 100S | | 060 A 96 | SUP 4 | |
| | | 1.1545 | C 105 W1 | 1.1545 | C 105U | C 100 KU | | | Y1 105 |
| | | 1.1645 | C 105 W2 | | | C 100 KU | | SK 3 | Y1 105 |
| | | 1.1663 | C 125 W | | | C 120 KU | | SK 2 | Y2 120 |
| | | 1.2210 | 115 CrV 3 | 1.2210 | 107 CrV 3 | 107 CrV 3 KU | | | 100 C 3 |
| | | 1.2510 | 100 MnCrW 4 | | | 95 MnWCr 5 KU | BO 1 | SKS 3 | 90 MWCV 5 |
| | | 1.2842 | 90 MnCrV 8 | 1.2842 | 90 MnCrV 8 | 90 MnVCr 8 KU | BO 2 | | 90 MV 8 |
| | | 1.3505 | 100 Cr 6 | 1.3505 | 100 Cr 6 | 100 Cr 6 | 534 A 99 | SUJ 2 | 100 C 6 |
| | | | | | | | | | |
| P5 | Tool steel<br>Rm 900÷1200 N/mm² | 1.2080 | X 210 Cr 12 | 1.2080 | X 210 Cr 12 | X 210 Cr 13 KU | BD 3 | SKD 1 | Z 200 C 12 |
| | | 1.2311 | 40 CrMnMo 7 | | | | | | |
| | | 1.2312 | 40 CrMnMoS 86 | | | | | | |
| | | 1.2343 | X 38 CrMoV 5 1 | | | X 37 CrMoV 5 1 KU | BH 11 | SKD 6 | Z 38 CDV 5 |
| | | 1.2344 | X 40 CrMoV 5 1 | 1.2344 | X 40 CrMoV 5 1 | X 40 CrMo 5 1 1 KU | BH 13 | SKD 61 | Z 40 CDV 5 |
| | | 1.2363 | X 100 CrMoV 5 | 1.2363 | X 100 CrMoV 5 1 | X 100 CrMoV 5 1 KU | BA 2 | SKD 12 | Z 100 CDV 5 |
| | | 1.2365 | X 32 CrMoV 3 3 | | | 30 CrMoV 12 27 KU | BH 10 | SKD 7 | 32 DCV 28 |
| | | 1.2379 | X 155 CrVMo 12 1 | | | X 155 CrMo 12 KU | | | |
| | | 1.2436 | X 210 CrW 12 | | | X 215 CrW 12 1 KU | | SKD 2 | |
| | | 1.2601 | X 165 CrMoV 12 | | | X 165 CrMoW 12 KU | | | |
| | | 1.2713 | 55 NiCrMoV 6 | | | | | SKT 4 | 55 NCDV 7 |
| | | 1.2714 | 56 NiCrMoV 7 | | | 56 NiCrMoV 7 KU | | | |
| | | 1.3243 | S 6-5-2-5 | 1.3243 | HS 6-5-2-5 | HS 6-5-2-5 | | SKH 55 | Z 85 WDKCV 06-05-05-04-02 |
| | | 1.3247 | S 2-10-1-8 | 1.3247 | HS 2-10-1-8 | HS 2-9-1-8 | BM 42 | SKH 51 | Z 110 DKCWV 09-08-04 |
| | | 1.3255 | S 18-1-2-5 | 1.3255 | HS 18-1-2-5 | HS 18-1-1-5 | BT 4 | SKH 3 | Z 80 WKCV 18-05-04-01 |
| | | 1.3343 | S 6-5-2 | 1.3343 | HS 6-5-2 | HS 6-5-2 | BM 2 | SKH 9, SKH 51 | Z 85 WDCV 06-05-04-02 |
| | | 1.3348 | S 2-9-2 | 1.3348 | HS 2-9-2 | HS 2-9-2 | | SKH 58 | Z 100 DCWV 09-04-02-02 |
| | | 1.3355 | S 18-0-1 | 1.3355 | HS 18-0-1 | HS 18-0-1 | BT 1 | SKH 2 | Z 80 WCV 18-04-01 |
| P6 | High tensile strength steel<br>Rm 1200÷1480 N/mm²<br>HRC 38÷45 | 1.6546 | 40 NiCrMo 2 2 | 1.6546 | 40 NiCrMo 2 KD | 40NiCrMo2 | 311 - Type 7 | SNCM 240 | 40 NCD 2 |
| | | 1.7045 | 42 Cr 4 | 1.7045 | | 41Cr4 | 530 A 40 | SCR 440 | 42 C 4 TS |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| P7 | Ferritic - Martensitic stainless steel | 1.4000 | X 6 Cr 13 | 1.4000 | X 6 Cr 13 | X 6 Cr 13 | 403 S 17 | SUS 403 | Z 6 C 12 |
| | | 1.4006 | X 10 Cr 13 | 1.4006 | X 12 Cr 13 | X 12 Cr 13 | 410 S 21 | SUS 410 | Z 10 C 13 |
| | | 1.4016 | X 6 Cr 17 | 1.4016 | X 6 Cr 17 | X 8 Cr 17 | 430 S 15 | SUS 430 | Z 8 C 17 |
| | | 1.4021 | X 20 Cr 13 | 1.4021 | X 20 Cr 13 | X 20 Cr 13 | 420 S 37 | SUS 420 J 1 | Z 20 C 13 |
| | | 1.4031 | X 40 Cr 13 | 1.4031 | X 39 Cr 13 | X 40 Cr 14 | 420 S 45 | SUS 420 | Z 40 C 14 |
| | | 1.4109 | X 65 CrMo 14 | 1.4109 | X 70 CrMo 15 | | | SUS 440 A | Z 70 D 14 |
| | | 1.4112 | X 90 CrMoV 18 | 1.4112 | X 90 CrMoV 18 | X CrTi 12 | 409 S 19 | SUS 440 B | Z 2 CND 18 05 |
| | | 1.4125 | X 105 CrMo 17 | 1.4125 | X 105 CrMo 17 | X 105 CrMo 17 | | SUS 440 C | Z 100 CD 17 |
| | | 1.4313 | X 5 CrNi 13 4 | 1.4313 | X 5 CrNiMo 13 3 | X 6 CrNi 13 04 | 425 C 11 | SCS 5 | Z 5 CN 13.4 |
| | | 1.4749 | X 18 CrN 28 | 1.4749 | X 18 CrN 28 | | | | Z 18 C 25 |
| P8 | PH stainless steel | 1.4534 | X 3 CrNiMoAl 13 8 2 | 1.4534 | X 6 NiCrTiMoV 25 15 | | | | |
| | | 1.4540 | X 4 CrNiCuNb 16 4 | 1.4540 | X 4 CrNiCuNb 16 4 | Z 4 CNUNb 16.4 M | | | Z 4 CNUNb 16.4 M |
| | | 1.4548 | X 5 CrNiCuNb 17 4 | 1.4548 | X 5 CrNiCuNb 17 4 | Z 6 CNU 17.4 | | SCS 24, SUS 630 | |
| | | 1.4568 | X 7 CrNiAl 17 7 | 1.4564 | X 3 CrNiMoAl 13 8 2 | X 7 CrNiAl 17 7 | 301 S 81 | SUS 631 | Z 9 CAN 17.7 |
| | | 1.6356 | X 2 NiCoMoTi 18 12 4 | 1.6356 | X 2 NiCoMoTi 18 12 4 | | | | |

Materiali Werkstoffmaterialien Matériaux Materiales Материалы

| SS | UNS | U.N.E. / I.H.A. | AISI-ASTM | GOST | ČSN | Trade Mark | Structure |
|---|---|---|---|---|---|---|---|
| 1770 | G10700 | F.5103 | 1070 | 70 | | | |
| 1870 | G10950 | F.5117 | 1095 | | | | |
| 1880 | | F.5118 | W1 | U10A | | | |
| | | | | U10 | | | |
| | | | W1 | U13 | | | |
| | T61202 | F.520L | L2 | 11KHF | | | |
| 2140 | T31501 | F.5220 | O1 | 9KHVG | | | |
| | T31502 | | O2 | 9G2F | | K720 | |
| 2258 | G51986 | F.5230 | 52100 | SHKH15 | 14 109 | | |
| | | | | | | TOOLOX 33 | |
| | T30403 | F.5212 | D3 | KH12 | | K100 | |
| | | | | | | M201 | |
| | | | | | | M200 - HOLDAX | |
| | T20811 | | H11 | 4KH5MFS | | VIDAR - W300 | |
| 2242 | T20813 | F.5318 | H13 | 4KH5MF1S | | ORVAR - W302 | |
| 2260 | T30102 | F.5227 | A2 | 9KH5VF | | | |
| | T20810 | | H10 | 3KH3M3F | | W320 | |
| | | | | | | K110 | |
| 2312 | | F.5213 | | KH12 | | | |
| 2310 | | | | KH12MF | | | |
| | T61206 | F.520.S | L6 | 5KHNM | | | |
| | | | L6 | | | W500 | |
| 2723 | | F.5613 | M35 | R6M5K5 | | | |
| | T11342 | | M42 | R2AM9K5 | | | |
| | T12004 | | T4 | R18K5F2 | | | |
| 2722 | T11302 | F.5603 | M2 | R6M5 | | S600 | |
| 2782 | T11307 | | M7 | | | | |
| | T12001 | | T1 | R18 | | | |
| | G86400 | | 8640 | | | Monix | |
| 2245 | | | 5140 | | | | |
| | | | | | | HARDOX 400® | |
| | | | | | | HARDOX 450® | |
| | | | | | | TOOLOX 40® | |
| | | | | | | TOOLOX 44® | |
| 2301 | S41008 | | 403 | 08KH13 | | | Ferritic |
| 2302 | S41000 | F.3401 | 410, CA-15 | 12KH13 | | | Martensitic |
| 2320 | S43000 | F.3113 | 430 | 12KH17 | | | Ferritic |
| 2303 | S42000 | F.5261 | 420 | 20KH13 | 17 022 | | Martensitic |
| 2304 | S40280 | F.3404 | 420 C | 40KH13 | | | Martensitic |
| | S44002 | | 440 A | | | | Martensitic |
| 2327 | S44003 | | 440 B | 95KH18 | | | Martensitic |
| | S44004 | | 440 C | 95KH18 | | | Martensitic |
| 2385 | S41500 | | A182 F6NM | | | | Martensitic |
| 2322 | S44600 | | 446 | 15KH28 | | | Ferritic |
| | S13800 | | XM-13 | | | PH13-8 Mo | Austenitic |
| | S15500 | | XM-12 | | | 15-5-PH | Martensitic |
| | S17400 | | 630 | | | 17-4-PH | Martensitic |
| 2388 | S17700 | | 631 | 09KH17N7YU1 | | 17-7-PH | Austenitic/Ferritic |
| | K93160 | | AMS 6515 | | | | Martensitic |

Materiali Werkstoffmaterialien Matériaux Materiales Материалы



| Gr. | Materials | W.-Nr | DIN | EN-Nr. | EN | UNI | BS | JIS | AFNOR |
|---|---|---|---|---|---|---|---|---|---|
| M1 | Austenitic stainless steel (good machinability) | 1.4300 | X 12 CrNi 18 8 | 1.4300 | X 12 CrNi 18 8 | | 302 S 25 | SUS 302 | Z 12 CN 18 |
| | | 1.4301 | X 5 CrNi 18 10 | 1.4301 | X 5 CrNi 18 10 | X 5 CrNi 18 11 | 304 S 31 | SUS 304 | Z 6 CN 18.09 |
| | | 1.4305 | X 10 CrNiS 18 9 | 1.4305 | X 10 CrNiS 18 9 | X 10 CrNi 18 09 | 303 S 31 | SUS 303 | Z 10 CNF 18.09 |
| | | 1.4306 | X 2 CrNi 19 11 | 1.4306 | X 2 CrNi 19 11 | X 3 Cr Ni 18 11 | 304 S 12 | SUS 304 L | Z 2 CN 18.10 |
| | | 1.4310 | X 12 CrNi 17 7 | 1.4310 | X 9 CrNi 18 8 | X 12 CrNi 17 07 | 301 S 21 | SUS 301 | Z 12 CN 17.07 |
| | | 1.4550 | X 6 CrNiNb 18 10 | 1.4550 | X 6 CrNiNb 18 10 | X 6 CrNiNb 18 11 | 347 S 31 | SUS 347 | Z 6 CNNb 18.10 |
| M2 | Austenitic stainless steel (medium machinability) and Duplex | 1.4311 | X 2 CrNiN 19 11 | 1.4311 | X 2 CrNiN 18 10 | X 2 CrNiN 18 11 | 304 S 62 | SUS 304 LN | Z 2 CN 18 .10 Az |
| | | 1.4335 | X 12 CrNi 25 21 | 1.4335 | X 12 CrNi 25 21 | X 6 CrNi 26 20 | 310 S 24 | SUH 310, SUS 310 S | Z 12 CN 25.20 |
| | | 1.4401 | X 5 CrNiMo 17 12 2 | 1.4401 | X 5 CrNiMo 17 12 2 | X 5 CrNiMo 17 12 | 316 S 31 | SUS 316 | Z 3 CND 17.11.1 |
| | | 1.4417 | X 2 CrNiMoSi 19 5 | 1.4424 | X 2 CrNiMoSi 19 5 | | | | Z 2 CND 18.05.03 |
| | | 1.4429 | X 2 CrNiMoN 17 13 3 | 1.4429 | X 2 CrNiMoN 17 13 3 | X 2 CrNiMoN 17 13 3 | 316 S 62 | SUS 316 LN | Z 2 CND 17.13 Az |
| | | 1.4435 | X 2 CrNiMo 18 14 3 | 1.4435 | X 2 CrNiMo 18 14 3 | X 2 CrNiMo 17 13 2 | 316 S 12 | SCS 16, SUS 316 L | Z 2 CND 17.13 |
| | | 1.4438 | X2 CrNiMo 18 16 | | | X2CrNiMo18 16 | 317 S 12 | SUS 317 L | Z 2 CND 19.15 |
| | | 1.4460 | X 4 CrNiMo 27 5 2 | 1.4460 | X 3 CrNiMo 27 5 2 | X 3 CrNiMo 27 5 2 | | SUS 329 J 1 | Z 3 CND 25.7 Az |
| | | 1.4462 | X 2 CrNiMoN 22 5 | 1.4462 | X 2 CrNiMoN 22 5 3 | X 2 CrNiMoN 22 5 | 332 S 15 | | Z 2 CND 22.05 Az |
| | | 1.4466 | X 5 CrNi 18 15 | 1.4466 | X 3 CrNiMo 18 12 3 | X 5 CrNi 18 15 | 317 S 16 | SUS 317 | |
| | | 1.4541 | X10 CrNiTi 18 9 | 1.4541 | | X6CrNiTi18 11 | 321 S 12 | SUS 321 | Z 6 CND 18.10 |
| | | 1.4550 | X 6 CrNiNb 18 10 | 1.4550 | X 6 CrNiNb 18 10 | X 6 CrNiNb 18 11 | 347 S 31 | SUS 347 | Z 6 CNNb 18.10 |
| | | 1.4571 | X10 CrNiMoTi 18 10 | | | X6CrNiMoTi 17 12 | 320 S 17 | - | Z 6 CNDT 17.12 |
| | | 1.4893 | X 9 CrNiSiNCe 21 11 2 | 1.4835 | X 9 CrNiSiNCe 21 11 2 | | 310 S 31 | | |
| M3 | Super austenitic stainless steel and super Duplex | 1.4410 | X 2 CrNiMoN 25 7 4 | 1.4410 | X 2 CrNiMoN 25 7 4 | X 2 CrNiMoN 25 7 4 | | | Z 3 CND 25.07 Az |
| | | 1.4501 | X 2 CrNiMoCuWN 15 7 4 | | | X 2 CrNiMoCuWN 15 7 4 | | | |
| | | 1.4529 | X 1 CrNiMoN 20 18 7 | 1.4547 | X 1 CrNiMoN 20 18 7 | X 1 CrNiMoN 20 18 7 | | | Z 1 CNDU 20.18.05 Az |
| | | 1.4539 | X 2 NiCrMoCu 25 20 5 | 1.4539 | X 2 NiCrMoCu 25 20 5 | | 904 S 13 | | Z 2 NCDU 25 20 |
| | | 1.4652 | X 2 CrNiMoN 25 22 7 | 1.4652 | X 1 CrNiMoN 25 22 8 | | | | |
| | | 1.4876 | X 10 NiCrAlTi 32 20 | 1.4876 | X 10 NiCrAlTi 32 20 | | | NCF 800 | Z 10 NC 32.21 |
| | | 1.4943 | X 4 NiCrTi 25 15 | 1.4980 | X 5 CrNiCuNb 16 4 | | HR 51 | SUH 660 | Z 6 NCTDV 25.15 |
| K1 | Grey cast iron 150 ÷ 250 HB | 0.6015 | GG-15 | 5.1200 | EN-GJL-150 | G15 | Grade 150 | FC 150 | Ft 15 D |
| | | 0.6020 | GG-20 | 5.1300 | EN-GJL-200 | G20 | Grade 220 | FC 200 | Ft 20 D |
| | | 0.6025 | GG-25 | 5.1301 | EN-GJL-250 | G25 | Grade 260 | FC 250 | Ft 25 D |
| | | 0.6027 | GG-220 HB | | EN-GJL-215 | | | | |
| | | 0.6035 | GG-35 | 5.1303 | EN-GJL-350 | G35 | Grade 350 | FC 350 | Ft 35 D |
| K2 | Nodular cast iron 150 ÷ 350 HB | 0.7033 | GGG 35.3 | 5.3100 | EN-GJS-350-22 | | Grade 350/22 | FCD 350-22L | FGS 370-17 |
| | | 0.7040 | GGG 40 | 5.3106 | EN-GJS-400-15 | GS400-12 | Grade 420/12 | | FGS 400-12 |
| | | 0.7043 | GGG 40.3 | 5.3105 | EN-GJS-400-18 | GSO 42/17 | Grade 370/17 | FCD 400-18L | FGS 370-17 |
| | | 0.7050 | GGG 50 | 5.3200 | EN-GJS-500-7 | GS500-7 | Grade 500/7 | FCD 500-7 | FGS 500-7 |
| | | 0.7060 | GGG 60 | 5.3201 | EN-GJS-600-3 | GS600-3 | Grade 600/3 | FCD 600-3 | FGS 600-3 |
| | | 0.7070 | GGG 70 | 5.3300 | EN-GJS-700-2 | GS700-2 | Grade 700/2 | FCD 700-2 | FGS 700-2 |
| | | 0.8155 | GTS-55-04 | | EN-GJMB-550-4 | P 55-04 | P 540/5 | PCMP55-04 | P 540/5 |
| | | 0.9990 | GGV-40 | 5.2201 | EN-GJV-400 | | | | |
| | | | GGV-45 | 5.2300 | EN-GJV-450 | | | | |
| | | | GGV-50 | 5.2301 | EN-GJV-500 | | | | |
| K3 | ADI cast iron 250 ÷ 500 HB | | GJS-800-8 | 5.3301 | EN-GJS-800-8 | | | | |
| | | | GJS-1000-5 | | EN-GJS-1000-5 | | | | |
| | | | GJS-1200-2 | | EN-GJS-1200-2 | | | | |
| | | | GJS-1400-1 | 5.3405 | EN-GJS-1400-1 | | | | |
| K4 | Austenitic cast iron 120 ÷ 260 HB | 0.6655 | GGL-NiCuCr 15 6 2 | | EN-GJLA-XNiCuCr 15-6-2 | | Grade F1 | | FGL Ni15 Cu6 Cr2 |
| | | 0.6660 | GGL-NiCr 20 2 | | EN-GJLA-XNiCr 20-2 | | Grade F2 | | FGL Ni20 Cr2 |
| | | 0.6676 | GGL-NiCr 30 3 | | EN-GJLA-XNiCr 30-3 | | Grade F3 | | FGL Ni30 Cr3 |
| | | 0.7652 | GGG-NiMn 13 7 | | EN-GJSA-XNiMn 13-7 | | Grade S6 | | FGS Ni13 Mn7 |
| | | 0.7660 | GGG-NiCr 20 2 | 5.3500 | EN-GJSA-XNiCr 20-2 | | Grade S2 | | FGS Ni20 Cr2 |
| | | 0.7673 | GGG-NiMn 23 4 | | EN-GJSA-XNiMn 23-4 | | Grade S2M | | FGS Ni23 Mn4 |
| | | 0.7676 | GGG-NiCr 30 3 | 5.3507 | EN-GJSA-XNiCr 30-3 | | Grade S3 | | FGS Ni30 Cr3 |
| | | 0.7683 | GGG-Ni 35 | 5.3504 | EN-GJSA-XNi 35 | | | | FGS Ni35 |

Materiali Werkstoffmaterialien Matériaux Materiales Материалы

| SS | UNS | U.N.E. / I.H.A. | AISI-ASTM | GOST | ČSN | Trade Mark | Structure |
|---|---|---|---|---|---|---|---|
| 2331 | S30200 | | 302 | 12KH18N9 | | | Austenitic |
| 2333 | S30400 | F.3504 | 304 | 08KH18N10 | 17 240 | | Austenitic |
| 2346 | S30300 | F.3508 | 303 | 12KH19N9 | | | Austenitic |
| 2352 | S30403 | F.3504 | 304 L | 03KH18N11 | | | Austenitic |
| | S30100 | F.3517 | 301 | 07KH16N6 | | | Austenitic |
| 2338 | S34700 | | 347 | 08KH18N12B | | | Austenitic |
| 2371 | S30453 | F.3541 | 304 LN | 03KH18N11 | | | Austenitic |
| 2361 | S31008 | | 310 S | 12KH25N20 | | | Austenitic |
| 2347 | S31600 | F.3534 | 316 | 08KH17H13M2T | 17 346 | | Austenitic |
| 2376 | S31500 | | | | | | Duplex |
| 2375 | S31653 | | 316 LN | 03KH16N15M3 | | | Austenitic |
| 2353 | S31603 | F.3533 | 316 L | 03KH17N14M3 | 17 349 | | Austenitic |
| 2367 | | | 317 L | | | | Austenitic |
| 2324 | S32900 | | 329 | | | | Duplex |
| 2377 | S31803 | | 329 LN | | | | Duplex |
| 2366 | S31700 | | 317 | 08KH17H15M3T | | | Austenitic |
| 2337 | | | 321 | | | | Austenitic |
| 2338 | S34700 | F.3524 | 347 | 08KH18N12B | | | Austenitic |
| 2350 | | | 316 Ti | | | | Austenitic |
| 2368 | S30815 | | | | | | Austenitic |
| 2328 | S32750 | | F 53 | | | | Super duplex |
| | S32760 | | F 55-329 S | | | | Super duplex |
| 2778 | S31254 | | | | | | Super Austenitic |
| 2562 | N08904 | | 904L | | | | Super Austenitic |
| | S32654 | | | | | | Super Austenitic |
| | N08800 | | | | | Alloy 800 | Austenitic |
| 2570 | S66286 | | 660 | | | A286 | Austenitic |
| 01 15-00 | F11601 | | A48 25 B | Sc 15 | 422 415 | | Lamellar |
| 01 20-00 | F12101 | | A48 30 B | Sc 20 | 422 420 | | Lamellar |
| 01 25-00 | F12401 | | A48 35 B | Sc 25 | 422 425 | | Lamellar |
| 02 19 | | | | | | | Lamellar |
| 01 35-00 | F13502 | | A48 50 B | Sc 35 | | | Lamellar |
| 07 17-15 | | | | | 422 303 | | Nodular |
| 07 17-02 | | FGE 38-17 | | Vc 42-12 | 422 304 | | Nodular |
| 07 17-12 | F32800 | | 60-40-18 | Vc 42-12 | 422 314 | | Nodular |
| 07 27-02 | F33800 | FGE 50-7 | A536, 80-55-06 | Vc 50-2 | 422 305 | | Nodular |
| 07 32-03 | F34100 | FGE 60-2 | A476, 80-60-03 | Vc 60-2 | 422 306 | | Nodular |
| 07 37-01 | F34800 | FGE 70-2 | A536, 100-70-03 | Vc 70-2 | 422 307 | | Nodular |
| 08 54-00 | F24130 | | A220 60004 | | | | Malleable |
| | | | Grade 400-15 | | | | Vermicular |
| | | | Grade 450 | | | | Vermicular |
| | | | Grade 500 | | | | Vermicular |
| | ADI grade 1 | | 850/550/10 | | | ADI 800 | Ductile austempered |
| | ADI grade 2 | | 1050/700/7 | | | ADI 1000 | Ductile austempered |
| | ADI grade 3 | | 1200/850/4 | | | ADI 1200 | Ductile austempered |
| | ADI grade 4 | | 1400/1100/1 | | | ADI 1400 | Ductile austempered |
| | F41000 | | A436 Type 1 | | | Ni-Resist 1 | Lamellar |
| 05 23-00 | F41002 | | A436 Type 2 | | | Ni-Resist 2 | Lamellar |
| | F41004 | | A436 Type 3 | | | Ni-Resist 3 | Lamellar |
| 07 72-00 | | | | | | Nodumag | Nodular |
| | F43000 | | A436 Type D-2 | | | Ni-Resist D-2 | Nodular |
| | F43010 | | A439 Type D-2M | | | Ni-Resist D-2M | Nodular |
| | F43003 | | A436 Type D-3 | | | Ni-Resist D-3 | Nodular |
| | F43006 | | A439 Type D-5 | | | Ni-Resist D-5 | Nodular |

INFO

CARBIDE DRILLS

PU/HPU
TA/4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

| Gr. | Materials | W.-Nr | DIN | EN-Nr. | EN | UNI | BS | JIS | AFNOR |
|---|---|---|---|---|---|---|---|---|---|
| N1 | Aluminium alloy < 12% Si | 3.0205 | Al 99 | | | 9001/1 | 1C | A1x3 | A4 |
| | | 3.0255 | Al99.5 | Al99.5 | AW-1050A | 9001/2 | 1B | (A1050) | A-5/1050A |
| | | 3.0505 | AlMn0,5Mg0,5 | | | | N31 | | |
| | | 3.0517 | AlMn1Cu | AlMn1Cu | AW-3003 | | | A3003 | A-M1/3003 |
| | | 3.0615 | AlMgSiPb | | | | | | ASGPB |
| | | 3.1255 | AlCuSiMn | AlCuSiMn | AW-2014 | | H15 | | A-U4SG |
| | | 3.1305 | AlCuMg0,5 | | | 9002/1 | L86 | | AU2G |
| | | 3.1325 | AlCuMg 1 | | | 9002/2 | (H14) | A3x2 | AU4G |
| | | 3.1355 | AlCuMg 2 | | | 9002/4 | DTD5090 | A3x4 | AU4G1 |
| | | 3.1645 | AlCuMgPb | | | 9002/8 | - | - | AU4Pb |
| | | 3.1655 | AlCuBiPb | AlCuBiPb | AW-2011 | | FC1 | A2011 | A-U5PbBi |
| | | 3.2161 | G-AlSi8Cu3 | AlSi8Cu3(Si) | AC-46200 | | | | |
| | | 3.2315 | AlSi1MgMn | AlMgSi1 | AW-6082 | 90006/4 | H30 | | A-SGM0.7 |
| | | 3.2341 | G-AlSi5Mg | | AC-42000 | 3599 | LM25 | AC 4C | A-S7G |
| | | 3.2381 | G-AlSi10Mg | AlSi10Mg(Fe) | AC-43400 | | LM9 | | A-S10G |
| | | 3.2383 | G-AlSi10Mg (Cu) | | 43200 | | (LM9) | | A-S10UG |
| | | 33.206 | AlMgSi0.5 | AlMgSi0.5 | AW-6060 | | (H9) | | A-GS/6060 |
| | | 3.3210 | AlMgSi0.7 | AlMgSi0.7 | AW-6063 | | (H10) | (A6063) | A-GSUC/6061 |
| | | 3.3211 | AlMg1SiCu | | | 9006/2 | H20 | A2x4 | AGSUC |
| | | 3.3315 | AlMg1 | AlMg1 | AW-5005 | | N41 | | A-G0.6 |
| | | 3.3316 | AlMg1,5 | | | 9005/7 | | | |
| | | 3.3523 | AlMg2,5 | | | 9005/2 | | A2x1 | AG2,5C |
| | | 3.3535 | AlMg3 | | | 9005/8 | N5/N56 | | AG3 |
| | | 3.3547 | AlMg4.5Mn0.7 | | | 9005/5 | N8 | A2x7 | AG4,5MC |
| | | 3.3555 | AlMg5 | | | | N6 | | A-G5 |
| | | 3.4335 | AlZn4.5Mg1 | AlZn4.5Mg1 | AW-7020 | | H17 | | A-Z5G |
| | | 34.365 | AlZn5.5MgCu | | AW-7075 | 9007/2 | 2L95 | A7075 | A-Z5GU |
| | | 3.5612 | G-MgAl6Zn | MgAl6Zn | MG-P-63 | | MAG-E-121 | | G-A6-Z1 |
| | | 3.5812 | G-MgAl8Zn | MgAl8Zn | MG-P-61 | | | | (G-A7-Z1) |
| N2 | Aluminium alloy > 12% Si and Aluminium-Magnesium | 32.382 | G-AlSi12 | AlSi12 | AC-44200 | 4514 | LM6 | AC3A | AS 13 |
| | | 3.2583 | G-AlSi12 (Cu) | AlSi12 (Cu) | AC-47000 | | LM20 | Al-Si12Cu | |
| | | 3.5101 | G-MgZn4SE1Zr1 | | | | MAG5 | | G-Z4TR |
| | | 3.5102 | G-MgZn5Th2Zr1 | | | | | | |
| | | 35.103 | G-MgSe3Zn2Zr1 | MgSe3Zn2Zr1 | MN65120 | | MAG6-TE | | ZRE1 |
| | | 3.5106 | G-MgAg3SE2Zr1 | | | | MAG 12 | | G-Ag22,5 |
| | | 3.5312 | G-MgAl3Zn | | | | MAG-E-111 | | |
| | | 3.5912 | G-MgAl9Zn1 | | | | MAG7 | | G-A9Z1 |
| N3 | Copper alloy | 2.0040 | OF Cu | | CW008A | | C103 | C1020 | Cu/c1 |
| | | 2.0060 | E-Cu57 | | CW004A | E-Cu57 | C101 | C1100 | Cu/a1 |
| | | 2.0070 | SE Cu | | CW021A | | | | |
| | | 2.0090 | SF Cu | | CW024A | | C106 | C1220 | Cu/b |
| | | 2.0240 | CuZn15 | CuZn15 | CW502L | | CZ102 | C2300 | CuZn15 |
| | | 2.0321 | CuZn37 | | CW508L | | CZ108 | | CuZn37 |
| | | 2.0401 | CuZn39Pb3 | CuZn39Pb3 | CW614N | | CZ121 | | CuZn39Pb3 |
| | | 2.0402 | CuZn40Pb2 | CuZn40Pb2 | CW612N | | CZ120 | | CuZn39Pb2 |
| | | 20.530 | CuZn38Sn1 | CuZn38Sn1 | CW717R | | | | |
| | | 2.0790 | CuNi18Zn19Pb | CW408J | | | | | CuNi18Zn19Pb1 |
| | | 2.0872 | CuNi10Fe1Mn | CuNi10Fe1Mn | | | CN102 | | CuNi10Fe1Mn |
| | | 2.0940 | CuAl10Fe | | CC331G | | AB1 | | CuAl10Fe |
| | | 2.0975 | CuAl10Ni | | CC333G | | AB2 | | CuAl10Ni5Fe5 |
| | | 2.1050 | CuSn10 | | CC480K | | CT1 | | CuSn10 |
| | | 2.1087 | CuSn10Zn | | | | | | |
| | | 2.1176 | CuPb10Sn | | CW352H | | LB2 | | CuSn10Pb10 |
| | | 2.1202 | SB Cu | | | | C107 | | |

Materiali Werkstoffmaterialien Matériaux Materiales Материалы

| SS | UNS | U.N.E. / I.H.A. | AISI-ASTM | GOST | ČSN | Trade Mark | Structure |
|---|---|---|---|---|---|---|---|
| 4010 | | | A1200 | | | | |
| 4007 | AA1050A | | A1050/1050A | | | | |
| | | | 3105 | | | | |
| | AA3003 | | | | | Aluman 100 | |
| | | | 6012 | | | | |
| 4338 | AA2014 | | 2014 | | | Avional 660 | |
| | | | 2117 | | | Avional 050 | |
| | | | 2017 | | | Avional 100 | |
| | | | 2024 | | | Avional 150 | |
| 4335 | | | 2030 | | | | |
| 4355 | AA2011 | | 2011 | | | Recidal 11 | |
| 4251 | A13800 | | A380 | | | | |
| 4212 | A96082 | | 6082 | | | Anticorodal 100 | |
| 4244 | | | B26 | | | | |
| 4253 | A13600 | | B85 | | | | |
| | | | | | | | |
| 4103 | AA6060 | | | | | Anticorodal 063 | |
| 4104, 4107 | AA6005 | | | | | | |
| | | | 6061 | | | Anticorodal 061 | |
| 4106 | AA5005 | | | | | Peraluman 080 | |
| | | | 5050 | | | Peraluman 150 | |
| 4120 | | | 5052 | | | Peraluman 250 | |
| | | | 5154 | | | Peraluman 350 | |
| 4140 | A95083 | | 5083 | | | Peraluman 440 | |
| | | | 5056 | | | Peraluman 500 | |
| 4425 | AA7020 | | 7020 | | | | |
| | A97075 | | 7075 | B95 | | Ergal | |
| | M11600 | | AZ61A | | | | |
| | | | AZ80A | | | | |
| | | | A413.2 | | | | |
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| | M12330 | | AMS 4442 | | | | |
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| | | | AZ31B | | | | |
| | | | | | | | |
| | C10200 | | | | | | |
| | C11000 | | | | | | |
| | C10300 | | | | | | |
| | C12200 | | | | | | |
| 5112 | C23000 | | | L90 | | | |
| 5150 | C27200 | | | | | | |
| 5170 | C38500 | | | | | | |
| 5168 | C37800 | | | | | | |
| | C46400 | | | LO60-1 | | | |
| | C76300 | | | | | | |
| 5667 | C70600 | | | | | | |
| 5710 | C95200 | | CA952 | BrA9ZH3L | | | |
| 5716 | C95500 | | CA955 | BrA10ZH4N4L | | | |
| 5443 | C90700 | | | | | | |
| 5458 | C90500 | | | | | | |
| 5640 | C93700 | | CA937 | | | | |
| | C14200 | | | | | | |

| Gr. | Materials | W.-Nr | DIN | EN-Nr. | EN | UNI | BS | JIS | AFNOR |
|---|---|---|---|---|---|---|---|---|---|
| N4 | Brass alloy and Bronze alloy | 2.0220 | CuZn5 | | CW500L | | CZ125 | C2100 | |
| | | 2.0230 | CuZn10 | | CW501L | | CZ101 | C2200 | |
| | | 2.0250 | CuZn20 | | CW503L | | CZ103 | C2400 | |
| | | 2.0265 | CuZn30 | | CW505L | | CZ106 | C2600 | |
| | | 2.0331 | CuZn36Pb1.5 | | CW600N | | CZ119 | C3501 | |
| | | 2.0360 | CuZn40 | | CW509L | | CZ109 | C2800 | |
| | | 2.0372 | CuZn39Pb0.5 | | CW610N | | CZ123 | | |
| | | 2.0375 | CuZn36Pb3 | | CW603N | | CZ124 | C3601 | |
| | | 2.0380 | CuZn39Pb2 | | CW612N | | CZ 131 | C3771 | |
| | | 2.0401 | CuZn39Pb3 | 12164 | CW614N | 5705 | CZ121 | C3603 | |
| | | 2.0402 | CuZn40Pb2 | | CW617N | | CZ122 | | |
| | | 2.0410 | CuZn44Pb2 | CuZn44Pb2 | CW622N | | CZ104 | | |
| | | 2.0460 | CuZn20Al2 | | | | CZ110 | | |
| | | 2.0470 | CuZn28Sn1 | CuZn28Sn1 | CW706R | | | | CuZn29Sn1 |
| | | 2.0932 | CuAl8Fe3 | | CW303G | | | | |
| | | 2.0966 | CuAl10Ni5Fe4 | | CW307G | | CA104 | | |
| | | 2.1010 | CuSn2 | | | | - | - | |
| | | 2.1016 | CuSn4 | | | | PB101 | C5111 | |
| | | 21.020 | CuSn6 | CuSn6 | CW452K | | PB103 | C5191 | CuSn6 |
| | | 2.1030 | CUSn8 | | | | PB104 | C5212 | |
| N5 | Plastic material | | | | | | | | |
| N6 | Carbon fiber and composite | | | | | | | | |
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| | | | | | | | | | |
| S1 | Heat resistant super alloy (HRSA) Ni base (good machinability) < 25 HRC | 1.4980 | | | | | | | Z3NCT25 |
| | | 2.4617 | | | | | | | NiMo28 |
| | | | NiCr17Mo17Few | | | | | | NC17DWY |
| | | 2.4816 | NiCr15Fe | | | | | | NC15Fe |
| | | 2.4851 | NiCr23Fe | | | | | | NC15FeA |
| | | 2.4856 | NiCr22Mo9Nb | | | | | | NC22DNb |
| | | | | | | | | | |
| | | 2.4669 | NiCr 15 Fe 7 TiAl | | | | HR505 | | NC19FeNB |
| S2 | Heat resistant super alloy (HRSA) Ni base (medium machinability) 25 ÷ 35 HRC | | | | | | | | |
| | | 1.4876 | X10NiCrAlTi32-21 | | | | 3075 | | |
| | | 2.4858 | NiCr21Mo | | | | | | NC21FeDU |
| | | 2.4665 | NiCr22FeMo | | | | HR6,204 | | NC22FeD |
| | | 2.4856 | NiCr22Mo9Nb | | | | | | NC22DNb |
| | | 2.4856 | NiCr22Mo9Nb | | | | | | NC22DNb |
| | | 2.4668 | NiCr19Fe19NbMo | | | | HR8 | | Nc19FeNb |
| | | 2.4668 | NiCr19Fe19NbMo | | | | HR8 | | Nc19FeNb |
| | | 2.4630 | NiCr20Ti | | | | HR5,203-4 | | NC20T |
| | | 2.4631 | NiCr20TiAl | | | | HR401,601 | | NC20TA |
| | | 2.4654 | NiCr20Co14MoTi | | | | | | NC20K14 |
| S3 | Heat resistant super alloy (HRSA) Ni base (low machinability) 35 ÷ 45 HRC | | | | | | | | |
| | | 2.4654 | NiCr20Co14MoTi | | | | | | NC20K14 |
| | | 2.4668 | NiCr19Fe19NbMo | | | | HR8 | | Nc19FeNb |
| | | 2.4669 | NiCr 15 Fe 7 TiAl | | | | HR505 | | NC19FeNB |
| | | | NiW13Co10Cr9AlTi | | | | | | |
| | | | NiCo10W10Cr9AlTi | | | | | | |
| | | | | | | | | | |
| | | | NiCr18cCoMoAlTi | | | | | | NCK19DAT |
| | | | NiCo15Cr15MoAlTi | | | | | | NCKD20AT |

| SS | UNS | U.N.E. / I.H.A. | AISI-ASTM | GOST | ČSN | Trade Mark | Structure |
|---|---|---|---|---|---|---|---|
| | C21000 | | | | | | |
| | C22000 | | | | | | |
| | C24000 | | | | | | |
| | C26000 | | | | | | |
| | C34000 | | | | | | |
| | C28000 | | | | | | |
| | C36500 | | | | | | |
| | C36000 | | | | | | |
| | C37700 | | | | | | |
| | C38500 | | | | | OT-58 | |
| | C38000 | | | | | | |
| 5272 | C68700 | | | LAMsh77-2-0.05 | | | |
| | C68700 | | | | | | |
| 5220 | C44300 | | | LOMsh70-1-0.05 | | | |
| | C61400 | | | | | | |
| | C63000 | | | | | | |
| | C50700 | | | | | | |
| | C51100 | | | | | | |
| 5428 | C51900 | | | BrOF6.5-0.15 | | | |
| | C52100 | | | | | | |
| | | | | | | | Polycarbonate |
| | | | | | | | E-glass |
| | | | | | | | Epoxy |
| | | | | | | | HTA |
| | | | | | | | HX |
| | | | | | | | Kevlar |
| | | | | | | | PEEK |
| | | | | | | | PPS |
| | | | | | | | T300 |
| | | | | | | | T700 |
| | | | | | | | T800 |
| | | | 5725 | | | Discalloy | HRSA Iron-based |
| | N10665 | | | | | Hastelloy B-2 | HRSA Nickel-based |
| | N10002 | | | | | Hastelloy C (casting) | HRSA Nickel-based |
| | N06600 | | | | | Inconel 600 | HRSA Nickel-based |
| | N06601 | | | | | Inconel 601 | HRSA Nickel-based |
| | N06625 | | | | | Inconel 625 (casting) | HRSA Nickel-based |
| | | | | | | Inconel 706 | HRSA Nickel-based |
| | N07750 | | | | | Inconel X750 (solubilized) | HRSA Nickel-based |
| | | | | | | Stellite | HRSA Cobalt-based |
| | N08800 | | | | | Incoloy 800 | HRSA Iron-based |
| | N08825 | | | | | Incoloy 825 | HRSA Iron-based |
| | N06002 | | | | | Hastelloy X | HRSA Nickel-based |
| | N06625 | | | | | Inconel 625 (forged) | HRSA Nickel-based |
| | N06625 | | | | | Inconel 625 (pipe) | HRSA Nickel-based |
| | N07718 | | | | | Inconel 718 (casting) | HRSA Nickel-based |
| | N07718 | | | | | Inconel 718 (pipe) | HRSA Nickel-based |
| | N06075 | | | | | Nimonic 80 | HRSA Nickel-based |
| | N07080 | | | | | Nimonic 81 | HRSA Nickel-based |
| | N07001 | | | | | Waspalloy (casting) | HRSA Nickel-based |
| | | | | | | Haynes | HRSA Cobalt-based |
| | N07001 | | | | | Waspalloy (forged) | HRSA Nickel-based |
| | N07718 | | | | | Inconel 718 (forged) | HRSA Nickel-based |
| | N07750 | | | | | Inconel X750 (precipitation) | HRSA Nickel-based |
| | | | | | | Mar-M 200 | HRSA Nickel-based |
| | | | | | | Mar-M 247 | HRSA Nickel-based |
| | | | | | | Rene 95 | HRSA Nickel-based |
| | | | | | | Udimet 500 | HRSA Nickel-based |
| | | | | | | Udimet 700 | HRSA Nickel-based |

INFO

CARBIDE DRILLS

PU/HPU
TA/4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

| Gr. | Materials | W.-Nr | DIN | EN-Nr. | EN | UNI | BS | JIS | AFNOR |
|---|---|---|---|---|---|---|---|---|---|
| S4 | Titanium alloy good machinability | | TiAl2Sn4Zr2MoSi | | | | | | |
| | | | TiAl2Sn4Zr6Mo | | | | | | |
| | | 3.7055 | Ti 99,6 | | | | | | |
| | | 3.7195 | Ti3Al2.5V | | | | | | |
| | | 3.7115 | TiAl5Sn2.5 | | | | TA14/17 | | |
| | | 3.7124 | TiCu2,5 | | | | | | |
| | | 3.7155 | TiAl6Zr5Mo0,5 | | | | | | |
| | | 3.7165 | TiAl6V4 ELI | | | | TA11 | | |
| | | 3.7175 | TiAl6V6Sn2 | | | | | | |
| | | 3.7185 | TiAl4Mo4Sn2 | | | | | | |
| | | 3.7025 | Ti 99,8 | | | | TA 1 | | |
| | | 3.7035 | Ti 99,7a | | | | TA 2-5 | | |
| S5 | Titanium alloy medium machinability | | | | | | | | |
| | | 3.7164 | TiAl6V4 | | | | | | |
| | | | Ti5Al2.5SN | | | | | | |
| | | | TiAl2Sn4Zr2MoSi | | | | | | |
| | | | TiAl2Sn4Zr6Mo | | | | | | |
| H1 | Hardened steel 50 ÷ 56 HRC | 1.1231 | Ck 67 | 1.1231 | C 67S | C 70 | 060 A 67 | | XC 68 |
| | | 1.1248 | Ck 75 | 1.1248 | C 75S | C 75 | 060 A 78 | | XC 75 |
| | | 1.1274 | Ck 101 | 1.1274 | C 100S | | 060 A 96 | SUP 4 | |
| | | 1.1545 | C 105 W1 | 1.1545 | C 105U | C 100 KU | | | Y1 105 |
| | | 1.2550 | 60 WCrV 7 | | | 55 WCrV 8 KU | | | 55 WC 20 |
| | | 1.7131 | 16 MnCr 5 | 1.7131 | 16 MnCr 5 | 16 MnCr 5 | 527 M 17 | SCR 415 | 16 MC 5 |
| | | 1.7176 | 55 Cr 3 | 1.7176 | 55 Cr 3 | 55 Cr 3 | 527 A 60 | SUP 9 (A) | 55 C 3 |
| | | 2.4669 | NiCr 15 Fe 7 TiAl | | | | HR505 | | NC19FeNB |
| H2 | Hardened bearing steel 54 ÷ 62 HRC | 1.2210 | 115 CrV 3 | 1.2210 | 107 CrV 3 | 107 CrV 3 KU | | | 100 C 3 |
| | | 1.2510 | 100 MnCrW 4 | | | 95 MnWCr 5 KU | BO 1 | SKS 3 | 90 MWCV 5 |
| | | 1.2842 | 90 MnCrV 8 | 1.2842 | 90 MnCrV 8 | 90 MnVCr 8 KU | BO 2 | | 90 MV 8 |
| | | 1.3505 | 100 Cr 6 | 1.3505 | 100 Cr 6 | 100 Cr 6 | 534 A 99 | SUJ 2 | 100 C 6 |
| H3 | Hardened tool steel 60 ÷ 65 HRC | 1.2344 | X 40 CrMoV 5 1 | 1.2344 | X 40 CrMoV 5 1 | X 40 CrMo 5 1 1 KU | BH 13 | SKD 61 | Z 40 CDV 5 |
| | | 1.2363 | X 100 CrMoV 5 1 | 1.2363 | X 100 CrMoV 5 | X 100 CrMoV 5 1 KU | BA 2 | SKD 12 | Z 100 CDV 5 |
| | | 1.2379 | X 155 CrVMo 12 1 | | X 155 CrVMo 12 1 | X 155 CrVMo 12 1 KU | BD 2 | SKD 11 | Z 160 CDV 12 |
| | | 1.2436 | X 210 CrW 12 | | | X 215 CrW 12 1 KU | | SKD 2 | |
| | | 1.2601 | X 165 CrMoV 12 | | | X 165 CrMoW 12 KU | | | |
| | | 1.2713 | 55 NiCrMoV 6 | | | | | SKT 4 | 55 NCDV 7 |
| | | 1.3243 | S 6-5-2-5 | 1.3243 | HS 6-5-2-5 | HS 6-5-2-5 | | SKH 55 | Z 85 WDKCV 06-05-05-04-02 |
| | | 1.3247 | S 2-10-1-8 | 1.3247 | HS 2-10-1-8 | HS 2-9-1-8 | BM 42 | SKH 51 | Z 110 DKCWV 09-08- |
| | | 1.3355 | S 18-0-1 | 1.3355 | HS 18-0-1 | HS 18-0-1 | BT 1 | SKH 2 | Z 80 WCV 18-04-01 |
| H4 | Hardened martensitic stainless steel 50 ÷ 56 HRC | 1.4021 | X 20 Cr 13 | 1.4021 | X 20 Cr 13 | X 20 Cr 13 | 420 S 37 | SUS 420 J 1 | Z 20 C 13 |
| | | 1.4109 | X 65 CrMo 14 | 1.4109 | X 70 CrMo 15 | | | SUS 440 A | Z 70 D 14 |
| | | 1.4112 | X 90 CrMoV 18 | 1.4112 | X 90 CrMoV 18 | X CrTi 12 | 409 S 19 | SUS 440 B | Z 2 CND 18 05 |
| | | 1.4125 | X 105 CrMo 17 | 1.4125 | X 105 CrMo 17 | X 105 CrMo 17 | | SUS 440 C | Z 100 CD 17 |
| | | 1.4542 | X 5 CrNiCuNb 16 4 | 1.4542 | X 5 CrNiCuNb 16 4 | | | SUS 630 | |
| | | 1.4568 | X 7 CrNiAl 17 7 | 1.4568 | X 7 CrNiAl 17 7 | X 7 CrNiAl 17 7 | 301 S 81 | SUS 631 | Z 9 CAN 17.7 |
| | | 1.4943 | X 4 NiCrTi 25 15 | 1.4980 | X 6 NiCrTiMoV 25 15 | | HR 51 | SUH 660 | Z 6 NCTDV 25.15 |
| H5 | Hardened white cast iron 48 ÷ 55 HRC | 0.9620 | G-X330 NiCr 4 2 | 0.9620 | EN-GJN-HV520 | | Grade 2 A | | FB Ni4 Cr2 BC |
| | | 0.9625 | G-X260 NiCr 4 2 | 0.9625 | EN-GJN-HV550 | | Grade 2 B | | FB Ni4 Cr2 HC |
| | | 0.9630 | G-X300 CrNiSi 9 5 2 | 0.9630 | EN-GJN-HV600 | | Grade 2 C, D, E | | FB Cr9 Ni5 |

Materiali Werkstoffmaterialien Matériaux Materiales Материалы

| SS | UNS | U.N.E. / I.H.A. | AISI-ASTM | GOST | ČSN | Trade Mark | Structure |
|---|---|---|---|---|---|---|---|
| | R50250 | | 265-G1 | | | Grade 1 | |
| | R50400 | | 265-G2 | | | Grade 2 | |
| | R50550 | | 265-G3 | | | Grade 3 | |
| | R56320 | | | | | Grade 9 | |
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| | R50700 | | 265-G4 | | | Grade 4 | |
| | R56400 | | | | | Grade 5 | |
| | | | | | | Grade 6 | |
| | | | 4975 | | | 6242 | |
| | R56260 | | | | | 6246 | |
| 1770 | G10700 | F.5103 | 1070 | 70 | | | |
| 1774, 1778 | G10780 | F.5107 | 1078, 1080 | 75 | | | |
| 1870 | G10950 | F.5117 | 1095 | | | | |
| 1880 | | F.5118 | W1 | U10A | | | |
| | | | S1 | 5KHV2SF | | | |
| 2511 | G51170 | F.1516 | 5115 | 12KHN2 | 14 220 | | |
| 2253 | G51550 | | 5155 | | | | |
| | N07750 | | | | | Inconel X750 (solubilized) | HRSA Nickel-based |
| | T61202 | F.520L | L2 | 11KHF | | | |
| 2140 | T31501 | F.5220 | O1 | 9KHVG | | | |
| | T31502 | | O2 | 9G2F | | | |
| 2258 | G51986 | F.5230 | 52100 | SHKH15 | 14 109 | | |
| 2242 | T20813 | F.5318 | H13 | 4KH5MF1S | | | |
| 2260 | T30102 | F.5227 | A2 | 9KH5VF | | | |
| | T30402 | F.5211 | D2 | KH12MF | | | |
| 2312 | | F.5213 | | KH12 | | | |
| 2310 | | | | KH12MF | | | |
| | T61206 | F.520.S | L6 | 5KHNM | | | |
| 2723 | | F.5613 | M35 | R6M5K5 | | | |
| | T11342 | | M42 | R2AM9K5 | | | |
| | T12001 | | T1 | R18 | | | |
| 2303 | S42000 | F.5261 | 420 | 20KH13 | 17 022 | | |
| | S44002 | | 440 A | | | | |
| 2327 | S44003 | | 440 B | 95KH18 | | | |
| | S44004 | | 440 C | 95KH18 | | | |
| | S17400 | | SAE 630 | | | 17-4 PH | H900 |
| 2388 | S17700 | | AMS 5528 | 09KH17N7YU1 | | 17-7 PH | TH1050 |
| 2570 | S66286 | | 660 | | | A286 | |
| 05 12-00 | F45001 | | A532 IB | | | Ni-Hard 2 | |
| 05 13-00 | F45000 | | A532 IA | | | Ni-Hard 1 | |
| 04 57-00 | F45003 | | A532 ID | | | Ni-Hard 4 | |

Durezza Härte Dureté Dureza Твёрдость



| HRC | VICKERS | BRINELL HARDNESS | | ROCKWELL HARDNESS | | | ROCKWELL SUPERFICIAL HARDNESS | | | SHORE HARDNESS | N/mm² TENSILE STRENGHT | HRC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | standard ball | tungsten carbide ball | A scale | B scale | D scale | 15-N scale | 30-N scale | 45-N scale | | | |
| 68 | 940 | - | - | 85.6 | - | 76.9 | 93.2 | 84.4 | 75.4 | 97 | - | 68 |
| 67 | 900 | - | - | 85.0 | - | 76.1 | 92.9 | 83.6 | 74.2 | 95 | - | 67 |
| 66 | 865 | - | - | 84.5 | - | 75.4 | 92.5 | 82.8 | 73.3 | 92 | - | 66 |
| 65 | 832 | - | (739) | 83.9 | - | 74.5 | 92.2 | 81.9 | 72.0 | 91 | - | 65 |
| 64 | 800 | - | (722) | 83.4 | - | 73.8 | 91.8 | 81.1 | 71.0 | 88 | - | 64 |
| 63 | 772 | - | (705) | 82.8 | - | 73.0 | 91.4 | 80.1 | 69.9 | 87 | - | 63 |
| 62 | 746 | - | (688) | 82.3 | - | 72.2 | 91.1 | 79.3 | 68.8 | 85 | - | 62 |
| 61 | 720 | - | (670) | 81.8 | - | 71.5 | 90.7 | 78.4 | 67.7 | 83 | - | 61 |
| 60 | 697 | - | (654) | 81.2 | - | 70.7 | 90.2 | 77.5 | 66.7 | 81 | - | 60 |
| 59 | 674 | - | (634) | 80.7 | - | 69.9 | 89.8 | 76.6 | 65.5 | 80 | - | 59 |
| 58 | 653 | - | 615 | 80.1 | - | 69.2 | 89.3 | 75.7 | 64.3 | 78 | - | 58 |
| 57 | 633 | - | 595 | 79.6 | - | 68.5 | 88.9 | 74.8 | 63.2 | 76 | - | 57 |
| 56 | 613 | - | 577 | 79.0 | - | 67.7 | 88.3 | 73.9 | 62.0 | 75 | - | 56 |
| 55 | 595 | - | 560 | 78.5 | - | 66.9 | 87.9 | 73.0 | 60.9 | 74 | 2075 | 55 |
| 54 | 577 | - | 543 | 78.0 | - | 66.1 | 87.4 | 72.0 | 59.8 | 72 | 2015 | 54 |
| 53 | 560 | - | 525 | 77.4 | - | 65.4 | 86.9 | 71.2 | 58.6 | 71 | 1950 | 53 |
| 52 | 544 | (500) | 512 | 76.8 | - | 64.6 | 86.4 | 70.2 | 57.4 | 69 | 1880 | 52 |
| 51 | 528 | (487) | 496 | 76.3 | - | 63.8 | 85.9 | 69.4 | 56.1 | 68 | 1820 | 51 |
| 50 | 513 | (475) | 481 | 75.9 | - | 63.1 | 85.5 | 68.5 | 55.0 | 67 | 1760 | 50 |
| 49 | 498 | (464) | 469 | 75.2 | - | 62.1 | 85.0 | 67.6 | 53.8 | 66 | 1695 | 49 |
| 48 | 484 | 451 | 455 | 74.7 | - | 61.4 | 84.5 | 66.7 | 52.5 | 64 | 1635 | 48 |
| 47 | 471 | 442 | 443 | 74.1 | - | 60.8 | 83.9 | 65.8 | 51.4 | 63 | 1580 | 47 |
| 46 | 458 | 432 | 432 | 73.6 | - | 60.0 | 83.5 | 64.8 | 50.3 | 62 | 1530 | 46 |
| 45 | 446 | 421 | 421 | 73.1 | - | 59.2 | 83.0 | 64.0 | 49.0 | 60 | 1480 | 45 |
| 44 | 434 | 409 | 409 | 72.5 | - | 58.5 | 82.5 | 63.1 | 47.8 | 58 | 1435 | 44 |
| 43 | 423 | 400 | 400 | 72.0 | - | 57.7 | 82.0 | 62.2 | 46.7 | 57 | 1385 | 43 |
| 42 | 412 | 390 | 390 | 71.5 | - | 56.9 | 81.5 | 61.3 | 45.5 | 56 | 1340 | 42 |
| 41 | 402 | 381 | 381 | 70.9 | - | 56.2 | 80.9 | 60.4 | 44.3 | 55 | 1295 | 41 |
| 40 | 392 | 371 | 371 | 70.4 | - | 55.4 | 80.4 | 59.5 | 43.1 | 54 | 1250 | 40 |
| 39 | 382 | 362 | 362 | 69.9 | - | 54.6 | 79.9 | 58.6 | 41.9 | 52 | 1215 | 39 |
| 38 | 372 | 353 | 353 | 69.4 | - | 53.8 | 79.4 | 57.7 | 40.8 | 51 | 1180 | 38 |
| 37 | 363 | 344 | 344 | 68.9 | - | 53.1 | 78.8 | 56.8 | 39.6 | 50 | 1160 | 37 |
| 36 | 354 | 336 | 336 | 68.4 | (109.0) | 52.3 | 78.3 | 55.9 | 38.4 | 49 | 1115 | 36 |
| 35 | 345 | 327 | 327 | 67.9 | (108.5) | 51.5 | 77.7 | 55.0 | 37.2 | 48 | 1080 | 35 |
| 34 | 336 | 319 | 319 | 67.4 | (108.0) | 50.8 | 77.2 | 54.2 | 36.1 | 47 | 1055 | 34 |
| 33 | 327 | 311 | 311 | 66.8 | (107.5) | 50.0 | 76.6 | 53.3 | 34.9 | 46 | 1025 | 33 |
| 32 | 318 | 301 | 301 | 66.3 | (107.0) | 49.2 | 76.1 | 52.1 | 33.7 | 44 | 1000 | 32 |
| 31 | 310 | 294 | 294 | 65.8 | (106.0) | 48.4 | 75.6 | 51.3 | 32.5 | 43 | 980 | 31 |
| 30 | 302 | 286 | 286 | 65.3 | (105.5) | 47.7 | 75.0 | 50.4 | 31.3 | 42 | 950 | 30 |
| 29 | 294 | 279 | 279 | 64.7 | (104.5) | 47.0 | 74.5 | 49.5 | 30.1 | 41 | 930 | 29 |
| 28 | 286 | 271 | 271 | 64.3 | (104.0) | 46.1 | 73.9 | 48.6 | 28.9 | 41 | 910 | 28 |
| 27 | 279 | 264 | 264 | 63.8 | (103.0) | 45.2 | 73.3 | 47.7 | 27.8 | 40 | 880 | 27 |
| 26 | 272 | 258 | 258 | 63.3 | (102.5) | 44.6 | 72.8 | 46.8 | 26.7 | 38 | 860 | 26 |
| 25 | 266 | 253 | 253 | 62.8 | (101.5) | 43.8 | 72.2 | 45.9 | 25.5 | 38 | 840 | 25 |
| 24 | 260 | 247 | 247 | 62.4 | (101.0) | 43.1 | 71.6 | 45.0 | 24.3 | 37 | 825 | 24 |
| 23 | 254 | 243 | 243 | 62.0 | 100.0 | 42.1 | 71.0 | 44.0 | 23.1 | 36 | 805 | 23 |
| 22 | 248 | 237 | 237 | 61.5 | 99.0 | 41.6 | 70.5 | 43.2 | 22.0 | 35 | 785 | 22 |
| 21 | 243 | 231 | 231 | 61.0 | 98.5 | 40.9 | 69.9 | 42.3 | 20.7 | 35 | 770 | 21 |
| 20 | 238 | 226 | 226 | 60.5 | 97.8 | 40.1 | 69.4 | 41.5 | 19.6 | 34 | 760 | 20 |
| (18) | 230 | 219 | 219 | - | 96.7 | - | - | - | - | 33 | 730 | (18) |
| (16) | 222 | 212 | 212 | - | 95.5 | - | - | - | - | 32 | 705 | (16) |
| (14) | 213 | 203 | 203 | - | 93.9 | - | - | - | - | 31 | 675 | (14) |
| (12) | 204 | 194 | 194 | - | 92.3 | - | - | - | - | 29 | 650 | (12) |
| (10) | 196 | 187 | 187 | - | 90.7 | - | - | - | - | 28 | 620 | (10) |
| (8) | 188 | 179 | 179 | - | 89.5 | - | - | - | - | 27 | 600 | (8) |
| (6) | 180 | 171 | 171 | - | 87.1 | - | - | - | - | 26 | 580 | (6) |
| (4) | 173 | 165 | 165 | - | 85.5 | - | - | - | - | 25 | 550 | (4) |
| (2) | 166 | 158 | 158 | - | 83.5 | - | - | - | - | 24 | 530 | (2) |
| (0) | 160 | 152 | 152 | - | 81.7 | - | - | - | - | 24 | 515 | (0) |

# Formule Formeln Formules Fórmulas Формулы

**CUTTING SPEED VELOCITÀ DI TAGLIO SCHNITTGESCHWINDIGKEIT**
**VITESSE DE COUPE VELOCIDAD DE CORTE СКОРОСТЬ РЕЗАНИЯ**

$$Vc = \frac{D \times \pi \times n}{1000} \quad \textbf{m/min}$$

**SPLINDLE SPEED VELOCITÀ DI ROTAZIONE MANDRINO SPINDELGESCHWINDIGKEIT**
**VITESSE DE ROTATION DU MANDRIN VELOCIDAD DE ROTACIÓN DEL MANDRIL ЧАСТОТА ВРАЩЕНИЯ ШПИНДЕЛЯ**

$$n = \frac{Vc \times 1000}{\pi \times D} \quad \textbf{rpm}$$

**FEED PER REVOLUTION AVANZAMENTO PER GIRO VORSCHUB PRO UMDREHUNG**
**AVANCE PAR TOUR AVANCE POR VUELTA ОБОРОТНАЯ ПОДАЧА**

$$fn = \frac{Vf}{n} \quad \textbf{mm/rev} \qquad fn = fz \times z \quad \textbf{mm/rev}$$

**FEED RATE VELOCITÀ DI AVANZAMENTO VORSCHUBSGESCHWINDIGKEIT**
**VITESSE D'AVANCE VELOCIDAD DE AVANCE МИНУТНАЯ ПОДАЧА**

$$Vf = fn \times n \quad \textbf{mm/min}$$

**FEED/TOOTH AVANZAMENTO/TAGLIENTE VORSCHUB/SCHNEIDE**
**AVANCE/ARÊTE DE COUPE AVANCE/FILO ПОДАЧА НА ЗУБ**

$$fz = \frac{Vf}{n \times z} \quad \textbf{mm}$$

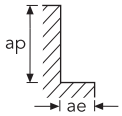
**METAL (CHIP) REMOVAL RATE VOLUME TRUCIOLO ASPORTATO VOLUMEN ABGETRAGENER SPÄNE**
**VOLUME DE COPEAU VOLUMEN VIRUTA EXTRAÍDA ОБЪЕМ УДАЛЕННОЙ СТРУЖКИ**

$$Q = \frac{ap \times ae \times Vf}{1000} \quad \textbf{cm}^3\textbf{/min}$$

**D** DIAMETER DIAMETRO DURCHMESSER DIAMÈTRE DIÁMETRO ДИАМЕТР

**Z** NUMBER OF TEETH NUMERO TAGLIENTI SCHNEIDENANZAHL NUMÉRO DE DENTS NÚMERO DE DIENTES КОЛИЧЕСТВО ЗУБЬЕВ

**ap**
**ae**



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TYPHOON HRC hardened steel 45÷62 HRC . 101
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Legenda Verzeichnis Légende Leyenda Условные обозначения

| STOCK | | |
|---|---|---|
| ● | stock standard<br>stock standard<br>Standard Lager | stock standard<br>stock estándar<br>складская позиция |
| ○ | non-standard stock<br>stock non standard<br>nicht Standard Lager | stock non standard<br>stock no estándar<br>не складская позиция |
| ▽ | stock exhaustion<br>esaurimento stock<br>Vorraterschöpfung | épuisement du stock<br>agotamiento de stock<br>складские остатки |

| APPLICATION GUIDELINES INDICAZIONI PER L'APPLICAZIONE LEITFADEN ZUR ANWENDUNG<br>INDICATIONS POUR L'APPLICATION INDICACIONES PARA SU APLICACIÓN УКАЗАНИЯ ПО ПРИМЕНЕНИЮ | | |
|---|---|---|
| ★ | 1st choice<br>1a scelta<br>1. Wahl | 1er choix<br>1ª elección<br>1-й выбор |
| ☆ | suitable<br>adatto<br>geeignet | adapté<br>adecuado<br>пригоден |

| SHANK ATTACCO SCHAFT QUEUE MANGO ХВОСТОВИК | | |
|---|---|---|
|  | cylindrical shank<br>attacco cilindrico<br>zylindrischer Schaft | queue cylindrique<br>mango cilíndrico<br>цилиндрическое крепление |

| GEOMETRY GEOMETRIA GEOMETRIE GÉOMÉTRIE GEOMETRÍA ГЕОМЕТРИЯ | | |
|---|---|---|
|  | universal application<br>applicazione universale<br>Universelle Anwendung | application universelle<br>aplicación universal<br>универсальное применение |
|  | universal application with inside coolant<br>applicazione universale con refrigerazione interna<br>Universelle Anwendung mit Innenkühlung | application universelle avec lubrification interne<br>aplicación universal con refrigeración interna<br>универсальное применение с внутренним охлаждением |
|  | general purpose<br>uso generico<br>allgemeine Anwendung | applications génériques<br>uso genérico<br>общего назначения |
|  | 4 guides chamfer with inside coolant<br>4 fasi con refrigerazione interna<br>4 Führungsfasen mit innerer Kühlmittelzuführung | 4 listels à trous d'huile<br>4 fases con refrigeración interna<br>4 направляющих с внутренней подачей СОЖ |
|  | stainless steel with inside coolant<br>acciaio inossidabile con refrigerazione interna<br>rostfreien Stahl mit innerer Kühlmittelzuführung | acier inoxydable à trous d'huile<br>acero inoxidable con refrigeración interna<br>нержавеющая сталь с внутренней подачей подачей СОЖ |
|  | aluminium with inside coolant<br>alluminio con refrigerazione interna<br>Aluminium mit innerer Kühlmittelzuführung | aluminium à trous d'huile<br>aluminio con refrigeración interna<br>алюминий с внутренней подачей подачей СОЖ |
|  | hardened steel<br>acciaio temprato<br>Hartstahl | acier trempé<br>acero templado<br>закалённая сталь |

# Legenda Verzeichnis Légende Leyenda Условные обозначения

## GEOMETRY GEOMETRIA GEOMETRIE GÉOMÉTRIE GEOMETRÍA ГЕОМЕТРИЯ

| | | |
|---|---|---|
|  | wide range of materials, with inside coolant, mini<br>ampia gamma di materiali, con refrigerazione interna, mini<br>breite Auswahl an Materialien, mit Innenkühlung, mini | large gamme de matériaux, avec lubrification interne, mini<br>amplia gama de materiales, con refrigeración interna, mini<br>широкий выбор материалов, с внутренним охлаждением, мини |
|  | wide range of materials, with inside coolant, long<br>ampia gamma di materiali, con refrigerazione interna, lunga<br>breite Auswahl an Materialien, mit Innenkühlung, lang | large gamme de matériaux, avec lubrification interne, longue<br>amplia gama de materiales, con refrigeración interna, larga<br>широкий выбор материалов, с внутренним охлаждением, длинная |
|  | universal application with inside coolant<br>applicazione universale con refrigerazione interna<br>Universelle Anwendung mit Innenkühlung | application universelle avec lubrification interne<br>aplicación universal con refrigeración interna<br>универсальное применение с внутренним охлаждением |
|  | NC starting drill<br>punte da centri NC<br>NC Anbohrer mit Spitzenwinkel | forets à centrer NC<br>brocas de hacer punto NC<br>центровочные свёрла для станков с ЧПУ |

## MATERIAL MATERIALE WERKSTOFF MATIÈRE MATERIAL МАТЕРИАЛ

| | | |
|---|---|---|
|  | micrograin<br>micrograna<br>Mikrokörnung | micrograin<br>micrograno<br>микрозернистый твёрдый сплав |

## SURFACE TREATMENT TRATTAMENTO SUPERFICIALE OBERFLÄCHENBEHANDLUNG TRAITMENT DE SURFACE TRATAMIENTO SUPERFICIAL ОБРАБОТКА ПОВЕРХНОСТИ

| | | |
|---|---|---|
|  | uncoated<br>non rivestito<br>unbeschichtet | non revêtu<br>no revestido<br>без покрытия |
|  | polished<br>lappato<br>geläppt | poli<br>pulido<br>полированный |

## COATINGS RIVESTIMENTI BESCHICHTUNGEN REVÊTEMENTS RECUBRIMIENTOS ПОКРЫТИЕ

| | | PV200 | PV250 | PV300 | PV1000 |
|---|---|---|---|---|---|
| hardness (HV)<br>durezza (HV)<br>Härte (HV) | dureté (HV)<br>dureza (HV)<br>твёрдость (HV) | 3300 | 3300 | 3300 | 3600 |
| friction coefficient<br>coefficiente d'attrito<br>Reibungskoeffizient | coefficent de frottement<br>coeficiente de rozamiento<br>коэффициент трения | 0.3 | 0.3 | 0.3 | 0.25 |
| thickness (µ)<br>spessore (µ)<br>dicke (µ) | épaisseur (µ)<br>espesor (µ)<br>толщина (мкм) | 3 | 2.5÷3.5 | 2.5÷3.5 | 2÷3 |
| max working temperature (°C)<br>temperatura max (°C)<br>hochste Temperatur (°C) | température maximale (°C)<br>temperatura máx (°C)<br>макс. температура (°C) | 950° | 900° | 1100° | 1200° |

Indice grafico Auswahlhilfe Indice graphique Índice gráfico Руководство по выбору

| | ITEM No. | PAGE | |
|---|---|---|---|
| PU-HPU universal application<br>3xD - 5xD | **353PU** | 43 |  |
| | **353HPU** | 43 |  |
| | **355PU** | 52 |  |
| | **355HPU** | 52 |  |
| TA-4HTA general purpose<br>3xD - 8xD | **343TA** | 66 |  |
| | **318N** | 66 |  |
| | **3584HTA** | 70 |  |
| SUH stainless steel<br>3xD - 5xD | **353SUH** | 79 |  |
| | **355SUH** | 85 |  |
| ALH non-ferrous material<br>3xD - 5xD | **353ALH** | 93 |  |
| | **355ALH** | 97 |  |
| HRC hardened steel 45-62 HRC<br>3xD | **353HRC** | 103 |  |
| SUH MINI short, long and extra long<br>5xD ÷ 30xD | **355SUH MINI** | 114 |  |
| | **358SUH MINI** | 118 |  |
| | **3512SUH MINI** | 122 |  |
| | **3520SUH MINI** | 126 |  |
| | **3525SUH MINI** | 130 |  |
| | **3530SUH MINI** | 134 |  |
| HL long and extra long<br>12xD ÷ 30xD | **3512HL** | 147 |  |
| | **3515HL** | 152 |  |
| | **3520HL** | 157 |  |
| | **3525HL** | 162 |  |
| | **3530HL** | 167 |  |
| HSD step drill for 90° chamfering | **372HSD** | 175 |  |
| NC spotting<br>90° - 120° | **CS-D-TA 90** | 180 |  |
| | **CS-D-TA 120** | 180 |  |

Indice grafico Auswahlhilfe Indice graphique Índice gráfico Руководство по выбору

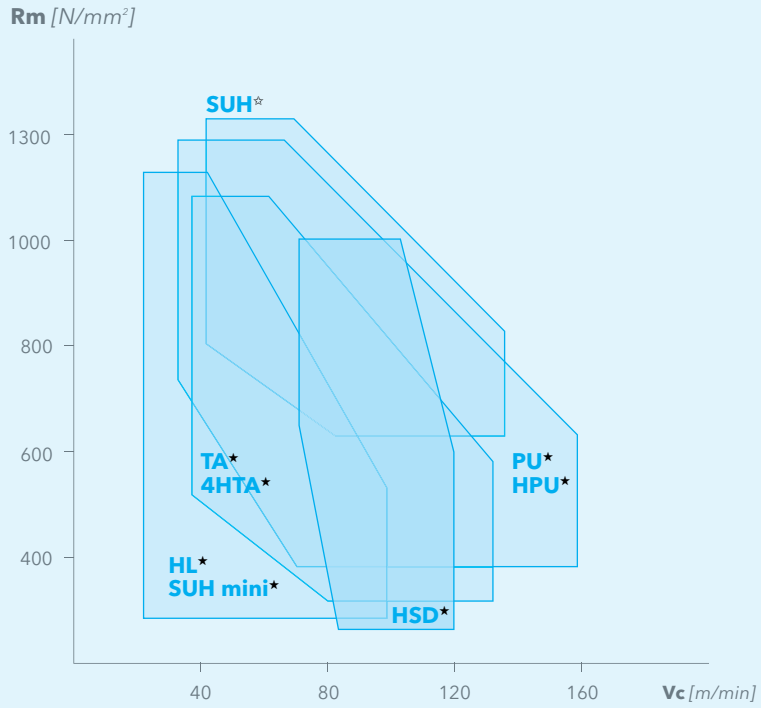
| RANGE | DRILLING DEPTH | NORM | TYPE | MATERIAL / COATING | HRC | POINT ANGLE | HELIX ANGLE | CHAMFER | ISO P | ISO M | ISO K | ISO N | ISO S | ISO H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3-20 | 3xD | DIN6537K | PU | MG PV250 | | 140° | 30° | 45° | ★ | ★ | ★ | ☆ | ★ | |
| 3-20 | 3xD | DIN6537K | HPU | MG PV250 | | 140° | 30° | 45° | ★ | ★ | ★ | ☆ | ★ | |
| 3-20 | 5xD | DIN6537L | PU | MG PV250 | | 140° | 30° | 45° | ★ | ★ | ★ | ☆ | ★ | |
| 3-20 | 5xD | DIN6537L | HPU | MG PV250 | | 140° | 30° | 45° | ★ | ★ | ★ | ☆ | ★ | |
| 1-16 | 3xD | DIN6539 | TA | MG PV200 | | 140° | 30° | | ★ | ☆ | ☆ | ☆ | | |
| 1-13 | 3xD | DIN6539 | TA | MG BR | | 140° | 30° | | ★ | ☆ | ☆ | ☆ | | |
| 3-16 | 8xD | OSAWA | 4HTA | MG PV300 | | 140° | 30° | | ★ | ★ | ★ | ☆ | ☆ | |
| 3-20 | 3xD | DIN6537K | SUH | MG PV300 | | 140° | 30° | | ☆ | ★ | ☆ | ☆ | ☆ | |
| 3-20 | 5xD | DIN6537L | SUH | MG PV300 | | 140° | 30° | | ☆ | ★ | ☆ | ☆ | ☆ | |
| 3-20 | 3xD | DIN6537K | ALH | MG POLISHED | | 130° | 30° | | | | | ★ | | |
| 3-20 | 5xD | DIN6537L | ALH | MG POLISHED | | 130° | 30° | | | | | ★ | | |
| 2.6-14.2 | 3xD | DIN6537K | HRC | MG PV1000 | 45-62 | 150° | 15° | 45° | | | | | | ★ |
| 1-3 | 5xD | OSAWA | SUH MINI | MG PV300 | | 135° | 30° | | ★ | ★ | ★ | ☆ | ☆ | |
| 1-3 | 8xD | OSAWA | SUH MINI | MG PV300 | | 135° | 30° | | ★ | ★ | ★ | ☆ | ☆ | |
| 1-3 | 12xD | OSAWA | SUH MINI | MG PV300 | | 135° | 30° | | ★ | ★ | ★ | ☆ | ☆ | |
| 1-3 | 20xD | OSAWA | SUH MINI | MG PV300 | | 135° | 30° | | ★ | ★ | ★ | ☆ | ☆ | |
| 1-3 | 25xD | OSAWA | SUH MINI | MG PV300 | | 135° | 30° | | ★ | ★ | ★ | ☆ | ☆ | |
| 1-3 | 30xD | OSAWA | SUH MINI | MG PV300 | | 135° | 30° | | ★ | ★ | ★ | ☆ | ☆ | |
| 3.1-10 | 12xD | OSAWA | HL | MG PV250 | | 135° | 30° | | ★ | ★ | ★ | ☆ | ☆ | |
| 3.1-10 | 15xD | OSAWA | HL | MG PV250 | | 135° | 30° | | ★ | ★ | ★ | ☆ | ☆ | |
| 3.1-10 | 20xD | OSAWA | HL | MG PV250 | | 135° | 30° | | ★ | ★ | ★ | ☆ | ☆ | |
| 3.1-9.5 | 25xD | OSAWA | HL | MG PV250 | | 135° | 30° | | ★ | ★ | ★ | ☆ | ☆ | |
| 3.1-8 | 30xD | OSAWA | HL | MG PV250 | | 135° | 30° | | ★ | ★ | ★ | ☆ | ☆ | |
| 8.3-10.3 | 2xD | OSAWA | HSD | MG PV250 | | 140° | 30° | 90° | ★ | ★ | | | ★ | |
| 6-16 | | OSAWA | SD | MG PV200 | | 90° | 30° | | ★ | ★ | ★ | ★ | ☆ | |
| 6-16 | | OSAWA | SD | MG PV200 | | 120° | 30° | | ★ | ★ | ★ | ★ | ☆ | |

★ 1st choice ☆ suitable

Grafici applicativi Anwendungsgrafiken Graphiques d'application Gráficos aplicativos Диаграммы

## STEEL APPLICATION

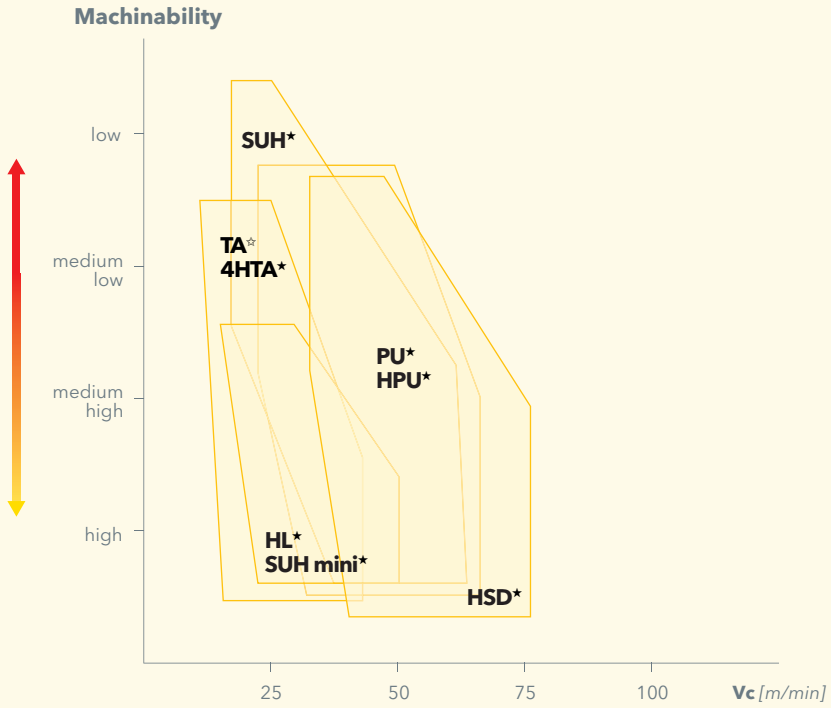
ISO P




★ 1st choice ☆ suitable

## STAINLESS STEEL APPLICATION

ISO M




★ 1st choice ☆ suitable

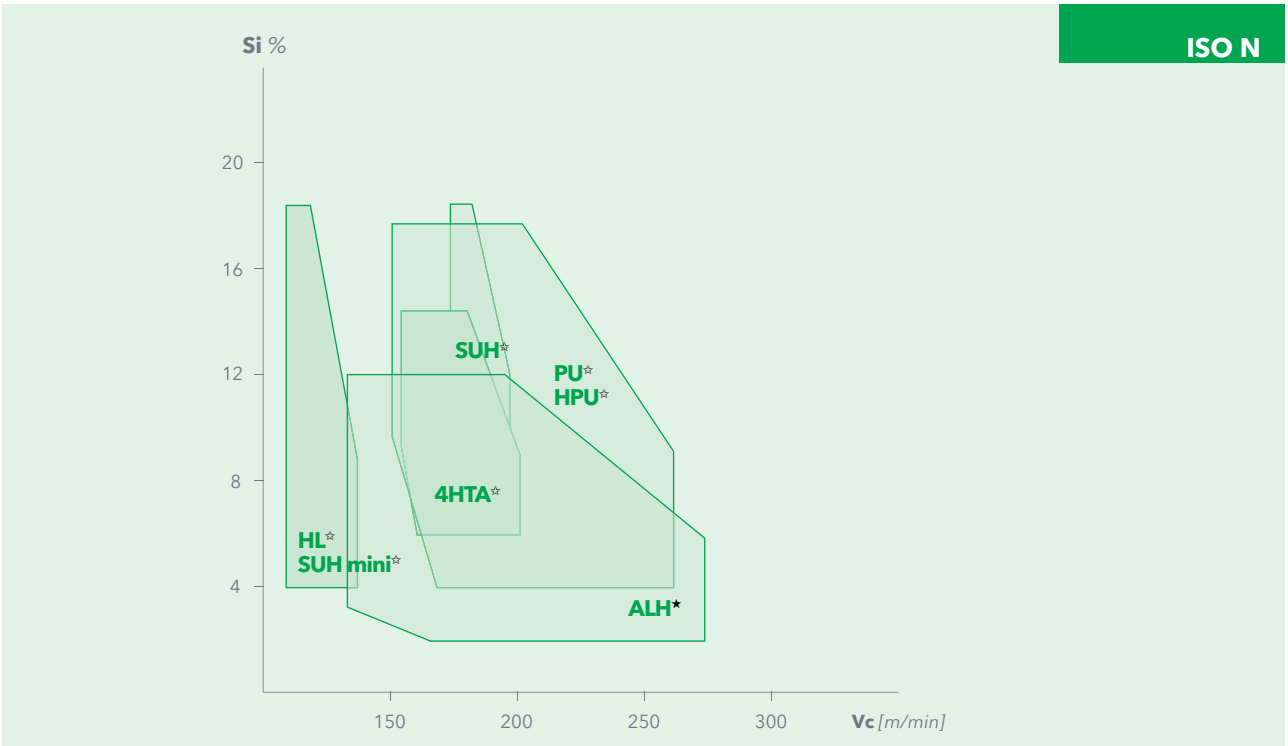
PU : universal purpose (page 43)
HPU : universal purpose with inside coolant (page 43)
TA : general purpose (page 66)
4HTA : 4 margins general purpose with inside coolant (page 70)
SUH : special purpose with inside coolant (page 79)
SUH MINI : miniature 5xD ÷ 30xD with inside coolant (page 114)
HL : long 12xD ÷ 30xD (page 147)
HSD : step drill with inside coolant (page 175)

## CAST IRON APPLICATION




★ 1st choice ☆ suitable

## NON-FERROUS MATERIALS APPLICATION



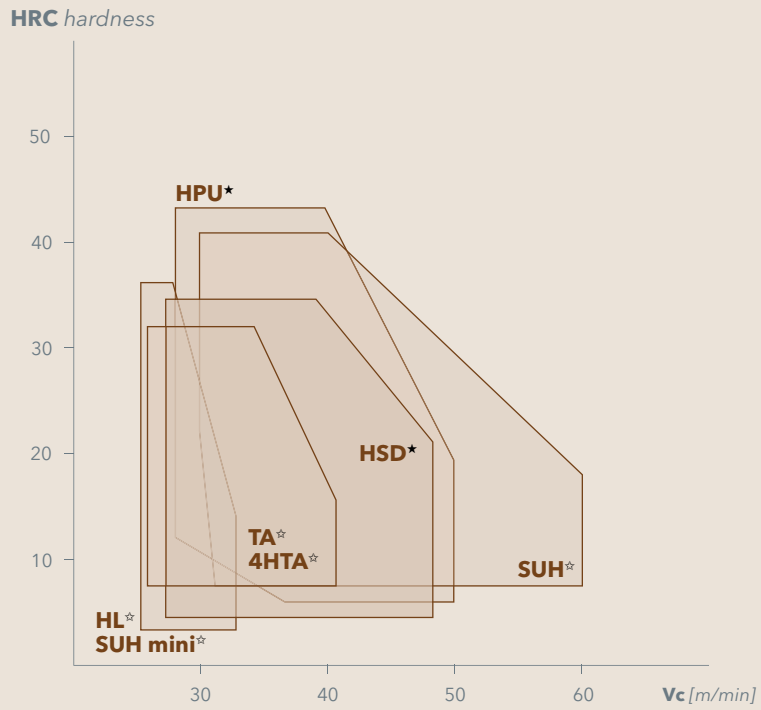

★ 1st choice ☆ suitable

PU : universal purpose (page 43)
HPU : universal purpose with inside coolant (page 43)
TA : general purpose (page 66)
4HTA : 4 margins general purpose with inside coolant (page 70)
SUH : special purpose with inside coolant (page 79)
ALH : special purpose with inside coolant (page 93)
SUH MINI : miniature 5xD ÷ 30xD with inside coolant (page 114)
HL : long 12xD ÷ 30xD (page 147)

Grafici applicativi Anwendungsgrafiken Graphiques d'application Gráficos aplicativos Диаграммы

## SUPER ALLOYS APPLICATION

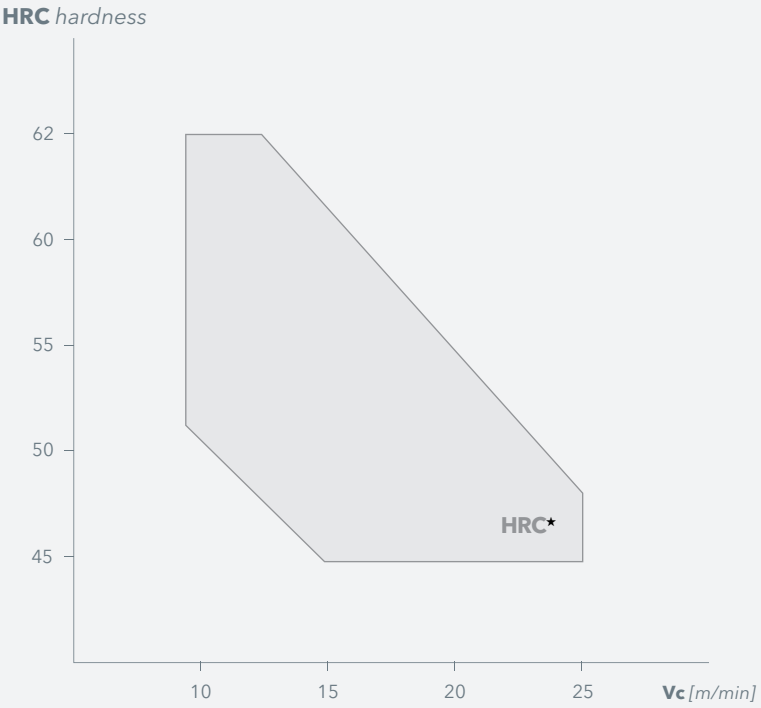
ISO S




★ 1st choice ☆ suitable

## HARDENED STEEL APPLICATION

ISO H




★ 1st choice ☆ suitable

PU : universal purpose (page 43)
HPU : universal purpose with inside coolant (page 43)
TA : general purpose (page 66)
4HTA : 4 margins general purpose with inside coolant (page 70)
SUH : special purpose with inside coolant (page 79)
HRC : special purpose (page 103)
SUH MINI : miniature 5xD ÷ 30xD with inside coolant (page 114)
HL : long 12xD ÷ 30xD (page 147)
HSD : step drill with inside coolant (page 175)





# TYPHOON PU-HPU

## HIGH PERFORMANCE - UNIVERSAL APPLICATION

Universal high performance drills for ISO P, M, K, N, S.

Punte universali ad alto rendimento per applicazione su materiali ISO P, M, K, N, S.

Universelle Hochleistungsbohrer für Anwendungen auf den Materialien ISO P, M, K, N, S.

Forets universels haute performance pour des applications sur des matériaux ISO P, M, K, N, S.

Puntas universales de alto rendimiento para aplicación en materiales ISO P, M, K, N, S.

Универсальные высокопроизводительные сверла для обработки материалов по ISO P, M, K, N, S.

## TYPHOON PU-HPU

HIGH PERFORMANCE - UNIVERSAL APPLICATION



**PU**



**HPU**

- Self-centering geometry for accurate holes
- Reinforced geometry for higher feed rate
- Wide flute for smoother chip ejection
- Straight cutting edge: high chipping resistance and short chip shape
- Thicker chisel edge: enables higher feed rate
- 45° chamfer for wear and chipping protection
- Selected substrate and last generation coating for great wear resistance and long life even at high cutting speed

- Affûtage autocentré pour des trous précis
- Géométrie renforcée pour des vitesses d'avance élevées
- Géométrie des goujures large pour une évacuation meilleure des copeaux
- Géométrie de l'arête rectiligne : très robuste, elle permet de former des copeaux courts
- Géométrie de l'arête transversale : épaissie pour permettre des avancements plus élevés
- Angles de l'arête biseautés à 45° pour les protéger de l'usure et des éclats
- Substrat en carbure et revêtement spécifique pour garantir une longue durée à des vitesses de coupe élevées

- Affilatura autocentrante per fori precisi
- Geometria rinforzata per elevati avanzamenti
- Geometria gole ampia per una migliore evacuazione dei trucioli
- Geometria del tagliente rettilineo: molto robusta che permette di formare trucioli corti
- Geometria del tagliente trasversale: inspessita per consentire avanzamenti più elevati
- Spigoli del tagliente smussati a 45° per proteggerli da usura e scheggiature
- Substrato in metallo duro e rivestimento specifici per garantire lunga durata anche a velocità di taglio elevate

- Afilado autocentrante para agujeros precisos
- Geometría reforzada para elevados avances
- Geometría de las ranuras amplia para una mejor evacuación de las virutas
- Geometría del filo rectilíneo: muy resistente, que permite formar virutas cortas
- Geometría del filo transversal: engrosada para permitir avances más elevados
- Ángulos del filo redondeados a 45° para protegerlos del desgaste y astillado
- Sustrato en metal duro y revestimiento específicos para garantizar una larga duración incluso a velocidades de corte elevadas

- Selbstzentrierender Schliff für präzise Bohrungen
- Verstärkte Geometrie für erhöhten Vorschub
- Breite Geometrie der Nuten für eine verbesserte Späneabführung
- Gerade Geometrie der Schneidkante: äußerst robust, wodurch kurze Späne erzeugt werden
- Transversale Geometrie der Schneidkante: verstärkt für erhöhten Vorschub
- Im 45°-Winkel angefaste Schneidkanten zum Schutz gegen Verschleiß und Absplittern
- Trägermaterial aus Hartmetall und spezielle Beschichtung zur Gewährleistung einer langen Lebensdauer auch bei hohen Schnittgeschwindigkeiten

- Самоцентрирующаяся заточка для сверления отверстий высокой точности
- Усиленная геометрия для работы с высокими подачами
- Широкие канавки для хорошего отвода стружки
- Прямые режущие кромки: формирование короткой стружки и предотвращение ее пакетирования
- Увеличенная перемычка: позволяет увеличить подачу
- Фаски 45° для защиты от износа и пакетирования стружки
- Специальное покрытие последнего поколения для повышения стойкости и надежности при работе с высокими скоростями резания

# 353PU-353HPU

universal application, high productivity

3XD | DIN 6537K | PU | HPU | MG PV250 | 140°+C45° | 30°

353PU 353HPU



353PU



353HPU

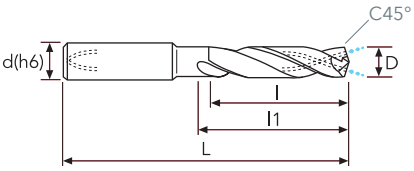
| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ★ | |

★ 1st choice ☆ suitable

353PU




353HPU




| | | | | | | 353PU | | 353HPU | |
|---|---|---|---|---|---|---|---|---|---|
| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock | EDP No. | Stock |
| **3.00** | +0.012/+0.002 | 6 | 14 | 20 | 62 | 353PU0300 | ● | 353HPU0300 | ● |
| **3.10** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353PU0310 | ● | 353HPU0310 | ● |
| **3.20** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353PU0320 | ● | 353HPU0320 | ● |
| **3.30** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353PU0330 | ● | 353HPU0330 | ● |
| **3.40** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353PU0340 | ● | 353HPU0340 | ● |
| **3.50** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353PU0350 | ● | 353HPU0350 | ● |
| **3.60** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353PU0360 | ● | 353HPU0360 | ● |
| **3.70** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353PU0370 | ● | 353HPU0370 | ● |
| **3.80** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353PU0380 | ● | 353HPU0380 | ● |
| **3.90** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353PU0390 | ● | 353HPU0390 | ● |
| **4.00** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353PU0400 | ● | 353HPU0400 | ● |
| **4.10** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353PU0410 | ● | 353HPU0410 | ● |
| **4.20** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353PU0420 | ● | 353HPU0420 | ● |
| **4.30** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353PU0430 | ● | 353HPU0430 | ● |
| **4.40** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353PU0440 | ● | 353HPU0440 | ● |
| **4.50** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353PU0450 | ● | 353HPU0450 | ● |
| **4.60** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353PU0460 | ● | 353HPU0460 | ● |
| **4.70** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353PU0470 | ● | 353HPU0470 | ● |
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| **5.10** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353PU0510 | ● | 353HPU0510 | ● |
| **5.20** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353PU0520 | ● | 353HPU0520 | ● |
| **5.30** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353PU0530 | ● | 353HPU0530 | ● |
| **5.40** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353PU0540 | ● | 353HPU0540 | ● |
| **5.50** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353PU0550 | ● | 353HPU0550 | ● |
| **5.60** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353PU0560 | ● | 353HPU0560 | ● |
| **5.70** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353PU0570 | ● | 353HPU0570 | ● |
| **5.80** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353PU0580 | ● | 353HPU0580 | ● |
| **5.90** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353PU0590 | ● | 353HPU0590 | ● |
| **6.00** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353PU0600 | ● | 353HPU0600 | ● |
| **6.10** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353PU0610 | ● | 353HPU0610 | ● |
| **6.20** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353PU0620 | ● | 353HPU0620 | ● |
| **6.30** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353PU0630 | ● | 353HPU0630 | ● |
| **6.40** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353PU0640 | ● | 353HPU0640 | ● |
| **6.50** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353PU0650 | ● | 353HPU0650 | ● |
| **6.60** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353PU0660 | ● | 353HPU0660 | ● |
| **6.70** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353PU0670 | ● | 353HPU0670 | ● |
| **6.80** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353PU0680 | ● | 353HPU0680 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 353PU-353HPU

universal application, high productivity

3XD | DIN 6537K | PU | HPU | MG PV250 | 140° +C45° | 30°

353PU 353HPU



353PU



353HPU

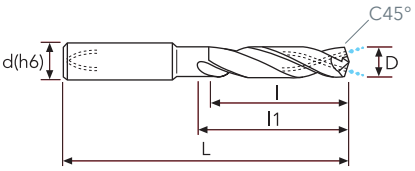
| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ★ | |

★ 1st choice ☆ suitable

353PU




353HPU




| | | | | | | 353PU | | 353HPU | |
|---|---|---|---|---|---|---|---|---|---|
| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock | EDP No. | Stock |
| **6.90** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353PU0690 | ● | 353HPU0690 | ● |
| **7.00** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353PU0700 | ● | 353HPU0700 | ● |
| **7.10** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353PU0710 | ● | 353HPU0710 | ● |
| **7.20** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353PU0720 | ● | 353HPU0720 | ● |
| **7.30** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353PU0730 | ● | 353HPU0730 | ● |
| **7.40** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353PU0740 | ● | 353HPU0740 | ● |
| **7.50** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353PU0750 | ● | 353HPU0750 | ● |
| **7.60** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353PU0760 | ● | 353HPU0760 | ● |
| **7.70** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353PU0770 | ● | 353HPU0770 | ● |
| **7.80** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353PU0780 | ● | 353HPU0780 | ● |
| **7.90** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353PU0790 | ● | 353HPU0790 | ● |
| **8.00** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353PU0800 | ● | 353HPU0800 | ● |
| **8.10** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0810 | ● | 353HPU0810 | ● |
| **8.20** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0820 | ● | 353HPU0820 | ● |
| **8.30** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0830 | ● | 353HPU0830 | ● |
| **8.40** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0840 | ● | 353HPU0840 | ● |
| **8.50** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0850 | ● | 353HPU0850 | ● |
| **8.60** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0860 | ● | 353HPU0860 | ● |
| **8.70** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0870 | ● | 353HPU0870 | ● |
| **8.80** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0880 | ● | 353HPU0880 | ● |
| **8.90** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0890 | ● | 353HPU0890 | ● |
| **9.00** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0900 | ● | 353HPU0900 | ● |
| **9.10** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0910 | ● | 353HPU0910 | ● |
| **9.20** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0920 | ● | 353HPU0920 | ● |
| **9.30** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0930 | ● | 353HPU0930 | ● |
| **9.40** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0940 | ● | 353HPU0940 | ● |
| **9.50** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0950 | ● | 353HPU0950 | ● |
| **9.60** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0960 | ● | 353HPU0960 | ● |
| **9.70** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0970 | ● | 353HPU0970 | ● |
| **9.80** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0980 | ● | 353HPU0980 | ● |
| **9.90** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU0990 | ● | 353HPU0990 | ● |
| **10.00** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353PU1000 | ● | 353HPU1000 | ● |
| **10.10** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1010 | ● | 353HPU1010 | ● |
| **10.20** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1020 | ● | 353HPU1020 | ● |
| **10.30** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1030 | ● | 353HPU1030 | ● |
| **10.40** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1040 | ● | 353HPU1040 | ● |
| **10.50** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1050 | ● | 353HPU1050 | ● |
| **10.60** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1060 | ● | 353HPU1060 | ● |
| **10.70** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1070 | ● | 353HPU1070 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 353PU-353HPU

universal application, high productivity

3XD | DIN 6537K | PU | HPU | MG PV250 | 140°+C45° | 30°

353PU 353HPU



353PU



353HPU

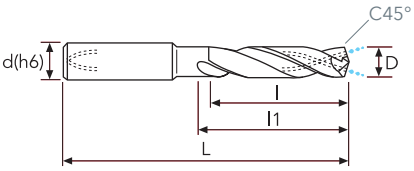
| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ★ | |

★ 1st choice ☆ suitable

353PU




353HPU




| | | | | | | 353PU | | 353HPU | |
|---|---|---|---|---|---|---|---|---|---|
| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock | EDP No. | Stock |
| **10.80** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1080 | ● | 353HPU1080 | ● |
| **10.90** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1090 | ● | 353HPU1090 | ● |
| **11.00** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1100 | ● | 353HPU1100 | ● |
| **11.10** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1110 | ● | 353HPU1110 | ● |
| **11.20** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1120 | ● | 353HPU1120 | ● |
| **11.30** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1130 | ● | 353HPU1130 | ● |
| **11.40** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1140 | ● | 353HPU1140 | ● |
| **11.50** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1150 | ● | 353HPU1150 | ● |
| **11.60** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1160 | ● | 353HPU1160 | ● |
| **11.70** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1170 | ● | 353HPU1170 | ● |
| **11.80** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1180 | ● | 353HPU1180 | ● |
| **11.90** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1190 | ● | 353HPU1190 | ● |
| **12.00** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353PU1200 | ● | 353HPU1200 | ● |
| **12.10** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1210 | ● | 353HPU1210 | ● |
| **12.20** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1220 | ● | 353HPU1220 | ● |
| **12.30** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1230 | ● | 353HPU1230 | ● |
| **12.40** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1240 | ● | 353HPU1240 | ● |
| **12.50** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1250 | ● | 353HPU1250 | ● |
| **12.60** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1260 | ● | 353HPU1260 | ● |
| **12.70** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1270 | ● | 353HPU1270 | ● |
| **12.80** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1280 | ● | 353HPU1280 | ● |
| **12.90** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1290 | ● | 353HPU1290 | ● |
| **13.00** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1300 | ● | 353HPU1300 | ● |
| **13.10** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1310 | ● | 353HPU1310 | ● |
| **13.20** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1320 | ● | 353HPU1320 | ● |
| **13.30** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1330 | ● | 353HPU1330 | ● |
| **13.40** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1340 | ● | 353HPU1340 | ● |
| **13.50** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1350 | ● | 353HPU1350 | ● |
| **13.60** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1360 | ● | 353HPU1360 | ● |
| **13.70** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1370 | ● | 353HPU1370 | ● |
| **13.80** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1380 | ● | 353HPU1380 | ● |
| **13.90** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1390 | ● | 353HPU1390 | ● |
| **14.00** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353PU1400 | ● | 353HPU1400 | ● |
| **14.10** | +0.025/+0.007 | 16 | 45 | 65 | 115 | 353PU1410 | ● | 353HPU1410 | ● |
| **14.20** | +0.025/+0.007 | 16 | 45 | 65 | 115 | 353PU1420 | ● | 353HPU1420 | ● |
| **14.30** | +0.025/+0.007 | 16 | 45 | 65 | 115 | 353PU1430 | ● | 353HPU1430 | ● |
| **14.50** | +0.025/+0.007 | 16 | 45 | 65 | 115 | 353PU1450 | ● | 353HPU1450 | ● |
| **14.60** | +0.025/+0.007 | 16 | 45 | 65 | 115 | 353PU1460 | ● | 353HPU1460 | ● |
| **14.70** | +0.025/+0.007 | 16 | 45 | 65 | 115 | 353PU1470 | ● | | |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 353PU-353HPU

universal application, high productivity

3XD | DIN 6537K | PU 353PU | HPU 353HPU | MG PV250 | 140°+C45° | 30°



353PU



353HPU

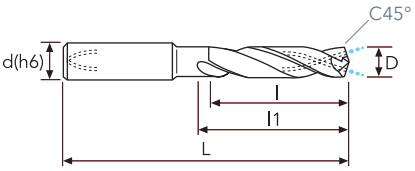
| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ★ | |

★ 1st choice ☆ suitable

353PU




353HPU




| | | | | | | 353PU | | 353HPU | |
|---|---|---|---|---|---|---|---|---|---|
| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock | EDP No. | Stock |
| **14.80** | +0.025/+0.007 | 16 | 45 | 65 | 115 | 353PU1480 | ● | 353HPU1480 | ● |
| **15.00** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353PU1500 | ● | 353HPU1500 | ● |
| **15.10** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353PU1510 | ● | 353HPU1510 | ● |
| **15.20** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353PU1520 | ● | 353HPU1520 | ● |
| **15.30** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353PU1530 | ● | 353HPU1530 | ● |
| **15.50** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353PU1550 | ● | 353HPU1550 | ● |
| **15.60** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353PU1560 | ● | 353HPU1560 | ● |
| **15.70** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353PU1570 | ● | 353HPU1570 | ● |
| **15.80** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353PU1580 | ● | 353HPU1580 | ● |
| **16.00** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353PU1600 | ● | 353HPU1600 | ● |
| **16.10** | +0.025/+0.007 | 18 | 73 | 73 | 123 | | | 353HPU1610 | ● |
| **16.20** | +0.025/+0.007 | 18 | 73 | 73 | 123 | | | 353HPU1620 | ● |
| **16.30** | +0.025/+0.007 | 18 | 73 | 73 | 123 | | | 353HPU1630 | ● |
| **16.50** | +0.025/+0.007 | 18 | 73 | 73 | 123 | 353PU1650 | ● | 353HPU1650 | ● |
| **16.70** | +0.025/+0.007 | 18 | 73 | 73 | 123 | | | 353HPU1670 | ● |
| **16.80** | +0.025/+0.007 | 18 | 73 | 73 | 123 | | | 353HPU1680 | ● |
| **17.00** | +0.025/+0.007 | 18 | 73 | 73 | 123 | 353PU1700 | ● | 353HPU1700 | ● |
| **17.10** | +0.025/+0.007 | 18 | 73 | 73 | 123 | | | 353HPU1710 | ● |
| **17.20** | +0.025/+0.007 | 18 | 73 | 73 | 123 | | | 353HPU1720 | ● |
| **17.50** | +0.025/+0.007 | 18 | 73 | 73 | 123 | 353PU1750 | ● | 353HPU1750 | ● |
| **17.60** | +0.025/+0.007 | 18 | 73 | 73 | 123 | | | 353HPU1760 | ● |
| **17.70** | +0.025/+0.007 | 18 | 73 | 73 | 123 | | | 353HPU1770 | ● |
| **17.80** | +0.025/+0.007 | 18 | 73 | 73 | 123 | | | 353HPU1780 | ● |
| **18.00** | +0.025/+0.007 | 18 | 73 | 73 | 123 | 353PU1800 | ● | 353HPU1800 | ● |
| **18.10** | +0.029/+0.008 | 20 | 79 | 79 | 131 | | | 353HPU1810 | ● |
| **18.20** | +0.029/+0.008 | 20 | 79 | 79 | 131 | | | 353HPU1820 | ● |
| **18.30** | +0.029/+0.008 | 20 | 79 | 79 | 131 | | | 353HPU1830 | ● |
| **18.50** | +0.029/+0.008 | 20 | 79 | 79 | 131 | 353PU1850 | ● | 353HPU1850 | ● |
| **18.60** | +0.029/+0.008 | 20 | 79 | 79 | 131 | | | 353HPU1860 | ● |
| **18.70** | +0.029/+0.008 | 20 | 79 | 79 | 131 | | | 353HPU1870 | ● |
| **18.80** | +0.029/+0.008 | 20 | 79 | 79 | 131 | | | 353HPU1880 | ● |
| **19.00** | +0.029/+0.008 | 20 | 79 | 79 | 131 | 353PU1900 | ● | 353HPU1900 | ● |
| **19.20** | +0.029/+0.008 | 20 | 79 | 79 | 131 | | | 353HPU1920 | ● |
| **19.30** | +0.029/+0.008 | 20 | 79 | 79 | 131 | | | 353HPU1930 | ● |
| **19.50** | +0.029/+0.008 | 20 | 79 | 79 | 131 | 353PU1950 | ● | 353HPU1950 | ● |
| **19.60** | +0.029/+0.008 | 20 | 79 | 79 | 131 | | | 353HPU1960 | ● |
| **19.80** | +0.029/+0.008 | 20 | 79 | 79 | 131 | | | 353HPU1980 | ● |
| **20.00** | +0.029/+0.008 | 20 | 79 | 79 | 131 | 353PU2000 | ● | 353HPU2000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

## 353PU

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **100÷140** | **80÷120** | **60÷85** | **50÷65** | **35÷50** | **20÷30** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| Ø RUN OUT <0.02mm | **3** | 0.120 | 0.108 | 0.096 | 0.084 | 0.074 | 0.044 |
| | **4** | 0.142 | 0.128 | 0.114 | 0.099 | 0.087 | 0.052 |
| | **5** | 0.164 | 0.147 | 0.131 | 0.115 | 0.101 | 0.061 |
| | **6** | 0.186 | 0.167 | 0.149 | 0.130 | 0.120 | 0.072 |
| | **7** | 0.208 | 0.187 | 0.166 | 0.145 | 0.134 | 0.081 |
| | **8** | 0.229 | 0.206 | 0.184 | 0.161 | 0.148 | 0.089 |
| | **9** | 0.251 | 0.226 | 0.201 | 0.176 | 0.162 | 0.097 |
| | **10** | 0.273 | 0.246 | 0.219 | 0.191 | 0.177 | 0.106 |
| | **11** | 0.284 | 0.256 | 0.227 | 0.199 | 0.184 | 0.110 |
| | **12** | 0.306 | 0.275 | 0.245 | 0.214 | 0.198 | 0.119 |
| | **13** | 0.328 | 0.295 | 0.262 | 0.229 | 0.212 | 0.127 |
| | **14** | 0.350 | 0.315 | 0.280 | 0.245 | 0.226 | 0.136 |
| | **15** | 0.371 | 0.334 | 0.297 | 0.260 | 0.240 | 0.144 |
| | **16** | 0.393 | 0.354 | 0.315 | 0.275 | 0.246 | 0.147 |
| | **17** | 0.404 | 0.364 | 0.323 | 0.283 | 0.249 | 0.149 |
| | **18** | 0.415 | 0.374 | 0.332 | 0.291 | 0.256 | 0.153 |
| | **19** | 0.426 | 0.383 | 0.341 | 0.298 | 0.262 | 0.157 |
| | **20** | 0.437 | 0.393 | 0.350 | 0.306 | 0.269 | 0.161 |

## 353HPU

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **120÷160** | **100÷140** | **70÷100** | **60÷80** | **50÷70** | **25÷40** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| Ø RUN OUT <0.02mm | **3** | 0.127 | 0.114 | 0.101 | 0.089 | 0.082 | 0.049 |
| | **4** | 0.150 | 0.135 | 0.120 | 0.105 | 0.097 | 0.058 |
| | **5** | 0.173 | 0.155 | 0.138 | 0.121 | 0.112 | 0.067 |
| | **6** | 0.196 | 0.176 | 0.156 | 0.137 | 0.133 | 0.080 |
| | **7** | 0.219 | 0.197 | 0.175 | 0.153 | 0.149 | 0.089 |
| | **8** | 0.242 | 0.217 | 0.193 | 0.169 | 0.165 | 0.099 |
| | **9** | 0.265 | 0.238 | 0.212 | 0.185 | 0.181 | 0.108 |
| | **10** | 0.288 | 0.259 | 0.230 | 0.201 | 0.196 | 0.118 |
| | **11** | 0.299 | 0.269 | 0.239 | 0.209 | 0.204 | 0.122 |
| | **12** | 0.322 | 0.290 | 0.258 | 0.225 | 0.220 | 0.132 |
| | **13** | 0.345 | 0.311 | 0.276 | 0.242 | 0.235 | 0.141 |
| | **14** | 0.368 | 0.331 | 0.294 | 0.258 | 0.251 | 0.151 |
| | **15** | 0.391 | 0.352 | 0.313 | 0.274 | 0.267 | 0.160 |
| | **16** | 0.414 | 0.373 | 0.331 | 0.290 | 0.273 | 0.163 |
| | **17** | 0.426 | 0.383 | 0.340 | 0.298 | 0.277 | 0.166 |
| | **18** | 0.437 | 0.393 | 0.350 | 0.306 | 0.284 | 0.170 |
| | **19** | 0.449 | 0.404 | 0.359 | 0.314 | 0.292 | 0.175 |
| | **20** | 0.460 | 0.414 | 0.368 | 0.322 | 0.299 | 0.179 |

## 353PU




| Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | <750 N/mm² | 550÷850 N/mm² | 650÷950 N/mm² | | | |
| Vc (m/min) | **35÷50** | **30÷45** | **20÷35** | | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| **3** | 0.067 | 0.053 | 0.047 | | | |
| **4** | 0.079 | 0.063 | 0.055 | | | |
| **5** | 0.101 | 0.081 | 0.064 | | | |
| **6** | 0.114 | 0.091 | 0.072 | | | |
| **7** | 0.128 | 0.102 | 0.081 | | | |
| **8** | 0.141 | 0.113 | 0.089 | | | |
| **9** | 0.155 | 0.124 | 0.097 | | | |
| **10** | 0.168 | 0.135 | 0.106 | | | |
| **11** | 0.175 | 0.140 | 0.110 | | | |
| **12** | 0.188 | 0.151 | 0.119 | | | |
| **13** | 0.202 | 0.161 | 0.127 | | | |
| **14** | 0.215 | 0.172 | 0.136 | | | |
| **15** | 0.229 | 0.183 | 0.144 | | | |
| **16** | 0.242 | 0.194 | 0.153 | | | |
| **17** | 0.249 | 0.199 | 0.157 | | | |
| **18** | 0.256 | 0.205 | 0.161 | | | |
| **19** | 0.262 | 0.210 | 0.165 | | | |
| **20** | 0.269 | 0.215 | 0.170 | | | |

## 353HPU




| Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | <750 N/mm² | 550÷850 N/mm² | 650÷950 N/mm² | | | |
| Vc (m/min) | **50÷70** | **40÷60** | **30÷45** | | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| **3** | 0.074 | 0.059 | 0.052 | | | |
| **4** | 0.087 | 0.070 | 0.061 | | | |
| **5** | 0.112 | 0.090 | 0.071 | | | |
| **6** | 0.127 | 0.102 | 0.080 | | | |
| **7** | 0.142 | 0.114 | 0.089 | | | |
| **8** | 0.157 | 0.126 | 0.099 | | | |
| **9** | 0.172 | 0.138 | 0.108 | | | |
| **10** | 0.187 | 0.150 | 0.118 | | | |
| **11** | 0.194 | 0.155 | 0.122 | | | |
| **12** | 0.209 | 0.167 | 0.132 | | | |
| **13** | 0.224 | 0.179 | 0.141 | | | |
| **14** | 0.239 | 0.191 | 0.151 | | | |
| **15** | 0.254 | 0.203 | 0.160 | | | |
| **16** | 0.269 | 0.215 | 0.170 | | | |
| **17** | 0.277 | 0.221 | 0.174 | | | |
| **18** | 0.284 | 0.227 | 0.179 | | | |
| **19** | 0.292 | 0.233 | 0.184 | | | |
| **20** | 0.299 | 0.239 | 0.188 | | | |

## 353PU

| | Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| | Vc (m/min) | **110÷150** | **90÷120** | **60÷80** | **40÷60** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| Ø RUN OUT <0.02mm | **3** | 0.120 | 0.108 | 0.096 | 0.084 | | |
| | **4** | 0.142 | 0.128 | 0.114 | 0.099 | | |
| | **5** | 0.164 | 0.147 | 0.131 | 0.115 | | |
| | **6** | 0.186 | 0.167 | 0.149 | 0.130 | | |
| | **7** | 0.208 | 0.187 | 0.166 | 0.145 | | |
| | **8** | 0.229 | 0.206 | 0.184 | 0.161 | | |
| | **9** | 0.251 | 0.226 | 0.201 | 0.176 | | |
| | **10** | 0.273 | 0.246 | 0.219 | 0.191 | | |
| | **11** | 0.284 | 0.256 | 0.227 | 0.199 | | |
| | **12** | 0.306 | 0.275 | 0.245 | 0.214 | | |
| | **13** | 0.328 | 0.295 | 0.262 | 0.229 | | |
| | **14** | 0.350 | 0.315 | 0.280 | 0.245 | | |
| | **15** | 0.371 | 0.334 | 0.297 | 0.260 | | |
| | **16** | 0.393 | 0.354 | 0.315 | 0.275 | | |
| | **17** | 0.404 | 0.364 | 0.323 | 0.283 | | |
| | **18** | 0.415 | 0.374 | 0.332 | 0.291 | | |
| | **19** | 0.426 | 0.383 | 0.341 | 0.298 | | |
| | **20** | 0.437 | 0.393 | 0.350 | 0.306 | | |

## 353HPU

| | Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| | Vc (m/min) | **120÷160** | **100÷140** | **80÷100** | **60÷80** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| Ø RUN OUT <0.02mm | **3** | 0.127 | 0.114 | 0.101 | 0.089 | | |
| | **4** | 0.150 | 0.135 | 0.120 | 0.105 | | |
| | **5** | 0.173 | 0.155 | 0.138 | 0.121 | | |
| | **6** | 0.196 | 0.176 | 0.156 | 0.137 | | |
| | **7** | 0.219 | 0.197 | 0.175 | 0.153 | | |
| | **8** | 0.242 | 0.217 | 0.193 | 0.169 | | |
| | **9** | 0.265 | 0.238 | 0.212 | 0.185 | | |
| | **10** | 0.288 | 0.259 | 0.230 | 0.201 | | |
| | **11** | 0.299 | 0.269 | 0.239 | 0.209 | | |
| | **12** | 0.322 | 0.290 | 0.258 | 0.225 | | |
| | **13** | 0.345 | 0.311 | 0.276 | 0.242 | | |
| | **14** | 0.368 | 0.331 | 0.294 | 0.258 | | |
| | **15** | 0.391 | 0.352 | 0.313 | 0.274 | | |
| | **16** | 0.414 | 0.373 | 0.331 | 0.290 | | |
| | **17** | 0.426 | 0.383 | 0.340 | 0.298 | | |
| | **18** | 0.437 | 0.393 | 0.350 | 0.306 | | |
| | **19** | 0.449 | 0.404 | 0.359 | 0.314 | | |
| | **20** | 0.460 | 0.414 | 0.368 | 0.322 | | |

CUTTING PARAMETERS

## 353PU




| Material Group ISO 513 | N1 | N2 | N3 | N4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | > 5%Si | | | | | |
| Vc (m/min) | 220÷260 | 200÷240 | 160÷200 | 160÷200 | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| 3 | 0.144 | 0.132 | 0.120 | 0.120 | | |
| 4 | 0.170 | 0.156 | 0.142 | 0.142 | | |
| 5 | 0.197 | 0.180 | 0.164 | 0.164 | | |
| 6 | 0.223 | 0.204 | 0.186 | 0.186 | | |
| 7 | 0.249 | 0.228 | 0.208 | 0.208 | | |
| 8 | 0.275 | 0.252 | 0.229 | 0.229 | | |
| 9 | 0.302 | 0.276 | 0.251 | 0.251 | | |
| 10 | 0.328 | 0.300 | 0.273 | 0.273 | | |
| 11 | 0.341 | 0.312 | 0.284 | 0.284 | | |
| 12 | 0.367 | 0.336 | 0.306 | 0.306 | | |
| 13 | 0.393 | 0.361 | 0.328 | 0.328 | | |
| 14 | 0.420 | 0.385 | 0.350 | 0.350 | | |
| 15 | 0.446 | 0.409 | 0.371 | 0.371 | | |
| 16 | 0.472 | 0.433 | 0.393 | 0.393 | | |
| 17 | 0.485 | 0.445 | 0.404 | 0.404 | | |
| 18 | 0.498 | 0.457 | 0.415 | 0.415 | | |
| 19 | 0.511 | 0.469 | 0.426 | 0.426 | | |
| 20 | 0.524 | 0.481 | 0.437 | 0.437 | | |

## 353HPU




| Material Group ISO 513 | N1 | N2 | N3 | N4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | > 5%Si | | | | | |
| Vc (m/min) | 260÷300 | 220÷260 | 180÷220 | 180÷220 | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| 3 | 0.152 | 0.139 | 0.127 | 0.127 | | |
| 4 | 0.179 | 0.164 | 0.150 | 0.150 | | |
| 5 | 0.207 | 0.190 | 0.173 | 0.173 | | |
| 6 | 0.235 | 0.215 | 0.196 | 0.196 | | |
| 7 | 0.262 | 0.240 | 0.219 | 0.219 | | |
| 8 | 0.290 | 0.266 | 0.242 | 0.242 | | |
| 9 | 0.317 | 0.291 | 0.265 | 0.265 | | |
| 10 | 0.345 | 0.316 | 0.288 | 0.288 | | |
| 11 | 0.359 | 0.329 | 0.299 | 0.299 | | |
| 12 | 0.386 | 0.354 | 0.322 | 0.322 | | |
| 13 | 0.414 | 0.380 | 0.345 | 0.345 | | |
| 14 | 0.442 | 0.405 | 0.368 | 0.368 | | |
| 15 | 0.469 | 0.430 | 0.391 | 0.391 | | |
| 16 | 0.497 | 0.455 | 0.414 | 0.414 | | |
| 17 | 0.511 | 0.468 | 0.426 | 0.426 | | |
| 18 | 0.524 | 0.481 | 0.437 | 0.437 | | |
| 19 | 0.538 | 0.493 | 0.449 | 0.449 | | |
| 20 | 0.552 | 0.506 | 0.460 | 0.460 | | |

## 353PU




| Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| Vc (m/min) | **15÷25** | **10÷20** | **20÷30** | **15÷25** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3** | 0.054 | 0.049 | 0.037 | 0.031 | | |
| **4** | 0.064 | 0.058 | 0.043 | 0.037 | | |
| **5** | 0.074 | 0.066 | 0.050 | 0.042 | | |
| **6** | 0.084 | 0.075 | 0.057 | 0.048 | | |
| **7** | 0.093 | 0.084 | 0.064 | 0.053 | | |
| **8** | 0.103 | 0.093 | 0.070 | 0.059 | | |
| **9** | 0.113 | 0.102 | 0.077 | 0.065 | | |
| **10** | 0.123 | 0.111 | 0.084 | 0.070 | | |
| **11** | 0.128 | 0.115 | 0.087 | 0.073 | | |
| **12** | 0.138 | 0.124 | 0.094 | 0.079 | | |
| **13** | 0.147 | 0.133 | 0.100 | 0.084 | | |
| **14** | 0.157 | 0.142 | 0.107 | 0.090 | | |
| **15** | 0.167 | 0.150 | 0.114 | 0.096 | | |
| **16** | 0.177 | 0.159 | 0.120 | 0.101 | | |
| **17** | 0.182 | 0.164 | 0.124 | 0.104 | | |
| **18** | 0.187 | 0.168 | 0.127 | 0.107 | | |
| **19** | 0.192 | 0.173 | 0.130 | 0.110 | | |
| **20** | 0.197 | 0.177 | 0.134 | 0.113 | | |

## 353HPU




| Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| Vc (m/min) | **30÷40** | **25÷35** | **40÷50** | **30÷40** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3** | 0.057 | 0.054 | 0.046 | 0.039 | | |
| **4** | 0.067 | 0.064 | 0.054 | 0.046 | | |
| **5** | 0.078 | 0.074 | 0.063 | 0.053 | | |
| **6** | 0.088 | 0.084 | 0.071 | 0.060 | | |
| **7** | 0.098 | 0.093 | 0.079 | 0.067 | | |
| **8** | 0.109 | 0.103 | 0.088 | 0.074 | | |
| **9** | 0.119 | 0.113 | 0.096 | 0.081 | | |
| **10** | 0.129 | 0.123 | 0.104 | 0.088 | | |
| **11** | 0.135 | 0.128 | 0.109 | 0.091 | | |
| **12** | 0.145 | 0.138 | 0.117 | 0.099 | | |
| **13** | 0.155 | 0.147 | 0.125 | 0.106 | | |
| **14** | 0.166 | 0.157 | 0.134 | 0.113 | | |
| **15** | 0.176 | 0.167 | 0.142 | 0.120 | | |
| **16** | 0.186 | 0.177 | 0.150 | 0.127 | | |
| **17** | 0.191 | 0.182 | 0.155 | 0.130 | | |
| **18** | 0.197 | 0.187 | 0.159 | 0.134 | | |
| **19** | 0.202 | 0.192 | 0.163 | 0.137 | | |
| **20** | 0.207 | 0.197 | 0.167 | 0.141 | | |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 355PU-355HPU

universal application, high productivity

5XD | DIN 6537L | PU 355PU | HPU 355HPU | MG PV250 | 140°+C45° | 30°



355PU



355HPU

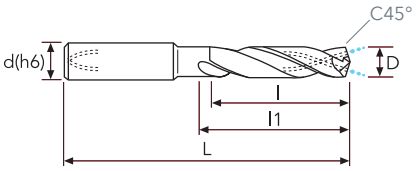
| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ★ | |

★ 1st choice ☆ suitable

355PU




355HPU




| | | | | | | 355PU | | 355HPU | |
|---|---|---|---|---|---|---|---|---|---|
| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock | EDP No. | Stock |
| **3.00** | +0.012/+0.002 | 6 | 23 | 28 | 66 | 355PU0300 | ● | 355HPU0300 | ● |
| **3.10** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355PU0310 | ● | 355HPU0310 | ● |
| **3.20** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355PU0320 | ● | 355HPU0320 | ● |
| **3.25** | +0.016/+0.004 | 6 | 23 | 28 | 66 | | | 355HPU0325 | ● |
| **3.30** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355PU0330 | ● | 355HPU0330 | ● |
| **3.40** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355PU0340 | ● | 355HPU0340 | ● |
| **3.50** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355PU0350 | ● | 355HPU0350 | ● |
| **3.60** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355PU0360 | ● | 355HPU0360 | ● |
| **3.70** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355PU0370 | ● | 355HPU0370 | ● |
| **3.80** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355PU0380 | ● | 355HPU0380 | ● |
| **3.90** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355PU0390 | ● | 355HPU0390 | ● |
| **4.00** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355PU0400 | ● | 355HPU0400 | ● |
| **4.10** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355PU0410 | ● | 355HPU0410 | ● |
| **4.20** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355PU0420 | ● | 355HPU0420 | ● |
| **4.30** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355PU0430 | ● | 355HPU0430 | ● |
| **4.40** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355PU0440 | ● | 355HPU0440 | ● |
| **4.50** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355PU0450 | ● | 355HPU0450 | ● |
| **4.60** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355PU0460 | ● | 355HPU0460 | ● |
| **4.65** | +0.016/+0.004 | 6 | 29 | 36 | 74 | | | 355HPU0465 | ● |
| **4.70** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355PU0470 | ● | 355HPU0470 | ● |
| **4.80** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355PU0480 | ● | 355HPU0480 | ● |
| **4.90** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355PU0490 | ● | 355HPU0490 | ● |
| **5.00** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355PU0500 | ● | 355HPU0500 | ● |
| **5.10** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355PU0510 | ● | 355HPU0510 | ● |
| **5.20** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355PU0520 | ● | 355HPU0520 | ● |
| **5.30** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355PU0530 | ● | 355HPU0530 | ● |
| **5.40** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355PU0540 | ● | 355HPU0540 | ● |
| **5.50** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355PU0550 | ● | 355HPU0550 | ● |
| **5.55** | +0.016/+0.004 | 6 | 35 | 44 | 82 | | | 355HPU0555 | ● |
| **5.60** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355PU0560 | ● | 355HPU0560 | ● |
| **5.70** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355PU0570 | ● | 355HPU0570 | ● |
| **5.80** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355PU0580 | ● | 355HPU0580 | ● |
| **5.90** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355PU0590 | ● | 355HPU0590 | ● |
| **6.00** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355PU0600 | ● | 355HPU0600 | ● |
| **6.10** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0610 | ● | 355HPU0610 | ● |
| **6.20** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0620 | ● | 355HPU0620 | ● |
| **6.30** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0630 | ● | 355HPU0630 | ● |
| **6.40** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0640 | ● | 355HPU0640 | ● |
| **6.50** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0650 | ● | 355HPU0650 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 355PU-355HPU

universal application, high productivity

5XD | DIN 6537L | PU | HPU | MG PV250 | 140° +C45° | 30°

355PU 355HPU



355PU



355HPU

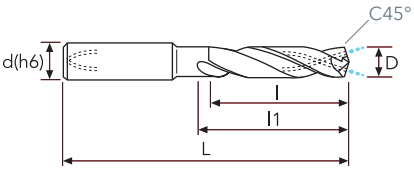
| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ★ | |

★ 1st choice ☆ suitable

355PU




355HPU




| | | | | | | 355PU | | 355HPU | |
|---|---|---|---|---|---|---|---|---|---|
| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock | EDP No. | Stock |
| **6.60** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0660 | ● | 355HPU0660 | ● |
| **6.70** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0670 | ● | 355HPU0670 | ● |
| **6.80** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0680 | ● | 355HPU0680 | ● |
| **6.90** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0690 | ● | 355HPU0690 | ● |
| **7.00** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0700 | ● | 355HPU0700 | ● |
| **7.10** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0710 | ● | 355HPU0710 | ● |
| **7.20** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0720 | ● | 355HPU0720 | ● |
| **7.30** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0730 | ● | 355HPU0730 | ● |
| **7.40** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0740 | ● | 355HPU0740 | ● |
| **7.45** | +0.021/+0.006 | 8 | 43 | 53 | 91 | | | 355HPU0745 | ● |
| **7.50** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0750 | ● | 355HPU0750 | ● |
| **7.60** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0760 | ● | 355HPU0760 | ● |
| **7.70** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0770 | ● | 355HPU0770 | ● |
| **7.80** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0780 | ● | 355HPU0780 | ● |
| **7.90** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0790 | ● | 355HPU0790 | ● |
| **8.00** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355PU0800 | ● | 355HPU0800 | ● |
| **8.10** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355PU0810 | ● | 355HPU0810 | ● |
| **8.20** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355PU0820 | ● | 355HPU0820 | ● |
| **8.30** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355PU0830 | ● | 355HPU0830 | ● |
| **8.40** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355PU0840 | ● | 355HPU0840 | ● |
| **8.50** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355PU0850 | ● | 355HPU0850 | ● |
| **8.60** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355PU0860 | ● | 355HPU0860 | ● |
| **8.70** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355PU0870 | ● | 355HPU0870 | ● |
| **8.80** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355PU0880 | ● | 355HPU0880 | ● |
| **8.90** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355PU0890 | ● | 355HPU0890 | ● |
| **9.00** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355PU0900 | ● | 355HPU0900 | ● |
| **9.10** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355PU0910 | ● | 355HPU0910 | ● |
| **9.20** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355PU0920 | ● | 355HPU0920 | ● |
| **9.25** | +0.021/+0.006 | 10 | 49 | 61 | 103 | | | 355HPU0925 | ● |
| **9.30** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355PU0930 | ● | 355HPU0930 | ● |
| **9.35** | +0.021/+0.006 | 10 | 49 | 61 | 103 | | | 355HPU0935 | ● |
| **9.40** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355PU0940 | ● | 355HPU0940 | ● |
| **9.45** | +0.021/+0.006 | 10 | 49 | 61 | 103 | | | 355HPU0945 | ● |
| **9.50** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355PU0950 | ● | 355HPU0950 | ● |
| **9.60** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355PU0960 | ● | 355HPU0960 | ● |
| **9.70** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355PU0970 | ● | 355HPU0970 | ● |
| **9.80** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355PU0980 | ● | 355HPU0980 | ● |
| **9.90** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355PU0990 | ● | 355HPU0990 | ● |
| **10.00** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355PU1000 | ● | 355HPU1000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 355PU-355HPU

universal application, high productivity

5XD | DIN 6537L | PU 355PU | HPU 355HPU | MG PV250 | 140°+C45° | 30°



355PU



355HPU

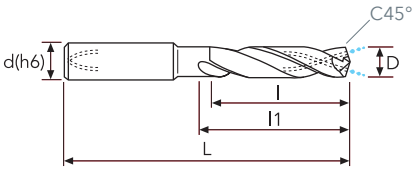
| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ★ | |

★ 1st choice ☆ suitable

355PU




355HPU




| | | | | | | 355PU | | 355HPU | |
|---|---|---|---|---|---|---|---|---|---|
| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock | EDP No. | Stock |
| **10.10** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1010 | ● | 355HPU1010 | ● |
| **10.20** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1020 | ● | 355HPU1020 | ● |
| **10.30** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1030 | ● | 355HPU1030 | ● |
| **10.40** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1040 | ● | 355HPU1040 | ● |
| **10.50** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1050 | ● | 355HPU1050 | ● |
| **10.60** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1060 | ● | 355HPU1060 | ● |
| **10.70** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1070 | ● | 355HPU1070 | ● |
| **10.80** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1080 | ● | 355HPU1080 | ● |
| **10.90** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1090 | ● | 355HPU1090 | ● |
| **11.00** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1100 | ● | 355HPU1100 | ● |
| **11.10** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1110 | ● | 355HPU1110 | ● |
| **11.20** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1120 | ● | 355HPU1120 | ● |
| **11.25** | +0.025/+0.007 | 12 | 71 | 71 | 118 | | | 355HPU1125 | ● |
| **11.30** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1130 | ● | 355HPU1130 | ● |
| **11.40** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1140 | ● | 355HPU1140 | ● |
| **11.50** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1150 | ● | 355HPU1150 | ● |
| **11.60** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1160 | ● | 355HPU1160 | ● |
| **11.70** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1170 | ● | 355HPU1170 | ● |
| **11.80** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1180 | ● | 355HPU1180 | ● |
| **11.90** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1190 | ● | 355HPU1190 | ● |
| **12.00** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355PU1200 | ● | 355HPU1200 | ● |
| **12.10** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355PU1210 | ● | 355HPU1210 | ● |
| **12.20** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355PU1220 | ● | 355HPU1220 | ● |
| **12.30** | +0.025/+0.007 | 14 | 77 | 77 | 124 | | | 355HPU1230 | ● |
| **12.40** | +0.025/+0.007 | 14 | 77 | 77 | 124 | | | 355HPU1240 | ● |
| **12.50** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355PU1250 | ● | 355HPU1250 | ● |
| **12.60** | +0.025/+0.007 | 14 | 77 | 77 | 124 | | | 355HPU1260 | ● |
| **12.70** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355PU1270 | ● | 355HPU1270 | ● |
| **12.80** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355PU1280 | ● | 355HPU1280 | ● |
| **12.90** | +0.025/+0.007 | 14 | 77 | 77 | 124 | | | 355HPU1290 | ● |
| **13.00** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355PU1300 | ● | 355HPU1300 | ● |
| **13.10** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355PU1310 | ● | 355HPU1310 | ● |
| **13.20** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355PU1320 | ● | 355HPU1320 | ● |
| **13.30** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355PU1330 | ● | 355HPU1330 | ● |
| **13.40** | +0.025/+0.007 | 14 | 77 | 77 | 124 | | | 355HPU1340 | ● |
| **13.50** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355PU1350 | ● | 355HPU1350 | ● |
| **13.60** | +0.025/+0.007 | 14 | 77 | 77 | 124 | | | 355HPU1360 | ● |
| **13.70** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355PU1370 | ● | 355HPU1370 | ● |
| **13.80** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355PU1380 | ● | 355HPU1380 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 355PU-355HPU

universal application, high productivity

5XD | DIN 6537L | PU | HPU | MG PV250 | 140° +C45° | 30°

355PU 355HPU



355PU



355HPU

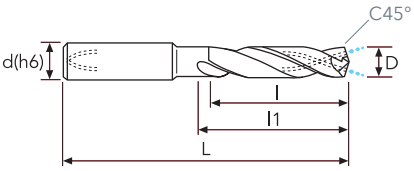
| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ★ | |

★ 1st choice ☆ suitable

355PU




355HPU




| | | | | | | 355PU | | 355HPU | |
|---|---|---|---|---|---|---|---|---|---|
| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock | EDP No. | Stock |
| **13.90** | +0.025/+0.007 | 14 | 77 | 77 | 124 | | | 355HPU1390 | ● |
| **14.00** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355PU1400 | ● | 355HPU1400 | ● |
| **14.10** | +0.025/+0.007 | 16 | 83 | 83 | 133 | | | 355HPU1410 | ● |
| **14.20** | +0.025/+0.007 | 16 | 83 | 83 | 133 | | | 355HPU1420 | ● |
| **14.30** | +0.025/+0.007 | 16 | 83 | 83 | 133 | | | 355HPU1430 | ● |
| **14.40** | +0.025/+0.007 | 16 | 83 | 83 | 133 | | | 355HPU1440 | ● |
| **14.50** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355PU1450 | ● | 355HPU1450 | ● |
| **14.60** | +0.025/+0.007 | 16 | 83 | 83 | 133 | | | 355HPU1460 | ● |
| **14.70** | +0.025/+0.007 | 16 | 83 | 83 | 133 | | | 355HPU1470 | ● |
| **14.80** | +0.025/+0.007 | 16 | 83 | 83 | 133 | | | 355HPU1480 | ● |
| **14.90** | +0.025/+0.007 | 16 | 83 | 83 | 133 | | | 355HPU1490 | ● |
| **15.00** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355PU1500 | ● | 355HPU1500 | ● |
| **15.10** | +0.025/+0.007 | 16 | 83 | 83 | 133 | | | 355HPU1510 | ● |
| **15.20** | +0.025/+0.007 | 16 | 83 | 83 | 133 | | | 355HPU1520 | ● |
| **15.30** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355PU1530 | ● | 355HPU1530 | ● |
| **15.40** | +0.025/+0.007 | 16 | 83 | 83 | 133 | | | 355HPU1540 | ● |
| **15.50** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355PU1550 | ● | 355HPU1550 | ● |
| **15.60** | +0.025/+0.007 | 16 | 83 | 83 | 133 | | | 355HPU1560 | ● |
| **15.70** | +0.025/+0.007 | 16 | 83 | 83 | 133 | | | 355HPU1570 | ● |
| **15.80** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355PU1580 | ● | 355HPU1580 | ● |
| **15.90** | +0.025/+0.007 | 16 | 83 | 83 | 133 | | | 355HPU1590 | ● |
| **16.00** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355PU1600 | ● | 355HPU1600 | ● |
| **16.10** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1610 | ● |
| **16.20** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1620 | ● |
| **16.30** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1630 | ● |
| **16.40** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1640 | ● |
| **16.50** | +0.025/+0.007 | 18 | 93 | 93 | 143 | 355PU1650 | ● | 355HPU1650 | ● |
| **16.60** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1660 | ● |
| **16.70** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1670 | ● |
| **16.80** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1680 | ● |
| **16.90** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1690 | ● |
| **17.00** | +0.025/+0.007 | 18 | 93 | 93 | 143 | 355PU1700 | ● | 355HPU1700 | ● |
| **17.10** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1710 | ● |
| **17.20** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1720 | ● |
| **17.30** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1730 | ● |
| **17.40** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1740 | ● |
| **17.50** | +0.025/+0.007 | 18 | 93 | 93 | 143 | 355PU1750 | ● | 355HPU1750 | ● |
| **17.60** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1760 | ● |
| **17.70** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1770 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 355PU-355HPU

universal application, high productivity

5XD | DIN 6537L | PU 355PU | HPU 355HPU | MG PV250 | 140°+C45° | 30°



355PU



355HPU

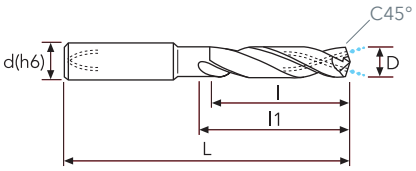
| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ★ | |

★ 1st choice ☆ suitable

355PU




355HPU




| | | | | | | 355PU | | 355HPU | |
|---|---|---|---|---|---|---|---|---|---|
| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock | EDP No. | Stock |
| **17.80** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1780 | ● |
| **17.90** | +0.025/+0.007 | 18 | 93 | 93 | 143 | | | 355HPU1790 | ● |
| **18.00** | +0.025/+0.007 | 18 | 93 | 93 | 143 | 355PU1800 | ● | 355HPU1800 | ● |
| **18.10** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1810 | ● |
| **18.20** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1820 | ● |
| **18.30** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1830 | ● |
| **18.40** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1840 | ● |
| **18.50** | +0.029/+0.008 | 20 | 101 | 101 | 153 | 355PU1850 | ● | 355HPU1850 | ● |
| **18.60** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1860 | ● |
| **18.70** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1870 | ● |
| **18.80** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1880 | ● |
| **18.90** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1890 | ● |
| **19.00** | +0.029/+0.008 | 20 | 101 | 101 | 153 | 355PU1900 | ● | 355HPU1900 | ● |
| **19.10** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1910 | ● |
| **19.20** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1920 | ● |
| **19.30** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1930 | ● |
| **19.40** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1940 | ● |
| **19.50** | +0.029/+0.008 | 20 | 101 | 101 | 153 | 355PU1950 | ● | 355HPU1950 | ● |
| **19.60** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1960 | ● |
| **19.70** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1970 | ● |
| **19.80** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1980 | ● |
| **19.90** | +0.029/+0.008 | 20 | 101 | 101 | 153 | | | 355HPU1990 | ● |
| **20.00** | +0.029/+0.008 | 20 | 101 | 101 | 153 | 355PU2000 | ● | 355HPU2000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

## 355PU

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **100÷140** | **80÷120** | **60÷85** | **50÷65** | **35÷50** | **20÷30** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| Ø RUN OUT <0.02mm | **3** | 0.114 | 0.103 | 0.091 | 0.080 | 0.070 | 0.042 |
| | **4** | 0.135 | 0.121 | 0.108 | 0.094 | 0.083 | 0.050 |
| | **5** | 0.156 | 0.140 | 0.125 | 0.109 | 0.096 | 0.058 |
| | **6** | 0.176 | 0.159 | 0.141 | 0.124 | 0.114 | 0.068 |
| | **7** | 0.197 | 0.177 | 0.158 | 0.138 | 0.128 | 0.077 |
| | **8** | 0.218 | 0.196 | 0.174 | 0.153 | 0.141 | 0.085 |
| | **9** | 0.239 | 0.215 | 0.191 | 0.167 | 0.154 | 0.093 |
| | **10** | 0.259 | 0.234 | 0.208 | 0.182 | 0.168 | 0.101 |
| | **11** | 0.270 | 0.243 | 0.216 | 0.189 | 0.174 | 0.105 |
| | **12** | 0.291 | 0.262 | 0.232 | 0.203 | 0.188 | 0.113 |
| | **13** | 0.311 | 0.280 | 0.249 | 0.218 | 0.201 | 0.121 |
| | **14** | 0.332 | 0.299 | 0.266 | 0.232 | 0.215 | 0.129 |
| | **15** | 0.353 | 0.318 | 0.282 | 0.247 | 0.228 | 0.137 |
| | **16** | 0.374 | 0.338 | 0.299 | 0.262 | 0.233 | 0.139 |
| | **17** | 0.384 | 0.346 | 0.307 | 0.269 | 0.236 | 0.142 |
| | **18** | 0.394 | 0.355 | 0.316 | 0.276 | 0.243 | 0.146 |
| | **19** | 0.405 | 0.364 | 0.324 | 0.283 | 0.249 | 0.150 |
| | **20** | 0.415 | 0.374 | 0.332 | 0.291 | 0.256 | 0.153 |

## 355HPU

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **120÷160** | **100÷140** | **70÷100** | **60÷80** | **50÷70** | **25÷40** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| Ø RUN OUT <0.02mm | **3** | 0.120 | 0.108 | 0.096 | 0.084 | 0.078 | 0.047 |
| | **4** | 0.142 | 0.128 | 0.114 | 0.099 | 0.092 | 0.055 |
| | **5** | 0.164 | 0.147 | 0.131 | 0.115 | 0.107 | 0.064 |
| | **6** | 0.186 | 0.167 | 0.149 | 0.130 | 0.127 | 0.076 |
| | **7** | 0.208 | 0.187 | 0.166 | 0.145 | 0.142 | 0.085 |
| | **8** | 0.229 | 0.206 | 0.184 | 0.161 | 0.157 | 0.094 |
| | **9** | 0.251 | 0.226 | 0.201 | 0.176 | 0.171 | 0.103 |
| | **10** | 0.273 | 0.246 | 0.219 | 0.191 | 0.186 | 0.112 |
| | **11** | 0.284 | 0.256 | 0.227 | 0.199 | 0.194 | 0.116 |
| | **12** | 0.306 | 0.275 | 0.245 | 0.214 | 0.209 | 0.125 |
| | **13** | 0.328 | 0.295 | 0.262 | 0.229 | 0.224 | 0.134 |
| | **14** | 0.350 | 0.315 | 0.280 | 0.245 | 0.239 | 0.143 |
| | **15** | 0.371 | 0.334 | 0.297 | 0.260 | 0.254 | 0.152 |
| | **16** | 0.393 | 0.356 | 0.315 | 0.275 | 0.259 | 0.155 |
| | **17** | 0.404 | 0.364 | 0.323 | 0.283 | 0.263 | 0.158 |
| | **18** | 0.415 | 0.374 | 0.332 | 0.291 | 0.270 | 0.162 |
| | **19** | 0.426 | 0.383 | 0.341 | 0.298 | 0.277 | 0.166 |
| | **20** | 0.437 | 0.393 | 0.350 | 0.306 | 0.284 | 0.170 |

## 355PU




| Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | <750 N/mm² | 550÷850 N/mm² | 650÷950 N/mm² | | | |
| Vc (m/min) | **35÷50** | **30÷45** | **20÷35** | | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| **3** | 0.063 | 0.051 | 0.044 | | | |
| **4** | 0.075 | 0.060 | 0.052 | | | |
| **5** | 0.096 | 0.077 | 0.060 | | | |
| **6** | 0.109 | 0.087 | 0.068 | | | |
| **7** | 0.121 | 0.097 | 0.077 | | | |
| **8** | 0.134 | 0.107 | 0.085 | | | |
| **9** | 0.147 | 0.118 | 0.093 | | | |
| **10** | 0.160 | 0.128 | 0.101 | | | |
| **11** | 0.166 | 0.133 | 0.105 | | | |
| **12** | 0.179 | 0.143 | 0.113 | | | |
| **13** | 0.192 | 0.153 | 0.121 | | | |
| **14** | 0.205 | 0.164 | 0.129 | | | |
| **15** | 0.217 | 0.174 | 0.137 | | | |
| **16** | 0.230 | 0.184 | 0.145 | | | |
| **17** | 0.236 | 0.189 | 0.149 | | | |
| **18** | 0.243 | 0.194 | 0.153 | | | |
| **19** | 0.249 | 0.199 | 0.157 | | | |
| **20** | 0.256 | 0.205 | 0.161 | | | |

## 355HPU




| Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | <750 N/mm² | 550÷850 N/mm² | 650÷950 N/mm² | | | |
| Vc (m/min) | **50÷70** | **40÷60** | **30÷45** | | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| **3** | 0.070 | 0.056 | 0.049 | | | |
| **4** | 0.083 | 0.066 | 0.058 | | | |
| **5** | 0.107 | 0.085 | 0.067 | | | |
| **6** | 0.121 | 0.097 | 0.076 | | | |
| **7** | 0.135 | 0.108 | 0.085 | | | |
| **8** | 0.149 | 0.119 | 0.094 | | | |
| **9** | 0.163 | 0.131 | 0.103 | | | |
| **10** | 0.178 | 0.142 | 0.112 | | | |
| **11** | 0.185 | 0.148 | 0.116 | | | |
| **12** | 0.199 | 0.159 | 0.125 | | | |
| **13** | 0.213 | 0.170 | 0.134 | | | |
| **14** | 0.227 | 0.182 | 0.143 | | | |
| **15** | 0.241 | 0.193 | 0.152 | | | |
| **16** | 0.256 | 0.205 | 0.161 | | | |
| **17** | 0.263 | 0.210 | 0.166 | | | |
| **18** | 0.270 | 0.216 | 0.170 | | | |
| **19** | 0.277 | 0.222 | 0.174 | | | |
| **20** | 0.284 | 0.227 | 0.179 | | | |

## 355PU

| Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| Vc (m/min) | **110÷150** | **90÷120** | **60÷80** | **40÷60** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3** | 0.114 | 0.103 | 0.091 | 0.080 | | |
| **4** | 0.135 | 0.121 | 0.108 | 0.094 | | |
| **5** | 0.156 | 0.140 | 0.125 | 0.109 | | |
| **6** | 0.176 | 0.159 | 0.141 | 0.124 | | |
| **7** | 0.197 | 0.177 | 0.158 | 0.138 | | |
| **8** | 0.218 | 0.196 | 0.174 | 0.153 | | |
| **9** | 0.239 | 0.215 | 0.191 | 0.167 | | |
| **10** | 0.259 | 0.234 | 0.208 | 0.182 | | |
| **11** | 0.270 | 0.243 | 0.216 | 0.189 | | |
| **12** | 0.291 | 0.262 | 0.232 | 0.203 | | |
| **13** | 0.311 | 0.280 | 0.249 | 0.218 | | |
| **14** | 0.332 | 0.299 | 0.266 | 0.232 | | |
| **15** | 0.353 | 0.318 | 0.282 | 0.247 | | |
| **16** | 0.374 | 0.338 | 0.299 | 0.262 | | |
| **17** | 0.384 | 0.346 | 0.307 | 0.269 | | |
| **18** | 0.394 | 0.355 | 0.316 | 0.276 | | |
| **19** | 0.405 | 0.364 | 0.324 | 0.283 | | |
| **20** | 0.415 | 0.374 | 0.332 | 0.291 | | |




## 355HPU

| Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| Vc (m/min) | **120÷160** | **100÷140** | **80÷100** | **60÷80** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3** | 0.120 | 0.108 | 0.096 | 0.084 | | |
| **4** | 0.142 | 0.128 | 0.114 | 0.099 | | |
| **5** | 0.164 | 0.147 | 0.131 | 0.115 | | |
| **6** | 0.186 | 0.167 | 0.149 | 0.130 | | |
| **7** | 0.208 | 0.187 | 0.166 | 0.145 | | |
| **8** | 0.229 | 0.206 | 0.184 | 0.161 | | |
| **9** | 0.251 | 0.226 | 0.201 | 0.176 | | |
| **10** | 0.273 | 0.246 | 0.219 | 0.191 | | |
| **11** | 0.284 | 0.256 | 0.227 | 0.199 | | |
| **12** | 0.306 | 0.275 | 0.245 | 0.214 | | |
| **13** | 0.328 | 0.295 | 0.262 | 0.229 | | |
| **14** | 0.350 | 0.315 | 0.280 | 0.245 | | |
| **15** | 0.371 | 0.334 | 0.297 | 0.260 | | |
| **16** | 0.393 | 0.356 | 0.315 | 0.275 | | |
| **17** | 0.404 | 0.364 | 0.323 | 0.283 | | |
| **18** | 0.415 | 0.374 | 0.332 | 0.291 | | |
| **19** | 0.426 | 0.383 | 0.341 | 0.298 | | |
| **20** | 0.437 | 0.393 | 0.350 | 0.306 | | |



INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

## 355PU




| Material Group ISO 513 | N1 | N2 | N3 | N4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | > 5%Si | | | | | |
| Vc (m/min) | **220÷260** | **200÷240** | **160÷200** | **160÷200** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3** | 0.137 | 0.126 | 0.114 | 0.114 | | |
| **4** | 0.162 | 0.148 | 0.135 | 0.135 | | |
| **5** | 0.187 | 0.171 | 0.156 | 0.156 | | |
| **6** | 0.212 | 0.194 | 0.176 | 0.176 | | |
| **7** | 0.237 | 0.217 | 0.197 | 0.197 | | |
| **8** | 0.262 | 0.240 | 0.218 | 0.218 | | |
| **9** | 0.286 | 0.263 | 0.239 | 0.239 | | |
| **10** | 0.311 | 0.285 | 0.259 | 0.259 | | |
| **11** | 0.324 | 0.297 | 0.270 | 0.270 | | |
| **12** | 0.349 | 0.320 | 0.291 | 0.291 | | |
| **13** | 0.374 | 0.342 | 0.311 | 0.311 | | |
| **14** | 0.399 | 0.365 | 0.332 | 0.332 | | |
| **15** | 0.423 | 0.388 | 0.353 | 0.353 | | |
| **16** | 0.448 | 0.411 | 0.374 | 0.374 | | |
| **17** | 0.461 | 0.422 | 0.384 | 0.384 | | |
| **18** | 0.473 | 0.434 | 0.394 | 0.394 | | |
| **19** | 0.486 | 0.445 | 0.405 | 0.405 | | |
| **20** | 0.498 | 0.457 | 0.415 | 0.415 | | |

## 355HPU




| Material Group ISO 513 | N1 | N2 | N3 | N4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | > 5%Si | | | | | |
| Vc (m/min) | **260÷300** | **220÷260** | **180÷220** | **180÷220** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3** | 0.144 | 0.132 | 0.120 | 0.120 | | |
| **4** | 0.170 | 0.156 | 0.142 | 0.142 | | |
| **5** | 0.197 | 0.180 | 0.164 | 0.164 | | |
| **6** | 0.223 | 0.204 | 0.186 | 0.186 | | |
| **7** | 0.249 | 0.228 | 0.208 | 0.208 | | |
| **8** | 0.275 | 0.252 | 0.229 | 0.229 | | |
| **9** | 0.302 | 0.276 | 0.251 | 0.251 | | |
| **10** | 0.328 | 0.300 | 0.273 | 0.273 | | |
| **11** | 0.341 | 0.312 | 0.284 | 0.284 | | |
| **12** | 0.367 | 0.336 | 0.306 | 0.306 | | |
| **13** | 0.393 | 0.361 | 0.328 | 0.328 | | |
| **14** | 0.420 | 0.385 | 0.350 | 0.350 | | |
| **15** | 0.446 | 0.409 | 0.371 | 0.371 | | |
| **16** | 0.472 | 0.433 | 0.393 | 0.393 | | |
| **17** | 0.485 | 0.445 | 0.404 | 0.404 | | |
| **18** | 0.498 | 0.457 | 0.415 | 0.415 | | |
| **19** | 0.511 | 0.469 | 0.426 | 0.426 | | |
| **20** | 0.524 | 0.481 | 0.437 | 0.437 | | |

## 355PU

| Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| Vc (m/min) | **15÷25** | **10÷20** | **20÷30** | **15÷25** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3** | 0.051 | 0.044 | 0.035 | 0.029 | | |
| **4** | 0.061 | 0.052 | 0.041 | 0.035 | | |
| **5** | 0.070 | 0.060 | 0.048 | 0.040 | | |
| **6** | 0.079 | 0.068 | 0.054 | 0.045 | | |
| **7** | 0.089 | 0.076 | 0.060 | 0.051 | | |
| **8** | 0.098 | 0.084 | 0.067 | 0.056 | | |
| **9** | 0.107 | 0.092 | 0.073 | 0.062 | | |
| **10** | 0.117 | 0.100 | 0.079 | 0.067 | | |
| **11** | 0.121 | 0.104 | 0.083 | 0.070 | | |
| **12** | 0.131 | 0.112 | 0.089 | 0.075 | | |
| **13** | 0.140 | 0.120 | 0.095 | 0.080 | | |
| **14** | 0.149 | 0.128 | 0.102 | 0.086 | | |
| **15** | 0.159 | 0.136 | 0.108 | 0.091 | | |
| **16** | 0.168 | 0.144 | 0.114 | 0.096 | | |
| **17** | 0.173 | 0.148 | 0.118 | 0.099 | | |
| **18** | 0.177 | 0.152 | 0.121 | 0.102 | | |
| **19** | 0.182 | 0.156 | 0.124 | 0.104 | | |
| **20** | 0.187 | 0.160 | 0.127 | 0.107 | | |

Ø RUN OUT <0.02mm

## 355HPU

| Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| Vc (m/min) | **30÷40** | **25÷35** | **40÷50** | **30÷40** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3** | 0.054 | 0.049 | 0.044 | 0.037 | | |
| **4** | 0.064 | 0.058 | 0.052 | 0.043 | | |
| **5** | 0.074 | 0.067 | 0.060 | 0.050 | | |
| **6** | 0.084 | 0.075 | 0.067 | 0.057 | | |
| **7** | 0.093 | 0.084 | 0.075 | 0.064 | | |
| **8** | 0.103 | 0.093 | 0.083 | 0.070 | | |
| **9** | 0.113 | 0.102 | 0.091 | 0.077 | | |
| **10** | 0.123 | 0.111 | 0.099 | 0.084 | | |
| **11** | 0.128 | 0.115 | 0.103 | 0.087 | | |
| **12** | 0.138 | 0.124 | 0.111 | 0.094 | | |
| **13** | 0.147 | 0.133 | 0.119 | 0.100 | | |
| **14** | 0.157 | 0.142 | 0.127 | 0.107 | | |
| **15** | 0.167 | 0.151 | 0.135 | 0.114 | | |
| **16** | 0.177 | 0.160 | 0.143 | 0.120 | | |
| **17** | 0.182 | 0.164 | 0.147 | 0.124 | | |
| **18** | 0.187 | 0.169 | 0.151 | 0.127 | | |
| **19** | 0.192 | 0.173 | 0.155 | 0.130 | | |
| **20** | 0.197 | 0.177 | 0.159 | 0.134 | | |

Ø RUN OUT <0.02mm





# TYPHOON TA-4HTA

## HIGH PERFORMANCE - GENERAL PURPOSE

The tool of choice for multi-purpose drilling on ISO P, M, K below 1100 N/mm².

La soluzione ideale per la foratura di materiali ISO P, M, K sino a 1100 N/mm².

Die optimale Lösung für das Bohren der Materialien ISO P, M, K bis zu 1100 N/mm².

La solution idéale pour le perçage de matériaux ISO P, M, K jusqu'à 1100 N/mm².

La solución ideal para el taladro de materiales ISO P, M, K hasta 1100 N/mm².

Идеальное решение для сверления материалов по ISO P, M, K до 1100 Н/мм².

## TYPHOON TA-HTA-4HTA





**TA**

**TA**
- Self-centering geometry for accurate holes
- Curved cutting edge for low cutting forces.
- High relief angle: reduces cutting forces, improves chip shape and ejection
- Wide chip pocket: improves chip ejection
- Back taper geometry: improves the cutting performance
- Substrate and coating: specifically selected for high wear resistance, long and reliable life

**TA**
- Affûtage autocentré pour un perçage plus précis
- Profil de l'arête ondulé pour faible effort de coupe
- Géométrie de l'arête avec dépouille accentuée pour réduire l'effort de coupe et améliorer la forme et le contrôle des copeaux
- Goujoures recourbées et larges pour améliorer l'évacuation des copeaux
- Géométrie du corps avec conicité arrière pour faciliter la coupe
- Substrat et revêtement spécifiques pour garantir durée et fiabilité

**TA**
- Affilatura autocentrante per fori precisi
- Profilo del tagliente ondulato per basso sforzo di taglio
- Geometria del tagliente con spoglia accentuata per ridurre lo sforzo di taglio e migliorare la forma e il controllo dei trucioli
- Gole ricurve e ampie per migliorare l'evacuazione dei trucioli
- Geometria del corpo con conicità posteriore per agevolare l'azione di taglio
- Substrato e rivestimento specifici per garantire durata e affidabilità

**TA**
- Afilado autocentrante para agujeros precisos
- Perfil del filo ondulado, para bajo esfuerzo de corte
- Geometría del filo con salida acentuada para reducir el esfuerzo de corte y mejorar la forma y el control de las virutas
- Ranuras curvadas y amplias para mejorar la evacuación de las virutas
- Geometría del cuerpo con conicidad posterior para facilitar la acción de corte
- Sustrato y revestimiento específicos para garantizar duración y fiabilidad

**TA**
- Selbstzentrierender Schliff für präzise Bohrungen
- Gewelltes Schneidkantenprofil für geringen Schneiddruck
- Geometrie der Schneidkante mit ausgeprägtem Hinterschliff zur Reduzierung des Schneiddrucks und zur Verbesserung der Späneform und -kontrolle
- Gebogene und breite Nuten zur Verbesserung der Späneabführung
- Geometrie des Körpers mit konischem hinteren Bereich zur Erleichterung des Schnittvorgangs
- Spezielles Trägermaterial und spezielle Beschichtung zur Gewährleistung von Standzeit und Zuverlässigkeit

**TA**
- Самоцентрирующаяся заточка для сверления отверстий высокой точности
- Закругленный профиль режущей кромки для низких режущий усилий
- Большой угол наклона спиральной канавки для уменьшения сил резания и улучшения условий удаления стружки
- Широкие стружечные канавки для лучшего вывода стружки
- Геометрия с обратным конусом для повышения производительности
- Специальное покрытие для повышения стойкости инструмента



4HTA



**4HTA 8xD**
- Self-centering geometry for accurate holes
- 4 margin lands: reliable machining for highly accurate and straight holes even in deep drilling
- Straight cutting edge: short chips for easy evacuation and high reliability
- Special edge design: high performance and edge protection
- Back taper geometry: improves the cutting performance
- Chip pocket finishing: highly polished to reduce welding and improves chip ejection
- Large oil holes: improves coolant feed
- Substrate and coating: specifically selected for high wear resistance, long and reliable life

**4HTA 8xD**
- Affûtage autocentré pour un perçage plus précis.
- Géométrie avec « 4 listels » : trous droits et précis, même en présence de trous profonds.
- Profil de l'arête droit et renforcé : il génère des copeaux courts et garantit une grande fiabilité
- Géométrie de l'arête avec affûtage spécifique pour protéger l'arête et les angles
- Géométrie du corps avec conicité arrière pour faciliter l'action de coupe
- Finition des goujoures : polie pour réduire le problème du collage et faciliter l'évacuation des copeaux
- Trous de lubrification avec géométrie modifiée pour un apport de lubrifiant plus important
- Substrat et revêtement spécifiques pour garantir durée et fiabilité

**4HTA 8xD**
- Affilatura autocentrante per fori precisi
- Geometria con "4 Margini": fori rettilinei e precisi, anche nel caso di profondità elevate.
- Profilo del tagliente diritto e rinforzato: genera trucioli corti e garantisce grande affidabilità
- Geometria del tagliente con affilatura specifica a protezione del tagliente e degli spigoli
- Geometria del corpo con conicità posteriore per agevolare l'azione di taglio
- Finitura gole: lappate per ridurre il problema dell'incollaggio e facilitare l'evacuazione dei trucioli
- Fori di refrigerazione con geometria modificata per un maggior apporto di refrigerante
- Substrato e rivestimento specifici per garantire durata e affidabilità

**4HTA 8xD**
- Afilado autocentrante para agujeros precisos
- Geometría con «4 Márgenes»: agujeros rectilíneos y precisos, incluso en caso de profundidades elevadas.
- Perfil del filo recto y reforzado: genera virutas cortas y garantiza una gran fiabilidad
- Geometría del filo con afilado específico para proteger el filo y los ángulos
- Geometría del cuerpo con conicidad posterior para facilitar la acción de corte
- Acabado ranuras: lapeadas para reducir el problema del encolado y facilitar la evacuación de las virutas
- Agujeros de refrigeración con geometría modificada para una mayor aportación de refrigerante
- Sustrato y revestimiento específicos para garantizar duración y fiabilidad

**4HTA 8xD**
- Selbstzentrierender Schliff für präzise Bohrungen
- Geometrie mit „4 Fasen": gerade und präzise Bohrungen, auch bei großen Tiefen.
- Gerades und verstärktes Schneidkantenprofil: zur Erzeugung kurzer Späne und zur Gewährleistung hoher Zuverlässigkeit
- Geometrie der Schneidkante mit speziellem Schliff zum Schutz von Schneidkante und Kanten
- Geometrie des Körpers mit konischem hinteren Bereich zur Erleichterung des Schnittvorgangs
- Schlichtbearbeitung der Nuten: geläppt, um Probleme durch Verkleben zu reduzieren und um die Späneabführung zu erleichtern
- Kühlöffnungen mit abgeänderter Geometrie für einen verbesserten Kühlmittelzufluss
- Spezielles Trägermaterial und spezielle Beschichtung zur Gewährleistung von Standzeit und Zuverlässigkeit

**4HTA 8xD**
- Самоцентрирующаяся заточка для сверления отверстий высокой точности
- Геометрия с 4 режущими кромками: надежная обработка и высокая точность отверстия, даже, при глубоком сверлении
- Прямые режущие кромки: легкий вывод короткой стружки и высокая эффективность
- Геометрия режущих кромок со специальной заточкой: высокая производительность и защита кромок
- Геометрия с обратным конусом: повышение производительности
- Отполированные стружечные канавки: уменьшают вероятность приваривания стружки и облегчают ее вывод
- Большие отверстия: увеличена эффективность подвода СОЖ
- Специальное покрытие для повышения стойкости инструмента

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 343TA-318N

general purpose, coated (343TA) and uncoated (318N)

3XD | DIN 6539 | TA | MG PV200 (343TA) | MG BR (318N) | 140° | 30°



343TA



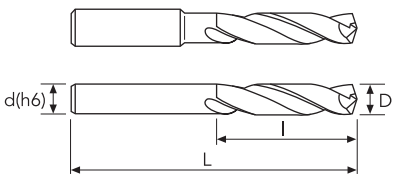
318N

| P | M | K | N | S | H | |
|---|---|---|---|---|---|---|
| ★ | ☆ | ☆ | ☆ | | | 343TA |
| ★ | ☆ | ☆ | ☆ | | | 318N |

★ 1st choice ☆ suitable

< ø2 mm

≥ ø2 mm




| | | | | | | 343TA | | 318N | |
|---|---|---|---|---|---|---|---|---|---|
| D(h7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock | EDP No. | Stock |
| **1.00** | 0/-0.010 | 2 | 6 | | 40 | 343TA0100 | ● | P318N0100 | ● |
| **1.10** | 0/-0.010 | 2 | 7 | | 40 | 343TA0110 | ● | P318N0110 | ● |
| **1.20** | 0/-0.010 | 2 | 8 | | 40 | 343TA0120 | ● | P318N0120 | ● |
| **1.30** | 0/-0.010 | 2 | 8 | | 40 | 343TA0130 | ● | P318N0130 | ● |
| **1.40** | 0/-0.010 | 2 | 9 | | 40 | 343TA0140 | ● | P318N0140 | ● |
| **1.50** | 0/-0.010 | 2 | 9 | | 40 | 343TA0150 | ● | P318N0150 | ● |
| **1.60** | 0/-0.010 | 2 | 10 | | 40 | 343TA0160 | ● | P318N0160 | ● |
| **1.70** | 0/-0.010 | 2 | 10 | | 40 | 343TA0170 | ● | P318N0170 | ● |
| **1.80** | 0/-0.010 | 2 | 11 | | 40 | 343TA0180 | ● | P318N0180 | ● |
| **1.90** | 0/-0.010 | 2 | 11 | | 40 | 343TA0190 | ● | P318N0190 | ● |
| **2.00** | 0/-0.010 | 2 | 12 | | 40 | 343TA0200 | ● | P318N0200 | ● |
| **2.10** | 0/-0.010 | 2.1 | 12 | | 40 | 343TA0210 | ● | P318N0210 | ● |
| **2.20** | 0/-0.010 | 2.2 | 13 | | 40 | 343TA0220 | ● | P318N0220 | ● |
| **2.30** | 0/-0.010 | 2.3 | 13 | | 46 | 343TA0230 | ● | P318N0230 | ● |
| **2.40** | 0/-0.010 | 2.4 | 14 | | 46 | 343TA0240 | ● | P318N0240 | ● |
| **2.50** | 0/-0.010 | 2.5 | 14 | | 46 | 343TA0250 | ● | P318N0250 | ● |
| **2.60** | 0/-0.010 | 2.6 | 14 | | 46 | 343TA0260 | ● | P318N0260 | ● |
| **2.70** | 0/-0.010 | 2.7 | 16 | | 46 | 343TA0270 | ● | P318N0270 | ● |
| **2.80** | 0/-0.010 | 2.8 | 16 | | 49 | 343TA0280 | ● | P318N0280 | ● |
| **2.90** | 0/-0.010 | 2.9 | 16 | | 49 | 343TA0290 | ● | P318N0290 | ● |
| **3.00** | 0/-0.010 | 3 | 16 | | 49 | 343TA0300 | ● | P318N0300 | ● |
| **3.10** | 0/-0.012 | 3.1 | 18 | | 49 | 343TA0310 | ● | P318N0310 | ● |
| **3.20** | 0/-0.012 | 3.2 | 18 | | 49 | 343TA0320 | ● | P318N0320 | ● |
| **3.30** | 0/-0.012 | 3.3 | 18 | | 52 | 343TA0330 | ● | P318N0330 | ● |
| **3.40** | 0/-0.012 | 3.4 | 20 | | 52 | 343TA0340 | ● | P318N0340 | ● |
| **3.50** | 0/-0.012 | 3.5 | 20 | | 52 | 343TA0350 | ● | P318N0350 | ● |
| **3.60** | 0/-0.012 | 3.6 | 20 | | 52 | 343TA0360 | ● | P318N0360 | ● |
| **3.70** | 0/-0.012 | 3.7 | 20 | | 52 | 343TA0370 | ● | P318N0370 | ● |
| **3.80** | 0/-0.012 | 3.8 | 22 | | 55 | 343TA0380 | ● | P318N0380 | ● |
| **3.90** | 0/-0.012 | 3.9 | 22 | | 55 | 343TA0390 | ● | P318N0390 | ● |
| **4.00** | 0/-0.012 | 4 | 22 | | 55 | 343TA0400 | ● | P318N0400 | ● |
| **4.10** | 0/-0.012 | 4.1 | 22 | | 55 | 343TA0410 | ● | P318N0410 | ● |
| **4.20** | 0/-0.012 | 4.2 | 22 | | 55 | 343TA0420 | ● | P318N0420 | ● |
| **4.30** | 0/-0.012 | 4.3 | 24 | | 58 | 343TA0430 | ● | P318N0430 | ● |
| **4.40** | 0/-0.012 | 4.4 | 24 | | 58 | 343TA0440 | ● | P318N0440 | ● |
| **4.50** | 0/-0.012 | 4.5 | 24 | | 58 | 343TA0450 | ● | P318N0450 | ● |
| **4.60** | 0/-0.012 | 4.6 | 24 | | 58 | 343TA0460 | ● | P318N0460 | ● |
| **4.70** | 0/-0.012 | 4.7 | 24 | | 58 | 343TA0470 | ● | P318N0470 | ● |
| **4.80** | 0/-0.012 | 4.8 | 26 | | 62 | 343TA0480 | ● | P318N0480 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 343TA-318N

general purpose, coated (343TA) and uncoated (318N)

3XD | DIN 6539 | TA | MG PV200 (343TA) | MG BR (318N) | 140° | 30°



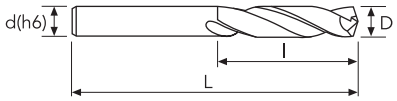
343TA



318N

| P | M | K | N | S | H | |
|---|---|---|---|---|---|---|
| ★ | ☆ | ☆ | ☆ | | | 343TA |
| ★ | ☆ | ☆ | ☆ | | | 318N |

★ 1st choice ☆ suitable




| | | | | | | 343TA | | 318N | |
|---|---|---|---|---|---|---|---|---|---|
| D(h7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock | EDP No. | Stock |
| **4.90** | 0/-0.012 | 4.9 | 26 | | 62 | 343TA0490 | ● | P318N0490 | ● |
| **5.00** | 0/-0.012 | 5 | 26 | | 62 | 343TA0500 | ● | P318N0500 | ● |
| **5.10** | 0/-0.012 | 5.1 | 26 | | 62 | 343TA0510 | ● | P318N0510 | ● |
| **5.20** | 0/-0.012 | 5.2 | 26 | | 62 | 343TA0520 | ● | P318N0520 | ● |
| **5.30** | 0/-0.012 | 5.3 | 26 | | 66 | 343TA0530 | ● | P318N0530 | ● |
| **5.40** | 0/-0.012 | 5.4 | 28 | | 66 | 343TA0540 | ● | P318N0540 | ● |
| **5.50** | 0/-0.012 | 5.5 | 28 | | 66 | 343TA0550 | ● | P318N0550 | ● |
| **5.60** | 0/-0.012 | 5.6 | 28 | | 66 | 343TA0560 | ● | P318N0560 | ● |
| **5.70** | 0/-0.012 | 5.7 | 28 | | 66 | 343TA0570 | ● | P318N0570 | ● |
| **5.80** | 0/-0.012 | 5.8 | 28 | | 70 | 343TA0580 | ● | P318N0580 | ● |
| **5.90** | 0/-0.012 | 5.9 | 28 | | 70 | 343TA0590 | ● | P318N0590 | ● |
| **6.00** | 0/-0.012 | 6 | 28 | | 70 | 343TA0600 | ● | P318N0600 | ● |
| **6.10** | 0/-0.015 | 6.1 | 31 | | 70 | 343TA0610 | ● | P318N0610 | ● |
| **6.20** | 0/-0.015 | 6.2 | 31 | | 70 | 343TA0620 | ● | P318N0620 | ● |
| **6.30** | 0/-0.015 | 6.3 | 31 | | 70 | 343TA0630 | ● | P318N0630 | ● |
| **6.40** | 0/-0.015 | 6.4 | 31 | | 70 | 343TA0640 | ● | P318N0640 | ● |
| **6.50** | 0/-0.015 | 6.5 | 31 | | 70 | 343TA0650 | ● | P318N0650 | ● |
| **6.60** | 0/-0.015 | 6.6 | 31 | | 70 | 343TA0660 | ● | P318N0660 | ● |
| **6.70** | 0/-0.015 | 6.7 | 31 | | 70 | 343TA0670 | ● | P318N0670 | ● |
| **6.80** | 0/-0.015 | 6.8 | 34 | | 74 | 343TA0680 | ● | P318N0680 | ● |
| **6.90** | 0/-0.015 | 6.9 | 34 | | 74 | 343TA0690 | ● | P318N0690 | ● |
| **7.00** | 0/-0.015 | 7 | 34 | | 74 | 343TA0700 | ● | P318N0700 | ● |
| **7.10** | 0/-0.015 | 7.1 | 34 | | 74 | 343TA0710 | ● | P318N0710 | ● |
| **7.20** | 0/-0.015 | 7.2 | 34 | | 74 | 343TA0720 | ● | P318N0720 | ● |
| **7.30** | 0/-0.015 | 7.3 | 34 | | 79 | 343TA0730 | ● | P318N0730 | ● |
| **7.40** | 0/-0.015 | 7.4 | 34 | | 79 | 343TA0740 | ● | P318N0740 | ● |
| **7.50** | 0/-0.015 | 7.5 | 34 | | 79 | 343TA0750 | ● | P318N0750 | ● |
| **7.60** | 0/-0.015 | 7.6 | 37 | | 79 | 343TA0760 | ● | P318N0760 | ○ |
| **7.70** | 0/-0.015 | 7.7 | 37 | | 79 | 343TA0770 | ● | P318N0770 | ○ |
| **7.80** | 0/-0.015 | 7.8 | 37 | | 79 | 343TA0780 | ● | P318N0780 | ● |
| **7.90** | 0/-0.015 | 7.9 | 37 | | 79 | 343TA0790 | ● | P318N0790 | ○ |
| **8.00** | 0/-0.015 | 8 | 37 | | 79 | 343TA0800 | ● | P318N0800 | ● |
| **8.10** | 0/-0.015 | 8.1 | 37 | | 79 | 343TA0810 | ● | P318N0810 | ● |
| **8.20** | 0/-0.015 | 8.2 | 37 | | 79 | 343TA0820 | ● | P318N0820 | ● |
| **8.30** | 0/-0.015 | 8.3 | 37 | | 84 | 343TA0830 | ● | P318N0830 | ● |
| **8.40** | 0/-0.015 | 8.4 | 37 | | 84 | 343TA0840 | ● | P318N0840 | ○ |
| **8.50** | 0/-0.015 | 8.5 | 37 | | 84 | 343TA0850 | ● | P318N0850 | ● |
| **8.60** | 0/-0.015 | 8.6 | 40 | | 84 | 343TA0860 | ● | P318N0860 | ● |
| **8.70** | 0/-0.015 | 8.7 | 40 | | 84 | 343TA0870 | ● | P318N0870 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 343TA-318N

general purpose, coated (343TA) and uncoated (318N)

3XD | DIN 6539 | TA | MG PV200 (343TA) | MG BR (318N) | 140° | 30°



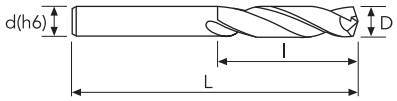
343TA



318N

| P | M | K | N | S | H | |
|---|---|---|---|---|---|---|
| ★ | ☆ | ☆ | ☆ | | | 343TA |
| ★ | ☆ | ☆ | ☆ | | | 318N |

★ 1st choice ☆ suitable




| | | | | | | 343TA | | 318N | |
|---|---|---|---|---|---|---|---|---|---|
| D(h7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock | EDP No. | Stock |
| **8.80** | 0/-0.015 | 8.8 | 40 | | 84 | 343TA0880 | ● | P318N0880 | ● |
| **8.90** | 0/-0.015 | 8.9 | 40 | | 84 | 343TA0890 | ● | P318N0890 | ○ |
| **9.00** | 0/-0.015 | 9 | 40 | | 84 | 343TA0900 | ● | P318N0900 | ● |
| **9.10** | 0/-0.015 | 9.1 | 40 | | 84 | 343TA0910 | ● | P318N0910 | ○ |
| **9.20** | 0/-0.015 | 9.2 | 40 | | 84 | 343TA0920 | ● | P318N0920 | ● |
| **9.30** | 0/-0.015 | 9.3 | 40 | | 89 | 343TA0930 | ● | P318N0930 | ● |
| **9.40** | 0/-0.015 | 9.4 | 40 | | 89 | 343TA0940 | ● | P318N0940 | ○ |
| **9.50** | 0/-0.015 | 9.5 | 40 | | 89 | 343TA0950 | ● | P318N0950 | ● |
| **9.60** | 0/-0.015 | 9.6 | 43 | | 89 | 343TA0960 | ● | P318N0960 | ○ |
| **9.70** | 0/-0.015 | 9.7 | 43 | | 89 | 343TA0970 | ● | P318N0970 | ○ |
| **9.80** | 0/-0.015 | 9.8 | 43 | | 89 | 343TA0980 | ● | P318N0980 | ● |
| **9.90** | 0/-0.015 | 9.9 | 43 | | 89 | 343TA0990 | ● | P318N0990 | ○ |
| **10.00** | 0/-0.015 | 10 | 43 | | 89 | 343TA1000 | ● | P318N1000 | ● |
| **10.20** | 0/-0.018 | 10.2 | 43 | | 89 | 343TA1020 | ● | P318N1020 | ● |
| **10.50** | 0/-0.018 | 10.5 | 43 | | 95 | 343TA1050 | ● | P318N1050 | ● |
| **11.00** | 0/-0.018 | 11 | 47 | | 95 | 343TA1100 | ● | P318N1100 | ● |
| **11.50** | 0/-0.018 | 11.5 | 47 | | 102 | 343TA1150 | ● | P318N1150 | ● |
| **12.00** | 0/-0.018 | 12 | 51 | | 102 | 343TA1200 | ● | P318N1200 | ● |
| **12.50** | 0/-0.018 | 12.5 | 51 | | 103 | 343TA1250 | ● | P318N1250 | ● |
| **13.00** | 0/-0.018 | 13 | 51 | | 103 | 343TA1300 | ● | P318N1300 | ● |
| **13.50** | 0/-0.018 | 13.5 | 54 | | 107 | 343TA1350 | ● | | |
| **14.00** | 0/-0.018 | 14 | 54 | | 107 | 343TA1400 | ● | | |
| **14.50** | 0/-0.018 | 14.5 | 56 | | 111 | 343TA1450 | ● | | |
| **15.00** | 0/-0.018 | 15 | 56 | | 111 | 343TA1500 | ● | | |
| **15.50** | 0/-0.018 | 15.5 | 58 | | 115 | 343TA1550 | ● | | |
| **16.00** | 0/-0.018 | 16 | 58 | | 115 | 343TA1600 | ● | | |

● stock standard ○ non-standard stock ▽ stock exhaustion

## 343TA

| | Material Group ISO 513 | P1 P2 P3 | P7 | M1 | K1 | N1 N2 | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | <800 N/mm² | <700 N/mm² | <750 N/mm² | 150÷250 HB | | |
| | Vc (m/min) | **80÷100** | **35÷45** | **35÷45** | **80÷100** | **140÷180** | |
|  | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| | **1** | 0.050 | 0.035 | 0.035 | 0.050 | 0.065 | |
| | **2** | 0.070 | 0.049 | 0.049 | 0.070 | 0.091 | |
| | **3** | 0.086 | 0.060 | 0.060 | 0.086 | 0.112 | |
| | **4** | 0.126 | 0.088 | 0.088 | 0.126 | 0.164 | |
| | **5** | 0.131 | 0.092 | 0.092 | 0.131 | 0.170 | |
| | **6** | 0.145 | 0.102 | 0.102 | 0.145 | 0.189 | |
| | **7** | 0.165 | 0.116 | 0.116 | 0.165 | 0.215 | |
| | **8** | 0.185 | 0.130 | 0.130 | 0.185 | 0.241 | |
| | **9** | 0.205 | 0.144 | 0.144 | 0.205 | 0.267 | |
| | **10** | 0.224 | 0.157 | 0.157 | 0.224 | 0.291 | |
| | **11** | 0.244 | 0.171 | 0.171 | 0.244 | 0.317 | |
| | **12** | 0.263 | 0.184 | 0.184 | 0.263 | 0.342 | |
| | **13** | 0.282 | 0.197 | 0.197 | 0.282 | 0.367 | |
| | **14** | 0.302 | 0.211 | 0.211 | 0.302 | 0.393 | |
| | **15** | 0.315 | 0.221 | 0.221 | 0.315 | 0.410 | |
| | **16** | 0.336 | 0.235 | 0.235 | 0.336 | 0.437 | |

Ø RUN OUT <0.02mm

## 318N

| | Material Group ISO 513 | P1 P2 P3 | P7 | M1 | K1 | N1 N2 | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | <800 N/mm² | <700 N/mm² | <750 N/mm² | 150÷250 HB | | |
| | Vc (m/min) | **60÷80** | **20÷30** | **20÷30** | **50÷70** | **100÷140** | |
|  | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| | **1** | 0.035 | 0.025 | 0.025 | 0.032 | 0.046 | |
| | **2** | 0.050 | 0.035 | 0.035 | 0.045 | 0.065 | |
| | **3** | 0.065 | 0.046 | 0.046 | 0.059 | 0.085 | |
| | **4** | 0.080 | 0.056 | 0.056 | 0.072 | 0.104 | |
| | **5** | 0.095 | 0.067 | 0.067 | 0.086 | 0.124 | |
| | **6** | 0.110 | 0.077 | 0.077 | 0.099 | 0.143 | |
| | **7** | 0.125 | 0.088 | 0.088 | 0.113 | 0.163 | |
| | **8** | 0.140 | 0.098 | 0.098 | 0.126 | 0.182 | |
| | **9** | 0.155 | 0.109 | 0.109 | 0.140 | 0.202 | |
| | **10** | 0.170 | 0.119 | 0.119 | 0.153 | 0.221 | |
| | **11** | 0.185 | 0.130 | 0.130 | 0.167 | 0.241 | |
| | **12** | 0.200 | 0.140 | 0.140 | 0.180 | 0.260 | |
| | **13** | 0.215 | 0.151 | 0.151 | 0.194 | 0.280 | |

Ø RUN OUT <0.02mm

# 3584HTA

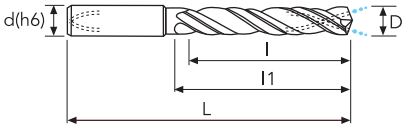
4-margin lands, long (8xD)

8XD | OSAWA NORM | 4HTA | MG PV300 | 140° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **3.00** | +0.012/+0.002 | 6 | 32 | 40 | 85 | 358HTA0300 | ● |
| **3.10** | +0.016/+0.004 | 6 | 32 | 40 | 85 | 358HTA0310 | ● |
| **3.20** | +0.016/+0.004 | 6 | 32 | 40 | 85 | 358HTA0320 | ● |
| **3.30** | +0.016/+0.004 | 6 | 32 | 40 | 85 | 358HTA0330 | ● |
| **3.40** | +0.016/+0.004 | 6 | 32 | 40 | 85 | 358HTA0340 | ● |
| **3.50** | +0.016/+0.004 | 6 | 32 | 40 | 85 | 358HTA0350 | ● |
| **3.60** | +0.016/+0.004 | 6 | 36 | 40 | 85 | 358HTA0360 | ● |
| **3.70** | +0.016/+0.004 | 6 | 36 | 40 | 85 | 358HTA0370 | ● |
| **3.80** | +0.016/+0.004 | 6 | 36 | 40 | 85 | 358HTA0380 | ● |
| **3.90** | +0.016/+0.004 | 6 | 36 | 40 | 85 | 358HTA0390 | ○ |
| **4.00** | +0.016/+0.004 | 6 | 38 | 46 | 85 | 358HTA0400 | ● |
| **4.10** | +0.016/+0.004 | 6 | 38 | 46 | 85 | 358HTA0410 | ● |
| **4.20** | +0.016/+0.004 | 6 | 38 | 46 | 85 | 358HTA0420 | ● |
| **4.30** | +0.016/+0.004 | 6 | 40 | 46 | 97 | 358HTA0430 | ● |
| **4.40** | +0.016/+0.004 | 6 | 40 | 46 | 97 | 358HTA0440 | ○ |
| **4.50** | +0.016/+0.004 | 6 | 44 | 46 | 97 | 358HTA0450 | ● |
| **4.60** | +0.016/+0.004 | 6 | 44 | 46 | 97 | 358HTA0460 | ● |
| **4.70** | +0.016/+0.004 | 6 | 44 | 46 | 97 | 358HTA0470 | ● |
| **4.80** | +0.016/+0.004 | 6 | 44 | 46 | 97 | 358HTA0480 | ● |
| **4.90** | +0.016/+0.004 | 6 | 44 | 46 | 97 | 358HTA0490 | ○ |
| **5.00** | +0.016/+0.004 | 6 | 48 | 57 | 97 | 358HTA0500 | ● |
| **5.10** | +0.016/+0.004 | 6 | 48 | 57 | 97 | 358HTA0510 | ● |
| **5.20** | +0.016/+0.004 | 6 | 48 | 57 | 97 | 358HTA0520 | ● |
| **5.30** | +0.016/+0.004 | 6 | 48 | 57 | 97 | 358HTA0530 | ● |
| **5.40** | +0.016/+0.004 | 6 | 48 | 57 | 97 | 358HTA0540 | ○ |
| **5.50** | +0.016/+0.004 | 6 | 48 | 57 | 97 | 358HTA0550 | ● |
| **5.60** | +0.016/+0.004 | 6 | 48 | 57 | 97 | 358HTA0560 | ● |
| **5.70** | +0.016/+0.004 | 6 | 48 | 57 | 97 | 358HTA0570 | ○ |
| **5.80** | +0.016/+0.004 | 6 | 48 | 57 | 97 | 358HTA0580 | ● |
| **5.90** | +0.016/+0.004 | 6 | 48 | 57 | 97 | 358HTA0590 | ● |
| **6.00** | +0.016/+0.004 | 6 | 48 | 57 | 97 | 358HTA0600 | ● |
| **6.10** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0610 | ● |
| **6.20** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0620 | ● |
| **6.30** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0630 | ● |
| **6.40** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0640 | ○ |
| **6.50** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0650 | ● |
| **6.60** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0660 | ○ |
| **6.70** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0670 | ● |
| **6.80** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0680 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 3584HTA

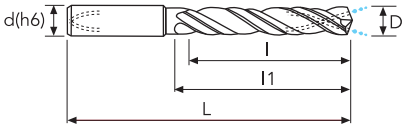
4-margin lands, long (8xD)

8XD | OSAWA NORM | 4HTA | MG PV300 | 140° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **6.90** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0690 | ● |
| **7.00** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0700 | ● |
| **7.10** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0710 | ● |
| **7.20** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0720 | ● |
| **7.30** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0730 | ● |
| **7.40** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0740 | ● |
| **7.50** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0750 | ● |
| **7.60** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0760 | ● |
| **7.70** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0770 | ○ |
| **7.80** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0780 | ● |
| **7.90** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0790 | ○ |
| **8.00** | +0.021/+0.006 | 8 | 64 | 76 | 116 | 358HTA0800 | ● |
| **8.10** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0810 | ● |
| **8.20** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0820 | ● |
| **8.30** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0830 | ● |
| **8.40** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0840 | ○ |
| **8.50** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0850 | ● |
| **8.60** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0860 | ● |
| **8.70** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0870 | ● |
| **8.80** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0880 | ● |
| **8.90** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0890 | ○ |
| **9.00** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0900 | ● |
| **9.10** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0910 | ● |
| **9.20** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0920 | ● |
| **9.30** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0930 | ● |
| **9.40** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0940 | ○ |
| **9.50** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0950 | ● |
| **9.60** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0960 | ○ |
| **9.70** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0970 | ○ |
| **9.80** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0980 | ● |
| **9.90** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA0990 | ○ |
| **10.00** | +0.021/+0.006 | 10 | 80 | 95 | 142 | 358HTA1000 | ● |
| **10.20** | +0.025/+0.007 | 12 | 96 | 114 | 163 | 358HTA1020 | ● |
| **10.50** | +0.025/+0.007 | 12 | 96 | 114 | 163 | 358HTA1050 | ● |
| **10.80** | +0.025/+0.007 | 12 | 96 | 114 | 163 | 358HTA1080 | ● |
| **11.00** | +0.025/+0.007 | 12 | 96 | 114 | 163 | 358HTA1100 | ● |
| **11.20** | +0.025/+0.007 | 12 | 96 | 114 | 163 | 358HTA1120 | ● |
| **11.30** | +0.025/+0.007 | 12 | 96 | 114 | 163 | 358HTA1130 | ○ |
| **11.50** | +0.025/+0.007 | 12 | 96 | 114 | 163 | 358HTA1150 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 3584HTA

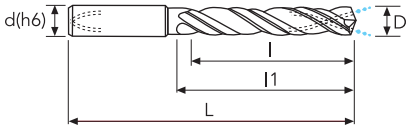
4-margin lands, long (8xD)

8XD | OSAWA NORM | 4HTA | MG PV300 | 140° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **11.80** | +0.025/+0.007 | 12 | 96 | 114 | 163 | 358HTA1180 | ● |
| **12.00** | +0.025/+0.007 | 12 | 96 | 114 | 163 | 358HTA1200 | ● |
| **12.20** | +0.025/+0.007 | 14 | 112 | 133 | 182 | 358HTA1220 | ● |
| **12.50** | +0.025/+0.007 | 14 | 112 | 133 | 182 | 358HTA1250 | ● |
| **12.80** | +0.025/+0.007 | 14 | 112 | 133 | 182 | 358HTA1280 | ● |
| **13.00** | +0.025/+0.007 | 14 | 112 | 133 | 182 | 358HTA1300 | ● |
| **13.50** | +0.025/+0.007 | 14 | 112 | 133 | 182 | 358HTA1350 | ● |
| **14.00** | +0.025/+0.007 | 14 | 112 | 133 | 182 | 358HTA1400 | ● |
| **14.50** | +0.025/+0.007 | 16 | 128 | 152 | 204 | 358HTA1450 | ● |
| **15.00** | +0.025/+0.007 | 16 | 128 | 152 | 204 | 358HTA1500 | ● |
| **15.50** | +0.025/+0.007 | 16 | 128 | 152 | 204 | 358HTA1550 | ● |
| **16.00** | +0.025/+0.007 | 16 | 128 | 152 | 204 | 358HTA1600 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 3584HTA

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **100÷120** | **80÷100** | **50÷70** | **40÷60** | **40÷50** | **15÷25** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| | **3** | 0.072 | 0.065 | 0.058 | 0.050 | 0.070 | 0.042 |
| | **4** | 0.089 | 0.080 | 0.071 | 0.062 | 0.090 | 0.054 |
| | **5** | 0.106 | 0.095 | 0.085 | 0.074 | 0.100 | 0.060 |
| | **6** | 0.122 | 0.110 | 0.098 | 0.085 | 0.110 | 0.066 |
| | **7** | 0.139 | 0.125 | 0.111 | 0.097 | 0.130 | 0.078 |
| | **8** | 0.155 | 0.140 | 0.124 | 0.109 | 0.150 | 0.090 |
| | **9** | 0.172 | 0.155 | 0.138 | 0.120 | 0.160 | 0.096 |
| | **10** | 0.188 | 0.169 | 0.150 | 0.132 | 0.175 | 0.105 |
| | **11** | 0.205 | 0.185 | 0.164 | 0.144 | 0.180 | 0.108 |
| | **12** | 0.221 | 0.199 | 0.177 | 0.155 | 0.200 | 0.120 |
| | **13** | 0.238 | 0.214 | 0.190 | 0.167 | 0.215 | 0.129 |
| | **14** | 0.254 | 0.229 | 0.203 | 0.178 | 0.230 | 0.138 |
| | **15** | 0.270 | 0.243 | 0.216 | 0.189 | 0.245 | 0.147 |
| | **16** | 0.286 | 0.257 | 0.229 | 0.200 | 0.260 | 0.156 |

| | Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **40÷50** | **30÷40** | **20÷30** | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| | **3** | 0.070 | 0.056 | 0.049 | | | |
| | **4** | 0.090 | 0.072 | 0.063 | | | |
| | **5** | 0.100 | 0.080 | 0.070 | | | |
| | **6** | 0.110 | 0.088 | 0.077 | | | |
| | **7** | 0.130 | 0.104 | 0.091 | | | |
| | **8** | 0.150 | 0.120 | 0.105 | | | |
| | **9** | 0.160 | 0.128 | 0.112 | | | |
| | **10** | 0.175 | 0.140 | 0.123 | | | |
| | **11** | 0.180 | 0.144 | 0.126 | | | |
| | **12** | 0.200 | 0.160 | 0.140 | | | |
| | **13** | 0.215 | 0.172 | 0.151 | | | |
| | **14** | 0.230 | 0.184 | 0.161 | | | |
| | **15** | 0.245 | 0.196 | 0.172 | | | |
| | **16** | 0.260 | 0.208 | 0.182 | | | |

# 3584HTA

| | Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| | Vc (m/min) | **100÷120** | **80÷100** | **50÷70** | **40÷60** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| | **3** | 0.072 | 0.065 | 0.058 | 0.050 | | |
| | **4** | 0.089 | 0.080 | 0.071 | 0.062 | | |
| | **5** | 0.106 | 0.095 | 0.085 | 0.074 | | |
| | **6** | 0.122 | 0.110 | 0.098 | 0.085 | | |
| | **7** | 0.139 | 0.125 | 0.111 | 0.097 | | |
| | **8** | 0.155 | 0.140 | 0.124 | 0.109 | | |
| | **9** | 0.172 | 0.155 | 0.138 | 0.120 | | |
| | **10** | 0.188 | 0.169 | 0.150 | 0.132 | | |
| | **11** | 0.205 | 0.185 | 0.164 | 0.144 | | |
| | **12** | 0.221 | 0.199 | 0.177 | 0.155 | | |
| | **13** | 0.238 | 0.214 | 0.190 | 0.167 | | |
| | **14** | 0.254 | 0.229 | 0.203 | 0.178 | | |
| | **15** | 0.270 | 0.243 | 0.216 | 0.189 | | |
| | **16** | 0.286 | 0.257 | 0.229 | 0.200 | | |

| | Material Group ISO 513 | N1 N2 | N3 | N4 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | >5% Si | | | | | |
| | Vc (m/min) | **160÷200** | **140÷180** | **130÷170** | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| | **3** | 0.086 | 0.078 | 0.078 | | | |
| | **4** | 0.107 | 0.096 | 0.096 | | | |
| | **5** | 0.127 | 0.114 | 0.114 | | | |
| | **6** | 0.146 | 0.132 | 0.132 | | | |
| | **7** | 0.167 | 0.150 | 0.150 | | | |
| | **8** | 0.186 | 0.167 | 0.167 | | | |
| | **9** | 0.206 | 0.186 | 0.186 | | | |
| | **10** | 0.226 | 0.203 | 0.203 | | | |
| | **11** | 0.246 | 0.221 | 0.221 | | | |
| | **12** | 0.265 | 0.239 | 0.239 | | | |
| | **13** | 0.286 | 0.257 | 0.257 | | | |
| | **14** | 0.305 | 0.274 | 0.274 | | | |
| | **15** | 0.324 | 0.292 | 0.292 | | | |
| | **16** | 0.343 | 0.309 | 0.309 | | | |

# 3584HTA

| | Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| | Vc (m/min) | **25÷35** | **15÷25** | **35÷45** | **25÷35** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| | **3** | 0.046 | 0.032 | 0.044 | 0.037 | | |
| | **4** | 0.055 | 0.039 | 0.052 | 0.044 | | |
| | **5** | 0.063 | 0.044 | 0.060 | 0.050 | | |
| | **6** | 0.073 | 0.051 | 0.069 | 0.058 | | |
| | **7** | 0.080 | 0.056 | 0.076 | 0.064 | | |
| | **8** | 0.090 | 0.063 | 0.086 | 0.072 | | |
| | **9** | 0.100 | 0.070 | 0.095 | 0.080 | | |
| | **10** | 0.110 | 0.077 | 0.105 | 0.088 | | |
| | **11** | 0.120 | 0.084 | 0.114 | 0.096 | | |
| | **12** | 0.130 | 0.091 | 0.124 | 0.104 | | |
| | **13** | 0.137 | 0.096 | 0.130 | 0.110 | | |
| | **14** | 0.145 | 0.102 | 0.138 | 0.116 | | |
| | **15** | 0.153 | 0.107 | 0.145 | 0.122 | | |
| | **16** | 0.160 | 0.112 | 0.152 | 0.128 | | |





# TYPHOON SUH

## HIGH PERFORMANCE - STAINLESS STEEL

High performance tools for stainless steel (ISO M), steel (ISO P), cast iron (ISO K) and HRSA super alloys (ISO S) below 45 HRC.

Punte ad alto rendimento per la foratura di acciaio inossidabile (ISO M), acciaio (ISO P), ghisa (ISO K) e super leghe (ISO S) sino a 45 HRC.

Hochleistungsbohrer für das Bohren von rostfreiem Stahl (ISO M), Stahl (ISO P), Gusseisen (ISO K) und Superlegierungen (ISO S) bis 45 HRC.

Forets haute performance pour le perçage de l'acier inoxydable (ISO M), de l'acier (ISO P), de la fonte (ISO K) et des super alliages (ISO S) jusqu'à 45 HRC.

Puntas de alto rendimiento para el taladro de acero inoxidable (ISO M), acero (ISO P), hierro fundido (ISO K) e súper aleaciones (ISO S) hasta 45 HRC.

Высокопроизводительный инструмент для обработки нержавеющей стали (ISO M), стали (ISO P), чугуна (ISO K) и жаропрочных сплавов (ISO S) с твёрдостью до 45 HRC.

## TYPHOON SUH

HIGH PERFORMANCE - STAINLESS STEEL





- Self-centering geometry: highly accurate holes
- Straight cutting edge: short chips for easy evacuation and high reliability
- Special edge design: high performance and edge protection
- Back taper geometry: improves the cutting efficiency
- Chip pocket finishing: highly polished to reduce welding and improve chip ejection
- Large oil holes: improves coolant feed
- Substrate and coating: specifically selected for high wear resistance, long and reliable life

- Affûtage autocentré pour l'exécution de trous précis
- Profil de l'arête droit et renforcé : il génère des copeaux courts et garantit une grande fiabilité
- Géométrie de l'arête avec affûtage spécifique pour protéger l'arête et les angles
- Géométrie du corps avec conicité arrière pour faciliter l'action de coupe
- Finition des goujoures : polie pour réduire le problème du collage et facilitent l'évacuation des copeaux
- Trous de lubrification avec géométrie modifiée pour un apport de lubrifiant plus important
- Substrat et revêtement spécifiques pour garantir durée et fiabilité

- Affilatura autocentrante per l'esecuzione di fori precisi
- Profilo del tagliente diritto e rinforzato: genera trucioli corti e garantisce grande affidabilità
- Geometria del tagliente con affilatura specifica a protezione del tagliente e degli spigoli
- Geometria del corpo con conicità posteriore per agevolare l'azione di taglio
- Finitura gole: lappate per ridurre il problema dell'incollaggio e facilitare l'evacuazione dei trucioli
- Fori di refrigerazione con geometria modificata per un maggior apporto di refrigerante
- Substrato e rivestimento specifici per garantire durata e affidabilità

- Afilado autocentrante para la ejecución de agujeros precisos
- Perfil del filo recto y reforzado: genera virutas cortas y garantiza una gran fiabilidad
- Geometría del filo con afilado específico para proteger el filo y los ángulos
- Geometría del cuerpo con conicidad posterior para facilitar la acción de corte
- Acabado ranuras: lapeadas para reducir el problema del encolado y facilitar la evacuación de las virutas
- Agujeros de refrigeración con geometría modificada para una mayor aportación de refrigerante
- Sustrato y revestimiento específicos para garantizar duración y fiabilidad

- Selbstzentrierender Schliff für die Herstellung von präzisen Bohrungen
- Gerades und verstärktes Schneidkantenprofil: zur Erzeugung kurzer Späne und zur Gewährleistung hoher Zuverlässigkeit
- Geometrie der Schneidkante mit speziellem Schliff zum Schutz von Schneidkante und Kanten
- Geometrie des Körpers mit konischem hinteren Bereich zur Erleichterung des Schnittvorgangs
- Schlichtbearbeitung der Nuten: geläppt, um Probleme durch Verkleben zu reduzieren und um die Späneabführung zu erleichtern
- Kühlöffnungen mit abgeänderter Geometrie für einen verbesserten Kühlmittelzufluss
- Spezielles Trägermaterial und spezielle Beschichtung zur Gewährleistung von Standzeit und Zuverlässigkeit

- Самоцентрирующаяся геометрия: высокая точность отверстий
- Прямые режущие кромки: формирование короткой стружки и высокая надежность
- Геометрия режущей кромки со специальной заточкой: высокая производительность и защита кромок
- Геометрия с обратным конусом: увеличивает эффективность обработки
- Отполированные стружечные канавки: уменьшают вероятность приваривания стружки и облегчают ее вывод
- Широкие каналы для СОЖ: увеличена эффективность подвода СОЖ
- Специальное покрытие для повышения стойкости инструмента

# 353SUH

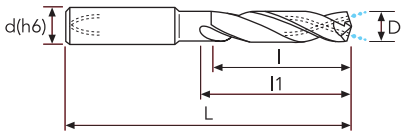
stainless steel, polished flutes

3XD | DIN 6537K | SUH | MG PV300 | 140° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **3.00** | +0.012/+0.002 | 6 | 14 | 20 | 62 | 353SUH0300 | ● |
| **3.10** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353SUH0310 | ● |
| **3.20** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353SUH0320 | ● |
| **3.30** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353SUH0330 | ● |
| **3.40** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353SUH0340 | ● |
| **3.50** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353SUH0350 | ● |
| **3.60** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353SUH0360 | ● |
| **3.70** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353SUH0370 | ● |
| **3.80** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353SUH0380 | ● |
| **3.90** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353SUH0390 | ● |
| **4.00** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353SUH0400 | ● |
| **4.10** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353SUH0410 | ● |
| **4.20** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353SUH0420 | ● |
| **4.30** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353SUH0430 | ● |
| **4.40** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353SUH0440 | ● |
| **4.50** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353SUH0450 | ● |
| **4.60** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353SUH0460 | ● |
| **4.70** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353SUH0470 | ● |
| **4.80** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353SUH0480 | ● |
| **4.90** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353SUH0490 | ● |
| **5.00** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353SUH0500 | ● |
| **5.10** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353SUH0510 | ● |
| **5.20** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353SUH0520 | ● |
| **5.30** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353SUH0530 | ● |
| **5.40** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353SUH0540 | ● |
| **5.50** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353SUH0550 | ● |
| **5.60** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353SUH0560 | ● |
| **5.70** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353SUH0570 | ● |
| **5.80** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353SUH0580 | ● |
| **5.90** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353SUH0590 | ● |
| **6.00** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353SUH0600 | ● |
| **6.10** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353SUH0610 | ● |
| **6.20** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353SUH0620 | ● |
| **6.30** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353SUH0630 | ● |
| **6.40** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353SUH0640 | ● |
| **6.50** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353SUH0650 | ● |
| **6.60** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353SUH0660 | ● |
| **6.70** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353SUH0670 | ● |
| **6.80** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353SUH0680 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 353SUH

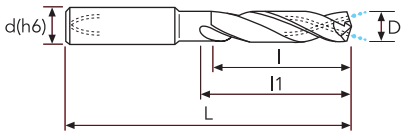
stainless steel, polished flutes

3XD | DIN 6537K | SUH | MG PV300 | 140° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **6.90** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353SUH0690 | ● |
| **7.00** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353SUH0700 | ● |
| **7.10** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353SUH0710 | ● |
| **7.20** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353SUH0720 | ● |
| **7.30** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353SUH0730 | ● |
| **7.40** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353SUH0740 | ● |
| **7.50** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353SUH0750 | ● |
| **7.60** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353SUH0760 | ● |
| **7.70** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353SUH0770 | ● |
| **7.80** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353SUH0780 | ● |
| **7.90** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353SUH0790 | ● |
| **8.00** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353SUH0800 | ● |
| **8.10** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0810 | ● |
| **8.20** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0820 | ● |
| **8.30** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0830 | ● |
| **8.40** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0840 | ● |
| **8.50** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0850 | ● |
| **8.60** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0860 | ● |
| **8.70** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0870 | ● |
| **8.80** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0880 | ● |
| **8.90** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0890 | ● |
| **9.00** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0900 | ● |
| **9.10** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0910 | ● |
| **9.20** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0920 | ● |
| **9.30** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0930 | ● |
| **9.40** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0940 | ● |
| **9.50** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0950 | ● |
| **9.60** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0960 | ● |
| **9.70** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0970 | ● |
| **9.80** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0980 | ● |
| **9.90** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH0990 | ● |
| **10.00** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353SUH1000 | ● |
| **10.20** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353SUH1020 | ● |
| **10.50** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353SUH1050 | ● |
| **10.80** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353SUH1080 | ● |
| **11.00** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353SUH1100 | ● |
| **11.20** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353SUH1120 | ○ |
| **11.30** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353SUH1130 | ○ |
| **11.50** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353SUH1150 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 353SUH

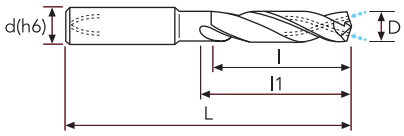
stainless steel, polished flutes

3XD | DIN 6537K | SUH | MG PV300 | 140° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **11.80** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353SUH1180 | ● |
| **12.00** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353SUH1200 | ● |
| **12.20** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353SUH1220 | ● |
| **12.50** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353SUH1250 | ● |
| **12.80** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353SUH1280 | ● |
| **13.00** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353SUH1300 | ● |
| **13.30** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353SUH1330 | ● |
| **13.50** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353SUH1350 | ● |
| **13.80** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353SUH1380 | ● |
| **14.00** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353SUH1400 | ● |
| **14.50** | +0.025/+0.007 | 16 | 45 | 65 | 115 | 353SUH1450 | ● |
| **15.00** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353SUH1500 | ● |
| **15.30** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353SUH1530 | ● |
| **15.50** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353SUH1550 | ● |
| **15.80** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353SUH1580 | ● |
| **16.00** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353SUH1600 | ● |
| **16.50** | +0.025/+0.007 | 18 | 73 | 73 | 123 | 353SUH1650 | ● |
| **17.00** | +0.025/+0.007 | 18 | 73 | 73 | 123 | 353SUH1700 | ● |
| **17.50** | +0.025/+0.007 | 18 | 73 | 73 | 123 | 353SUH1750 | ● |
| **18.00** | +0.025/+0.007 | 18 | 73 | 73 | 123 | 353SUH1800 | ● |
| **18.50** | +0.029/+0.008 | 20 | 79 | 79 | 131 | 353SUH1850 | ● |
| **19.00** | +0.029/+0.008 | 20 | 79 | 79 | 131 | 353SUH1900 | ● |
| **19.50** | +0.029/+0.008 | 20 | 79 | 79 | 131 | 353SUH1950 | ● |
| **20.00** | +0.029/+0.008 | 20 | 79 | 79 | 131 | 353SUH2000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 353SUH




| Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|
| Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| Vc (m/min) | **130÷150** | **100÷140** | **80÷100** | **55÷75** | **50÷70** | **20÷30** |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| **3** | 0.118 | 0.106 | 0.095 | 0.083 | 0.077 | 0.046 |
| **4** | 0.140 | 0.126 | 0.112 | 0.098 | 0.091 | 0.055 |
| **5** | 0.161 | 0.145 | 0.129 | 0.113 | 0.105 | 0.063 |
| **6** | 0.183 | 0.164 | 0.146 | 0.128 | 0.119 | 0.071 |
| **7** | 0.204 | 0.184 | 0.163 | 0.143 | 0.133 | 0.080 |
| **8** | 0.226 | 0.203 | 0.181 | 0.158 | 0.147 | 0.088 |
| **9** | 0.247 | 0.223 | 0.198 | 0.173 | 0.161 | 0.096 |
| **10** | 0.269 | 0.242 | 0.215 | 0.188 | 0.175 | 0.105 |
| **11** | 0.280 | 0.252 | 0.224 | 0.196 | 0.182 | 0.109 |
| **12** | 0.301 | 0.271 | 0.241 | 0.211 | 0.196 | 0.117 |
| **13** | 0.323 | 0.290 | 0.258 | 0.226 | 0.210 | 0.126 |
| **14** | 0.344 | 0.310 | 0.275 | 0.241 | 0.224 | 0.134 |
| **15** | 0.366 | 0.329 | 0.292 | 0.256 | 0.238 | 0.143 |
| **16** | 0.387 | 0.348 | 0.310 | 0.271 | 0.252 | 0.151 |
| **17** | 0.398 | 0.358 | 0.318 | 0.278 | 0.259 | 0.155 |
| **18** | 0.409 | 0.368 | 0.327 | 0.286 | 0.266 | 0.159 |
| **19** | 0.419 | 0.377 | 0.335 | 0.293 | 0.273 | 0.164 |
| **20** | 0.430 | 0.387 | 0.344 | 0.301 | 0.280 | 0.168 |




| Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **50÷70** | **40÷60** | **30÷40** | | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| **3** | 0.077 | 0.061 | 0.054 | | | |
| **4** | 0.091 | 0.073 | 0.064 | | | |
| **5** | 0.105 | 0.084 | 0.073 | | | |
| **6** | 0.119 | 0.095 | 0.083 | | | |
| **7** | 0.133 | 0.106 | 0.093 | | | |
| **8** | 0.147 | 0.117 | 0.103 | | | |
| **9** | 0.161 | 0.129 | 0.112 | | | |
| **10** | 0.175 | 0.140 | 0.122 | | | |
| **11** | 0.182 | 0.145 | 0.127 | | | |
| **12** | 0.196 | 0.157 | 0.137 | | | |
| **13** | 0.210 | 0.168 | 0.147 | | | |
| **14** | 0.224 | 0.179 | 0.157 | | | |
| **15** | 0.238 | 0.190 | 0.166 | | | |
| **16** | 0.252 | 0.201 | 0.176 | | | |
| **17** | 0.259 | 0.207 | 0.181 | | | |
| **18** | 0.266 | 0.212 | 0.186 | | | |
| **19** | 0.273 | 0.218 | 0.191 | | | |
| **20** | 0.280 | 0.224 | 0.196 | | | |

# 353SUH

| | Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| | Vc (m/min) | **110÷130** | **90÷110** | **70÷90** | **55÷75** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| Ø RUN OUT <0.02mm | **3** | 0.118 | 0.106 | 0.095 | 0.083 | | |
| | **4** | 0.140 | 0.126 | 0.112 | 0.098 | | |
| | **5** | 0.161 | 0.145 | 0.129 | 0.113 | | |
| | **6** | 0.183 | 0.164 | 0.146 | 0.128 | | |
| | **7** | 0.204 | 0.184 | 0.163 | 0.143 | | |
| | **8** | 0.226 | 0.203 | 0.181 | 0.158 | | |
| | **9** | 0.247 | 0.223 | 0.198 | 0.173 | | |
| | **10** | 0.269 | 0.242 | 0.215 | 0.188 | | |
| | **11** | 0.280 | 0.252 | 0.224 | 0.196 | | |
| | **12** | 0.301 | 0.271 | 0.241 | 0.211 | | |
| | **13** | 0.323 | 0.290 | 0.258 | 0.226 | | |
| | **14** | 0.344 | 0.310 | 0.275 | 0.241 | | |
| | **15** | 0.366 | 0.329 | 0.292 | 0.256 | | |
| | **16** | 0.387 | 0.348 | 0.310 | 0.271 | | |
| | **17** | 0.398 | 0.358 | 0.318 | 0.278 | | |
| | **18** | 0.409 | 0.368 | 0.327 | 0.286 | | |
| | **19** | 0.419 | 0.377 | 0.335 | 0.293 | | |
| | **20** | 0.430 | 0.387 | 0.344 | 0.301 | | |

| | Material Group ISO 513 | N2 | N4 | | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **180÷220** | **160÷200** | | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | | | | |
| Ø RUN OUT <0.02mm | **3** | 0.128 | 0.128 | | | | |
| | **4** | 0.151 | 0.151 | | | | |
| | **5** | 0.174 | 0.174 | | | | |
| | **6** | 0.197 | 0.197 | | | | |
| | **7** | 0.221 | 0.221 | | | | |
| | **8** | 0.244 | 0.244 | | | | |
| | **9** | 0.267 | 0.267 | | | | |
| | **10** | 0.290 | 0.290 | | | | |
| | **11** | 0.302 | 0.302 | | | | |
| | **12** | 0.325 | 0.325 | | | | |
| | **13** | 0.348 | 0.348 | | | | |
| | **14** | 0.372 | 0.372 | | | | |
| | **15** | 0.395 | 0.395 | | | | |
| | **16** | 0.418 | 0.418 | | | | |
| | **17** | 0.430 | 0.430 | | | | |
| | **18** | 0.441 | 0.441 | | | | |
| | **19** | 0.453 | 0.453 | | | | |
| | **20** | 0.464 | 0.464 | | | | |

CUTTING PARAMETERS

# 353SUH




| Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| Vc (m/min) | **30÷50** | **20÷40** | **45÷65** | **35÷55** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3** | 0.053 | 0.037 | 0.051 | 0.043 | | |
| **4** | 0.063 | 0.044 | 0.060 | 0.050 | | |
| **5** | 0.073 | 0.051 | 0.069 | 0.058 | | |
| **6** | 0.082 | 0.058 | 0.078 | 0.066 | | |
| **7** | 0.092 | 0.064 | 0.087 | 0.074 | | |
| **8** | 0.102 | 0.071 | 0.097 | 0.081 | | |
| **9** | 0.111 | 0.078 | 0.106 | 0.089 | | |
| **10** | 0.121 | 0.085 | 0.115 | 0.097 | | |
| **11** | 0.126 | 0.088 | 0.119 | 0.101 | | |
| **12** | 0.135 | 0.095 | 0.129 | 0.108 | | |
| **13** | 0.145 | 0.102 | 0.138 | 0.116 | | |
| **14** | 0.155 | 0.108 | 0.147 | 0.124 | | |
| **15** | 0.164 | 0.115 | 0.156 | 0.132 | | |
| **16** | 0.174 | 0.122 | 0.165 | 0.139 | | |
| **17** | 0.179 | 0.125 | 0.170 | 0.143 | | |
| **18** | 0.184 | 0.129 | 0.175 | 0.147 | | |
| **19** | 0.189 | 0.132 | 0.179 | 0.151 | | |
| **20** | 0.194 | 0.135 | 0.155 | 0.155 | | |

# 355SUH

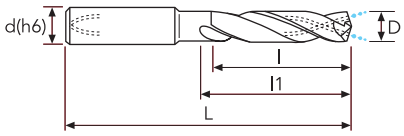
stainless steel, polished flutes

5XD | DIN 6537L | SUH | MG PV300 | 140° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **3.00** | +0.012/+0.002 | 6 | 23 | 28 | 66 | 355SUH0300 | ● |
| **3.10** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355SUH0310 | ● |
| **3.20** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355SUH0320 | ● |
| **3.30** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355SUH0330 | ● |
| **3.40** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355SUH0340 | ● |
| **3.50** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355SUH0350 | ● |
| **3.60** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355SUH0360 | ● |
| **3.70** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355SUH0370 | ● |
| **3.80** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355SUH0380 | ● |
| **3.90** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355SUH0390 | ● |
| **4.00** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355SUH0400 | ● |
| **4.10** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355SUH0410 | ● |
| **4.20** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355SUH0420 | ● |
| **4.30** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355SUH0430 | ● |
| **4.40** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355SUH0440 | ● |
| **4.50** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355SUH0450 | ● |
| **4.60** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355SUH0460 | ● |
| **4.70** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355SUH0470 | ● |
| **4.80** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355SUH0480 | ● |
| **4.90** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355SUH0490 | ● |
| **5.00** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355SUH0500 | ● |
| **5.10** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355SUH0510 | ● |
| **5.20** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355SUH0520 | ● |
| **5.30** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355SUH0530 | ● |
| **5.40** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355SUH0540 | ● |
| **5.50** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355SUH0550 | ● |
| **5.60** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355SUH0560 | ● |
| **5.70** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355SUH0570 | ● |
| **5.80** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355SUH0580 | ● |
| **5.90** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355SUH0590 | ● |
| **6.00** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355SUH0600 | ● |
| **6.10** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0610 | ● |
| **6.20** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0620 | ● |
| **6.30** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0630 | ● |
| **6.40** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0640 | ● |
| **6.50** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0650 | ● |
| **6.60** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0660 | ● |
| **6.70** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0670 | ● |
| **6.80** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0680 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 355SUH

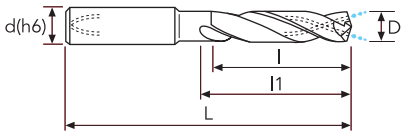
stainless steel, polished flutes

5XD | DIN 6537L | SUH | MG PV300 | 140° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **6.90** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0690 | ● |
| **7.00** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0700 | ● |
| **7.10** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0710 | ● |
| **7.20** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0720 | ● |
| **7.30** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0730 | ● |
| **7.40** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0740 | ● |
| **7.50** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0750 | ● |
| **7.60** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0760 | ● |
| **7.70** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0770 | ● |
| **7.80** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0780 | ● |
| **7.90** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0790 | ● |
| **8.00** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355SUH0800 | ● |
| **8.10** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355SUH0810 | ● |
| **8.20** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355SUH0820 | ● |
| **8.30** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355SUH0830 | ● |
| **8.40** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355SUH0840 | ● |
| **8.50** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355SUH0850 | ● |
| **8.60** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355SUH0860 | ● |
| **8.70** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355SUH0870 | ● |
| **8.80** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355SUH0880 | ● |
| **8.90** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355SUH0890 | ● |
| **9.00** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355SUH0900 | ● |
| **9.10** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355SUH0910 | ● |
| **9.20** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355SUH0920 | ● |
| **9.30** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355SUH0930 | ● |
| **9.40** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355SUH0940 | ● |
| **9.50** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355SUH0950 | ● |
| **9.60** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355SUH0960 | ● |
| **9.70** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355SUH0970 | ● |
| **9.80** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355SUH0980 | ● |
| **9.90** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355SUH0990 | ● |
| **10.00** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355SUH1000 | ● |
| **10.20** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355SUH1020 | ● |
| **10.30** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355SUH1030 | ● |
| **10.50** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355SUH1050 | ● |
| **10.80** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355SUH1080 | ● |
| **11.00** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355SUH1100 | ● |
| **11.20** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355SUH1120 | ● |
| **11.30** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355SUH1130 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 355SUH

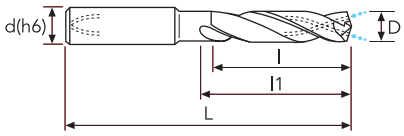
stainless steel, polished flutes

5XD | DIN 6537L | SUH | MG PV300 | 140° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **11.50** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355SUH1150 | ● |
| **11.80** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355SUH1180 | ● |
| **12.00** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355SUH1200 | ● |
| **12.20** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355SUH1220 | ● |
| **12.50** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355SUH1250 | ● |
| **12.80** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355SUH1280 | ● |
| **13.00** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355SUH1300 | ● |
| **13.30** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355SUH1330 | ● |
| **13.50** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355SUH1350 | ● |
| **13.80** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355SUH1380 | ● |
| **14.00** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355SUH1400 | ● |
| **14.50** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355SUH1450 | ● |
| **15.00** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355SUH1500 | ● |
| **15.30** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355SUH1530 | ● |
| **15.50** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355SUH1550 | ● |
| **15.80** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355SUH1580 | ● |
| **16.00** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355SUH1600 | ● |
| **16.50** | +0.025/+0.007 | 18 | 93 | 93 | 143 | 355SUH1650 | ● |
| **17.00** | +0.025/+0.007 | 18 | 93 | 93 | 143 | 355SUH1700 | ● |
| **17.50** | +0.025/+0.007 | 18 | 93 | 93 | 143 | 355SUH1750 | ● |
| **18.00** | +0.025/+0.007 | 18 | 93 | 93 | 143 | 355SUH1800 | ● |
| **18.50** | +0.029/+0.008 | 20 | 101 | 101 | 153 | 355SUH1850 | ● |
| **19.00** | +0.029/+0.008 | 20 | 101 | 101 | 153 | 355SUH1900 | ● |
| **19.50** | +0.029/+0.008 | 20 | 101 | 101 | 153 | 355SUH1950 | ● |
| **20.00** | +0.029/+0.008 | 20 | 101 | 101 | 153 | 355SUH2000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 355SUH

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **120÷140** | **100÷120** | **70÷90** | **45÷65** | **40÷60** | **15÷25** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| Ø RUN OUT <0.02mm | **3** | 0.101 | 0.075 | 0.060 | 0.050 | 0.065 | 0.039 |
| | **4** | 0.119 | 0.089 | 0.071 | 0.059 | 0.077 | 0.046 |
| | **5** | 0.137 | 0.103 | 0.082 | 0.069 | 0.089 | 0.053 |
| | **6** | 0.155 | 0.117 | 0.093 | 0.078 | 0.101 | 0.061 |
| | **7** | 0.174 | 0.130 | 0.104 | 0.087 | 0.113 | 0.068 |
| | **8** | 0.192 | 0.144 | 0.115 | 0.096 | 0.125 | 0.075 |
| | **9** | 0.210 | 0.158 | 0.126 | 0.105 | 0.137 | 0.082 |
| | **10** | 0.228 | 0.171 | 0.137 | 0.114 | 0.148 | 0.089 |
| | **11** | 0.238 | 0.178 | 0.143 | 0.119 | 0.154 | 0.093 |
| | **12** | 0.256 | 0.192 | 0.154 | 0.128 | 0.166 | 0.100 |
| | **13** | 0.274 | 0.206 | 0.164 | 0.137 | 0.178 | 0.107 |
| | **14** | 0.292 | 0.219 | 0.175 | 0.146 | 0.190 | 0.114 |
| | **15** | 0.311 | 0.233 | 0.186 | 0.155 | 0.202 | 0.121 |
| | **16** | 0.329 | 0.247 | 0.197 | 0.164 | 0.214 | 0.128 |
| | **17** | 0.338 | 0.254 | 0.203 | 0.169 | 0.220 | 0.132 |
| | **18** | 0.347 | 0.260 | 0.208 | 0.174 | 0.226 | 0.135 |
| | **19** | 0.356 | 0.267 | 0.214 | 0.178 | 0.232 | 0.139 |
| | **20** | 0.366 | 0.274 | 0.219 | 0.183 | 0.238 | 0.143 |

| | Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **40÷60** | **30÷50** | **25÷35** | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| Ø RUN OUT <0.02mm | **3** | 0.065 | 0.052 | 0.046 | | | |
| | **4** | 0.077 | 0.062 | 0.054 | | | |
| | **5** | 0.089 | 0.071 | 0.062 | | | |
| | **6** | 0.101 | 0.081 | 0.071 | | | |
| | **7** | 0.113 | 0.090 | 0.079 | | | |
| | **8** | 0.125 | 0.100 | 0.087 | | | |
| | **9** | 0.137 | 0.109 | 0.096 | | | |
| | **10** | 0.148 | 0.119 | 0.104 | | | |
| | **11** | 0.154 | 0.124 | 0.108 | | | |
| | **12** | 0.166 | 0.133 | 0.116 | | | |
| | **13** | 0.178 | 0.143 | 0.125 | | | |
| | **14** | 0.190 | 0.152 | 0.133 | | | |
| | **15** | 0.202 | 0.162 | 0.141 | | | |
| | **16** | 0.214 | 0.171 | 0.150 | | | |
| | **17** | 0.220 | 0.176 | 0.154 | | | |
| | **18** | 0.226 | 0.181 | 0.158 | | | |
| | **19** | 0.232 | 0.185 | 0.162 | | | |
| | **20** | 0.238 | 0.190 | 0.166 | | | |

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA
HSS DRILLS
LFTA
SUTA
HSS-HSS/CO
CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH
HSS END-MILLS
CARBIDE BURRS

# 355SUH

| | Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| | Vc (m/min) | **100÷120** | **80÷100** | **55÷75** | **40÷60** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| Ø RUN OUT <0.02mm | **3** | 0.101 | 0.090 | 0.080 | 0.070 | | |
| | **4** | 0.119 | 0.107 | 0.095 | 0.083 | | |
| | **5** | 0.137 | 0.123 | 0.110 | 0.096 | | |
| | **6** | 0.155 | 0.140 | 0.124 | 0.109 | | |
| | **7** | 0.174 | 0.156 | 0.139 | 0.122 | | |
| | **8** | 0.192 | 0.173 | 0.154 | 0.134 | | |
| | **9** | 0.210 | 0.189 | 0.168 | 0.147 | | |
| | **10** | 0.228 | 0.206 | 0.183 | 0.160 | | |
| | **11** | 0.238 | 0.214 | 0.190 | 0.166 | | |
| | **12** | 0.256 | 0.230 | 0.205 | 0.179 | | |
| | **13** | 0.274 | 0.247 | 0.219 | 0.192 | | |
| | **14** | 0.292 | 0.263 | 0.234 | 0.205 | | |
| | **15** | 0.311 | 0.280 | 0.249 | 0.217 | | |
| | **16** | 0.329 | 0.296 | 0.263 | 0.230 | | |
| | **17** | 0.338 | 0.304 | 0.270 | 0.237 | | |
| | **18** | 0.347 | 0.313 | 0.278 | 0.243 | | |
| | **19** | 0.356 | 0.321 | 0.285 | 0.249 | | |
| | **20** | 0.366 | 0.329 | 0.292 | 0.256 | | |

| | Material Group ISO 513 | N2 | N4 | | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **180÷220** | **160÷200** | | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | | | | |
| Ø RUN OUT <0.02mm | **3** | 0.109 | 0.096 | | | | |
| | **4** | 0.128 | 0.114 | | | | |
| | **5** | 0.148 | 0.132 | | | | |
| | **6** | 0.168 | 0.149 | | | | |
| | **7** | 0.188 | 0.167 | | | | |
| | **8** | 0.207 | 0.184 | | | | |
| | **9** | 0.227 | 0.202 | | | | |
| | **10** | 0.247 | 0.219 | | | | |
| | **11** | 0.257 | 0.228 | | | | |
| | **12** | 0.276 | 0.246 | | | | |
| | **13** | 0.296 | 0.263 | | | | |
| | **14** | 0.316 | 0.281 | | | | |
| | **15** | 0.336 | 0.298 | | | | |
| | **16** | 0.355 | 0.316 | | | | |
| | **17** | 0.365 | 0.325 | | | | |
| | **18** | 0.375 | 0.333 | | | | |
| | **19** | 0.385 | 0.342 | | | | |
| | **20** | 0.395 | 0.351 | | | | |

CUTTING PARAMETERS

# 355SUH




| Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| Vc (m/min) | **25÷45** | **15÷35** | **40÷60** | **30÷50** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3** | 0.045 | 0.032 | 0.043 | 0.036 | | |
| **4** | 0.053 | 0.037 | 0.051 | 0.043 | | |
| **5** | 0.062 | 0.043 | 0.059 | 0.049 | | |
| **6** | 0.070 | 0.049 | 0.066 | 0.056 | | |
| **7** | 0.078 | 0.055 | 0.074 | 0.063 | | |
| **8** | 0.086 | 0.060 | 0.082 | 0.069 | | |
| **9** | 0.095 | 0.066 | 0.090 | 0.076 | | |
| **10** | 0.103 | 0.072 | 0.098 | 0.082 | | |
| **11** | 0.107 | 0.075 | 0.102 | 0.086 | | |
| **12** | 0.115 | 0.081 | 0.109 | 0.092 | | |
| **13** | 0.123 | 0.086 | 0.117 | 0.099 | | |
| **14** | 0.132 | 0.092 | 0.125 | 0.105 | | |
| **15** | 0.140 | 0.098 | 0.133 | 0.112 | | |
| **16** | 0.148 | 0.104 | 0.141 | 0.118 | | |
| **17** | 0.152 | 0.106 | 0.145 | 0.122 | | |
| **18** | 0.156 | 0.109 | 0.148 | 0.125 | | |
| **19** | 0.160 | 0.112 | 0.152 | 0.128 | | |
| **20** | 0.164 | 0.115 | 0.156 | 0.132 | | |





# TYPHOON ALH

## HIGH PERFORMANCE - NON-FERROUS MATERIALS

Drills specifically designed for non-ferrous materials (ISO N).

Punte progettate appositamente per la foratura di materiali non ferrosi (ISO N).

Eigens für das Bohren von nicht eisenhaltigen Materialien (ISO N) entwickelte Bohrer.

Forets conçus spécialement pour le perçage de matériaux non ferreux (ISO N).

Puntas proyectadas específicamente para el taladro de materiales no ferrosos (ISO N).

Свёрла, разработанные специально для сверления отверстий в цветных металлах (ISO N).

## TYPHOON ALH







- Self-centering geometry: highly accurate holes
- Straight cutting edge and highly positive geometry: low cutting forces to prevent welding
- Chip pocket: wide and curved to improve the chip ejection
- Back taper geometry: improves the cutting efficiency
- Chip pocket finishing: highly polished to reduce welding and improve chip ejection
- Modified oil holes: improves coolant feed
- Substrate: specifically selected for high wear resistance, long and reliable life

- Affûtage autocentré pour l'exécution de trous précis
- Profil de l'arête droit avec affûtage spécifique pour réduire l'effort de coupe
- Géométrie des goujoures : arquées et larges pour faciliter l'évacuation des copeaux
- Géométrie du corps avec conicité arrière pour faciliter l'action de coupe
- Finition des goujoures : polie pour réduire le problème du collage et faciliter l'évacuation des copeaux
- Trous de lubrification avec géométrie modifiée pour un apport de lubrifiant plus important
- Substrat spécifique pour garantir durée et fiabilité

- Affilatura autocentrante per l'esecuzione di fori precisi
- Profilo del tagliente diritto con affilatura specifica per ridurre lo sforzo di taglio
- Geometria delle gole: arcuate e ampie per agevolare l'evacuazione dei trucioli
- Geometria del corpo con conicità posteriore per agevolare l'azione di taglio
- Finitura gole: lappate per ridurre il problema dell'incollaggio e facilitare l'evacuazione dei trucioli
- Fori di refrigerazione con geometria modificata per un maggior apporto di refrigerante
- Substrato specifico per garantire durata e affidabilità

- Afilado autocentrante para la ejecución de agujeros precisos
- Perfil del borde recto con afilado específico para reducir el esfuerzo de corte
- Geometría de las ranuras: arqueadas y amplias para facilitar la evacuación de las virutas
- Geometría del cuerpo con conicidad posterior para facilitar la acción de corte
- Acabado ranuras: lapeadas para reducir el problema del encolado y facilitar la evacuación de las virutas
- Agujeros de refrigeración con geometría modificada para una mayor aportación de refrigerante
- Sustrato específico para garantizar duración y fiabilidad

- Selbstzentrierender Schliff für die Herstellung von präzisen Bohrungen
- Gerades Schneidkantenprofil mit Spezialschliff zur Reduzierung des Schneiddrucks
- Geometrie der Nuten: gebogen und breit zur Vereinfachung der Späneabführung
- Geometrie des Körpers mit konischem hinteren Bereich zur Erleichterung des Schnittvorgangs
- Schlichtbearbeitung der Nuten: geläppt, um Probleme durch Verkleben zu reduzieren und um die Späneabführung zu erleichtern
- Kühlöffnungen mit abgeänderter Geometrie für einen verbesserten Kühlmittelzufluss
- Spezielles Trägermaterial zur Gewährleistung von Lebensdauer und Zuverlässigkeit

- Самоцентрирующаяся геометрия: высокая точность отверстий
- Прямые режущие кромки и большой передний угол: низкие силы резания
- Стружечные канавки: широкие с большим наклоном для надежной эвакуации стружки
- Геометрия с обратным конусом: увеличивает эффективность обработки
- Отполированные стружечные канавки: уменьшают вероятность приваривания стружки и облегчают ее вывод
- Большие отверстия: увеличена эффективность подвода СОЖ
- Специальное покрытие для повышения стойкости инструмента

# 353ALH

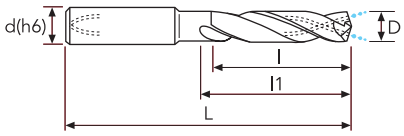
aluminium, polished flutes






| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **3.00** | +0.012/+0.002 | 6 | 14 | 20 | 62 | 353ALH0300 | ● |
| **3.10** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353ALH0310 | ● |
| **3.20** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353ALH0320 | ● |
| **3.30** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353ALH0330 | ● |
| **3.40** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353ALH0340 | ● |
| **3.50** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353ALH0350 | ● |
| **3.60** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353ALH0360 | ● |
| **3.70** | +0.016/+0.004 | 6 | 14 | 20 | 62 | 353ALH0370 | ● |
| **3.80** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353ALH0380 | ● |
| **3.90** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353ALH0390 | ● |
| **4.00** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353ALH0400 | ● |
| **4.10** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353ALH0410 | ● |
| **4.20** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353ALH0420 | ● |
| **4.30** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353ALH0430 | ● |
| **4.40** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353ALH0440 | ○ |
| **4.50** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353ALH0450 | ● |
| **4.60** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353ALH0460 | ● |
| **4.70** | +0.016/+0.004 | 6 | 17 | 24 | 66 | 353ALH0470 | ● |
| **4.80** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353ALH0480 | ● |
| **4.90** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353ALH0490 | ○ |
| **5.00** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353ALH0500 | ● |
| **5.10** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353ALH0510 | ● |
| **5.20** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353ALH0520 | ● |
| **5.30** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353ALH0530 | ● |
| **5.40** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353ALH0540 | ○ |
| **5.50** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353ALH0550 | ● |
| **5.60** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353ALH0560 | ● |
| **5.70** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353ALH0570 | ● |
| **5.80** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353ALH0580 | ● |
| **5.90** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353ALH0590 | ○ |
| **6.00** | +0.016/+0.004 | 6 | 20 | 28 | 66 | 353ALH0600 | ● |
| **6.10** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353ALH0610 | ● |
| **6.20** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353ALH0620 | ● |
| **6.30** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353ALH0630 | ● |
| **6.40** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353ALH0640 | ○ |
| **6.50** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353ALH0650 | ● |
| **6.60** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353ALH0660 | ○ |
| **6.70** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353ALH0670 | ● |
| **6.80** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353ALH0680 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 353ALH

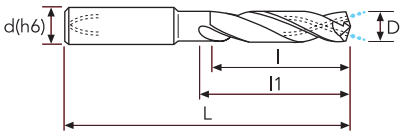
aluminium, polished flutes

3XD | DIN 6537K | ALH | MG POLISHED | 130° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **6.90** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353ALH0690 | ○ |
| **7.00** | +0.021/+0.006 | 8 | 24 | 34 | 79 | 353ALH0700 | ● |
| **7.10** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353ALH0710 | ○ |
| **7.20** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353ALH0720 | ● |
| **7.30** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353ALH0730 | ○ |
| **7.40** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353ALH0740 | ○ |
| **7.50** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353ALH0750 | ● |
| **7.60** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353ALH0760 | ○ |
| **7.70** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353ALH0770 | ○ |
| **7.80** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353ALH0780 | ● |
| **7.90** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353ALH0790 | ○ |
| **8.00** | +0.021/+0.006 | 8 | 29 | 41 | 79 | 353ALH0800 | ● |
| **8.10** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0810 | ○ |
| **8.20** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0820 | ● |
| **8.30** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0830 | ● |
| **8.40** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0840 | ○ |
| **8.50** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0850 | ● |
| **8.60** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0860 | ● |
| **8.70** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0870 | ○ |
| **8.80** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0880 | ● |
| **8.90** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0890 | ○ |
| **9.00** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0900 | ● |
| **9.10** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0910 | ○ |
| **9.20** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0920 | ○ |
| **9.30** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0930 | ○ |
| **9.40** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0940 | ○ |
| **9.50** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0950 | ● |
| **9.60** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0960 | ○ |
| **9.70** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0970 | ○ |
| **9.80** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0980 | ○ |
| **9.90** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH0990 | ○ |
| **10.00** | +0.021/+0.006 | 10 | 35 | 47 | 89 | 353ALH1000 | ● |
| **10.20** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353ALH1020 | ● |
| **10.30** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353ALH1030 | ● |
| **10.50** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353ALH1050 | ● |
| **10.80** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353ALH1080 | ○ |
| **11.00** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353ALH1100 | ● |
| **11.20** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353ALH1120 | ○ |
| **11.30** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353ALH1130 | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 353ALH

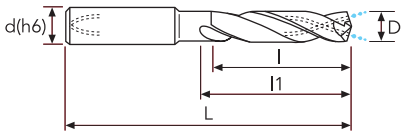
aluminium, polished flutes

3XD | DIN 6537K | ALH | MG POLISHED | 130° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **11.50** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353ALH1150 | ● |
| **11.80** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353ALH1180 | ○ |
| **12.00** | +0.025/+0.007 | 12 | 40 | 55 | 102 | 353ALH1200 | ● |
| **12.20** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353ALH1220 | ○ |
| **12.50** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353ALH1250 | ○ |
| **12.80** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353ALH1280 | ○ |
| **13.00** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353ALH1300 | ○ |
| **13.50** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353ALH1350 | ○ |
| **14.00** | +0.025/+0.007 | 14 | 43 | 60 | 107 | 353ALH1400 | ○ |
| **14.50** | +0.025/+0.007 | 16 | 45 | 65 | 115 | 353ALH1450 | ○ |
| **15.00** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353ALH1500 | ○ |
| **15.50** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353ALH1550 | ○ |
| **16.00** | +0.025/+0.007 | 16 | 65 | 65 | 115 | 353ALH1600 | ○ |
| **16.50** | +0.025/+0.007 | 18 | 73 | 73 | 123 | 353ALH1650 | ○ |
| **17.00** | +0.025/+0.007 | 18 | 73 | 73 | 123 | 353ALH1700 | ○ |
| **17.50** | +0.025/+0.007 | 18 | 73 | 73 | 123 | 353ALH1750 | ○ |
| **18.00** | +0.025/+0.007 | 18 | 73 | 73 | 123 | 353ALH1800 | ○ |
| **18.50** | +0.029/+0.008 | 20 | 79 | 79 | 131 | 353ALH1850 | ○ |
| **19.00** | +0.029/+0.008 | 20 | 79 | 79 | 131 | 353ALH1900 | ○ |
| **19.50** | +0.029/+0.008 | 20 | 79 | 79 | 131 | 353ALH1950 | ○ |
| **20.00** | +0.029/+0.008 | 20 | 79 | 79 | 131 | 353ALH2000 | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# 353ALH




| Material Group ISO 513 | N1 | N2 | N3 N4 | N5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | 260÷300 | 230÷270 | 200÷240 | 280÷320 | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| 3 | 0.160 | 0.152 | 0.136 | 0.176 | | |
| 4 | 0.190 | 0.181 | 0.162 | 0.209 | | |
| 5 | 0.220 | 0.209 | 0.187 | 0.242 | | |
| 6 | 0.250 | 0.238 | 0.213 | 0.275 | | |
| 7 | 0.280 | 0.266 | 0.238 | 0.308 | | |
| 8 | 0.310 | 0.295 | 0.264 | 0.341 | | |
| 9 | 0.340 | 0.323 | 0.289 | 0.374 | | |
| 10 | 0.370 | 0.352 | 0.315 | 0.407 | | |
| 11 | 0.400 | 0.380 | 0.340 | 0.440 | | |
| 12 | 0.430 | 0.409 | 0.366 | 0.473 | | |
| 13 | 0.460 | 0.437 | 0.391 | 0.506 | | |
| 14 | 0.490 | 0.466 | 0.417 | 0.539 | | |
| 15 | 0.520 | 0.494 | 0.442 | 0.572 | | |
| 16 | 0.550 | 0.523 | 0.468 | 0.605 | | |
| 17 | 0.580 | 0.551 | 0.493 | 0.638 | | |
| 18 | 0.610 | 0.580 | 0.519 | 0.671 | | |
| 19 | 0.640 | 0.608 | 0.544 | 0.704 | | |
| 20 | 0.670 | 0.637 | 0.570 | 0.737 | | |

# 355ALH

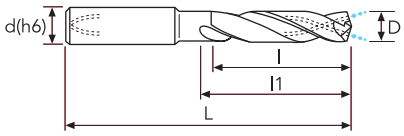
aluminium, polished flutes

5XD | DIN 6537L | ALH | MG POLISHED | 130° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **3.00** | +0.012/+0.002 | 6 | 23 | 28 | 66 | 355ALH0300 | ● |
| **3.10** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355ALH0310 | ○ |
| **3.20** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355ALH0320 | ● |
| **3.30** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355ALH0330 | ● |
| **3.40** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355ALH0340 | ● |
| **3.50** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355ALH0350 | ● |
| **3.60** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355ALH0360 | ● |
| **3.70** | +0.016/+0.004 | 6 | 23 | 28 | 66 | 355ALH0370 | ● |
| **3.80** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355ALH0380 | ● |
| **3.90** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355ALH0390 | ○ |
| **4.00** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355ALH0400 | ● |
| **4.10** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355ALH0410 | ○ |
| **4.20** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355ALH0420 | ● |
| **4.30** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355ALH0430 | ● |
| **4.40** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355ALH0440 | ○ |
| **4.50** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355ALH0450 | ● |
| **4.60** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355ALH0460 | ○ |
| **4.70** | +0.016/+0.004 | 6 | 29 | 36 | 74 | 355ALH0470 | ○ |
| **4.80** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355ALH0480 | ● |
| **4.90** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355ALH0490 | ○ |
| **5.00** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355ALH0500 | ● |
| **5.10** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355ALH0510 | ● |
| **5.20** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355ALH0520 | ● |
| **5.30** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355ALH0530 | ○ |
| **5.40** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355ALH0540 | ○ |
| **5.50** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355ALH0550 | ● |
| **5.60** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355ALH0560 | ● |
| **5.70** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355ALH0570 | ○ |
| **5.80** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355ALH0580 | ● |
| **5.90** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355ALH0590 | ○ |
| **6.00** | +0.016/+0.004 | 6 | 35 | 44 | 82 | 355ALH0600 | ● |
| **6.10** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0610 | ○ |
| **6.20** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0620 | ● |
| **6.30** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0630 | ○ |
| **6.40** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0640 | ○ |
| **6.50** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0650 | ● |
| **6.60** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0660 | ○ |
| **6.70** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0670 | ● |
| **6.80** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0680 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 355ALH

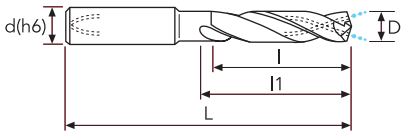
aluminium, polished flutes

5XD | DIN 6537L | ALH | MG POLISHED | 130° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **6.90** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0690 | ● |
| **7.00** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0700 | ● |
| **7.10** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0710 | ○ |
| **7.20** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0720 | ● |
| **7.30** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0730 | ○ |
| **7.40** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0740 | ○ |
| **7.50** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0750 | ● |
| **7.60** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0760 | ○ |
| **7.70** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0770 | ○ |
| **7.80** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0780 | ● |
| **7.90** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0790 | ○ |
| **8.00** | +0.021/+0.006 | 8 | 43 | 53 | 91 | 355ALH0800 | ● |
| **8.10** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355ALH0810 | ○ |
| **8.20** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355ALH0820 | ● |
| **8.30** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355ALH0830 | ○ |
| **8.40** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355ALH0840 | ○ |
| **8.50** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355ALH0850 | ● |
| **8.60** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355ALH0860 | ○ |
| **8.70** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355ALH0870 | ○ |
| **8.80** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355ALH0880 | ● |
| **8.90** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355ALH0890 | ○ |
| **9.00** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355ALH0900 | ● |
| **9.10** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355ALH0910 | ○ |
| **9.20** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355ALH0920 | ○ |
| **9.30** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355ALH0930 | ○ |
| **9.40** | +0.021/+0.006 | 10 | 49 | 61 | 103 | 355ALH0940 | ○ |
| **9.50** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355ALH0950 | ● |
| **9.60** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355ALH0960 | ○ |
| **9.70** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355ALH0970 | ○ |
| **9.80** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355ALH0980 | ○ |
| **9.90** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355ALH0990 | ○ |
| **10.00** | +0.021/+0.006 | 10 | 61 | 61 | 103 | 355ALH1000 | ● |
| **10.20** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355ALH1020 | ● |
| **10.50** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355ALH1050 | ● |
| **10.80** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355ALH1080 | ○ |
| **11.00** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355ALH1100 | ● |
| **11.20** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355ALH1120 | ○ |
| **11.30** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355ALH1130 | ○ |
| **11.50** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355ALH1150 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

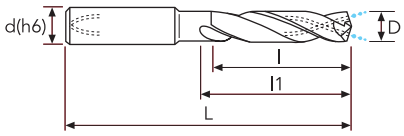
# 355ALH

aluminium, polished flutes



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **11.80** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355ALH1180 | ○ |
| **12.00** | +0.025/+0.007 | 12 | 71 | 71 | 118 | 355ALH1200 | ● |
| **12.50** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355ALH1250 | ○ |
| **13.00** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355ALH1300 | ○ |
| **13.50** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355ALH1350 | ○ |
| **14.00** | +0.025/+0.007 | 14 | 77 | 77 | 124 | 355ALH1400 | ○ |
| **14.50** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355ALH1450 | ○ |
| **15.00** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355ALH1500 | ○ |
| **15.50** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355ALH1550 | ○ |
| **16.00** | +0.025/+0.007 | 16 | 83 | 83 | 133 | 355ALH1600 | ○ |
| **16.50** | +0.025/+0.007 | 18 | 93 | 93 | 143 | 355ALH1650 | ○ |
| **17.00** | +0.025/+0.007 | 18 | 93 | 93 | 143 | 355ALH1700 | ○ |
| **17.50** | +0.025/+0.007 | 18 | 93 | 93 | 143 | 355ALH1750 | ○ |
| **18.00** | +0.025/+0.007 | 18 | 93 | 93 | 143 | 355ALH1800 | ○ |
| **18.50** | +0.029/+0.008 | 20 | 101 | 101 | 153 | 355ALH1850 | ○ |
| **19.00** | +0.029/+0.008 | 20 | 101 | 101 | 153 | 355ALH1900 | ○ |
| **19.50** | +0.029/+0.008 | 20 | 101 | 101 | 153 | 355ALH1950 | ○ |
| **20.00** | +0.029/+0.008 | 20 | 101 | 101 | 153 | 355ALH2000 | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# 355ALH




| Material Group ISO 513 | N1 | N2 | N3 N4 | N5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | 240÷280 | 200÷240 | 180÷200 | 260÷300 | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| 3 | 0.136 | 0.129 | 0.116 | 0.150 | | |
| 4 | 0.162 | 0.153 | 0.137 | 0.178 | | |
| 5 | 0.187 | 0.178 | 0.159 | 0.206 | | |
| 6 | 0.213 | 0.202 | 0.181 | 0.234 | | |
| 7 | 0.238 | 0.226 | 0.202 | 0.262 | | |
| 8 | 0.264 | 0.250 | 0.224 | 0.290 | | |
| 9 | 0.289 | 0.275 | 0.246 | 0.318 | | |
| 10 | 0.315 | 0.299 | 0.267 | 0.346 | | |
| 11 | 0.340 | 0.323 | 0.289 | 0.374 | | |
| 12 | 0.366 | 0.347 | 0.311 | 0.402 | | |
| 13 | 0.391 | 0.371 | 0.332 | 0.430 | | |
| 14 | 0.417 | 0.396 | 0.354 | 0.458 | | |
| 15 | 0.442 | 0.420 | 0.376 | 0.486 | | |
| 16 | 0.468 | 0.444 | 0.397 | 0.514 | | |
| 17 | 0.493 | 0.468 | 0.419 | 0.542 | | |
| 18 | 0.519 | 0.493 | 0.441 | 0.570 | | |
| 19 | 0.544 | 0.517 | 0.462 | 0.598 | | |
| 20 | 0.570 | 0.541 | 0.484 | 0.626 | | |





# TYPHOON HRC

## HIGH PERFORMANCE - HARDENED STEEL 45÷62 HRC

Reliable high precision drills for hardened steel 45÷62 HRC.

Punte ad alta precisione per la foratura di acciai temprati 45÷62 HRC.

Hohe Präzision und zuverlässige Bohrungen für gehärteten Stahl 45÷62 HRC.

Forets haute précision et fiables pour acier trempé 45÷62 HRC.

Brocas de alta precisión para aceros templados 45÷62 HRC.

Высокоточные и высокопроизводительные сверла для обработки сталей с твердостью 45÷62 HRC.

## TYPHOON HRC

HIGH PERFORMANCE - HARDENED STEEL 45÷62 HRC





- Drills for hardened steel 45÷62 HRC
- Self-centering geometry: high accurate holes
- Straight and reinforced edge: high stability and chipping resistance
- 45° chamfer: edge corners protection
- Thicker web: high rigidity and stability
- 15° helix angle: low helix for higher rigidity
- Substrate and coating: specifically selected for high wear resistance, long and reliable life

- Forets pour aciers trempés 45÷62 HRC
- Affûtage autocentré pour l'exécution de trous précis
- Profil de l'arête droit et renforcé
- Géométrie des angles : protection avec biseau à 45°
- Cœur très épais pour garantir rigidité et stabilité
- Angle de l'hélice à 15° : angle peu accentué pour une solidité maximale
- Substrat et revêtement spécifiques pour garantir durée et fiabilité

- Punte per acciai temprati 45÷62 HRC
- Affilatura autocentrante per l'esecuzione di fori precisi
- Profilo del tagliente diritto e rinforzato
- Geometria degli spigoli: protezione con smusso a 45°
- Nocciolo molto spesso per garantire rigidità e stabilità
- Angolo dell'elica a 15°: angolo poco accentuato per massima robustezza
- Substrato e rivestimento specifici per garantire durata e affidabilità

- Brocas para aceros templados 45÷62 HRC
- Geometría autocentrante para la realización de agujeros precisos
- Perfil del filo recto y reforzado
- Geometría de las bordes: protección con redondeo a 45°
- Núcleo muy grueso para garantizar rigidez y estabilidad
- Ángulo de la hélice a 15°: ángulo poco acentuado para la máxima resistencia
- Sustrato y revestimiento específicos para garantizar duración y fiabilidad

- Bohrer für gehärteten Stahl 45-62 HRC
- Selbstzentrierender Schliff für die Herstellung von präzisen Bohrungen
- Gerades und verstärktes Schneidkantenprofil
- Geometrie der Kanten: Schutzfase mit 45°
- Sehr starker Kern zur Gewährleistung von Steifigkeit und Stabilität
- Anstellwinkel 15°: geringer Winkel für maximale Robustheit
- Spezielles Trägermaterial und spezielle Beschichtung zur Gewährleistung von Standzeit und Zuverlässigkeit

- Свёрла для закалённой стали 45÷62 HRC
- Самоцентрирующаяся геометрия: высокая точность отверстий
- Прямые усиленные кромки: высокая стабильность резания и предотвращение пакетирования
- Фаска 45°: защита кромок
- Утолщенная сердцевина: высокая жесткость и стабильность
- Угол наклона винтовой канавки 15°: маленький угол для высокой жесткости
- Специальное покрытие для повышения стойкости инструмента

# 353HRC

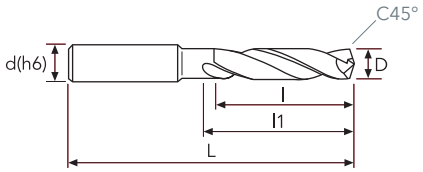
hardened steel 45÷62 HRC

3XD | DIN 6537K | HRC | MG PV1000 | 45÷62 HRC | 150° +C45° | 15°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | | | ★ |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **2.60** | 0/-0.010 | 6 | 14 | 20 | 62 | 353HRC0260 | ● |
| **3.00** | 0/-0.010 | 6 | 14 | 20 | 62 | 353HRC0300 | ● |
| **3.30** | 0/-0.012 | 6 | 14 | 20 | 62 | 353HRC0330 | ● |
| **3.40** | 0/-0.012 | 6 | 14 | 20 | 62 | 353HRC0340 | ● |
| **3.50** | 0/-0.012 | 6 | 14 | 20 | 62 | 353HRC0350 | ● |
| **3.70** | 0/-0.012 | 6 | 14 | 20 | 62 | 353HRC0370 | ● |
| **3.80** | 0/-0.012 | 6 | 17 | 24 | 66 | 353HRC0380 | ● |
| **4.00** | 0/-0.012 | 6 | 17 | 24 | 66 | 353HRC0400 | ● |
| **4.10** | 0/-0.012 | 6 | 17 | 24 | 66 | 353HRC0410 | ● |
| **4.20** | 0/-0.012 | 6 | 17 | 24 | 66 | 353HRC0420 | ● |
| **4.30** | 0/-0.012 | 6 | 17 | 24 | 66 | 353HRC0430 | ● |
| **4.50** | 0/-0.012 | 6 | 17 | 24 | 66 | 353HRC0450 | ● |
| **4.60** | 0/-0.012 | 6 | 17 | 24 | 66 | 353HRC0460 | ● |
| **4.80** | 0/-0.012 | 6 | 20 | 28 | 66 | 353HRC0480 | ● |
| **5.00** | 0/-0.012 | 6 | 20 | 28 | 66 | 353HRC0500 | ● |
| **5.10** | 0/-0.012 | 6 | 20 | 28 | 66 | 353HRC0510 | ● |
| **5.20** | 0/-0.012 | 6 | 20 | 28 | 66 | 353HRC0520 | ● |
| **5.30** | 0/-0.012 | 6 | 20 | 28 | 66 | 353HRC0530 | ● |
| **5.50** | 0/-0.012 | 6 | 20 | 28 | 66 | 353HRC0550 | ● |
| **5.60** | 0/-0.012 | 6 | 20 | 28 | 66 | 353HRC0560 | ● |
| **5.80** | 0/-0.012 | 6 | 20 | 28 | 66 | 353HRC0580 | ● |
| **6.00** | 0/-0.012 | 6 | 20 | 28 | 66 | 353HRC0600 | ● |
| **6.10** | 0/-0.015 | 8 | 29 | 41 | 79 | 353HRC0610 | ● |
| **6.20** | 0/-0.015 | 8 | 29 | 41 | 79 | 353HRC0620 | ● |
| **6.50** | 0/-0.015 | 8 | 29 | 41 | 79 | 353HRC0650 | ● |
| **6.80** | 0/-0.015 | 8 | 29 | 41 | 79 | 353HRC0680 | ● |
| **6.90** | 0/-0.015 | 8 | 29 | 41 | 79 | 353HRC0690 | ● |
| **7.00** | 0/-0.015 | 8 | 29 | 41 | 79 | 353HRC0700 | ● |
| **7.40** | 0/-0.015 | 8 | 29 | 41 | 79 | 353HRC0740 | ● |
| **7.50** | 0/-0.015 | 8 | 29 | 41 | 79 | 353HRC0750 | ● |
| **7.80** | 0/-0.015 | 8 | 29 | 41 | 79 | 353HRC0780 | ● |
| **8.00** | 0/-0.015 | 8 | 29 | 41 | 79 | 353HRC0800 | ● |
| **8.10** | 0/-0.015 | 10 | 35 | 47 | 89 | 353HRC0810 | ● |
| **8.20** | 0/-0.015 | 10 | 35 | 47 | 89 | 353HRC0820 | ● |
| **8.50** | 0/-0.015 | 10 | 35 | 47 | 89 | 353HRC0850 | ● |
| **8.60** | 0/-0.015 | 10 | 35 | 47 | 89 | 353HRC0860 | ● |
| **8.70** | 0/-0.015 | 10 | 35 | 47 | 89 | 353HRC0870 | ● |
| **8.80** | 0/-0.015 | 10 | 35 | 47 | 89 | 353HRC0880 | ● |
| **9.00** | 0/-0.015 | 10 | 35 | 47 | 89 | 353HRC0900 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 353HRC

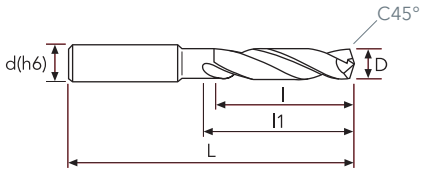
hardened steel 45÷62 HRC

3XD | DIN 6537K | HRC | MG PV1000 | 45÷62 HRC | 150°+C45° | 15°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | | | ★ |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **9.30** | 0/-0.015 | 10 | 35 | 47 | 89 | 353HRC0930 | ● |
| **9.50** | 0/-0.015 | 10 | 35 | 47 | 89 | 353HRC0950 | ● |
| **9.80** | 0/-0.015 | 10 | 35 | 47 | 89 | 353HRC0980 | ● |
| **10.00** | 0/-0.015 | 10 | 35 | 47 | 89 | 353HRC1000 | ● |
| **10.20** | 0/-0.018 | 12 | 40 | 55 | 102 | 353HRC1020 | ● |
| **10.30** | 0/-0.018 | 12 | 40 | 55 | 102 | 353HRC1030 | ● |
| **10.40** | 0/-0.018 | 12 | 40 | 55 | 102 | 353HRC1040 | ● |
| **10.50** | 0/-0.018 | 12 | 40 | 55 | 102 | 353HRC1050 | ● |
| **10.80** | 0/-0.018 | 12 | 40 | 55 | 102 | 353HRC1080 | ● |
| **11.00** | 0/-0.018 | 12 | 40 | 55 | 102 | 353HRC1100 | ● |
| **11.20** | 0/-0.018 | 12 | 40 | 55 | 102 | 353HRC1120 | ● |
| **11.50** | 0/-0.018 | 12 | 40 | 55 | 102 | 353HRC1150 | ● |
| **11.80** | 0/-0.018 | 12 | 40 | 55 | 102 | 353HRC1180 | ● |
| **12.00** | 0/-0.018 | 12 | 40 | 55 | 102 | 353HRC1200 | ● |
| **12.20** | 0/-0.018 | 14 | 43 | 60 | 107 | 353HRC1220 | ● |
| **12.50** | 0/-0.018 | 14 | 43 | 60 | 107 | 353HRC1250 | ● |
| **12.80** | 0/-0.018 | 14 | 43 | 60 | 107 | 353HRC1280 | ● |
| **13.00** | 0/-0.018 | 14 | 43 | 60 | 107 | 353HRC1300 | ● |
| **14.20** | 0/-0.018 | 16 | 45 | 65 | 115 | 353HRC1420 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 353HRC

| | Material Group ISO 513 | H1 H4 | H2 | H3 | H5 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 50÷65 HRC | 54÷62 HRC | 60÷65 HRC | 48÷65 HRC | | |
| | Vc (m/min) | **15÷25** | **12÷18** | **8÷12** | **20÷30** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| Ø RUN OUT <0.02mm | **3** | 0,020 | 0,017 | 0,013 | 0,020 | | |
| | **4** | 0,030 | 0,026 | 0,020 | 0,030 | | |
| | **5** | 0,040 | 0,034 | 0,026 | 0,040 | | |
| | **6** | 0,050 | 0,043 | 0,033 | 0,050 | | |
| | **7** | 0,060 | 0,051 | 0,039 | 0,060 | | |
| | **8** | 0,070 | 0,060 | 0,046 | 0,070 | | |
| | **9** | 0,080 | 0,068 | 0,052 | 0,080 | | |
| | **10** | 0,090 | 0,077 | 0,059 | 0,090 | | |
| | **11** | 0,100 | 0,085 | 0,065 | 0,100 | | |
| | **12** | 0,110 | 0,094 | 0,072 | 0,110 | | |
| | **13** | 0,120 | 0,102 | 0,078 | 0,120 | | |
| | **14** | 0,130 | 0,111 | 0,085 | 0,130 | | |
| | **15** | 0,140 | 0,119 | 0,091 | 0,140 | | |
| | **16** | 0,150 | 0,128 | 0,098 | 0,150 | | |





# TYPHOON SUH MINI

## HIGH PERFORMANCE - MINIATURE SHORT, LONG AND EXTRA LONG

Miniature drills, from short (5xD) to extra-long (30xD) type, suitable for ISO P, M, K, N, S materials.

Mini punte corte (5xD), lunghe ed extra-lunghe (30xD), adatte alla foratura di materiali ISO P, M, K, N, S.

Kurze (5xD), lange und extra-lange (30xD) Kleinstbohrer für das Bohren der Materialien ISO P, M, K, N, S.

Mini forets courts (5xD), longs et extra-longs (30xD), appropriés au perçage de matériaux ISO P, M, K, N, S.

Mini brocas cortas (5xD), largas y extra largas (30xD), adecuadas para el taladro de materiales ISO P, M, K, N, S.

Мини-свёрла от коротких (5xD) до супердлинных (30xD). Пригодны для обработки отверстий в материалах по ISO P, M, K, N, S.

## TYPHOON SUH MINI

HIGH PERFORMANCE - MINIATURE SHORT AND LONG





- Miniature drills are manufactured with unified 3 mm shank
- Oil holes for internal coolant feed
- Self-centering geometry: highly accurate holes
- Straight and reinforced edge: high stability and chipping resistance
- Edge geometry: special design for edge and corners protection
- Chip pocket: highly polished to prevent welding and to improve the chip ejection
- Substrate and coating: specifically selected for high wear resistance, long and reliable life
- Available from Ø1 mm to Ø3 mm
- Different cutting length types from short (5xD) to extra-long (30xD)

- Mini forets fabriqués avec une tige unifiée ayant un diamètre de 3 mm
- Trous de lubrification
- Affûtage autocentré pour l'exécution de trous précis et peu d'efforts de coupe
- Profil de l'arête droit et renforcé : il génère des copeaux courts et garantit une grande fiabilité
- Géométrie de l'arête avec affûtage spécifique pour protéger l'arête et les angles
- Finition des goujoures : polie pour réduire le problème du collage et faciliter l'évacuation des copeaux
- Substrat et revêtement : spécifiques pour garantir durée et fiabilité
- Disponibles du Ø1 mm au Ø3 mm
- Différents types de longueur, de la plus courte (5xD) aux extra-longues (30xD)

- Mini-punte costruite con gambo unificato Ø3 mm
- Fori di refrigerazione
- Affilatura autocentrante per l'esecuzione di fori precisi e bassi sforzi di taglio
- Profilo del tagliente diritto e rinforzato: genera trucioli corti e garantisce grande affidabilità
- Geometria del tagliente con affilatura specifica a protezione del tagliente e degli spigoli
- Finitura gole: lappate per ridurre il problema dell'incollaggio e facilitare l'evacuazione dei trucioli
- Substrato e rivestimento: specifici per garantire durata e affidabilità
- Disponibili da Ø1 mm a Ø3 mm
- Differenti tipi di lunghezza, dalle corte (5XD) alle extra-lunghe (30XD)

- Mini-brocas fabricadas con mango unificado con diámetro de 3 mm
- Agujeros de refrigeración
- Afilado autocentrante para la realización de agujeros precisos y bajos esfuerzos de corte
- Perfil del filo recto y reforzado: genera virutas cortas y garantiza una gran fiabilidad
- Geometría del filo con afilado específico para proteger el filo y los ángulos
- Acabado ranuras: lapeadas para reducir el problema del encolado y facilitar la evacuación de las virutas
- Sustrato y revestimiento: específicos para garantizar duración y fiabilidad
- Disponibles de Ø1 mm a Ø3mm
- Diferentes tipos de longitud, desde las cortas (5XD) hasta las extra-largas (30XD)

- Kleinstbohrer mit genormtem Schaft und einem Durchmesser von 3 mm
- Kühlöffnungen
- Selbstzentrierender Schliff für präzise Bohrungen und geringen Schneiddruck
- Gerades und verstärktes Schneidkantenprofil: zur Erzeugung kurzer Späne und zur Gewährleistung hoher Zuverlässigkeit
- Geometrie der Schneidkante mit speziellem Schliff zum Schutz von Schneidkante und Kanten
- Schlichtbearbeitung der Nuten: geläppt, um Probleme durch Verkleben zu reduzieren und um die Späneabführung zu erleichtern
- Trägermaterial und Beschichtung: speziell zur Gewährleistung von Standzeit und Zuverlässigkeit
- Erhältlich von Ø1 mm bis Ø3 mm
- Verschiedene Längen, von kurz (5XD) bis extra-lang (30XD)

- Мини-свёрла с унифицированным 3х мм хвостовиком
- Отверстия для подвода СОЖ
- Самоцентрирующаяся геометрия: высокая точность отверстий
- Прямые усиленные кромки: высокая стабильность резания и предотвращение пакетирования
- Геометрия режущей кромки со специальной заточкой для защиты лезвия и кромок
- Отполированные стружечные канавки: уменьшают вероятность приваривания стружки и облегчают ее вывод
- Специальное покрытие для повышения стойкости инструмента
- Доступны диаметром от Ø1 мм до Ø3 мм
- Различные длины: от коротких (5XD) до супердлинных (30XD)

**MACHINING OF DEEP HOLES PERPENDICULAR TO THE SURFACE**

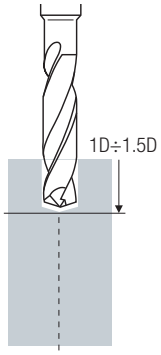
**ESECUZIONE FORI PROFONDI ORTOGONALI ALLA SUPERFICIE**

**HERSTELLUNG TIEFER RECHTWINKLIGER BOHRUNGEN**

**EXÉCUTION DE TROUS PROFONDS ORTHOGONAUX À LA SURFACE**

**MECANIZADO DE AGUJEROS PROFUNDOS PERPENDICULARES A LA SUPERFÍCIE**

**СВЕРЛЕНИЕ ГЛУБОКИХ ОТВЕРСТИЙ ПЕРПЕНДИКУЛЯРНО ОБРАБАТЫВАЕМОЙ ПОВЕХНОСТИ**




## STEP 1

As pilot drill (1xD,1.5xD), please use 343TA with head angle 140° (SUH MINI=135°) and m7 tolerance (SUH MINI=h7)

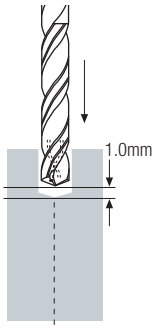
Utiliser un foret 343TA avec un angle en bout de 140° (SUH MINI=135°) et une tolérance m7 (SUH MINI=h7), pour effectuer un trou pilote (1xD -1.5xD) très précis.

Utilizzare una punta 343TA con angolo in testa di 140° (SUH MINI=135°) e tolleranza m7 (SUH MINI=h7), per eseguire un foro pilota (1xD -1.5xD) molto preciso

Utilice una broca 343TA con ángulo de punta de 140° (SUH MINI=135°) y tolerancia m7 (SUH MINI=h7), para realizar un agujero piloto (1xD -1,5xD) muy preciso

Einen Bohrer 343TA mit einem Spitzenwinkel von 140° (SUH MINI=135°) und Toleranz m7 (SUH MINI=h7) für die Herstellung einer äußerst präzisen Richtbohrung (1xD - 1.5xD) verwenden.

Для пилотного отверстия (1xD -1.5xD) используйте сверло 343TA с углом при вершине 140° (SUH MINI=135°) и допуском на диаметр m7 (SUH MINI=h7).




## STEP 2

With coolant feed OFF, enter the pilot hole with SUH MINI drill at Vc=20 m/min and fn=0.3 mm/rev. Position the SUH MINI drill at 1 mm from the end of the pilot hole, then start supplying the coolant and start drilling.

Sans actionner la lubrification interne, entrer avec le foret long série SUH MINI à l'intérieur du trou. Vc=20 m/min, fn=0.3 mm/rév. Placer le foret SUH MINI jusqu'à 1 mm du fond du trou pilote. Actionner la lubrification interne à haute pression et commencer le perçage.

Senza azionare il refrigerante interno, entrare con la punta lunga serie SUH MINI all'interno del foro. Vc=20 m/min, fn=0.3 mm/rev. Posizionare la punta SUH MINI sino a 1 mm dal fondo del foro pilota. Azionare il refrigerante interno ad alta pressione e cominciare la foratura.

Sin accionar el refrigerante interno, entre con la broca larga de la serie SUH MINI dentro del agujero. Vc=20m/min, fn=0.3mm/rev. Posicione la broca SUH MINI hasta 1 mm. del fondo del agujero piloto. Accione el refrigerante interno a alta presión y comience el taladro.

Ohne Aktivierung der internen Kühlung, einen langen Bohrer der Serie SUH MINI in die Bohrung einführen. Vc=20 m/min, fn=0,3 mm/U. Den Bohrer SUH MINI bis 1 mm vom Ende der Richtbohrung ansetzen. Die interne Kühlung mit Hochdruck aktivieren und mit der Bohrung beginnen.

Без подачи СОЖ, введите длинное сверло серии SUH MINI внутрь пилотного отверстия с режимами Vc=20 м/мин и fn=0,3 мм/об. Спозиционируйте сверло SUH MINI на расстоянии 1 мм от дна отверстия. Включите подачу СОЖ и начните сверление.



## STEP 3

Make continue drilling operation without steps for chip ejection. In case of through holes, reduce the feed by 30% before the hole exit (approx. 1 mm). Stop the coolant feed. Use the step drilling process whenever the chip ejection becomes poor.

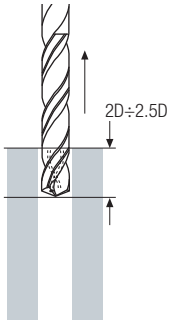
Percer sans step pour l'évacuation des copeaux. En présence de trous débouchants, 1 mm avant d'avoir terminé le trou, réduire l'avance de 30 %. Arrêter la lubrification. Man soll bei schlechter Spanabfuhr einen Step-Bohrvorgang machen.

Forare senza step per scarico trucioli. Nel caso di fori passanti, 1 mm prima di aver completato il foro, ridurre l'avanzamento del 30%. Fermare il refrigerante. Utilizzare il processo di foratura a step nel caso di evacuazione trucioli problematica.

Taladre sin step para la descarga de virutas. En el caso de agujeros pasantes, 1 mm antes de haber completado el agujero, reduzca el avance un 30%. Pare el refrigerante. Aplicar taladrado a step (por pasos) en el caso de problemas de evacuación de viruta.

Für die Späneabführung Stufenlos bohren. Bei Durchgangsbohrungen 1 mm vor Fertigstellung der Bohrung den Vorschub um 30% reduzieren. Die Kühlung deaktivieren. Man soll bei schlechter Spanabfuhr einen Step-Bohrvorgang machen.

Сверлите без остановок и выводов инструмента. В случае обработки сквозного отверстия, снизьте подачу на 30%, за 1 мм до выхода. Отключите подачу СОЖ. Используйте пошаговый процесс сверления при недостаточном удалении стружки.




## STEP 4

Withdraw the drill using max rpm and double fn, until 2xD from the hole entrance.

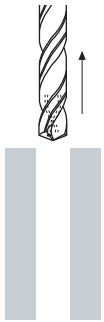
Retirer le foret en utilisant le maximum de tours disponibles et le double de l'avancement conseillé jusqu'à une profondeur 2xD.

Ritirare la punta utilizzando il massimo dei giri disponibili e il doppio dell'avanzamento consigliato sino ad una profondità 2xD.

Retire la broca utilizando el máximo de rpm disponibles y el doble del avance aconsejado hasta una profundidad 2xD.

Den Bohrer zurückziehen, dabei die maximal verfügbare Drehzahl und den doppelten Wert des empfohlenen Vorschubs bis zu einer Tiefe 2xD einsetzen.

Выньте сверло до уровня 2xD, используя максимальную частоту вращения и двойную подачу.



## STEP 5

Completing the exit from the hole by using slow and constant speed (200-300 rpm).

Terminer la dernière partie du perçage avec une vitesse réduite et constante (200-300 rpm).

Completare l'ultimo tratto di arretramento con velocità ridotta e costante (200-300 rpm).

Complete el último tramo de retroceso con velocidad reducida y constante (200-300 rpm).

Den letzten Abschnitt beim Zurückziehen mit reduzierter und konstanter Geschwindigkeit fertigstellen (200-300 rpm).

Полностью выньте сверло на заниженных режимах (200-300 rpm).

**MACHINING OF DEEP HOLES ON SLANTED OR IRREGULAR SURFACES**

**ESECUZIONE FORI PROFONDI SU SUPERFICI IRREGOLARI O OBLIQUE**

**HERSTELLUNG TIEFER BOHRUNGEN AUF SCHRÄGEN ODER UNREGELMÄSSIGEN OBERFLÄCHEN**

**EXÉCUTION DE TROUS PROFONDS SUR DES SURFACES IRRÉGULIÈRES OU OBLIQUES**

**MECANIZADO DE AGUJEROS PROFUNDOS SOBRE SUPERFÍCIES IRREGULARES U OBLICUAS**

**ОБРАБОТКА ГЛУБОКИХ ОТВЕРСТИЙ НА НАКЛОННЫХ ИЛИ НЕРОВНЫХ ПЛОСКОСТЯХ**



## STEP 1

Prepare a flat surface of the same size as the drilling diameter.

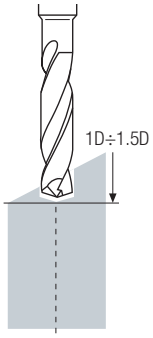
Realizzare una superficie piana utilizzando una fresa con tagliente frontale. Il piano realizzato deve avere le stesse dimensioni del diametro di foratura profonda.

Eine ebene Oberfläche, durch einen Fräser mit stirnseitiger Schneidkante, herstellen. Die hergestellte Oberfläche muss dieselben Abmessungen des Durchmessers der tiefen Bohrung aufweisen.

Réaliser une surface plane en utilisant une fraise avec une arête frontale. Le plan réalisé doit avoir les mêmes dimensions que le diamètre de perçage profond.

Realizar una superficie plana usando una fresa con filo frontal. El plano realizado tiene que tener las mismas dimensiones que el diámetro de taladro profundo.

Подготовьте ровную поверхность с помощью концевой фрезы. Эта поверхность должна быть того же размера, что и диаметр будущего глубокого отверстия.




## STEP 2

As pilot drill (1xD,1.5xD), please use 343TA with head angle 140° (SUH MINI=135°) and m7 tolerance (SUH MINI=h7).

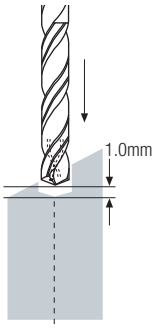
Utilizzare una punta 343TA con angolo in testa di 140° (SUH MINI=135°) e tolleranza m7 (SUH MINI=h7), per eseguire un foro pilota (1xD -1.5xD) molto preciso.

Einen Bohrer 343TA mit einem Spitzenwinkel von 140° (SUH MINI=135°) und Toleranz m7 (SUH MINI=h7) für die Herstellung einer äußerst präzisen Richtbohrung (1xD - 1.5xD) verwenden.

Utiliser un foret 343TA avec un angle en bout de 140° (SUH MINI=135°) et une tolérance m7 (SUH MINI=h7), pour effectuer un trou pilote (1xD -1.5xD) très précis.

Utilice una broca 343TA con ángulo punta de 140° (SUH MINI=135°) y tolerancia m7 (SUH MINI=h7), para realizar un agujero piloto (1xD -1,5xD) muy preciso.

Для пилотного отверстия (1xD -1.5xD) используйте сверло 343TA с углом при вершине 140° (SUH MINI=135°) и допуском на диаметр m7 (SUH MINI=h7).




## STEP 3

With coolant feed OFF, enter the pilot hole with SUH MINI drill at Vc=20 m/min and fn=0.3 mm/rev. Position the SUH MINI drill at 1 mm from the end of the pilot hole, then start supplying the coolant and start drilling.

Sans actionner la lubrification interne, entrer avec le foret long série SUH MINI à l'intérieur du trou. Vc=20 m/min, fn=0.3 mm/rév. Placer le foret SUH MINI jusqu'à 1 mm du fond du trou pilote. Actionner la lubrification interne à haute pression et commencer le perçage.

Senza azionare il refrigerante interno, entrare con la punta lunga serie SUH MINI all'interno del foro. Vc=20 m/min, fn=0.3 mm/rev. Posizionare la punta SUH MINI sino a 1 mm dal fondo del foro pilota. Azionare il refrigerante interno ad alta pressione e cominciare la foratura.

Sin accionar el refrigerante interno, entre con la broca larga de la serie SUH MINI dentro del agujero. Vc=20m/min, fn=0.3 mm/rev. Posicione la broca SUH MINI hasta 1 mm. del fondo del agujero piloto. Accione el refrigerante interno a alta presión y comience el taladro.

Ohne Aktivierung der internen Kühlung, einen langen Bohrer der Serie SUH MINI in die Bohrung einführen. Vc=20 m/min, fn=0,3 mm/U. Den Bohrer SUH MINI bis 1 mm vom Ende der Richtbohrung ansetzen. Die interne Kühlung mit Hochdruck aktivieren und mit der Bohrung beginnen.

Без включения СОЖ, введите длинное сверло серии SUH MINI внутрь пилотного отверстия с режимами Vc=20 м/мин и fn=0.3 мм/об. Спозиционируйте сверло SUH MINI на расстоянии 1 мм от дна отверстия. Включите подачу СОЖ и начните сверление.



## STEP 4

Make continue drilling operation without steps for chip ejection.
In case of through holes, reduce the feed by 30% before the hole exit (approx. 1 mm).
Stop the coolant feed.

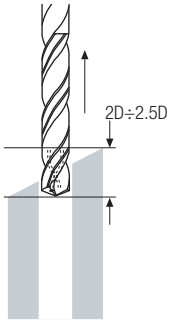
Percer sans step pour l'évacuation des copeaux.
En présence de trous débouchants, 1 mm avant d'avoir terminé le trou, réduire l'avance de 30 %.
Arrêter la lubrification.

Forare senza step per scarico trucioli.
Nel caso di fori passanti, 1 mm prima di aver completato il foro, ridurre l'avanzamento del 30%.
Fermare il refrigerante.

Taladre sin step para la descarga de virutas.
En el caso de agujeros pasantes, 1 mm antes de haber completado el agujero, reduzca el avance un 30%.
Pare el refrigerante.

Für die Späneabführung Stufenlos bohren.
Bei Durchgangsbohrungen 1 mm vor Fertigstellung der Bohrung den Vorschub um 30% reduzieren.
Die Kühlung deaktivieren.

Сверлите без остановок и выводов инструмента.
В случае обработки сквозного отверстия, снизьте подачу на 30%, за 1 мм до выхода.
Отключите подачу СОЖ.




## STEP 5

Withdraw the drill using max rpm and double fn, until 2xD÷2.5xD from the hole entrance.

Retirer le foret en utilisant le maximum de tours disponibles et le double de l'avancement conseillé jusqu'à une profondeur 2xD÷2.5xD.

Ritirare la punta utilizzando il massimo dei giri disponibili e il doppio dell'avanzamento consigliato sino ad una profondità 2xD÷2.5xD.

Retire la broca utilizando el máximo de rpm disponibles y el doble del avance aconsejado hasta una profundidad de 2xD÷2.5xD.

Den Bohrer zurückziehen, dabei die maximal verfügbare Drehzahl und den doppelten Wert des empfohlenen Vorschubs bis zu einer Tiefe 2xD÷2.5xD einsetzen.

Выньте сверло до уровня 2xD, используя максимальную частоту вращения и двойную подачу.



## STEP 6

Completing the exit from the hole by using slow and constant speed (200-300 rpm).

Terminer la dernière partie du perçage avec une vitesse réduite et constante (200-300 rpm).

Completare l'ultimo tratto di arretramento con velocità ridotta e costante (200-300 rpm).

Complete el último tramo de retroceso con velocidad reducida y constante (200-300 rpm).

Den letzten Abschnitt beim Zurückziehen mit reduzierter und konstanter Geschwindigkeit fertigstellen (200-300 rpm).

Полностью выньте сверло на заниженных режимах (200-300 rpm).

# 355SUH MINI

3 mm shank, polished flutes

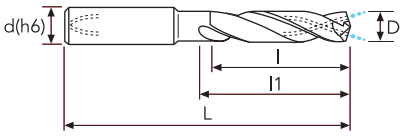
5XD | OSAWA NORM | SUH MINI | MG PV300 | 135° | 30°





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|
| **1.00** | 0/-0.010 | 3 | 6.5 | 8 | 50 | 5 x D | 355SUH0100N | ● |
| **1.10** | 0/-0.010 | 3 | 7.2 | 8.7 | 50 | 5 x D | 355SUH0110N | ● |
| **1.20** | 0/-0.010 | 3 | 7.8 | 9.3 | 50 | 5 x D | 355SUH0120N | ● |
| **1.30** | 0/-0.010 | 3 | 8.5 | 10 | 50 | 5 x D | 355SUH0130N | ● |
| **1.40** | 0/-0.010 | 3 | 9.1 | 10.6 | 50 | 5 x D | 355SUH0140N | ● |
| **1.50** | 0/-0.010 | 3 | 9.8 | 11.3 | 50 | 5 x D | 355SUH0150N | ● |
| **1.60** | 0/-0.010 | 3 | 10.4 | 11.9 | 50 | 5 x D | 355SUH0160N | ● |
| **1.70** | 0/-0.010 | 3 | 11.1 | 12.6 | 55 | 5 x D | 355SUH0170N | ● |
| **1.80** | 0/-0.010 | 3 | 11.7 | 13.2 | 55 | 5 x D | 355SUH0180N | ● |
| **1.90** | 0/-0.010 | 3 | 12.4 | 13.9 | 55 | 5 x D | 355SUH0190N | ● |
| **2.00** | 0/-0.010 | 3 | 13 | 16 | 55 | 5 x D | 355SUH0200N | ● |
| **2.10** | 0/-0.010 | 3 | 13.7 | 16.9 | 55 | 5 x D | 355SUH0210N | ● |
| **2.20** | 0/-0.010 | 3 | 14.3 | 17.6 | 55 | 5 x D | 355SUH0220N | ● |
| **2.30** | 0/-0.010 | 3 | 15 | 18.5 | 55 | 5 x D | 355SUH0230N | ● |
| **2.40** | 0/-0.010 | 3 | 15.6 | 19.2 | 55 | 5 x D | 355SUH0240N | ● |
| **2.50** | 0/-0.010 | 3 | 16.3 | 20.1 | 55 | 5 x D | 355SUH0250N | ● |
| **2.60** | 0/-0.010 | 3 | 16.9 | 20.8 | 55 | 5 x D | 355SUH0260N | ● |
| **2.70** | 0/-0.010 | 3 | 17.6 | 21.7 | 55 | 5 x D | 355SUH0270N | ● |
| **2.80** | 0/-0.010 | 3 | 18.2 | 22.4 | 55 | 5 x D | 355SUH0280N | ● |
| **2.90** | 0/-0.010 | 3 | 18.9 | 23.3 | 55 | 5 x D | 355SUH0290N | ● |
| **3.00** | 0/-0.010 | 3 | 19.5 | 24 | 55 | 5 x D | 355SUH030003N | ● |



● stock standard ○ non-standard stock ▽ stock exhaustion

# 355SUH MINI

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **85÷95*** | **75÷85*** | **65÷75*** | **60÷70*** | **55÷65*** | **38÷42*** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| Ø RUN OUT <0.02mm | **1.0** | 0.025 | 0.025 | 0.026 | 0.026 | 0.012 | 0.012 |
| | **1.1** | 0.027 | 0.028 | 0.029 | 0.029 | 0.014 | 0.013 |
| | **1.2** | 0.030 | 0.030 | 0.032 | 0.031 | 0.015 | 0.014 |
| | **1.3** | 0.032 | 0.033 | 0.034 | 0.034 | 0.016 | 0.015 |
| | **1.4** | 0.035 | 0.035 | 0.037 | 0.037 | 0.017 | 0.017 |
| | **1.5** | 0.037 | 0.038 | 0.040 | 0.039 | 0.018 | 0.018 |
| | **1.6** | 0.041 | 0.041 | 0.044 | 0.043 | 0.021 | 0.020 |
| | **1.7** | 0.044 | 0.044 | 0.047 | 0.046 | 0.022 | 0.021 |
| | **1.8** | 0.047 | 0.047 | 0.049 | 0.049 | 0.024 | 0.023 |
| | **1.9** | 0.049 | 0.049 | 0.052 | 0.051 | 0.025 | 0.024 |
| | **2.0** | 0.052 | 0.052 | 0.055 | 0.054 | 0.026 | 0.025 |
| | **2.1** | 0.056 | 0.056 | 0.059 | 0.059 | 0.029 | 0.028 |
| | **2.2** | 0.059 | 0.059 | 0.062 | 0.062 | 0.031 | 0.029 |
| | **2.3** | 0.062 | 0.061 | 0.065 | 0.064 | 0.032 | 0.031 |
| | **2.4** | 0.064 | 0.064 | 0.068 | 0.067 | 0.033 | 0.032 |
| | **2.5** | 0.067 | 0.067 | 0.071 | 0.070 | 0.035 | 0.033 |
| | **2.6** | 0.073 | 0.071 | 0.076 | 0.075 | 0.038 | 0.037 |
| | **2.7** | 0.075 | 0.074 | 0.079 | 0.078 | 0.040 | 0.038 |
| | **2.8** | 0.078 | 0.077 | 0.082 | 0.081 | 0.041 | 0.040 |
| | **2.9** | 0.081 | 0.080 | 0.085 | 0.084 | 0.043 | 0.041 |
| | **3.0** | 0.084 | 0.082 | 0.088 | 0.087 | 0.044 | 0.042 |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

| | Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **55÷65*** | **50÷60*** | **40÷50*** | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| Ø RUN OUT <0.02mm | **1.0** | 0.012 | 0.013 | 0.013 | | | |
| | **1.1** | 0.014 | 0.014 | 0.014 | | | |
| | **1.2** | 0.015 | 0.015 | 0.015 | | | |
| | **1.3** | 0.016 | 0.016 | 0.016 | | | |
| | **1.4** | 0.017 | 0.018 | 0.018 | | | |
| | **1.5** | 0.018 | 0.019 | 0.019 | | | |
| | **1.6** | 0.021 | 0.021 | 0.021 | | | |
| | **1.7** | 0.022 | 0.022 | 0.023 | | | |
| | **1.8** | 0.024 | 0.024 | 0.024 | | | |
| | **1.9** | 0.025 | 0.025 | 0.025 | | | |
| | **2.0** | 0.026 | 0.026 | 0.027 | | | |
| | **2.1** | 0.029 | 0.029 | 0.029 | | | |
| | **2.2** | 0.031 | 0.030 | 0.031 | | | |
| | **2.3** | 0.032 | 0.032 | 0.032 | | | |
| | **2.4** | 0.033 | 0.033 | 0.034 | | | |
| | **2.5** | 0.035 | 0.034 | 0.035 | | | |
| | **2.6** | 0.038 | 0.037 | 0.038 | | | |
| | **2.7** | 0.040 | 0.039 | 0.040 | | | |
| | **2.8** | 0.041 | 0.040 | 0.041 | | | |
| | **2.9** | 0.043 | 0.041 | 0.043 | | | |
| | **3.0** | 0.044 | 0.043 | 0.044 | | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 355SUH MINI




| Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| Vc (m/min) | **80÷90*** | **70÷80*** | **60÷70*** | **55÷65*** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **1.0** | 0.016 | 0.015 | 0.014 | 0.012 | | |
| **1.1** | 0.018 | 0.017 | 0.015 | 0.014 | | |
| **1.2** | 0.019 | 0.018 | 0.017 | 0.015 | | |
| **1.3** | 0.021 | 0.020 | 0.018 | 0.016 | | |
| **1.4** | 0.023 | 0.021 | 0.019 | 0.017 | | |
| **1.5** | 0.024 | 0.023 | 0.021 | 0.018 | | |
| **1.6** | 0.027 | 0.025 | 0.023 | 0.021 | | |
| **1.7** | 0.028 | 0.027 | 0.025 | 0.022 | | |
| **1.8** | 0.030 | 0.028 | 0.026 | 0.024 | | |
| **1.9** | 0.032 | 0.030 | 0.028 | 0.025 | | |
| **2.0** | 0.033 | 0.031 | 0.029 | 0.026 | | |
| **2.1** | 0.036 | 0.034 | 0.032 | 0.029 | | |
| **2.2** | 0.038 | 0.036 | 0.034 | 0.031 | | |
| **2.3** | 0.040 | 0.038 | 0.035 | 0.032 | | |
| **2.4** | 0.041 | 0.039 | 0.037 | 0.033 | | |
| **2.5** | 0.043 | 0.041 | 0.038 | 0.035 | | |
| **2.6** | 0.046 | 0.044 | 0.041 | 0.038 | | |
| **2.7** | 0.048 | 0.046 | 0.043 | 0.040 | | |
| **2.8** | 0.050 | 0.047 | 0.045 | 0.041 | | |
| **2.9** | 0.051 | 0.049 | 0.046 | 0.043 | | |
| **3.0** | 0.053 | 0.051 | 0.048 | 0.044 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)




| Material Group ISO 513 | N1 | N2 | N3 N4 | N5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **140÷150*** | **120÷130*** | **110÷120*** | **155÷165*** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **1.0** | 0.016 | 0.016 | 0.015 | 0.016 | | |
| **1.1** | 0.018 | 0.018 | 0.016 | 0.017 | | |
| **1.2** | 0.019 | 0.019 | 0.018 | 0.019 | | |
| **1.3** | 0.021 | 0.021 | 0.019 | 0.020 | | |
| **1.4** | 0.022 | 0.023 | 0.021 | 0.022 | | |
| **1.5** | 0.024 | 0.024 | 0.022 | 0.023 | | |
| **1.6** | 0.026 | 0.027 | 0.024 | 0.026 | | |
| **1.7** | 0.028 | 0.028 | 0.026 | 0.027 | | |
| **1.8** | 0.030 | 0.030 | 0.028 | 0.029 | | |
| **1.9** | 0.031 | 0.032 | 0.029 | 0.031 | | |
| **2.0** | 0.033 | 0.033 | 0.031 | 0.032 | | |
| **2.1** | 0.035 | 0.036 | 0.033 | 0.035 | | |
| **2.2** | 0.037 | 0.038 | 0.035 | 0.037 | | |
| **2.3** | 0.039 | 0.039 | 0.036 | 0.038 | | |
| **2.4** | 0.041 | 0.041 | 0.038 | 0.040 | | |
| **2.5** | 0.042 | 0.043 | 0.040 | 0.042 | | |
| **2.6** | 0.045 | 0.046 | 0.043 | 0.045 | | |
| **2.7** | 0.047 | 0.048 | 0.044 | 0.047 | | |
| **2.8** | 0.049 | 0.049 | 0.046 | 0.048 | | |
| **2.9** | 0.050 | 0.051 | 0.048 | 0.050 | | |
| **3.0** | 0.052 | 0.053 | 0.049 | 0.052 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

# 355SUH MINI

| | Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| | Vc (m/min) | **26÷30*** | **24÷26*** | **34÷36*** | **28÷32*** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| Ø RUN OUT <0.02mm | **1.0** | 0.009 | 0.011 | 0.011 | 0.009 | | |
| | **1.1** | 0.010 | 0.012 | 0.012 | 0.010 | | |
| | **1.2** | 0.011 | 0.013 | 0.013 | 0.011 | | |
| | **1.3** | 0.012 | 0.014 | 0.014 | 0.012 | | |
| | **1.4** | 0.013 | 0.015 | 0.015 | 0.013 | | |
| | **1.5** | 0.013 | 0.016 | 0.016 | 0.014 | | |
| | **1.6** | 0.016 | 0.018 | 0.019 | 0.017 | | |
| | **1.7** | 0.017 | 0.019 | 0.020 | 0.018 | | |
| | **1.8** | 0.018 | 0.020 | 0.021 | 0.019 | | |
| | **1.9** | 0.019 | 0.021 | 0.022 | 0.020 | | |
| | **2.0** | 0.020 | 0.023 | 0.023 | 0.021 | | |
| | **2.1** | 0.024 | 0.025 | 0.026 | 0.024 | | |
| | **2.2** | 0.025 | 0.026 | 0.028 | 0.025 | | |
| | **2.3** | 0.026 | 0.027 | 0.029 | 0.027 | | |
| | **2.4** | 0.027 | 0.029 | 0.030 | 0.028 | | |
| | **2.5** | 0.028 | 0.030 | 0.031 | 0.029 | | |
| | **2.6** | 0.032 | 0.033 | 0.035 | 0.033 | | |
| | **2.7** | 0.033 | 0.034 | 0.036 | 0.034 | | |
| | **2.8** | 0.035 | 0.035 | 0.038 | 0.035 | | |
| | **2.9** | 0.036 | 0.036 | 0.039 | 0.036 | | |
| | **3.0** | 0.037 | 0.038 | 0.040 | 0.038 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

# 358SUH MINI

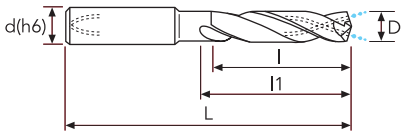
3 mm shank, polished flutes

8XD | OSAWA NORM | SUH MINI | MG PV300 | 135° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|
| **1.00** | 0/-0.010 | 3 | 9.5 | 11 | 50 | 8 x D | 358SUH0100N | ● |
| **1.10** | 0/-0.010 | 3 | 10.5 | 12 | 50 | 8 x D | 358SUH0110N | ● |
| **1.20** | 0/-0.010 | 3 | 11.4 | 12.9 | 50 | 8 x D | 358SUH0120N | ● |
| **1.30** | 0/-0.010 | 3 | 12.4 | 13.9 | 50 | 8 x D | 358SUH0130N | ● |
| **1.40** | 0/-0.010 | 3 | 13.3 | 14.8 | 50 | 8 x D | 358SUH0140N | ● |
| **1.50** | 0/-0.010 | 3 | 14.3 | 15.8 | 50 | 8 x D | 358SUH0150N | ● |
| **1.60** | 0/-0.010 | 3 | 15.2 | 16.7 | 50 | 8 x D | 358SUH0160N | ● |
| **1.70** | 0/-0.010 | 3 | 16.2 | 17.7 | 60 | 8 x D | 358SUH0170N | ● |
| **1.80** | 0/-0.010 | 3 | 17.1 | 18.6 | 60 | 8 x D | 358SUH0180N | ● |
| **1.90** | 0/-0.010 | 3 | 18.1 | 19.6 | 60 | 8 x D | 358SUH0190N | ● |
| **2.00** | 0/-0.010 | 3 | 19 | 22 | 60 | 8 x D | 358SUH0200N | ● |
| **2.10** | 0/-0.010 | 3 | 20 | 23.2 | 60 | 8 x D | 358SUH0210N | ● |
| **2.20** | 0/-0.010 | 3 | 20.9 | 24.2 | 60 | 8 x D | 358SUH0220N | ● |
| **2.30** | 0/-0.010 | 3 | 21.9 | 25.4 | 60 | 8 x D | 358SUH0230N | ● |
| **2.40** | 0/-0.010 | 3 | 22.8 | 26.4 | 60 | 8 x D | 358SUH0240N | ● |
| **2.50** | 0/-0.010 | 3 | 23.8 | 27.6 | 60 | 8 x D | 358SUH0250N | ● |
| **2.60** | 0/-0.010 | 3 | 24.7 | 28.6 | 60 | 8 x D | 358SUH0260N | ● |
| **2.70** | 0/-0.010 | 3 | 25.7 | 29.8 | 60 | 8 x D | 358SUH0270N | ● |
| **2.80** | 0/-0.010 | 3 | 26.6 | 30.8 | 60 | 8 x D | 358SUH0280N | ● |
| **2.90** | 0/-0.010 | 3 | 27.6 | 32 | 60 | 8 x D | 358SUH0290N | ● |
| **3.00** | 0/-0.010 | 3 | 28.5 | 33 | 60 | 8 x D | 358SUH0300N | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 358SUH MINI

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **85÷95*** | **75÷85*** | **65÷75*** | **60÷70*** | **55÷65*** | **38÷42*** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| Ø RUN OUT <0.02mm | **1.0** | 0.025 | 0.025 | 0.026 | 0.026 | 0.012 | 0.012 |
| | **1.1** | 0.027 | 0.028 | 0.029 | 0.029 | 0.014 | 0.013 |
| | **1.2** | 0.030 | 0.030 | 0.032 | 0.031 | 0.015 | 0.014 |
| | **1.3** | 0.032 | 0.033 | 0.034 | 0.034 | 0.016 | 0.015 |
| | **1.4** | 0.035 | 0.035 | 0.037 | 0.037 | 0.017 | 0.017 |
| | **1.5** | 0.037 | 0.038 | 0.040 | 0.039 | 0.018 | 0.018 |
| | **1.6** | 0.041 | 0.041 | 0.044 | 0.043 | 0.021 | 0.020 |
| | **1.7** | 0.044 | 0.044 | 0.047 | 0.046 | 0.022 | 0.021 |
| | **1.8** | 0.047 | 0.047 | 0.049 | 0.049 | 0.024 | 0.023 |
| | **1.9** | 0.049 | 0.049 | 0.052 | 0.051 | 0.025 | 0.024 |
| | **2.0** | 0.052 | 0.052 | 0.055 | 0.054 | 0.026 | 0.025 |
| | **2.1** | 0.056 | 0.056 | 0.059 | 0.059 | 0.029 | 0.028 |
| | **2.2** | 0.059 | 0.059 | 0.062 | 0.062 | 0.031 | 0.029 |
| | **2.3** | 0.062 | 0.061 | 0.065 | 0.064 | 0.032 | 0.031 |
| | **2.4** | 0.064 | 0.064 | 0.068 | 0.067 | 0.033 | 0.032 |
| | **2.5** | 0.067 | 0.067 | 0.071 | 0.070 | 0.035 | 0.033 |
| | **2.6** | 0.073 | 0.071 | 0.076 | 0.075 | 0.038 | 0.037 |
| | **2.7** | 0.075 | 0.074 | 0.079 | 0.078 | 0.040 | 0.038 |
| | **2.8** | 0.078 | 0.077 | 0.082 | 0.081 | 0.041 | 0.040 |
| | **2.9** | 0.081 | 0.080 | 0.085 | 0.084 | 0.043 | 0.041 |
| | **3.0** | 0.084 | 0.082 | 0.088 | 0.087 | 0.044 | 0.042 |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

| | Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **55÷65*** | **50÷60*** | **40÷50*** | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| Ø RUN OUT <0.02mm | **1.0** | 0.012 | 0.013 | 0.013 | | | |
| | **1.1** | 0.014 | 0.014 | 0.014 | | | |
| | **1.2** | 0.015 | 0.015 | 0.015 | | | |
| | **1.3** | 0.016 | 0.016 | 0.016 | | | |
| | **1.4** | 0.017 | 0.018 | 0.018 | | | |
| | **1.5** | 0.018 | 0.019 | 0.019 | | | |
| | **1.6** | 0.021 | 0.021 | 0.021 | | | |
| | **1.7** | 0.022 | 0.022 | 0.023 | | | |
| | **1.8** | 0.024 | 0.024 | 0.024 | | | |
| | **1.9** | 0.025 | 0.025 | 0.025 | | | |
| | **2.0** | 0.026 | 0.026 | 0.027 | | | |
| | **2.1** | 0.029 | 0.029 | 0.029 | | | |
| | **2.2** | 0.031 | 0.030 | 0.031 | | | |
| | **2.3** | 0.032 | 0.032 | 0.032 | | | |
| | **2.4** | 0.033 | 0.033 | 0.034 | | | |
| | **2.5** | 0.035 | 0.034 | 0.035 | | | |
| | **2.6** | 0.038 | 0.037 | 0.038 | | | |
| | **2.7** | 0.040 | 0.039 | 0.040 | | | |
| | **2.8** | 0.041 | 0.040 | 0.041 | | | |
| | **2.9** | 0.043 | 0.041 | 0.043 | | | |
| | **3.0** | 0.044 | 0.043 | 0.044 | | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 358SUH MINI




| Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| Vc (m/min) | **80÷90*** | **70÷80*** | **60÷70*** | **55÷65*** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **1.0** | 0.016 | 0.015 | 0.014 | 0.012 | | |
| **1.1** | 0.018 | 0.017 | 0.015 | 0.014 | | |
| **1.2** | 0.019 | 0.018 | 0.017 | 0.015 | | |
| **1.3** | 0.021 | 0.020 | 0.018 | 0.016 | | |
| **1.4** | 0.023 | 0.021 | 0.019 | 0.017 | | |
| **1.5** | 0.024 | 0.023 | 0.021 | 0.018 | | |
| **1.6** | 0.027 | 0.025 | 0.023 | 0.021 | | |
| **1.7** | 0.028 | 0.027 | 0.025 | 0.022 | | |
| **1.8** | 0.030 | 0.028 | 0.026 | 0.024 | | |
| **1.9** | 0.032 | 0.030 | 0.028 | 0.025 | | |
| **2.0** | 0.033 | 0.031 | 0.029 | 0.026 | | |
| **2.1** | 0.036 | 0.034 | 0.032 | 0.029 | | |
| **2.2** | 0.038 | 0.036 | 0.034 | 0.031 | | |
| **2.3** | 0.040 | 0.038 | 0.035 | 0.032 | | |
| **2.4** | 0.041 | 0.039 | 0.037 | 0.033 | | |
| **2.5** | 0.043 | 0.041 | 0.038 | 0.035 | | |
| **2.6** | 0.046 | 0.044 | 0.041 | 0.038 | | |
| **2.7** | 0.048 | 0.046 | 0.043 | 0.040 | | |
| **2.8** | 0.050 | 0.047 | 0.045 | 0.041 | | |
| **2.9** | 0.051 | 0.049 | 0.046 | 0.043 | | |
| **3.0** | 0.053 | 0.051 | 0.048 | 0.044 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)




| Material Group ISO 513 | N1 | N2 | N3 N4 | N5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **140÷150*** | **120÷130*** | **110÷120*** | **155÷165*** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **1.0** | 0.016 | 0.016 | 0.015 | 0.016 | | |
| **1.1** | 0.018 | 0.018 | 0.016 | 0.017 | | |
| **1.2** | 0.019 | 0.019 | 0.018 | 0.019 | | |
| **1.3** | 0.021 | 0.021 | 0.019 | 0.020 | | |
| **1.4** | 0.022 | 0.023 | 0.021 | 0.022 | | |
| **1.5** | 0.024 | 0.024 | 0.022 | 0.023 | | |
| **1.6** | 0.026 | 0.027 | 0.024 | 0.026 | | |
| **1.7** | 0.028 | 0.028 | 0.026 | 0.027 | | |
| **1.8** | 0.030 | 0.030 | 0.028 | 0.029 | | |
| **1.9** | 0.031 | 0.032 | 0.029 | 0.031 | | |
| **2.0** | 0.033 | 0.033 | 0.031 | 0.032 | | |
| **2.1** | 0.035 | 0.036 | 0.033 | 0.035 | | |
| **2.2** | 0.037 | 0.038 | 0.035 | 0.037 | | |
| **2.3** | 0.039 | 0.039 | 0.036 | 0.038 | | |
| **2.4** | 0.041 | 0.041 | 0.038 | 0.040 | | |
| **2.5** | 0.042 | 0.043 | 0.040 | 0.042 | | |
| **2.6** | 0.045 | 0.046 | 0.043 | 0.045 | | |
| **2.7** | 0.047 | 0.048 | 0.044 | 0.047 | | |
| **2.8** | 0.049 | 0.049 | 0.046 | 0.048 | | |
| **2.9** | 0.050 | 0.051 | 0.048 | 0.050 | | |
| **3.0** | 0.052 | 0.053 | 0.049 | 0.052 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

# 358SUH MINI

| | Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| | Vc (m/min) | **26÷30*** | **24÷26*** | **34÷36*** | **28÷32*** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| Ø RUN OUT <0.02mm | **1.0** | 0.009 | 0.011 | 0.011 | 0.009 | | |
| | **1.1** | 0.010 | 0.012 | 0.012 | 0.010 | | |
| | **1.2** | 0.011 | 0.013 | 0.013 | 0.011 | | |
| | **1.3** | 0.012 | 0.014 | 0.014 | 0.012 | | |
| | **1.4** | 0.013 | 0.015 | 0.015 | 0.013 | | |
| | **1.5** | 0.013 | 0.016 | 0.016 | 0.014 | | |
| | **1.6** | 0.016 | 0.018 | 0.019 | 0.017 | | |
| | **1.7** | 0.017 | 0.019 | 0.020 | 0.018 | | |
| | **1.8** | 0.018 | 0.020 | 0.021 | 0.019 | | |
| | **1.9** | 0.019 | 0.021 | 0.022 | 0.020 | | |
| | **2.0** | 0.020 | 0.023 | 0.023 | 0.021 | | |
| | **2.1** | 0.024 | 0.025 | 0.026 | 0.024 | | |
| | **2.2** | 0.025 | 0.026 | 0.028 | 0.025 | | |
| | **2.3** | 0.026 | 0.027 | 0.029 | 0.027 | | |
| | **2.4** | 0.027 | 0.029 | 0.030 | 0.028 | | |
| | **2.5** | 0.028 | 0.030 | 0.031 | 0.029 | | |
| | **2.6** | 0.032 | 0.033 | 0.035 | 0.033 | | |
| | **2.7** | 0.033 | 0.034 | 0.036 | 0.034 | | |
| | **2.8** | 0.035 | 0.035 | 0.038 | 0.035 | | |
| | **2.9** | 0.036 | 0.036 | 0.039 | 0.036 | | |
| | **3.0** | 0.037 | 0.038 | 0.040 | 0.038 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

# 3512SUH MINI

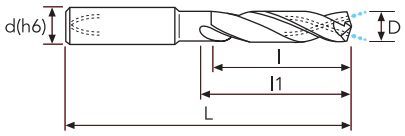
3 mm shank, polished flutes

12XD | OSAWA NORM | SUH MINI | MG PV300 | 135° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|
| **1.00** | 0/-0.010 | 3 | 13.5 | 15 | 55 | 12 x D | 3512SUH0100N | ● |
| **1.10** | 0/-0.010 | 3 | 14.9 | 16.4 | 55 | 12 x D | 3512SUH0110N | ● |
| **1.20** | 0/-0.010 | 3 | 16.2 | 17.7 | 55 | 12 x D | 3512SUH0120N | ● |
| **1.30** | 0/-0.010 | 3 | 17.6 | 19.1 | 55 | 12 x D | 3512SUH0130N | ● |
| **1.40** | 0/-0.010 | 3 | 18.9 | 20.4 | 55 | 12 x D | 3512SUH0140N | ● |
| **1.50** | 0/-0.010 | 3 | 20.3 | 21.8 | 55 | 12 x D | 3512SUH0150N | ● |
| **1.60** | 0/-0.010 | 3 | 21.6 | 23.1 | 65 | 12 x D | 3512SUH0160N | ● |
| **1.70** | 0/-0.010 | 3 | 23 | 24.5 | 65 | 12 x D | 3512SUH0170N | ● |
| **1.80** | 0/-0.010 | 3 | 24.3 | 25.8 | 65 | 12 x D | 3512SUH0180N | ● |
| **1.90** | 0/-0.010 | 3 | 25.7 | 27.2 | 65 | 12 x D | 3512SUH0190N | ● |
| **2.00** | 0/-0.010 | 3 | 27 | 30 | 65 | 12 x D | 3512SUH0200N | ● |
| **2.10** | 0/-0.010 | 3 | 28.4 | 31.6 | 65 | 12 x D | 3512SUH0210N | ● |
| **2.20** | 0/-0.010 | 3 | 29.7 | 33 | 65 | 12 x D | 3512SUH0220N | ● |
| **2.30** | 0/-0.010 | 3 | 31.1 | 34.6 | 65 | 12 x D | 3512SUH0230N | ● |
| **2.40** | 0/-0.010 | 3 | 32.4 | 36 | 75 | 12 x D | 3512SUH0240N | ● |
| **2.50** | 0/-0.010 | 3 | 33.8 | 37.6 | 75 | 12 x D | 3512SUH0250N | ● |
| **2.60** | 0/-0.010 | 3 | 35.1 | 39 | 75 | 12 x D | 3512SUH0260N | ● |
| **2.70** | 0/-0.010 | 3 | 36.5 | 40.6 | 75 | 12 x D | 3512SUH0270N | ● |
| **2.80** | 0/-0.010 | 3 | 37.8 | 42 | 75 | 12 x D | 3512SUH0280N | ● |
| **2.90** | 0/-0.010 | 3 | 39.2 | 43.6 | 75 | 12 x D | 3512SUH0290N | ● |
| **3.00** | 0/-0.010 | 3 | 40.5 | 45 | 75 | 12 x D | 3512SUH0300N | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 3512SUH MINI

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **80÷90*** | **60÷70*** | **55÷65*** | **50÷60*** | **45÷55*** | **38÷42*** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| Ø RUN OUT <0.02mm | **1.0** | 0.012 | 0.010 | 0.010 | 0.007 | 0.008 | 0.007 |
| | **1.1** | 0.013 | 0.011 | 0.012 | 0.008 | 0.009 | 0.008 |
| | **1.2** | 0.014 | 0.012 | 0.013 | 0.008 | 0.010 | 0.008 |
| | **1.3** | 0.015 | 0.014 | 0.014 | 0.009 | 0.011 | 0.009 |
| | **1.4** | 0.016 | 0.015 | 0.015 | 0.010 | 0.011 | 0.010 |
| | **1.5** | 0.017 | 0.016 | 0.016 | 0.010 | 0.012 | 0.011 |
| | **1.6** | 0.020 | 0.019 | 0.018 | 0.013 | 0.014 | 0.013 |
| | **1.7** | 0.021 | 0.020 | 0.019 | 0.014 | 0.015 | 0.013 |
| | **1.8** | 0.023 | 0.021 | 0.020 | 0.014 | 0.016 | 0.014 |
| | **1.9** | 0.024 | 0.022 | 0.021 | 0.015 | 0.017 | 0.015 |
| | **2.0** | 0.025 | 0.023 | 0.022 | 0.016 | 0.018 | 0.016 |
| | **2.1** | 0.028 | 0.027 | 0.024 | 0.019 | 0.020 | 0.018 |
| | **2.2** | 0.030 | 0.028 | 0.025 | 0.020 | 0.021 | 0.019 |
| | **2.3** | 0.031 | 0.029 | 0.027 | 0.021 | 0.022 | 0.020 |
| | **2.4** | 0.032 | 0.031 | 0.028 | 0.022 | 0.023 | 0.021 |
| | **2.5** | 0.034 | 0.032 | 0.029 | 0.023 | 0.024 | 0.022 |
| | **2.6** | 0.037 | 0.035 | 0.031 | 0.027 | 0.026 | 0.024 |
| | **2.7** | 0.038 | 0.037 | 0.033 | 0.028 | 0.027 | 0.025 |
| | **2.8** | 0.039 | 0.038 | 0.034 | 0.029 | 0.028 | 0.026 |
| | **2.9** | 0.041 | 0.039 | 0.035 | 0.030 | 0.029 | 0.027 |
| | **3.0** | 0.042 | 0.041 | 0.036 | 0.031 | 0.030 | 0.028 |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

| | Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **45÷55*** | **45÷50*** | **40÷45*** | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| Ø RUN OUT <0.02mm | **1.0** | 0.008 | 0.008 | 0.007 | | | |
| | **1.1** | 0.009 | 0.008 | 0.008 | | | |
| | **1.2** | 0.010 | 0.009 | 0.009 | | | |
| | **1.3** | 0.011 | 0.010 | 0.009 | | | |
| | **1.4** | 0.011 | 0.011 | 0.010 | | | |
| | **1.5** | 0.012 | 0.012 | 0.011 | | | |
| | **1.6** | 0.014 | 0.013 | 0.013 | | | |
| | **1.7** | 0.015 | 0.014 | 0.014 | | | |
| | **1.8** | 0.016 | 0.015 | 0.014 | | | |
| | **1.9** | 0.017 | 0.016 | 0.015 | | | |
| | **2.0** | 0.018 | 0.017 | 0.016 | | | |
| | **2.1** | 0.020 | 0.019 | 0.018 | | | |
| | **2.2** | 0.021 | 0.020 | 0.019 | | | |
| | **2.3** | 0.022 | 0.021 | 0.020 | | | |
| | **2.4** | 0.023 | 0.022 | 0.021 | | | |
| | **2.5** | 0.024 | 0.023 | 0.022 | | | |
| | **2.6** | 0.026 | 0.025 | 0.025 | | | |
| | **2.7** | 0.027 | 0.026 | 0.026 | | | |
| | **2.8** | 0.028 | 0.027 | 0.027 | | | |
| | **2.9** | 0.029 | 0.028 | 0.028 | | | |
| | **3.0** | 0.030 | 0.029 | 0.029 | | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

# 3512SUH MINI




| Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| Vc (m/min) | **75÷85*** | **60÷70*** | **50÷60*** | **48÷52*** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **1.0** | 0.012 | 0.013 | 0.013 | 0.008 | | |
| **1.1** | 0.014 | 0.014 | 0.014 | 0.009 | | |
| **1.2** | 0.015 | 0.015 | 0.015 | 0.010 | | |
| **1.3** | 0.016 | 0.016 | 0.016 | 0.011 | | |
| **1.4** | 0.017 | 0.018 | 0.018 | 0.011 | | |
| **1.5** | 0.019 | 0.019 | 0.019 | 0.012 | | |
| **1.6** | 0.021 | 0.021 | 0.021 | 0.014 | | |
| **1.7** | 0.022 | 0.023 | 0.022 | 0.015 | | |
| **1.8** | 0.023 | 0.024 | 0.024 | 0.016 | | |
| **1.9** | 0.025 | 0.025 | 0.025 | 0.017 | | |
| **2.0** | 0.026 | 0.027 | 0.026 | 0.018 | | |
| **2.1** | 0.028 | 0.029 | 0.029 | 0.020 | | |
| **2.2** | 0.030 | 0.031 | 0.030 | 0.021 | | |
| **2.3** | 0.031 | 0.032 | 0.032 | 0.022 | | |
| **2.4** | 0.033 | 0.034 | 0.033 | 0.023 | | |
| **2.5** | 0.034 | 0.035 | 0.034 | 0.024 | | |
| **2.6** | 0.037 | 0.038 | 0.037 | 0.026 | | |
| **2.7** | 0.038 | 0.040 | 0.039 | 0.027 | | |
| **2.8** | 0.040 | 0.041 | 0.040 | 0.028 | | |
| **2.9** | 0.041 | 0.043 | 0.041 | 0.029 | | |
| **3.0** | 0.042 | 0.044 | 0.043 | 0.030 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)




| Material Group ISO 513 | N1 | N2 | N3 N4 | N5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **125÷135*** | **110÷120*** | **100÷110*** | **140÷150*** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **1.0** | 0.015 | 0.014 | 0.013 | 0.014 | | |
| **1.1** | 0.016 | 0.016 | 0.014 | 0.016 | | |
| **1.2** | 0.018 | 0.017 | 0.016 | 0.017 | | |
| **1.3** | 0.019 | 0.018 | 0.017 | 0.019 | | |
| **1.4** | 0.021 | 0.020 | 0.018 | 0.020 | | |
| **1.5** | 0.022 | 0.021 | 0.020 | 0.021 | | |
| **1.6** | 0.025 | 0.024 | 0.022 | 0.024 | | |
| **1.7** | 0.026 | 0.025 | 0.023 | 0.025 | | |
| **1.8** | 0.028 | 0.027 | 0.024 | 0.027 | | |
| **1.9** | 0.029 | 0.028 | 0.026 | 0.028 | | |
| **2.0** | 0.031 | 0.030 | 0.027 | 0.030 | | |
| **2.1** | 0.034 | 0.032 | 0.029 | 0.033 | | |
| **2.2** | 0.035 | 0.034 | 0.031 | 0.034 | | |
| **2.3** | 0.037 | 0.035 | 0.032 | 0.036 | | |
| **2.4** | 0.038 | 0.037 | 0.033 | 0.037 | | |
| **2.5** | 0.040 | 0.038 | 0.035 | 0.039 | | |
| **2.6** | 0.043 | 0.041 | 0.037 | 0.042 | | |
| **2.7** | 0.044 | 0.043 | 0.039 | 0.044 | | |
| **2.8** | 0.046 | 0.044 | 0.040 | 0.046 | | |
| **2.9** | 0.048 | 0.046 | 0.042 | 0.047 | | |
| **3.0** | 0.049 | 0.048 | 0.043 | 0.049 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

# 3512SUH MINI

| | Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| | Vc (m/min) | **26÷30*** | **24÷26*** | **34÷36*** | **28÷32*** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
|   | **1.0** | 0.008 | 0.007 | 0.008 | 0.009 | | |
| | **1.1** | 0.009 | 0.008 | 0.009 | 0.010 | | |
| | **1.2** | 0.009 | 0.008 | 0.010 | 0.011 | | |
| | **1.3** | 0.010 | 0.009 | 0.011 | 0.012 | | |
| | **1.4** | 0.011 | 0.010 | 0.011 | 0.012 | | |
| | **1.5** | 0.012 | 0.010 | 0.012 | 0.013 | | |
| | **1.6** | 0.013 | 0.012 | 0.014 | 0.015 | | |
| | **1.7** | 0.014 | 0.013 | 0.015 | 0.016 | | |
| | **1.8** | 0.015 | 0.014 | 0.016 | 0.017 | | |
| | **1.9** | 0.016 | 0.014 | 0.017 | 0.018 | | |
| | **2.0** | 0.017 | 0.015 | 0.018 | 0.019 | | |
| | **2.1** | 0.019 | 0.017 | 0.021 | 0.021 | | |
| | **2.2** | 0.020 | 0.018 | 0.022 | 0.022 | | |
| | **2.3** | 0.021 | 0.019 | 0.023 | 0.023 | | |
| | **2.4** | 0.022 | 0.020 | 0.024 | 0.024 | | |
| | **2.5** | 0.022 | 0.020 | 0.025 | 0.025 | | |
| | **2.6** | 0.025 | 0.023 | 0.028 | 0.027 | | |
| | **2.7** | 0.026 | 0.024 | 0.029 | 0.028 | | |
| | **2.8** | 0.027 | 0.025 | 0.030 | 0.029 | | |
| | **2.9** | 0.028 | 0.026 | 0.031 | 0.030 | | |
| | **3.0** | 0.029 | 0.026 | 0.032 | 0.031 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

# 3520SUH MINI

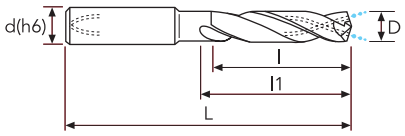
3 mm shank, polished flutes

20XD | OSAWA NORM | SUH MINI | MG PV300 | 135° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|
| **1.00** | 0/-0.010 | 3 | 21.5 | 23 | 65 | 20 x D | 3520SUH0100N | ● |
| **1.10** | 0/-0.010 | 3 | 23.7 | 25.2 | 65 | 20 x D | 3520SUH0110N | ○ |
| **1.20** | 0/-0.010 | 3 | 25.8 | 27.3 | 65 | 20 x D | 3520SUH0120N | ● |
| **1.30** | 0/-0.010 | 3 | 28 | 29.5 | 65 | 20 x D | 3520SUH0130N | ● |
| **1.40** | 0/-0.010 | 3 | 30.1 | 31.6 | 65 | 20 x D | 3520SUH0140N | ○ |
| **1.50** | 0/-0.010 | 3 | 32.3 | 33.8 | 75 | 20 x D | 3520SUH0150N | ● |
| **1.60** | 0/-0.010 | 3 | 34.4 | 35.9 | 75 | 20 x D | 3520SUH0160N | ● |
| **1.70** | 0/-0.010 | 3 | 36.6 | 38.1 | 75 | 20 x D | 3520SUH0170N | ● |
| **1.80** | 0/-0.010 | 3 | 38.7 | 40.2 | 75 | 20 x D | 3520SUH0180N | ● |
| **1.90** | 0/-0.010 | 3 | 40.9 | 42.4 | 75 | 20 x D | 3520SUH0190N | ○ |
| **2.00** | 0/-0.010 | 3 | 43 | 46 | 82 | 20 x D | 3520SUH0200N | ● |
| **2.10** | 0/-0.010 | 3 | 45.2 | 48.4 | 82 | 20 x D | 3520SUH0210N | ○ |
| **2.20** | 0/-0.010 | 3 | 47.3 | 50.6 | 82 | 20 x D | 3520SUH0220N | ● |
| **2.30** | 0/-0.010 | 3 | 49.5 | 53 | 100 | 20 x D | 3520SUH0230N | ● |
| **2.40** | 0/-0.010 | 3 | 51.6 | 55.2 | 100 | 20 x D | 3520SUH0240N | ○ |
| **2.50** | 0/-0.010 | 3 | 53.8 | 57.6 | 100 | 20 x D | 3520SUH0250N | ● |
| **2.60** | 0/-0.010 | 3 | 55.9 | 59.8 | 100 | 20 x D | 3520SUH0260N | ○ |
| **2.70** | 0/-0.010 | 3 | 58.1 | 62.2 | 100 | 20 x D | 3520SUH0270N | ○ |
| **2.80** | 0/-0.010 | 3 | 60.2 | 64.4 | 100 | 20 x D | 3520SUH0280N | ● |
| **2.90** | 0/-0.010 | 3 | 61.4 | 65.8 | 100 | 20 x D | 3520SUH0290N | ○ |
| **3.00** | 0/-0.010 | 3 | 64.5 | 69 | 100 | 20 x D | 3520SUH0300N | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 3520SUH MINI

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **80÷90*** | **60÷70*** | **55÷65*** | **50÷60*** | **45÷55*** | **38÷42*** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| Ø RUN OUT <0.02mm | **1.0** | 0.012 | 0.010 | 0.010 | 0.007 | 0.008 | 0.007 |
| | **1.1** | 0.013 | 0.011 | 0.012 | 0.008 | 0.009 | 0.008 |
| | **1.2** | 0.014 | 0.012 | 0.013 | 0.008 | 0.010 | 0.008 |
| | **1.3** | 0.015 | 0.014 | 0.014 | 0.009 | 0.011 | 0.009 |
| | **1.4** | 0.016 | 0.015 | 0.015 | 0.010 | 0.011 | 0.010 |
| | **1.5** | 0.017 | 0.016 | 0.016 | 0.010 | 0.012 | 0.011 |
| | **1.6** | 0.020 | 0.019 | 0.018 | 0.013 | 0.014 | 0.013 |
| | **1.7** | 0.021 | 0.020 | 0.019 | 0.014 | 0.015 | 0.013 |
| | **1.8** | 0.023 | 0.021 | 0.020 | 0.014 | 0.016 | 0.014 |
| | **1.9** | 0.024 | 0.022 | 0.021 | 0.015 | 0.017 | 0.015 |
| | **2.0** | 0.025 | 0.023 | 0.022 | 0.016 | 0.018 | 0.016 |
| | **2.1** | 0.028 | 0.027 | 0.024 | 0.019 | 0.020 | 0.018 |
| | **2.2** | 0.030 | 0.028 | 0.025 | 0.020 | 0.021 | 0.019 |
| | **2.3** | 0.031 | 0.029 | 0.027 | 0.021 | 0.022 | 0.020 |
| | **2.4** | 0.032 | 0.031 | 0.028 | 0.022 | 0.023 | 0.021 |
| | **2.5** | 0.034 | 0.032 | 0.029 | 0.023 | 0.024 | 0.022 |
| | **2.6** | 0.037 | 0.035 | 0.031 | 0.027 | 0.026 | 0.024 |
| | **2.7** | 0.038 | 0.037 | 0.033 | 0.028 | 0.027 | 0.025 |
| | **2.8** | 0.039 | 0.038 | 0.034 | 0.029 | 0.028 | 0.026 |
| | **2.9** | 0.041 | 0.039 | 0.035 | 0.030 | 0.029 | 0.027 |
| | **3.0** | 0.042 | 0.041 | 0.036 | 0.031 | 0.030 | 0.028 |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

| | Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **45÷55*** | **45÷50*** | **40÷45*** | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| Ø RUN OUT <0.02mm | **1.0** | 0.008 | 0.008 | 0.007 | | | |
| | **1.1** | 0.009 | 0.008 | 0.008 | | | |
| | **1.2** | 0.010 | 0.009 | 0.009 | | | |
| | **1.3** | 0.011 | 0.010 | 0.009 | | | |
| | **1.4** | 0.011 | 0.011 | 0.010 | | | |
| | **1.5** | 0.012 | 0.012 | 0.011 | | | |
| | **1.6** | 0.014 | 0.013 | 0.013 | | | |
| | **1.7** | 0.015 | 0.014 | 0.014 | | | |
| | **1.8** | 0.016 | 0.015 | 0.014 | | | |
| | **1.9** | 0.017 | 0.016 | 0.015 | | | |
| | **2.0** | 0.018 | 0.017 | 0.016 | | | |
| | **2.1** | 0.020 | 0.019 | 0.018 | | | |
| | **2.2** | 0.021 | 0.020 | 0.019 | | | |
| | **2.3** | 0.022 | 0.021 | 0.020 | | | |
| | **2.4** | 0.023 | 0.022 | 0.021 | | | |
| | **2.5** | 0.024 | 0.023 | 0.022 | | | |
| | **2.6** | 0.026 | 0.025 | 0.025 | | | |
| | **2.7** | 0.027 | 0.026 | 0.026 | | | |
| | **2.8** | 0.028 | 0.027 | 0.027 | | | |
| | **2.9** | 0.029 | 0.028 | 0.028 | | | |
| | **3.0** | 0.030 | 0.029 | 0.029 | | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 3520SUH MINI




| Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| Vc (m/min) | **75÷85*** | **60÷70*** | **50÷60*** | **48÷52*** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **1.0** | 0.012 | 0.013 | 0.013 | 0.008 | | |
| **1.1** | 0.014 | 0.014 | 0.014 | 0.009 | | |
| **1.2** | 0.015 | 0.015 | 0.015 | 0.010 | | |
| **1.3** | 0.016 | 0.016 | 0.016 | 0.011 | | |
| **1.4** | 0.017 | 0.018 | 0.018 | 0.011 | | |
| **1.5** | 0.019 | 0.019 | 0.019 | 0.012 | | |
| **1.6** | 0.021 | 0.021 | 0.021 | 0.014 | | |
| **1.7** | 0.022 | 0.023 | 0.022 | 0.015 | | |
| **1.8** | 0.023 | 0.024 | 0.024 | 0.016 | | |
| **1.9** | 0.025 | 0.025 | 0.025 | 0.017 | | |
| **2.0** | 0.026 | 0.027 | 0.026 | 0.018 | | |
| **2.1** | 0.028 | 0.029 | 0.029 | 0.020 | | |
| **2.2** | 0.030 | 0.031 | 0.030 | 0.021 | | |
| **2.3** | 0.031 | 0.032 | 0.032 | 0.022 | | |
| **2.4** | 0.033 | 0.034 | 0.033 | 0.023 | | |
| **2.5** | 0.034 | 0.035 | 0.034 | 0.024 | | |
| **2.6** | 0.037 | 0.038 | 0.037 | 0.026 | | |
| **2.7** | 0.038 | 0.040 | 0.039 | 0.027 | | |
| **2.8** | 0.040 | 0.041 | 0.040 | 0.028 | | |
| **2.9** | 0.041 | 0.043 | 0.041 | 0.029 | | |
| **3.0** | 0.042 | 0.044 | 0.043 | 0.030 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)




| Material Group ISO 513 | N1 | N2 | N3 N4 | N5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **125÷135*** | **110÷120*** | **100÷110*** | **140÷150*** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **1.0** | 0.015 | 0.014 | 0.013 | 0.014 | | |
| **1.1** | 0.016 | 0.016 | 0.014 | 0.016 | | |
| **1.2** | 0.018 | 0.017 | 0.016 | 0.017 | | |
| **1.3** | 0.019 | 0.018 | 0.017 | 0.019 | | |
| **1.4** | 0.021 | 0.020 | 0.018 | 0.020 | | |
| **1.5** | 0.022 | 0.021 | 0.020 | 0.021 | | |
| **1.6** | 0.025 | 0.024 | 0.022 | 0.024 | | |
| **1.7** | 0.026 | 0.025 | 0.023 | 0.025 | | |
| **1.8** | 0.028 | 0.027 | 0.024 | 0.027 | | |
| **1.9** | 0.029 | 0.028 | 0.026 | 0.028 | | |
| **2.0** | 0.031 | 0.030 | 0.027 | 0.030 | | |
| **2.1** | 0.034 | 0.032 | 0.029 | 0.033 | | |
| **2.2** | 0.035 | 0.034 | 0.031 | 0.034 | | |
| **2.3** | 0.037 | 0.035 | 0.032 | 0.036 | | |
| **2.4** | 0.038 | 0.037 | 0.033 | 0.037 | | |
| **2.5** | 0.040 | 0.038 | 0.035 | 0.039 | | |
| **2.6** | 0.043 | 0.041 | 0.037 | 0.042 | | |
| **2.7** | 0.044 | 0.043 | 0.039 | 0.044 | | |
| **2.8** | 0.046 | 0.044 | 0.040 | 0.046 | | |
| **2.9** | 0.048 | 0.046 | 0.042 | 0.047 | | |
| **3.0** | 0.049 | 0.048 | 0.043 | 0.049 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

# 3520SUH MINI

| | Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| | Vc (m/min) | **26÷30*** | **24÷26*** | **34÷36*** | **28÷32*** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| Ø RUN OUT <0.02mm | **1.0** | 0.008 | 0.007 | 0.008 | 0.009 | | |
| | **1.1** | 0.009 | 0.008 | 0.009 | 0.010 | | |
| | **1.2** | 0.009 | 0.008 | 0.010 | 0.011 | | |
| | **1.3** | 0.010 | 0.009 | 0.011 | 0.012 | | |
| | **1.4** | 0.011 | 0.010 | 0.011 | 0.012 | | |
| | **1.5** | 0.012 | 0.010 | 0.012 | 0.013 | | |
| | **1.6** | 0.013 | 0.012 | 0.014 | 0.015 | | |
| | **1.7** | 0.014 | 0.013 | 0.015 | 0.016 | | |
| | **1.8** | 0.015 | 0.014 | 0.016 | 0.017 | | |
| | **1.9** | 0.016 | 0.014 | 0.017 | 0.018 | | |
| | **2.0** | 0.017 | 0.015 | 0.018 | 0.019 | | |
| | **2.1** | 0.019 | 0.017 | 0.021 | 0.021 | | |
| | **2.2** | 0.020 | 0.018 | 0.022 | 0.022 | | |
| | **2.3** | 0.021 | 0.019 | 0.023 | 0.023 | | |
| | **2.4** | 0.022 | 0.020 | 0.024 | 0.024 | | |
| | **2.5** | 0.022 | 0.020 | 0.025 | 0.025 | | |
| | **2.6** | 0.025 | 0.023 | 0.028 | 0.027 | | |
| | **2.7** | 0.026 | 0.024 | 0.029 | 0.028 | | |
| | **2.8** | 0.027 | 0.025 | 0.030 | 0.029 | | |
| | **2.9** | 0.028 | 0.026 | 0.031 | 0.030 | | |
| | **3.0** | 0.029 | 0.026 | 0.032 | 0.031 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

# 3525SUH MINI

3 mm shank, polished flutes

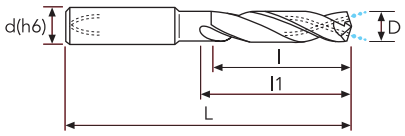
25XD | OSAWA NORM | SUH MINI | MG PV300 | 135° | 30°





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|
| **1.00** | 0/-0.010 | 3 | 26.5 | 28 | 70 | 25 x D | 3525SUH0100N | ● |
| **1.10** | 0/-0.010 | 3 | 29.2 | 30.7 | 70 | 25 x D | 3525SUH0110N | ○ |
| **1.20** | 0/-0.010 | 3 | 31.8 | 33.3 | 75 | 25 x D | 3525SUH0120N | ○ |
| **1.30** | 0/-0.010 | 3 | 34.5 | 36 | 75 | 25 x D | 3525SUH0130N | ○ |
| **1.40** | 0/-0.010 | 3 | 37.1 | 38.6 | 75 | 25 x D | 3525SUH0140N | ○ |
| **1.50** | 0/-0.010 | 3 | 39.8 | 41.3 | 80 | 25 x D | 3525SUH0150N | ● |
| **1.60** | 0/-0.010 | 3 | 42.4 | 43.9 | 80 | 25 x D | 3525SUH0160N | ○ |
| **1.70** | 0/-0.010 | 3 | 45.1 | 46.6 | 80 | 25 x D | 3525SUH0170N | ○ |
| **1.80** | 0/-0.010 | 3 | 47.7 | 49.2 | 90 | 25 x D | 3525SUH0180N | ○ |
| **1.90** | 0/-0.010 | 3 | 50.4 | 51.9 | 90 | 25 x D | 3525SUH0190N | ○ |
| **2.00** | 0/-0.010 | 3 | 53 | 56 | 90 | 25 x D | 3525SUH0200N | ● |
| **2.10** | 0/-0.010 | 3 | 55.7 | 58.8 | 100 | 25 x D | 3525SUH0210N | ○ |
| **2.20** | 0/-0.010 | 3 | 58.3 | 61.6 | 100 | 25 x D | 3525SUH0220N | ○ |
| **2.30** | 0/-0.010 | 3 | 61 | 64.4 | 100 | 25 x D | 3525SUH0230N | ○ |
| **2.40** | 0/-0.010 | 3 | 63.6 | 67.2 | 100 | 25 x D | 3525SUH0240N | ○ |
| **2.50** | 0/-0.010 | 3 | 66.3 | 70 | 110 | 25 x D | 3525SUH0250N | ● |
| **2.60** | 0/-0.010 | 3 | 68.9 | 72.8 | 110 | 25 x D | 3525SUH0260N | ○ |
| **2.70** | 0/-0.010 | 3 | 71.6 | 75.6 | 110 | 25 x D | 3525SUH0270N | ○ |
| **2.80** | 0/-0.010 | 3 | 74.2 | 78.4 | 110 | 25 x D | 3525SUH0280N | ○ |
| **2.90** | 0/-0.010 | 3 | 76.9 | 81.2 | 120 | 25 x D | 3525SUH0290N | ○ |
| **3.00** | 0/-0.010 | 3 | 79.5 | 84 | 120 | 25 x D | 3525SUH0300N | ● |



● stock standard ○ non-standard stock ▽ stock exhaustion

# 3525SUH MINI

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **80÷90*** | **60÷70*** | **55÷65*** | **50÷60*** | **45÷55*** | **38÷42*** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| Ø RUN OUT <0.02mm | **1.0** | 0.008 | 0.008 | 0.007 | 0.005 | 0.005 | 0.005 |
| | **1.1** | 0.009 | 0.009 | 0.008 | 0.006 | 0.006 | 0.006 |
| | **1.2** | 0.010 | 0.010 | 0.008 | 0.006 | 0.006 | 0.006 |
| | **1.3** | 0.010 | 0.010 | 0.009 | 0.007 | 0.007 | 0.007 |
| | **1.4** | 0.011 | 0.011 | 0.010 | 0.007 | 0.007 | 0.007 |
| | **1.5** | 0.012 | 0.012 | 0.011 | 0.008 | 0.008 | 0.008 |
| | **1.6** | 0.014 | 0.014 | 0.012 | 0.009 | 0.009 | 0.009 |
| | **1.7** | 0.014 | 0.015 | 0.013 | 0.010 | 0.010 | 0.009 |
| | **1.8** | 0.015 | 0.016 | 0.014 | 0.010 | 0.010 | 0.010 |
| | **1.9** | 0.016 | 0.017 | 0.014 | 0.011 | 0.011 | 0.010 |
| | **2.0** | 0.017 | 0.017 | 0.015 | 0.011 | 0.011 | 0.011 |
| | **2.1** | 0.019 | 0.020 | 0.017 | 0.013 | 0.013 | 0.012 |
| | **2.2** | 0.020 | 0.021 | 0.018 | 0.014 | 0.013 | 0.013 |
| | **2.3** | 0.021 | 0.022 | 0.019 | 0.014 | 0.014 | 0.014 |
| | **2.4** | 0.022 | 0.023 | 0.019 | 0.015 | 0.014 | 0.014 |
| | **2.5** | 0.023 | 0.024 | 0.020 | 0.016 | 0.015 | 0.015 |
| | **2.6** | 0.025 | 0.026 | 0.022 | 0.018 | 0.016 | 0.016 |
| | **2.7** | 0.026 | 0.027 | 0.023 | 0.019 | 0.017 | 0.017 |
| | **2.8** | 0.027 | 0.028 | 0.024 | 0.019 | 0.018 | 0.018 |
| | **2.9** | 0.028 | 0.029 | 0.025 | 0.020 | 0.018 | 0.018 |
| | **3.0** | 0.029 | 0.030 | 0.026 | 0.021 | 0.019 | 0.019 |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

| | Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **45÷55*** | **45÷50*** | **40÷45*** | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| Ø RUN OUT <0.02mm | **1.0** | 0.005 | 0.005 | 0.005 | | | |
| | **1.1** | 0.006 | 0.006 | 0.006 | | | |
| | **1.2** | 0.006 | 0.006 | 0.007 | | | |
| | **1.3** | 0.007 | 0.007 | 0.007 | | | |
| | **1.4** | 0.007 | 0.007 | 0.008 | | | |
| | **1.5** | 0.008 | 0.008 | 0.008 | | | |
| | **1.6** | 0.009 | 0.009 | 0.009 | | | |
| | **1.7** | 0.010 | 0.010 | 0.010 | | | |
| | **1.8** | 0.010 | 0.010 | 0.011 | | | |
| | **1.9** | 0.011 | 0.011 | 0.011 | | | |
| | **2.0** | 0.011 | 0.011 | 0.012 | | | |
| | **2.1** | 0.013 | 0.013 | 0.013 | | | |
| | **2.2** | 0.013 | 0.013 | 0.014 | | | |
| | **2.3** | 0.014 | 0.014 | 0.014 | | | |
| | **2.4** | 0.014 | 0.014 | 0.015 | | | |
| | **2.5** | 0.015 | 0.015 | 0.016 | | | |
| | **2.6** | 0.016 | 0.017 | 0.017 | | | |
| | **2.7** | 0.017 | 0.017 | 0.018 | | | |
| | **2.8** | 0.018 | 0.018 | 0.018 | | | |
| | **2.9** | 0.018 | 0.018 | 0.019 | | | |
| | **3.0** | 0.019 | 0.019 | 0.020 | | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

# 3525SUH MINI




| Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| Vc (m/min) | **75÷85*** | **60÷70*** | **50÷60*** | **45÷55*** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **1.0** | 0.008 | 0.009 | 0.010 | 0.005 | | |
| **1.1** | 0.009 | 0.010 | 0.011 | 0.006 | | |
| **1.2** | 0.010 | 0.011 | 0.012 | 0.006 | | |
| **1.3** | 0.011 | 0.012 | 0.013 | 0.007 | | |
| **1.4** | 0.012 | 0.013 | 0.014 | 0.007 | | |
| **1.5** | 0.012 | 0.014 | 0.015 | 0.008 | | |
| **1.6** | 0.014 | 0.015 | 0.016 | 0.009 | | |
| **1.7** | 0.015 | 0.016 | 0.017 | 0.010 | | |
| **1.8** | 0.016 | 0.017 | 0.019 | 0.010 | | |
| **1.9** | 0.016 | 0.018 | 0.020 | 0.011 | | |
| **2.0** | 0.017 | 0.019 | 0.021 | 0.011 | | |
| **2.1** | 0.019 | 0.021 | 0.023 | 0.013 | | |
| **2.2** | 0.020 | 0.022 | 0.024 | 0.013 | | |
| **2.3** | 0.021 | 0.023 | 0.025 | 0.014 | | |
| **2.4** | 0.022 | 0.024 | 0.026 | 0.014 | | |
| **2.5** | 0.023 | 0.025 | 0.027 | 0.015 | | |
| **2.6** | 0.025 | 0.028 | 0.030 | 0.016 | | |
| **2.7** | 0.025 | 0.029 | 0.031 | 0.017 | | |
| **2.8** | 0.026 | 0.030 | 0.032 | 0.018 | | |
| **2.9** | 0.027 | 0.031 | 0.033 | 0.018 | | |
| **3.0** | 0.028 | 0.032 | 0.034 | 0.019 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)




| Material Group ISO 513 | N1 | N2 | N3 N4 | N5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **125÷135*** | **105÷115*** | **96÷104*** | **135÷140*** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **1.0** | 0.012 | 0.012 | 0.010 | 0.012 | | |
| **1.1** | 0.013 | 0.013 | 0.011 | 0.013 | | |
| **1.2** | 0.015 | 0.014 | 0.012 | 0.015 | | |
| **1.3** | 0.016 | 0.015 | 0.013 | 0.016 | | |
| **1.4** | 0.017 | 0.017 | 0.014 | 0.017 | | |
| **1.5** | 0.018 | 0.018 | 0.015 | 0.018 | | |
| **1.6** | 0.020 | 0.020 | 0.017 | 0.020 | | |
| **1.7** | 0.021 | 0.021 | 0.018 | 0.021 | | |
| **1.8** | 0.023 | 0.022 | 0.019 | 0.023 | | |
| **1.9** | 0.024 | 0.023 | 0.020 | 0.024 | | |
| **2.0** | 0.025 | 0.025 | 0.021 | 0.025 | | |
| **2.1** | 0.027 | 0.027 | 0.023 | 0.027 | | |
| **2.2** | 0.029 | 0.028 | 0.024 | 0.029 | | |
| **2.3** | 0.030 | 0.029 | 0.025 | 0.030 | | |
| **2.4** | 0.031 | 0.031 | 0.026 | 0.031 | | |
| **2.5** | 0.033 | 0.032 | 0.027 | 0.033 | | |
| **2.6** | 0.035 | 0.034 | 0.029 | 0.035 | | |
| **2.7** | 0.037 | 0.035 | 0.031 | 0.036 | | |
| **2.8** | 0.038 | 0.037 | 0.032 | 0.038 | | |
| **2.9** | 0.039 | 0.038 | 0.033 | 0.039 | | |
| **3.0** | 0.041 | 0.039 | 0.034 | 0.040 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

# 3525SUH MINI

| | Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| | Vc (m/min) | **26÷30*** | **24÷26*** | **34÷36*** | **28÷32*** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| Ø RUN OUT <0.02mm | **1.0** | 0.005 | 0.005 | 0.004 | 0.005 | | |
| | **1.1** | 0.006 | 0.006 | 0.005 | 0.005 | | |
| | **1.2** | 0.006 | 0.007 | 0.005 | 0.006 | | |
| | **1.3** | 0.007 | 0.007 | 0.006 | 0.006 | | |
| | **1.4** | 0.007 | 0.008 | 0.006 | 0.007 | | |
| | **1.5** | 0.008 | 0.008 | 0.007 | 0.007 | | |
| | **1.6** | 0.009 | 0.010 | 0.008 | 0.008 | | |
| | **1.7** | 0.010 | 0.011 | 0.008 | 0.009 | | |
| | **1.8** | 0.010 | 0.011 | 0.009 | 0.009 | | |
| | **1.9** | 0.011 | 0.012 | 0.009 | 0.010 | | |
| | **2.0** | 0.011 | 0.013 | 0.010 | 0.010 | | |
| | **2.1** | 0.013 | 0.015 | 0.011 | 0.012 | | |
| | **2.2** | 0.014 | 0.016 | 0.012 | 0.013 | | |
| | **2.3** | 0.014 | 0.016 | 0.012 | 0.013 | | |
| | **2.4** | 0.015 | 0.017 | 0.013 | 0.014 | | |
| | **2.5** | 0.016 | 0.018 | 0.013 | 0.014 | | |
| | **2.6** | 0.018 | 0.020 | 0.015 | 0.016 | | |
| | **2.7** | 0.019 | 0.021 | 0.016 | 0.017 | | |
| | **2.8** | 0.019 | 0.022 | 0.016 | 0.018 | | |
| | **2.9** | 0.020 | 0.023 | 0.017 | 0.018 | | |
| | **3.0** | 0.021 | 0.024 | 0.018 | 0.019 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

# 3530SUH MINI

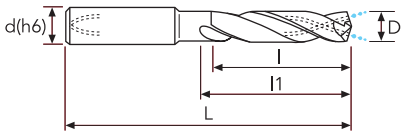
3 mm shank, polished flutes

30XD | OSAWA NORM | SUH MINI | MG PV300 | 135° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|
| **1.00** | 0/-0.010 | 3 | 31.5 | 33 | 75 | 30 x D | 3530SUH0100N | ● |
| **1.10** | 0/-0.010 | 3 | 34.7 | 36.2 | 75 | 30 x D | 3530SUH0110N | ○ |
| **1.20** | 0/-0.010 | 3 | 37.8 | 39.3 | 75 | 30 x D | 3530SUH0120N | ○ |
| **1.30** | 0/-0.010 | 3 | 41 | 42.5 | 85 | 30 x D | 3530SUH0130N | ○ |
| **1.40** | 0/-0.010 | 3 | 44.1 | 45.6 | 85 | 30 x D | 3530SUH0140N | ○ |
| **1.50** | 0/-0.010 | 3 | 47.3 | 48.8 | 85 | 30 x D | 3530SUH0150N | ● |
| **1.60** | 0/-0.010 | 3 | 50.4 | 51.9 | 90 | 30 x D | 3530SUH0160N | ○ |
| **1.70** | 0/-0.010 | 3 | 53.6 | 55.1 | 90 | 30 x D | 3530SUH0170N | ○ |
| **1.80** | 0/-0.010 | 3 | 56.7 | 58.2 | 100 | 30 x D | 3530SUH0180N | ○ |
| **1.90** | 0/-0.010 | 3 | 59.9 | 61.4 | 100 | 30 x D | 3530SUH0190N | ○ |
| **2.00** | 0/-0.010 | 3 | 63 | 66 | 100 | 30 x D | 3530SUH0200N | ● |
| **2.10** | 0/-0.010 | 3 | 66.2 | 69.3 | 110 | 30 x D | 3530SUH0210N | ○ |
| **2.20** | 0/-0.010 | 3 | 69.3 | 72.6 | 110 | 30 x D | 3530SUH0220N | ○ |
| **2.30** | 0/-0.010 | 3 | 72.5 | 75.9 | 110 | 30 x D | 3530SUH0230N | ○ |
| **2.40** | 0/-0.010 | 3 | 75.6 | 79.2 | 120 | 30 x D | 3530SUH0240N | ○ |
| **2.50** | 0/-0.010 | 3 | 78.8 | 82.5 | 120 | 30 x D | 3530SUH0250N | ● |
| **2.60** | 0/-0.010 | 3 | 81.9 | 85.8 | 120 | 30 x D | 3530SUH0260N | ○ |
| **2.70** | 0/-0.010 | 3 | 85.1 | 89.1 | 130 | 30 x D | 3530SUH0270N | ○ |
| **2.80** | 0/-0.010 | 3 | 88.2 | 92.4 | 130 | 30 x D | 3530SUH0280N | ○ |
| **2.90** | 0/-0.010 | 3 | 91.4 | 95.7 | 130 | 30 x D | 3530SUH0290N | ○ |
| **3.00** | 0/-0.010 | 3 | 94.5 | 99 | 130 | 30 x D | 3530SUH0300N | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 3530SUH MINI

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **80÷90*** | **60÷70*** | **55÷65*** | **50÷60*** | **45÷55*** | **38÷42*** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| Ø RUN OUT <0.02mm | **1.0** | 0.008 | 0.008 | 0.007 | 0.005 | 0.005 | 0.005 |
| | **1.1** | 0.009 | 0.009 | 0.008 | 0.006 | 0.006 | 0.006 |
| | **1.2** | 0.010 | 0.010 | 0.008 | 0.006 | 0.006 | 0.006 |
| | **1.3** | 0.010 | 0.010 | 0.009 | 0.007 | 0.007 | 0.007 |
| | **1.4** | 0.011 | 0.011 | 0.010 | 0.007 | 0.007 | 0.007 |
| | **1.5** | 0.012 | 0.012 | 0.011 | 0.008 | 0.008 | 0.008 |
| | **1.6** | 0.014 | 0.014 | 0.012 | 0.009 | 0.009 | 0.009 |
| | **1.7** | 0.014 | 0.015 | 0.013 | 0.010 | 0.010 | 0.009 |
| | **1.8** | 0.015 | 0.016 | 0.014 | 0.010 | 0.010 | 0.010 |
| | **1.9** | 0.016 | 0.017 | 0.014 | 0.011 | 0.011 | 0.010 |
| | **2.0** | 0.017 | 0.017 | 0.015 | 0.011 | 0.011 | 0.011 |
| | **2.1** | 0.019 | 0.020 | 0.017 | 0.013 | 0.013 | 0.012 |
| | **2.2** | 0.020 | 0.021 | 0.018 | 0.014 | 0.013 | 0.013 |
| | **2.3** | 0.021 | 0.022 | 0.019 | 0.014 | 0.014 | 0.014 |
| | **2.4** | 0.022 | 0.023 | 0.019 | 0.015 | 0.014 | 0.014 |
| | **2.5** | 0.023 | 0.024 | 0.020 | 0.016 | 0.015 | 0.015 |
| | **2.6** | 0.025 | 0.026 | 0.022 | 0.018 | 0.016 | 0.016 |
| | **2.7** | 0.026 | 0.027 | 0.023 | 0.019 | 0.017 | 0.017 |
| | **2.8** | 0.027 | 0.028 | 0.024 | 0.019 | 0.018 | 0.018 |
| | **2.9** | 0.028 | 0.029 | 0.025 | 0.020 | 0.018 | 0.018 |
| | **3.0** | 0.029 | 0.030 | 0.026 | 0.021 | 0.019 | 0.019 |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

| | Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **45÷55*** | **45÷50*** | **40÷45*** | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| Ø RUN OUT <0.02mm | **1.0** | 0.005 | 0.005 | 0.005 | | | |
| | **1.1** | 0.006 | 0.006 | 0.006 | | | |
| | **1.2** | 0.006 | 0.006 | 0.007 | | | |
| | **1.3** | 0.007 | 0.007 | 0.007 | | | |
| | **1.4** | 0.007 | 0.007 | 0.008 | | | |
| | **1.5** | 0.008 | 0.008 | 0.008 | | | |
| | **1.6** | 0.009 | 0.009 | 0.009 | | | |
| | **1.7** | 0.010 | 0.010 | 0.010 | | | |
| | **1.8** | 0.010 | 0.010 | 0.011 | | | |
| | **1.9** | 0.011 | 0.011 | 0.011 | | | |
| | **2.0** | 0.011 | 0.011 | 0.012 | | | |
| | **2.1** | 0.013 | 0.013 | 0.013 | | | |
| | **2.2** | 0.013 | 0.013 | 0.014 | | | |
| | **2.3** | 0.014 | 0.014 | 0.014 | | | |
| | **2.4** | 0.014 | 0.014 | 0.015 | | | |
| | **2.5** | 0.015 | 0.015 | 0.016 | | | |
| | **2.6** | 0.016 | 0.017 | 0.017 | | | |
| | **2.7** | 0.017 | 0.017 | 0.018 | | | |
| | **2.8** | 0.018 | 0.018 | 0.018 | | | |
| | **2.9** | 0.018 | 0.018 | 0.019 | | | |
| | **3.0** | 0.019 | 0.019 | 0.020 | | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 3530SUH MINI




| Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| Vc (m/min) | **75÷85*** | **60÷70*** | **50÷60*** | **45÷55*** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **1.0** | 0.008 | 0.009 | 0.010 | 0.005 | | |
| **1.1** | 0.009 | 0.010 | 0.011 | 0.006 | | |
| **1.2** | 0.010 | 0.011 | 0.012 | 0.006 | | |
| **1.3** | 0.011 | 0.012 | 0.013 | 0.007 | | |
| **1.4** | 0.012 | 0.013 | 0.014 | 0.007 | | |
| **1.5** | 0.012 | 0.014 | 0.015 | 0.008 | | |
| **1.6** | 0.014 | 0.015 | 0.016 | 0.009 | | |
| **1.7** | 0.015 | 0.016 | 0.017 | 0.010 | | |
| **1.8** | 0.016 | 0.017 | 0.019 | 0.010 | | |
| **1.9** | 0.016 | 0.018 | 0.020 | 0.011 | | |
| **2.0** | 0.017 | 0.019 | 0.021 | 0.011 | | |
| **2.1** | 0.019 | 0.021 | 0.023 | 0.013 | | |
| **2.2** | 0.020 | 0.022 | 0.024 | 0.013 | | |
| **2.3** | 0.021 | 0.023 | 0.025 | 0.014 | | |
| **2.4** | 0.022 | 0.024 | 0.026 | 0.014 | | |
| **2.5** | 0.023 | 0.025 | 0.027 | 0.015 | | |
| **2.6** | 0.025 | 0.028 | 0.030 | 0.016 | | |
| **2.7** | 0.025 | 0.029 | 0.031 | 0.017 | | |
| **2.8** | 0.026 | 0.030 | 0.032 | 0.018 | | |
| **2.9** | 0.027 | 0.031 | 0.033 | 0.018 | | |
| **3.0** | 0.028 | 0.032 | 0.034 | 0.019 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)




| Material Group ISO 513 | N1 | N2 | N3 N4 | N5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **125÷135*** | **105÷115*** | **96÷104*** | **135÷140*** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **1.0** | 0.012 | 0.012 | 0.010 | 0.012 | | |
| **1.1** | 0.013 | 0.013 | 0.011 | 0.013 | | |
| **1.2** | 0.015 | 0.014 | 0.012 | 0.015 | | |
| **1.3** | 0.016 | 0.015 | 0.013 | 0.016 | | |
| **1.4** | 0.017 | 0.017 | 0.014 | 0.017 | | |
| **1.5** | 0.018 | 0.018 | 0.015 | 0.018 | | |
| **1.6** | 0.020 | 0.020 | 0.017 | 0.020 | | |
| **1.7** | 0.021 | 0.021 | 0.018 | 0.021 | | |
| **1.8** | 0.023 | 0.022 | 0.019 | 0.023 | | |
| **1.9** | 0.024 | 0.023 | 0.020 | 0.024 | | |
| **2.0** | 0.025 | 0.025 | 0.021 | 0.025 | | |
| **2.1** | 0.027 | 0.027 | 0.023 | 0.027 | | |
| **2.2** | 0.029 | 0.028 | 0.024 | 0.029 | | |
| **2.3** | 0.030 | 0.029 | 0.025 | 0.030 | | |
| **2.4** | 0.031 | 0.031 | 0.026 | 0.031 | | |
| **2.5** | 0.033 | 0.032 | 0.027 | 0.033 | | |
| **2.6** | 0.035 | 0.034 | 0.029 | 0.035 | | |
| **2.7** | 0.037 | 0.035 | 0.031 | 0.036 | | |
| **2.8** | 0.038 | 0.037 | 0.032 | 0.038 | | |
| **2.9** | 0.039 | 0.038 | 0.033 | 0.039 | | |
| **3.0** | 0.041 | 0.039 | 0.034 | 0.040 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)

# 3530SUH MINI

| | Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| | Vc (m/min) | **26÷30*** | **24÷26*** | **34÷36*** | **28÷32*** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| Ø RUN OUT <0.02mm | **1.0** | 0.005 | 0.005 | 0.004 | 0.005 | | |
| | **1.1** | 0.006 | 0.006 | 0.005 | 0.005 | | |
| | **1.2** | 0.006 | 0.007 | 0.005 | 0.006 | | |
| | **1.3** | 0.007 | 0.007 | 0.006 | 0.006 | | |
| | **1.4** | 0.007 | 0.008 | 0.006 | 0.007 | | |
| | **1.5** | 0.008 | 0.008 | 0.007 | 0.007 | | |
| | **1.6** | 0.009 | 0.010 | 0.008 | 0.008 | | |
| | **1.7** | 0.010 | 0.011 | 0.008 | 0.009 | | |
| | **1.8** | 0.010 | 0.011 | 0.009 | 0.009 | | |
| | **1.9** | 0.011 | 0.012 | 0.009 | 0.010 | | |
| | **2.0** | 0.011 | 0.013 | 0.010 | 0.010 | | |
| | **2.1** | 0.013 | 0.015 | 0.011 | 0.012 | | |
| | **2.2** | 0.014 | 0.016 | 0.012 | 0.013 | | |
| | **2.3** | 0.014 | 0.016 | 0.012 | 0.013 | | |
| | **2.4** | 0.015 | 0.017 | 0.013 | 0.014 | | |
| | **2.5** | 0.016 | 0.018 | 0.013 | 0.014 | | |
| | **2.6** | 0.018 | 0.020 | 0.015 | 0.016 | | |
| | **2.7** | 0.019 | 0.021 | 0.016 | 0.017 | | |
| | **2.8** | 0.019 | 0.022 | 0.016 | 0.018 | | |
| | **2.9** | 0.020 | 0.023 | 0.017 | 0.018 | | |
| | **3.0** | 0.021 | 0.024 | 0.018 | 0.019 | | |

*if the machine tool or the equipment wouldn't allow to reach the requested rpm, please use the max. available rpm recalculating the Vf value (Vf=n available x fn)





# TYPHOON HL

## HIGH PERFORMANCE - LONG AND EXTRA-LONG

The Typhoon HL long and extra-long drills are the tool of choice for deep holes on ISO P, M, K, N, S.

La gamma Typhoon HL di punte lunghe ed extra-lunghe è progettata per la foratura di materiali ISO P, M, K, N, S.

Die Produktlinie Typhoon HL mit langen und extra-langen Bohrern wurde für das Bohren der Materialien ISO P, M, K, N, S entwickelt.

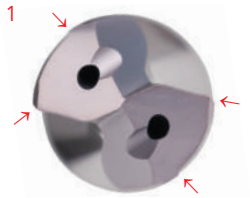
La gamme Typhoon HL de forets longs et extra longs est conçue pour le perçage de matériaux ISO P, M, K, N, S.

La gama Typhoon HL de brocas largas y extra-largas está diseñada para el taladro de materiales ISO P, M, K, N, S.

Серия Typhoon HL длинных и супердлинных свёрл предназначена для сверления отверстий в материалах по ISO P, M, K, N, S.

## TYPHOON HL

HIGH PERFORMANCE - LONG AND EXTRA-LONG










- Suitable for deep and extra-deep drilling on ISO P, M, K, N, S materials
- Drill geometry ①: 4 margin lands for accurate and straight deep holes. Very stable and reliable even in case of work-pieces with slant exit holes and cross holes
- Chip pocket ②: highly polished to prevent welding and to improve the chip ejection
- Wide gash ③ to protect the drill edge thanks to faster and smoother chip ejection
- Substrate and coating: specifically selected for high wear resistance, long and reliable life
- Drilling process: no steps for reliable and faster process
- Addressable industries: automotive, hydraulic component, mould and die, energy, general engineering
- Available from Ø3.1*mm to Ø10 mm
- Different cutting length types, from long (12xD) to extra-long (30xD).

- Forets conçus pour le perçage profond de matériaux ISO P, M, K, N, S
- Géométrie de l'arête : « 4 listels » pour l'exécution de trous profonds précis et droits
- Elle garantit stabilité et fiabilité même en présence de trous avec sortie inclinée ou de trous croisés
- Large entaille ③ pour protéger l'arête de coupe du foret grâce à une meilleure évacuation des copeaux plus rapide et plus fluide
- Finition des goujoures : polie pour réduire le problème du collage et faciliter l'évacuation des copeaux
- Substrat et revêtement : spécifiques pour garantir durée et fiabilité
- Processus de perçage : le perçage sans step garantit un processus fiable et rapide
- Secteurs industriels : automotive, oléohydraulique, moules, énergie, mécanique générale
- Disponibles du Ø3.1*mm au Ø10 mm
- Différents types de longueur, de la longueur 12xD aux extra-longues 30xD

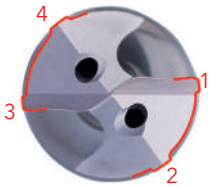
- Punte progettate per la foratura profonda di materiali ISO P, M, K, N, S
- Geometria del tagliente: 4 Margini per esecuzione di fori profondi precisi e rettilinei. Garantisce stabilità e affidabilità anche nel caso di fori con uscita inclinata o fori intersecanti
- Finitura gole: lappate per ridurre il problema dell'incollaggio e facilitare l'evacuazione dei trucioli
- Ampio scarico frontale ③ per proteggere il tagliente grazie ad una rapida ed efficace evacuazione dei trucioli
- Substrato e rivestimento: specifici per garantire durata e affidabilità
- Processo di foratura: la foratura senza step garantisce un processo affidabile e veloce
- Settori industriali: automotive, oleodinamica, stampi, energia, meccanica generale
- Disponibili dal Ø3.1*mm fino a Ø10 mm
- Differenti tipi di lunghezza, dalle lunghe (12xD) alle extra-lunghe (30xD)

- Brocas proyectadas para el taladro profundo de materiales ISO P, M, K, N, S
- Geometría del filo: 4 Márgenes para el mecanizado de agujeros profundos, precisos y rectilíneos. Garantiza estabilidad y fiabilidad incluso en caso de agujeros con salida inclinada o agujeros que se cruzan
- Acabado ranuras: lapeadas para reducir el problema del encolado y facilitar la evacuación de las virutas
- corte frontal amplio ③ para proteger el filo de la broca gracias a una expulsión de viruta más rápida y suave
- Sustrato y revestimiento: específicos para garantizar duración y fiabilidad
- Proceso de taladro: el taladro sin step garantiza un proceso fiable y rápido
- Sectores industriales: automoción, oleodinámico, moldes, energía, mecánica general
- Disponibles de Ø3.1*mm hasta Ø10 mm
- Diferentes tipos de longitud, desde las largas (12XD) hasta las extra-largas (30XD)

* < Ø3.1 = SUH MINI

## TYPHOON HL

HIGH PERFORMANCE - LONG AND EXTRA-LONG






- Für das tiefe Bohren der Materialien ISO P, M, K, N, S entwickelte Bohrer
- Schneidkantengeometrie: 4 Fasen für die Herstellung von präzisen und geraden Tiefbohrungen. Zur Gewährleistung von Stabilität und Zuverlässigkeit, auch bei Bohrungen mit geneigtem Ausgang oder sich kreuzenden Bohrungen
- Schlichtbearbeitung der Nuten: geläppt, um Probleme durch Verkleben zu reduzieren und um die Späneabführung zu erleichtern
- Großer Raum ③ auf der Stirnseite um die Schneide zu schützen, weil dadurch ein gute Spanabfuhr ermöglicht wird
- Trägermaterial und Beschichtung: speziell zur Gewährleistung von Standzeit und Zuverlässigkeit
- Bohrverfahren: das stufenlose Bohren gewährleistet ein zuverlässiges und rasches Verfahren
- Industriesektoren: Automobilindustrie, Ölhydraulik, Formpressen, Energie, allgemeine Mechanik
- Erhältlich von Ø3.1*mm bis Ø10 mm
- Verschiedene Längen, von lang (12XD) bis extra-lang (30XD)

- Свёрла предназначены для сверления глубоких отверстий в материалах по ISO P, M, K, N, S
- Геометрия с 4 режущими кромками для выполнения точных и прямолинейных отверстий. Гарантирует стабильность и надёжность, даже, в случае обработки отверстий с выходом в наклонную плоскость или взаимопересекающихся отверстий
- Отполированные стружечные канавки: уменьшают вероятность приваривания стружки и облегчают ее вывод
- глубокая фронтальная ③ подточка служит для защиты режущей кромки и лучшему удалению стружки
- Специальное покрытие для повышения стойкости инструмента
- Процесс сверления отверстий: сверление без ступенчатых отходов, гарантирующее производительность
- Промышленные отрасли: автомобилестроение, детали гидравлики, пресс-формы, энергетика, общее машиностроение
- Доступны диаметром от Ø3.1*мм до Ø10 мм
- Различные длины: от длинных (12XD) до супердлинных (30XD)

* < Ø3.1 = SUH MINI

## TYPHOON HL

HIGH PERFORMANCE - LONG AND EXTRA-LONG

**MACHINING OF DEEP HOLES PERPENDICULAR TO THE SURFACE**

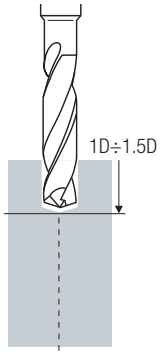
**ESECUZIONE FORI PROFONDI ORTOGONALI ALLA SUPERFICIE**

**HERSTELLUNG TIEFER RECHTWINKLIGER BOHRUNGEN**

**EXÉCUTION DE TROUS PROFONDS ORTHOGONAUX À LA SURFACE**

**MECANIZADO DE AGUJEROS PROFUNDOS PERPENDICULARES A LA SUPERFÍCIE**

**СВЕРЛЕНИЕ ГЛУБОКИХ ОТВЕРСТИЙ ПЕРПЕНДИКУЛЯРНО ОБРАБАТЫВАЕМОЙ ПОВЕХНОСТИ**




### STEP 1

As pilot drill (1xD,1.5xD), please use 353HTA or 353HPU with head angle 140° (HL=135°) and m7 tolerance (HL=h7).

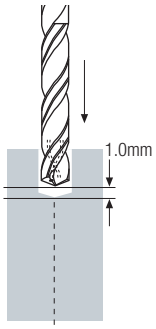
Utiliser un foret 353HTA ou 353HPU avec un angle en bout de 140° (HL=135°) et une tolérance m7 (HL=h7), pour effectuer un trou pilote (1xD÷1.5xD) très précis.

Utilizzare una punta 353HTA o 353HPU con angolo in testa di 140° (HL=135°) e tolleranza m7 (HL=h7), per eseguire un foro pilota (1xD÷1.5xD) molto preciso.

Utilice una broca 353HTA o 353HPU con ángulo punta de 140° (HL=135°) y tolerancia m7 (HL=h7), para realizar un agujero piloto (1xD÷1,5xD) muy preciso.

Einen Bohrer 353HTA oder 353HPU mit einem Spitzenwinkel von 140° (HL=135°) und Toleranz m7 (HL=h7) für die Herstellung einer äußerst präzisen Richtbohrung (1xD÷1.5xD) verwenden.

Для пилотного отверстия (1xD÷1.5xD) используйте сверло 353HTA или 353HPU с углом при вершине 140° (HL=135°) и допуском на диаметр m7 (HL=h7).




### STEP 2

With coolant feed OFF, enter the pilot hole with HL drill at Vc=20 m/min and fn=0.3 mm/rev. Position the HL drill at 1 mm from the end of the pilot hole, then start supplying the coolant and start drilling.

Sans actionner la lubrification interne, entrer avec le foret long série HL à l'intérieur du trou. Vc=20 m/min, fn=0.3 mm/rév. Placer le foret HL jusqu'à 1 mm du fond du trou pilote. Actionner la lubrification interne à haute pression et commencer le perçage.

Senza azionare il refrigerante interno, entrare con la punta lunga serie HL all'interno del foro. Vc=20 m/min, fn=0.3 mm/rev. Posizionare la punta HL sino a 1 mm dal fondo del foro pilota. Azionare il refrigerante interno ad alta pressione e cominciare la foratura.

Sin accionar el refrigerante interno, entre con la broca larga de la serie HL dentro del agujero. Vc=20 m/min, fn=0.3 mm/rev. Posicione la punta HL hasta 1 mm del fondo del agujero piloto. Accione el refrigerante interno a alta presión y comience el taladro.

Ohne Aktivierung der internen Kühlung, einen langen Bohrer der Serie HL in die Bohrung einführen. Vc=20 m/min, fn=0.3 mm/U den Bohrer HL bis 1 mm vom Ende der Richtbohrung ansetzen. Die interne Kühlung mit Hochdruck aktivieren und mit der Bohrung beginnen.

Без включения СОЖ, введите длинное сверло серии HL внутрь пилотного отверстия с режимами Vc=20 м/мин и fn=0.3 мм/об. Спозиционируйте сверло HL на расстоянии 1 мм от дна отверстия. Включите подачу СОЖ и начните сверление.



## STEP 3

Make continue drilling operation without steps for chip ejection.
In case of through holes, reduce the feed by 30% before the hole exit (approx. 1 mm).
Stop the coolant feed.

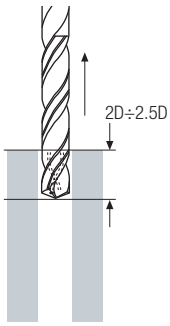
Percer sans step pour l'évacuation des copeaux.
En présence de trous débouchants, 1 mm avant d'avoir terminé le trou, réduire l'avancement du 30 %. Arrêter la lubrification.

Forare senza step per scarico trucioli.
Nel caso di fori passanti, 1 mm prima di aver completato il foro, ridurre l'avanzamento del 30%.
Fermare il refrigerante.

Taladre sin step para la descarga de virutas.
En el caso de agujeros pasantes, 1 mm antes de haber completado el agujero, reduzca el avance un 30%. Pare el refrigerante.

Für die Späneabführung Stufenlos bohren. Bei Durchgangsbohrungen 1 mm vor Fertigstellung der Bohrung den Vorschub um 30% reduzieren. Die Kühlung deaktivieren.

Сверлите без остановок и выводов инструмента.
В случае обработки сквозного отверстия, снизьте подачу на 30%, за 1 мм до выхода. Отключите подачу СОЖ.




## STEP 4

Withdraw the drill using max rpm and double fn, until 2xD from the hole entrance.

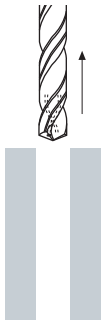
Retirer le foret en utilisant le maximum de tours disponibles et le double de l'avancement conseillé jusqu'à une profondeur 2xD.

Ritirare la punta utilizzando il massimo dei giri disponibili e il doppio dell'avanzamento consigliato sino ad una profondità 2xD.

Retire la broca utilizando el máximo de rpm disponibles y el doble del avance aconsejado hasta una profundidad 2xD.

Den Bohrer zurückziehen, dabei die maximal verfügbare Drehzahl und den doppelten Wert des empfohlenen Vorschubs bis zu einer Tiefe 2xD einsetzen.

Выньте сверло до уровня 2xD, используя максимальную частоту вращения и двойную подачу.



## STEP 5

Completing the exit from the hole by using slow and constant speed.

Terminer la dernière partie du perçage avec une vitesse réduite et constante.

Completare l'ultimo tratto di arretramento con velocità ridotta e costante.

Complete el último tramo de retroceso con velocidad reducida y constante.

Den letzten Abschnitt beim Zurückziehen mit reduzierter und konstanter Geschwindigkeit fertigstellen.

Полностью выньте сверло на заниженных режимах.

**MACHINING OF DEEP HOLES ON SLANTED OR IRREGULAR SURFACES**

**ESECUZIONE FORI PROFONDI SU SUPERFICI IRREGOLARI O OBLIQUE**

**HERSTELLUNG TIEFER BOHRUNGEN AUF SCHRÄGEN ODER UNREGELMÄSSIGEN OBERFLÄCHEN**

**EXÉCUTION DE TROUS PROFONDS SUR DES SURFACES IRRÉGULIÈRES OU OBLIQUES**

**MECANIZADO DE AGUJEROS PROFUNDOS SOBRE SUPERFÍCIES IRREGULARES U OBLICUAS**

**ОБРАБОТКА ГЛУБОКИХ ОТВЕРСТИЙ НА НАКЛОННЫХ ИЛИ НЕРОВНЫХ ПЛОСКОСТЯХ**



## STEP 1

Prepare a flat surface of the same size as the drilling diameter.

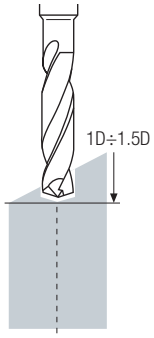
Réaliser une surface plane en utilisant une fraise avec une arête frontale. Le plan réalisé doit avoir les mêmes dimensions que le diamètre de perçage profond.

Realizzare una superficie piana utilizzando una fresa con tagliente frontale. Il piano realizzato deve avere le stesse dimensioni del diametro di foratura profonda.

Realizar una superficie plana usando una fresa con filo frontal. El plano realizado tiene que tener las mismas dimensiones que el diámetro de taladro profundo.

Eine ebene Oberfläche, durch einen Fräser mit stirnseitiger Schneidkante, herstellen. Die hergestellte Oberfläche muss dieselben Abmessungen des Durchmessers der tiefen Bohrung aufweisen.

Подготовьте ровную поверхность с помощью концевой фрезы. Эта поверхность должна быть того же размера, что и диаметр будущего глубокого отверстия.




## STEP 2

As pilot drill (1xD,1.5xD), please use 353HTA or 353HPU with head angle 140° (HL=135°) and m7 tolerance (HL=h7).

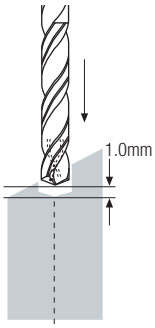
Utiliser un foret 353HTA ou 353HPU avec un angle en bout de 140° (HL=135°) et une tolérance m7 (HL=h7), pour effectuer un trou pilote (1xD÷1.5xD) très précis.

Utilizzare una punta 353HTA o 353HPU con angolo in testa di 140° (HL=135°) e tolleranza m7 (HL=h7), per eseguire un foro pilota (1xD÷1.5xD) molto preciso.

Utilice una broca 353HTA o 353HPU con ángulo punta de 140° (HL=135°) y tolerancia m7 (HL=h7), para realizar un agujero piloto (1xD÷1,5xD) muy preciso.

Einen Bohrer 353HTA oder 353HPU mit einem Spitzenwinkel von 140° (HL=135°) und Toleranz m7 (HL=h7) für die Herstellung einer äußerst präzisen Richtbohrung (1xD÷1.5xD) verwenden.

Для пилотного отверстия (1xD÷1.5xD) используйте сверло 353HTA или 353HPU с углом при вершине 140° (HL=135°) и допуском на диаметр m7 (HL=h7).




## STEP 3

With coolant feed OFF, enter the pilot hole with HL drill at Vc=20 m/min and fn=0.3 mm/rev. Position the HL drill at 1 mm from the end of the pilot hole, then start supplying the coolant and start drilling.

Sans actionner la lubrification interne, entrer avec le foret long série HL à l'intérieur du trou. Vc=20 m/min, fn=0.3 mm/rév. Placer le foret HL jusqu'à 1 mm du fond du trou pilote. Actionner la lubrification interne à haute pression et commencer le perçage.

Senza azionare il refrigerante interno, entrare con la punta lunga serie HL all'interno del foro. Vc=20 m/min, fn=0.3 mm/rev. Posizionare la punta HL sino a 1 mm dal fondo del foro pilota. Azionare il refrigerante interno ad alta pressione e cominciare la foratura.

Sin accionar el refrigerante interno, entre con la broca larga de la serie HL dentro del agujero. Vc=20 m/min, fn=0.3 mm/rev. Posicione la broca HL hasta 1 mm del fondo del agujero piloto. Accione el refrigerante interno a alta presión y comience el taladro.

Ohne Aktivierung der internen Kühlung, einen langen Bohrer der Serie HL in die Bohrung einführen. Vc=20 m/min, fn=0.3 mm/Umdr. Den Bohrer HL bis 1 mm vom Ende der Richtbohrung ansetzen. Die interne Kühlung mit Hochdruck aktivieren und mit der Bohrung beginnen.

Без включения СОЖ, введите длинное сверло серии HL внутрь пилотного отверстия с режимами Vc=20 м/мин и fn=0.3 мм/об. Спозиционируйте сверло HL на расстоянии 1 мм от дна отверстия. Включите подачу СОЖ и начните сверление.



## STEP 4

Make continue drilling operation without steps for chip ejection.
In case of through holes, reduce the feed by 30% before the hole exit (approx 1 mm).
Stop the coolant feed.

Percer sans step pour l'évacuation des copeaux.
En présence de trous débouchants, 1 mm avant d'avoir terminé le trou, réduire l'avancement du 30 %. Arrêter la lubrification.

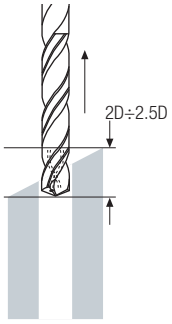
Forare senza step per scarico trucioli.
Nel caso di fori passanti, 1 mm prima di aver completato il foro, ridurre l'avanzamento del 30%
Fermare il refrigerante.

Taladre sin step para la descarga de virutas.
En el caso de agujeros pasantes, 1 mm antes de haber completado el agujero, reduzca el avance un 30%.
Pare el refrigerante.

Für die Späneabführung Stufenlos bohren.
Bei Durchgangsbohrungen 1 mm vor Fertigstellung der Bohrung den Vorschub um 30% reduzieren.
Die Kühlung deaktivieren.

Сверлите без остановок и выводов инструмента.
В случае обработки сквозного отверстия, снизьте подачу на 30%, за 1 мм до выхода.
Отключите подачу СОЖ.

INFO
CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
**HL**
HSD
C-SD-TA
HSS DRILLS
LFTA
SUTA
HSS-HSS/CO
CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH
HSS END-MILLS
CARBIDE BURRS




## STEP 5

Withdraw the drill using max rpm and double fn, until 2xD÷2.5xD from the hole entrance.

Retirer le foret en utilisant le maximum de tours disponibles et le double de l'avancement conseillé jusqu'à une profondeur 2xD÷2.5xD.

Ritirare la punta utilizzando il massimo dei giri disponibili e il doppio dell'avanzamento consigliato sino ad una profondità 2xD÷2.5xD.

Retire la broca utilizando el máximo de rpm disponibles y el doble del avance aconsejado hasta una profundidad de 2xD÷2.5xD.

Den Bohrer zurückziehen, dabei die maximal verfügbare Drehzahl und den doppelten Wert des empfohlenen Vorschubs bis zu einer Tiefe 2xD÷2.5xD einsetzen.

Выньте сверло до уровня 2xD÷2.5xD, используя максимальную частоту вращения и двойную подачу.



## STEP 6

Completing the exit from the hole by using slow and constant speed.

Terminer la dernière partie du perçage avec une vitesse réduite et constante.

Completare l'ultimo tratto di arretramento con velocità ridotta e costante.

Complete el último tramo de retroceso con velocidad reducida y constante.

Den letzten Abschnitt beim Zurückziehen mit reduzierter und konstanter Geschwindigkeit fertigstellen.

Полностью выньте сверло на заниженных режимах.

# 3512HL

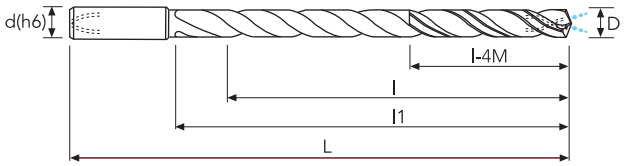
4-margin lands, polished flutes

12XD | OSAWA NORM | HL | MG PV250 | 135° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | l-4M | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|
| **3.10*** | 0/-0.012 | 4 | 45 | 50 | 85 | 15.5 | 12 x D | 3512HL0310N | ● |
| **3.20** | 0/-0.012 | 4 | 45 | 50 | 85 | 16 | 12 x D | 3512HL0320N | ● |
| **3.30** | 0/-0.012 | 4 | 45 | 50 | 85 | 16.5 | 12 x D | 3512HL0330N | ● |
| **3.40** | 0/-0.012 | 4 | 48 | 54 | 90 | 17 | 12 x D | 3512HL0340N | ○ |
| **3.50** | 0/-0.012 | 4 | 48 | 54 | 90 | 17.5 | 12 x D | 3512HL0350N | ● |
| **3.60** | 0/-0.012 | 4 | 48 | 54 | 90 | 18 | 12 x D | 3512HL0360N | ○ |
| **3.70** | 0/-0.012 | 4 | 48 | 54 | 90 | 18.5 | 12 x D | 3512HL0370N | ● |
| **3.80** | 0/-0.012 | 4 | 57 | 64 | 100 | 19 | 12 x D | 3512HL0380N | ● |
| **3.90** | 0/-0.012 | 4 | 57 | 64 | 100 | 19.5 | 12 x D | 3512HL0390N | ○ |
| **4.00** | 0/-0.012 | 4 | 57 | 64 | 100 | 20 | 12 x D | 3512HL0400N | ● |
| **4.10** | 0/-0.012 | 5 | 57 | 64 | 100 | 20.5 | 12 x D | 3512HL0410N | ● |
| **4.20** | 0/-0.012 | 5 | 57 | 64 | 100 | 21 | 12 x D | 3512HL0420N | ● |
| **4.30** | 0/-0.012 | 5 | 57 | 64 | 100 | 21.5 | 12 x D | 3512HL0430N | ● |
| **4.40** | 0/-0.012 | 5 | 57 | 64 | 100 | 22 | 12 x D | 3512HL0440N | ○ |
| **4.50** | 0/-0.012 | 5 | 57 | 64 | 100 | 22.5 | 12 x D | 3512HL0450N | ● |
| **4.60** | 0/-0.012 | 5 | 57 | 64 | 100 | 23 | 12 x D | 3512HL0460N | ○ |
| **4.70** | 0/-0.012 | 5 | 57 | 64 | 100 | 23.5 | 12 x D | 3512HL0470N | ○ |
| **4.80** | 0/-0.012 | 5 | 67 | 74 | 110 | 24 | 12 x D | 3512HL0480N | ● |
| **4.90** | 0/-0.012 | 5 | 72 | 81 | 120 | 24.5 | 12 x D | 3512HL0490N | ○ |
| **5.00** | 0/-0.012 | 5 | 72 | 81 | 120 | 25 | 12 x D | 3512HL0500N | ● |
| **5.10** | 0/-0.012 | 6 | 72 | 81 | 120 | 25.5 | 12 x D | 3512HL0510N | ● |
| **5.20** | 0/-0.012 | 6 | 72 | 81 | 120 | 26 | 12 x D | 3512HL0520N | ● |
| **5.30** | 0/-0.012 | 6 | 72 | 81 | 120 | 26.5 | 12 x D | 3512HL0530N | ● |
| **5.40** | 0/-0.012 | 6 | 72 | 81 | 120 | 27 | 12 x D | 3512HL0540N | ○ |
| **5.50** | 0/-0.012 | 6 | 72 | 81 | 120 | 27.5 | 12 x D | 3512HL0550N | ● |
| **5.60** | 0/-0.012 | 6 | 72 | 81 | 120 | 28 | 12 x D | 3512HL0560N | ● |
| **5.70** | 0/-0.012 | 6 | 72 | 81 | 120 | 28.5 | 12 x D | 3512HL0570N | ○ |
| **5.80** | 0/-0.012 | 6 | 72 | 81 | 120 | 29 | 12 x D | 3512HL0580N | ● |
| **5.90** | 0/-0.012 | 6 | 72 | 81 | 120 | 29.5 | 12 x D | 3512HL0590N | ○ |
| **6.00** | 0/-0.012 | 6 | 72 | 81 | 120 | 30 | 12 x D | 3512HL0600N | ● |
| **6.10** | 0/-0.015 | 8 | 88 | 97 | 135 | 30.5 | 12 x D | 3512HL0610N | ● |
| **6.20** | 0/-0.015 | 8 | 88 | 97 | 135 | 31 | 12 x D | 3512HL0620N | ● |
| **6.30** | 0/-0.015 | 8 | 88 | 97 | 135 | 31.5 | 12 x D | 3512HL0630N | ● |
| **6.40** | 0/-0.015 | 8 | 96 | 108 | 145 | 32 | 12 x D | 3512HL0640N | ○ |
| **6.50** | 0/-0.015 | 8 | 96 | 108 | 145 | 32.5 | 12 x D | 3512HL0650N | ● |
| **6.60** | 0/-0.015 | 8 | 96 | 108 | 145 | 33 | 12 x D | 3512HL0660N | ○ |
| **6.70** | 0/-0.015 | 8 | 96 | 108 | 145 | 33.5 | 12 x D | 3512HL0670N | ○ |
| **6.80** | 0/-0.015 | 8 | 96 | 108 | 145 | 34 | 12 x D | 3512HL0680N | ● |
| **6.90** | 0/-0.015 | 8 | 96 | 108 | 145 | 34.5 | 12 x D | 3512HL0690N | ○ |

* Ø1÷Ø3 = 3512 SUH MINI page 148

● stock standard ○ non-standard stock ▽ stock exhaustion

# 3512HL

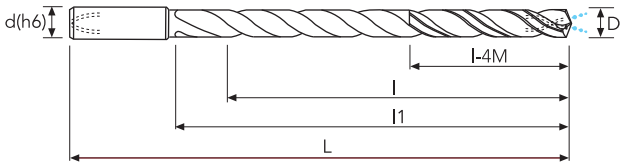
4-margin lands, polished flutes

12XD | OSAWA NORM | HL | MG PV250 | 135° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | l-4M | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|
| **7.00** | 0/-0.015 | 8 | 96 | 108 | 145 | 35 | 12 x D | 3512HL0700N | ● |
| **7.10** | 0/-0.015 | 8 | 96 | 108 | 145 | 35.5 | 12 x D | 3512HL0710N | ○ |
| **7.20** | 0/-0.015 | 8 | 96 | 108 | 145 | 36 | 12 x D | 3512HL0720N | ○ |
| **7.30** | 0/-0.015 | 8 | 96 | 108 | 145 | 36.5 | 12 x D | 3512HL0730N | ○ |
| **7.40** | 0/-0.015 | 8 | 96 | 108 | 145 | 37 | 12 x D | 3512HL0740N | ○ |
| **7.50** | 0/-0.015 | 8 | 96 | 108 | 145 | 37.5 | 12 x D | 3512HL0750N | ● |
| **7.60** | 0/-0.015 | 8 | 96 | 108 | 145 | 38 | 12 x D | 3512HL0760N | ○ |
| **7.70** | 0/-0.015 | 8 | 96 | 108 | 145 | 38.5 | 12 x D | 3512HL0770N | ○ |
| **7.80** | 0/-0.015 | 8 | 96 | 108 | 145 | 39 | 12 x D | 3512HL0780N | ● |
| **7.90** | 0/-0.015 | 8 | 96 | 108 | 145 | 39.5 | 12 x D | 3512HL0790N | ○ |
| **8.00** | 0/-0.015 | 8 | 96 | 108 | 145 | 40 | 12 x D | 3512HL0800N | ● |
| **8.10** | 0/-0.015 | 10 | 115 | 127 | 170 | 40.5 | 12 x D | 3512HL0810N | ○ |
| **8.20** | 0/-0.015 | 10 | 120 | 135 | 180 | 41 | 12 x D | 3512HL0820N | ○ |
| **8.30** | 0/-0.015 | 10 | 120 | 135 | 180 | 41.5 | 12 x D | 3512HL0830N | ○ |
| **8.40** | 0/-0.015 | 10 | 120 | 135 | 180 | 42 | 12 x D | 3512HL0840N | ○ |
| **8.50** | 0/-0.015 | 10 | 120 | 135 | 180 | 42.5 | 12 x D | 3512HL0850N | ● |
| **8.60** | 0/-0.015 | 10 | 120 | 135 | 180 | 43 | 12 x D | 3512HL0860N | ● |
| **8.70** | 0/-0.015 | 10 | 120 | 135 | 180 | 43.5 | 12 x D | 3512HL0870N | ● |
| **8.80** | 0/-0.015 | 10 | 120 | 135 | 180 | 44 | 12 x D | 3512HL0880N | ● |
| **8.90** | 0/-0.015 | 10 | 120 | 135 | 180 | 44.5 | 12 x D | 3512HL0890N | ○ |
| **9.00** | 0/-0.015 | 10 | 120 | 135 | 180 | 45 | 12 x D | 3512HL0900N | ● |
| **9.10** | 0/-0.015 | 10 | 120 | 135 | 180 | 45.5 | 12 x D | 3512HL0910N | ○ |
| **9.20** | 0/-0.015 | 10 | 120 | 135 | 180 | 46 | 12 x D | 3512HL0920N | ○ |
| **9.30** | 0/-0.015 | 10 | 120 | 135 | 180 | 46.5 | 12 x D | 3512HL0930N | ○ |
| **9.40** | 0/-0.015 | 10 | 120 | 135 | 180 | 47 | 12 x D | 3512HL0940N | ○ |
| **9.50** | 0/-0.015 | 10 | 120 | 135 | 180 | 47.5 | 12 x D | 3512HL0950N | ● |
| **9.60** | 0/-0.015 | 10 | 120 | 135 | 180 | 48 | 12 x D | 3512HL0960N | ○ |
| **9.70** | 0/-0.015 | 10 | 120 | 135 | 180 | 48.5 | 12 x D | 3512HL0970N | ○ |
| **9.80** | 0/-0.015 | 10 | 120 | 135 | 180 | 49 | 12 x D | 3512HL0980N | ● |
| **9.90** | 0/-0.015 | 10 | 120 | 135 | 180 | 49.5 | 12 x D | 3512HL0990N | ○ |
| **10.00** | 0/-0.015 | 10 | 120 | 135 | 180 | 50 | 12 x D | 3512HL1000N | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 3512HL

| Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|
| Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| Vc (m/min) | **70÷90** | **60÷80** | **50÷70** | **45÷65** | **40÷60** | **35÷40** |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| **3.0** | 0.047 | 0.046 | 0.046 | 0.045 | 0.047 | 0.044 |
| **3.5** | 0.057 | 0.055 | 0.054 | 0.053 | 0.056 | 0.053 |
| **4.0** | 0.068 | 0.066 | 0.064 | 0.063 | 0.067 | 0.063 |
| **4.5** | 0.079 | 0.076 | 0.076 | 0.075 | 0.077 | 0.071 |
| **5.0** | 0.090 | 0.088 | 0.087 | 0.086 | 0.087 | 0.081 |
| **5.5** | 0.102 | 0.098 | 0.099 | 0.097 | 0.100 | 0.092 |
| **6.0** | 0.117 | 0.109 | 0.110 | 0.109 | 0.113 | 0.105 |
| **6.5** | 0.128 | 0.121 | 0.125 | 0.123 | 0.123 | 0.118 |
| **7.0** | 0.144 | 0.135 | 0.138 | 0.137 | 0.136 | 0.126 |
| **7.5** | 0.156 | 0.151 | 0.152 | 0.150 | 0.150 | 0.144 |
| **8.0** | 0.175 | 0.166 | 0.167 | 0.165 | 0.167 | 0.156 |
| **8.5** | 0.184 | 0.173 | 0.170 | 0.168 | 0.172 | 0.163 |
| **9.0** | 0.194 | 0.176 | 0.180 | 0.178 | 0.177 | 0.160 |
| **9.5** | 0.198 | 0.185 | 0.186 | 0.184 | 0.181 | 0.168 |
| **10.0** | 0.210 | 0.188 | 0.192 | 0.190 | 0.185 | 0.177 |

Ø RUN OUT <0.02mm

| Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **40÷60** | **40÷60** | **35÷55** | | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| **3.0** | 0.047 | 0.042 | 0.041 | | | |
| **3.5** | 0.056 | 0.051 | 0.048 | | | |
| **4.0** | 0.067 | 0.060 | 0.058 | | | |
| **4.5** | 0.077 | 0.070 | 0.067 | | | |
| **5.0** | 0.087 | 0.079 | 0.075 | | | |
| **5.5** | 0.100 | 0.091 | 0.086 | | | |
| **6.0** | 0.113 | 0.103 | 0.096 | | | |
| **6.5** | 0.123 | 0.113 | 0.108 | | | |
| **7.0** | 0.136 | 0.125 | 0.122 | | | |
| **7.5** | 0.150 | 0.135 | 0.127 | | | |
| **8.0** | 0.167 | 0.150 | 0.145 | | | |
| **8.5** | 0.172 | 0.157 | 0.147 | | | |
| **9.0** | 0.177 | 0.159 | 0.156 | | | |
| **9.5** | 0.181 | 0.162 | 0.159 | | | |
| **10.0** | 0.185 | 0.170 | 0.169 | | | |

Ø RUN OUT <0.02mm

CUTTING PARAMETERS

# 3512HL




| Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| Vc (m/min) | **65÷85** | **60÷80** | **45÷65** | **45÷65** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3.0** | 0.048 | 0.045 | 0.048 | 0.047 | | |
| **3.5** | 0.058 | 0.055 | 0.057 | 0.056 | | |
| **4.0** | 0.069 | 0.064 | 0.067 | 0.066 | | |
| **4.5** | 0.080 | 0.075 | 0.079 | 0.078 | | |
| **5.0** | 0.093 | 0.087 | 0.090 | 0.089 | | |
| **5.5** | 0.105 | 0.097 | 0.103 | 0.101 | | |
| **6.0** | 0.117 | 0.109 | 0.114 | 0.113 | | |
| **6.5** | 0.133 | 0.122 | 0.130 | 0.128 | | |
| **7.0** | 0.149 | 0.136 | 0.143 | 0.142 | | |
| **7.5** | 0.161 | 0.152 | 0.157 | 0.155 | | |
| **8.0** | 0.179 | 0.166 | 0.173 | 0.171 | | |
| **8.5** | 0.186 | 0.173 | 0.176 | 0.174 | | |
| **9.0** | 0.187 | 0.174 | 0.187 | 0.185 | | |
| **9.5** | 0.197 | 0.183 | 0.191 | 0.189 | | |
| **10.0** | 0.200 | 0.187 | 0.195 | 0.194 | | |




| Material Group ISO 513 | N1 | N2 | N3 N4 | | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **125÷145** | **110÷130** | **100÷120** | | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| **3.0** | 0.060 | 0.059 | 0.058 | | | |
| **3.5** | 0.073 | 0.071 | 0.070 | | | |
| **4.0** | 0.086 | 0.085 | 0.083 | | | |
| **4.5** | 0.100 | 0.099 | 0.096 | | | |
| **5.0** | 0.115 | 0.114 | 0.111 | | | |
| **5.5** | 0.132 | 0.129 | 0.126 | | | |
| **6.0** | 0.149 | 0.145 | 0.140 | | | |
| **6.5** | 0.167 | 0.161 | 0.158 | | | |
| **7.0** | 0.185 | 0.181 | 0.175 | | | |
| **7.5** | 0.202 | 0.196 | 0.195 | | | |
| **8.0** | 0.222 | 0.218 | 0.213 | | | |
| **8.5** | 0.229 | 0.227 | 0.218 | | | |
| **9.0** | 0.237 | 0.231 | 0.229 | | | |
| **9.5** | 0.246 | 0.243 | 0.236 | | | |
| **10.0** | 0.251 | 0.250 | 0.243 | | | |

# 3512HL

| | Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| | Vc (m/min) | **24÷28** | **20÷25** | **28÷32** | **25÷30** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| Ø RUN OUT <0.02mm | **3.0** | 0.040 | 0.037 | 0.047 | 0.044 | | |
| | **3.5** | 0.048 | 0.046 | 0.055 | 0.052 | | |
| | **4.0** | 0.057 | 0.055 | 0.065 | 0.063 | | |
| | **4.5** | 0.067 | 0.061 | 0.077 | 0.070 | | |
| | **5.0** | 0.075 | 0.069 | 0.088 | 0.080 | | |
| | **5.5** | 0.084 | 0.077 | 0.104 | 0.094 | | |
| | **6.0** | 0.100 | 0.086 | 0.124 | 0.113 | | |
| | **6.5** | 0.109 | 0.092 | 0.136 | 0.123 | | |
| | **7.0** | 0.119 | 0.100 | 0.150 | 0.136 | | |
| | **7.5** | 0.133 | 0.114 | 0.164 | 0.150 | | |
| | **8.0** | 0.138 | 0.130 | 0.181 | 0.167 | | |
| | **8.5** | 0.148 | 0.130 | 0.189 | 0.163 | | |
| | **9.0** | 0.160 | 0.144 | 0.183 | 0.173 | | |
| | **9.5** | 0.155 | 0.139 | 0.195 | 0.168 | | |
| | **10.0** | 0.167 | 0.150 | 0.191 | 0.180 | | |

*during the exit phase the use of external coolant supply is recommended to keep the tool and the workpiece cooled and lubricated to avoid failures due to overheating.

*nella fase di uscita, per evitare il grippaggio causa surriscaldamento, è necessario usare l'adduzione esterna del refrigerante per mantenere raffreddati e lubrificati l'utensile ed il pezzo in lavorazione.

*beim Herausfahren des Bohrers aus der Bohrung, muss beachtet werden, um das Einklemmen wegen Überhitzung zu verhindern, dass von Aussen Kühlmittel zugeführt wird um das Werkzeug und das Teil zu Kühlen und zu Schmieren.

*en phase de sortie, pour éviter le grippage dû à une surchauffe, il est nécessaire d'utiliser l'arrosage externe pour maintenir l'outil et la pièce refroidis et lubrifiés.

*en la fase de salida, para evitar el bloqueo debido al sobrecalentamiento, es necesario usar la aducción externa del refrigerante para mantener enfriadas y lubricadas la herramienta y la pieza.

*на этапе выхода, чтобы избежать заклинивания из-за перегрева, необходимо использовать внешний подвод СОЖ, чтобы инструмент и заготовка охлаждались и смазывались.

# 3515HL

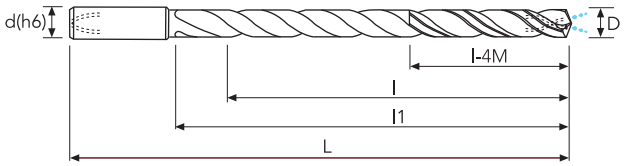
4-margin lands, polished flutes

15XD | OSAWA NORM | HL | MG PV250 | 135° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | l-4M | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|
| **3.10** | 0/-0.012 | 4 | 50 | 55 | 90 | 15.5 | 15 x D | 3515HL0310N | ○ |
| **3.20** | 0/-0.012 | 4 | 50 | 55 | 90 | 16 | 15 x D | 3515HL0320N | ○ |
| **3.30** | 0/-0.012 | 4 | 52 | 56 | 90 | 16.5 | 15 x D | 3515HL0330N | ○ |
| **3.40** | 0/-0.012 | 4 | 53 | 58 | 95 | 17 | 15 x D | 3515HL0340N | ○ |
| **3.50** | 0/-0.012 | 4 | 55 | 60 | 95 | 17.5 | 15 x D | 3515HL0350N | ● |
| **3.60** | 0/-0.012 | 4 | 56 | 61 | 95 | 18 | 15 x D | 3515HL0360N | ○ |
| **3.70** | 0/-0.012 | 4 | 58 | 63 | 100 | 18.5 | 15 x D | 3515HL0370N | ○ |
| **3.80** | 0/-0.012 | 4 | 60 | 65 | 100 | 19 | 15 x D | 3515HL0380N | ○ |
| **3.90** | 0/-0.012 | 4 | 60 | 66 | 100 | 19.5 | 15 x D | 3515HL0390N | ○ |
| **4.00** | 0/-0.012 | 4 | 62 | 68 | 105 | 20 | 15 x D | 3515HL0400N | ● |
| **4.10** | 0/-0.012 | 5 | 64 | 70 | 105 | 20.5 | 15 x D | 3515HL0410N | ○ |
| **4.20** | 0/-0.012 | 5 | 65 | 71 | 110 | 21 | 15 x D | 3515HL0420N | ○ |
| **4.30** | 0/-0.012 | 5 | 67 | 73 | 110 | 21.5 | 15 x D | 3515HL0430N | ● |
| **4.40** | 0/-0.012 | 5 | 68 | 75 | 110 | 22 | 15 x D | 3515HL0440N | ○ |
| **4.50** | 0/-0.012 | 5 | 70 | 76 | 115 | 22.5 | 15 x D | 3515HL0450N | ● |
| **4.60** | 0/-0.012 | 5 | 71 | 78 | 115 | 23 | 15 x D | 3515HL0460N | ○ |
| **4.70** | 0/-0.012 | 5 | 73 | 80 | 115 | 23.5 | 15 x D | 3515HL0470N | ○ |
| **4.80** | 0/-0.012 | 5 | 75 | 82 | 115 | 24 | 15 x D | 3515HL0480N | ○ |
| **4.90** | 0/-0.012 | 5 | 76 | 83 | 120 | 24.5 | 15 x D | 3515HL0490N | ○ |
| **5.00** | 0/-0.012 | 5 | 77 | 85 | 120 | 25 | 15 x D | 3515HL0500N | ● |
| **5.10** | 0/-0.012 | 6 | 79 | 86 | 125 | 25.5 | 15 x D | 3515HL0510N | ○ |
| **5.20** | 0/-0.012 | 6 | 80 | 88 | 125 | 26 | 15 x D | 3515HL0520N | ○ |
| **5.30** | 0/-0.012 | 6 | 82 | 89 | 130 | 26.5 | 15 x D | 3515HL0530N | ○ |
| **5.40** | 0/-0.012 | 6 | 83 | 91 | 130 | 27 | 15 x D | 3515HL0540N | ○ |
| **5.50** | 0/-0.012 | 6 | 85 | 93 | 130 | 27.5 | 15 x D | 3515HL0550N | ● |
| **5.60** | 0/-0.012 | 6 | 86 | 94 | 135 | 28 | 15 x D | 3515HL0560N | ○ |
| **5.70** | 0/-0.012 | 6 | 88 | 96 | 135 | 28.5 | 15 x D | 3515HL0570N | ○ |
| **5.80** | 0/-0.012 | 6 | 89 | 98 | 135 | 29 | 15 x D | 3515HL0580N | ○ |
| **5.90** | 0/-0.012 | 6 | 91 | 99 | 140 | 29.5 | 15 x D | 3515HL0590N | ○ |
| **6.00** | 0/-0.012 | 6 | 92 | 101 | 140 | 30 | 15 x D | 3515HL0600N | ● |
| **6.10** | 0/-0.015 | 8 | 94 | 103 | 140 | 30.5 | 15 x D | 3515HL0610N | ○ |
| **6.20** | 0/-0.015 | 8 | 95 | 104 | 140 | 31 | 15 x D | 3515HL0620N | ○ |
| **6.30** | 0/-0.015 | 8 | 98 | 108 | 145 | 31.5 | 15 x D | 3515HL0630N | ○ |
| **6.40** | 0/-0.015 | 8 | 100 | 110 | 145 | 32 | 15 x D | 3515HL0640N | ○ |
| **6.50** | 0/-0.015 | 8 | 100 | 110 | 150 | 32.5 | 15 x D | 3515HL0650N | ● |
| **6.60** | 0/-0.015 | 8 | 101 | 111 | 150 | 33 | 15 x D | 3515HL0660N | ○ |
| **6.70** | 0/-0.015 | 8 | 103 | 113 | 150 | 33.5 | 15 x D | 3515HL0670N | ○ |
| **6.80** | 0/-0.015 | 8 | 104 | 114 | 155 | 34 | 15 x D | 3515HL0680N | ○ |
| **6.90** | 0/-0.015 | 8 | 106 | 116 | 155 | 34.5 | 15 x D | 3515HL0690N | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 3515HL

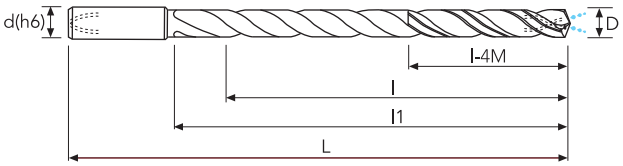
4-margin lands, polished flutes

15XD | OSAWA NORM | HL | MG PV250 | 135° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | l-4M | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|
| **7.00** | 0/-0.015 | 8 | 107 | 118 | 160 | 35 | 15 x D | 3515HL0700N | ● |
| **7.10** | 0/-0.015 | 8 | 109 | 119 | 160 | 35.5 | 15 x D | 3515HL0710N | ○ |
| **7.20** | 0/-0.015 | 8 | 110 | 121 | 160 | 36 | 15 x D | 3515HL0720N | ○ |
| **7.30** | 0/-0.015 | 8 | 112 | 122 | 165 | 36.5 | 15 x D | 3515HL0730N | ○ |
| **7.40** | 0/-0.015 | 8 | 113 | 124 | 165 | 37 | 15 x D | 3515HL0740N | ○ |
| **7.50** | 0/-0.015 | 8 | 115 | 126 | 165 | 37.5 | 15 x D | 3515HL0750N | ● |
| **7.60** | 0/-0.015 | 8 | 116 | 127 | 170 | 38 | 15 x D | 3515HL0760N | ○ |
| **7.70** | 0/-0.015 | 8 | 118 | 129 | 170 | 38.5 | 15 x D | 3515HL0770N | ○ |
| **7.80** | 0/-0.015 | 8 | 119 | 131 | 170 | 39 | 15 x D | 3515HL0780N | ○ |
| **7.90** | 0/-0.015 | 8 | 121 | 132 | 175 | 39.5 | 15 x D | 3515HL0790N | ○ |
| **8.00** | 0/-0.015 | 8 | 122 | 134 | 175 | 40 | 15 x D | 3515HL0800N | ● |
| **8.10** | 0/-0.015 | 10 | 125 | 137 | 180 | 40.5 | 15 x D | 3515HL0810N | ○ |
| **8.20** | 0/-0.015 | 10 | 125 | 137 | 180 | 41 | 15 x D | 3515HL0820N | ○ |
| **8.30** | 0/-0.015 | 10 | 127 | 139 | 180 | 41.5 | 15 x D | 3515HL0830N | ○ |
| **8.40** | 0/-0.015 | 10 | 128 | 141 | 185 | 42 | 15 x D | 3515HL0840N | ○ |
| **8.50** | 0/-0.015 | 10 | 130 | 142 | 185 | 42.5 | 15 x D | 3515HL0850N | ● |
| **8.60** | 0/-0.015 | 10 | 131 | 144 | 185 | 43 | 15 x D | 3515HL0860N | ○ |
| **8.70** | 0/-0.015 | 10 | 133 | 146 | 190 | 43.5 | 15 x D | 3515HL0870N | ○ |
| **8.80** | 0/-0.015 | 10 | 134 | 147 | 190 | 44 | 15 x D | 3515HL0880N | ○ |
| **8.90** | 0/-0.015 | 10 | 136 | 149 | 190 | 44.5 | 15 x D | 3515HL0890N | ○ |
| **9.00** | 0/-0.015 | 10 | 137 | 151 | 195 | 45 | 15 x D | 3515HL0900N | ● |
| **9.10** | 0/-0.015 | 10 | 139 | 152 | 195 | 45.5 | 15 x D | 3515HL0910N | ○ |
| **9.20** | 0/-0.015 | 10 | 140 | 154 | 195 | 46 | 15 x D | 3515HL0920N | ○ |
| **9.30** | 0/-0.015 | 10 | 142 | 155 | 200 | 46.5 | 15 x D | 3515HL0930N | ○ |
| **9.40** | 0/-0.015 | 10 | 143 | 157 | 200 | 47 | 15 x D | 3515HL0940N | ○ |
| **9.50** | 0/-0.015 | 10 | 145 | 159 | 200 | 47.5 | 15 x D | 3515HL0950N | ● |
| **9.60** | 0/-0.015 | 10 | 146 | 160 | 205 | 48 | 15 x D | 3515HL0960N | ○ |
| **9.70** | 0/-0.015 | 10 | 148 | 162 | 205 | 48.5 | 15 x D | 3515HL0970N | ○ |
| **9.80** | 0/-0.015 | 10 | 149 | 164 | 205 | 49 | 15 x D | 3515HL0980N | ○ |
| **9.90** | 0/-0.015 | 10 | 151 | 165 | 210 | 49.5 | 15 x D | 3515HL0990N | ○ |
| **10.00** | 0/-0.015 | 10 | 152 | 167 | 210 | 50 | 15 x D | 3515HL1000N | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 3515HL

| Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|
| Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| Vc (m/min) | **65÷85** | **50÷70** | **40÷60** | **35÷55** | **40÷50** | **30÷40** |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| **3.0** | 0.044 | 0.043 | 0.045 | 0.044 | 0.043 | 0.035 |
| **3.5** | 0.054 | 0.053 | 0.054 | 0.053 | 0.052 | 0.042 |
| **4.0** | 0.065 | 0.063 | 0.065 | 0.064 | 0.063 | 0.050 |
| **4.5** | 0.075 | 0.075 | 0.077 | 0.076 | 0.072 | 0.057 |
| **5.0** | 0.085 | 0.086 | 0.088 | 0.086 | 0.084 | 0.065 |
| **5.5** | 0.098 | 0.097 | 0.102 | 0.100 | 0.097 | 0.075 |
| **6.0** | 0.111 | 0.109 | 0.112 | 0.110 | 0.107 | 0.086 |
| **6.5** | 0.125 | 0.123 | 0.130 | 0.128 | 0.120 | 0.098 |
| **7.0** | 0.138 | 0.137 | 0.140 | 0.138 | 0.135 | 0.105 |
| **7.5** | 0.151 | 0.152 | 0.156 | 0.154 | 0.145 | 0.121 |
| **8.0** | 0.171 | 0.169 | 0.175 | 0.173 | 0.165 | 0.131 |
| **8.5** | 0.177 | 0.172 | 0.179 | 0.176 | 0.171 | 0.137 |
| **9.0** | 0.177 | 0.183 | 0.183 | 0.180 | 0.178 | 0.133 |
| **9.5** | 0.186 | 0.186 | 0.189 | 0.187 | 0.182 | 0.139 |
| **10.0** | 0.189 | 0.190 | 0.196 | 0.194 | 0.188 | 0.146 |

Ø RUN OUT <0.02mm

| Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **40÷50** | **40÷50** | **35÷45** | | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| **3.0** | 0.043 | 0.039 | 0.031 | | | |
| **3.5** | 0.052 | 0.048 | 0.038 | | | |
| **4.0** | 0.063 | 0.057 | 0.046 | | | |
| **4.5** | 0.072 | 0.066 | 0.053 | | | |
| **5.0** | 0.084 | 0.077 | 0.061 | | | |
| **5.5** | 0.097 | 0.088 | 0.071 | | | |
| **6.0** | 0.107 | 0.098 | 0.080 | | | |
| **6.5** | 0.120 | 0.110 | 0.088 | | | |
| **7.0** | 0.135 | 0.123 | 0.099 | | | |
| **7.5** | 0.145 | 0.132 | 0.106 | | | |
| **8.0** | 0.165 | 0.150 | 0.120 | | | |
| **8.5** | 0.171 | 0.155 | 0.124 | | | |
| **9.0** | 0.178 | 0.161 | 0.128 | | | |
| **9.5** | 0.182 | 0.165 | 0.132 | | | |
| **10.0** | 0.188 | 0.171 | 0.136 | | | |

Ø RUN OUT <0.02mm

*during the exit phase the use of external coolant supply is recommended to keep the tool and the workpiece cooled and lubricated to avoid failures due to overheating.

*nella fase di uscita, per evitare il grippaggio causa surriscaldamento, è necessario usare l'adduzione esterna del refrigerante per mantenere raffreddati e lubrificati l'utensile ed il pezzo in lavorazione.

*beim Herausfahren des Bohrers aus der Bohrung, muss beachtet werden, um das Einklemmen wegen Überhitzung zu verhindern, dass von Aussen Kühlmittel zugeführt wird um das Werkzeug und das Teil zu Kühlen und zu Schmieren.

*en phase de sortie, pour éviter le grippage dû à une surchauffe, il est nécessaire d'utiliser l'arrosage externe pour maintenir l'outil et la pièce refroidis et lubrifiés.

*en la fase de salida, para evitar el bloqueo debido al sobrecalentamiento, es necesario usar la aducción externa del refrigerante para mantener enfriadas y lubricadas la herramienta y la pieza.

*на этапе выхода, чтобы избежать заклинивания из-за перегрева, необходимо использовать внешний подвод СОЖ, чтобы инструмент и заготовка охлаждались и смазывались.

# 3515HL

| | Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| | Vc (m/min) | **60÷80** | **55÷75** | **40÷60** | **40÷60** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| Ø RUN OUT <0.02mm | **3.0** | 0.047 | 0.045 | 0.047 | 0.047 | | |
| | **3.5** | 0.057 | 0.055 | 0.057 | 0.056 | | |
| | **4.0** | 0.067 | 0.065 | 0.068 | 0.067 | | |
| | **4.5** | 0.079 | 0.077 | 0.081 | 0.079 | | |
| | **5.0** | 0.092 | 0.089 | 0.092 | 0.090 | | |
| | **5.5** | 0.103 | 0.101 | 0.106 | 0.105 | | |
| | **6.0** | 0.116 | 0.112 | 0.117 | 0.115 | | |
| | **6.5** | 0.130 | 0.127 | 0.135 | 0.133 | | |
| | **7.0** | 0.146 | 0.144 | 0.146 | 0.144 | | |
| | **7.5** | 0.163 | 0.158 | 0.163 | 0.160 | | |
| | **8.0** | 0.178 | 0.173 | 0.182 | 0.180 | | |
| | **8.5** | 0.185 | 0.175 | 0.186 | 0.183 | | |
| | **9.0** | 0.186 | 0.184 | 0.190 | 0.188 | | |
| | **9.5** | 0.196 | 0.188 | 0.195 | 0.193 | | |
| | **10.0** | 0.200 | 0.191 | 0.200 | 0.199 | | |

| | Material Group ISO 513 | N1 | N2 | N3 N4 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **115÷135** | **95÷115** | **85÷105** | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| Ø RUN OUT <0.02mm | **3.0** | 0.058 | 0.057 | 0.056 | | | |
| | **3.5** | 0.071 | 0.070 | 0.068 | | | |
| | **4.0** | 0.084 | 0.083 | 0.081 | | | |
| | **4.5** | 0.098 | 0.096 | 0.095 | | | |
| | **5.0** | 0.114 | 0.111 | 0.110 | | | |
| | **5.5** | 0.129 | 0.127 | 0.125 | | | |
| | **6.0** | 0.147 | 0.142 | 0.141 | | | |
| | **6.5** | 0.163 | 0.160 | 0.158 | | | |
| | **7.0** | 0.182 | 0.177 | 0.177 | | | |
| | **7.5** | 0.201 | 0.198 | 0.194 | | | |
| | **8.0** | 0.222 | 0.217 | 0.214 | | | |
| | **8.5** | 0.229 | 0.222 | 0.220 | | | |
| | **9.0** | 0.238 | 0.232 | 0.226 | | | |
| | **9.5** | 0.242 | 0.238 | 0.233 | | | |
| | **10.0** | 0.253 | 0.246 | 0.241 | | | |

*during the exit phase the use of external coolant supply is recommended to keep the tool and the workpiece cooled and lubricated to avoid failures due to overheating.

*nella fase di uscita, per evitare il grippaggio causa surriscaldamento, è necessario usare l'adduzione esterna del refrigerante per mantenere raffreddati e lubrificati l'utensile ed il pezzo in lavorazione.

*beim Herausfahren des Bohrers aus der Bohrung, muss beachtet werden, um das Einklemmen wegen Überhitzung zu verhindern, dass von Aussen Kühlmittel zugeführt wird um das Werkzeug und das Teil zu Kühlen und zu Schmieren.

*en phase de sortie, pour éviter le grippage dû à une surchauffe, il est nécessaire d'utiliser l'arrosage externe pour maintenir l'outil et la pièce refroidis et lubrifiés.

*en la fase de salida, para evitar el bloqueo debido al sobrecalentamiento, es necesario usar la aducción externa del refrigerante para mantener enfriadas y lubricadas la herramienta y la pieza.

*на этапе выхода, чтобы избежать заклинивания из-за перегрева, необходимо использовать внешний подвод СОЖ, чтобы инструмент и заготовка охлаждались и смазывались.

CUTTING PARAMETERS

# 3515HL




| Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| Vc (m/min) | **24÷28** | **20÷25** | **28÷32** | **25÷30** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3.0** | 0.037 | 0.030 | 0.050 | 0.044 | | |
| **3.5** | 0.044 | 0.037 | 0.058 | 0.052 | | |
| **4.0** | 0.052 | 0.045 | 0.069 | 0.063 | | |
| **4.5** | 0.062 | 0.050 | 0.081 | 0.070 | | |
| **5.0** | 0.069 | 0.056 | 0.093 | 0.080 | | |
| **5.5** | 0.078 | 0.063 | 0.109 | 0.094 | | |
| **6.0** | 0.093 | 0.071 | 0.129 | 0.113 | | |
| **6.5** | 0.102 | 0.077 | 0.142 | 0.123 | | |
| **7.0** | 0.112 | 0.083 | 0.157 | 0.136 | | |
| **7.5** | 0.125 | 0.095 | 0.171 | 0.150 | | |
| **8.0** | 0.129 | 0.110 | 0.188 | 0.167 | | |
| **8.5** | 0.139 | 0.110 | 0.198 | 0.163 | | |
| **9.0** | 0.150 | 0.122 | 0.192 | 0.173 | | |
| **9.5** | 0.145 | 0.117 | 0.205 | 0.168 | | |
| **10.0** | 0.156 | 0.125 | 0.200 | 0.180 | | |

*during the exit phase the use of external coolant supply is recommended to keep the tool and the workpiece cooled and lubricated to avoid failures due to overheating.

*nella fase di uscita, per evitare il grippaggio causa surriscaldamento, è necessario usare l'adduzione esterna del refrigerante per mantenere raffreddati e lubrificati l'utensile ed il pezzo in lavorazione.

*beim Herausfahren des Bohrers aus der Bohrung, muss beachtet werden, um das Einklemmen wegen Überhitzung zu verhindern, dass von Aussen Kühlmittel zugeführt wird um das Werkzeug und das Teil zu Kühlen und zu Schmieren.

*en phase de sortie, pour éviter le grippage dû à une surchauffe, il est nécessaire d'utiliser l'arrosage externe pour maintenir l'outil et la pièce refroidis et lubrifiés.

*en la fase de salida, para evitar el bloqueo debido al sobrecalentamiento, es necesario usar la aducción externa del refrigerante para mantener enfriadas y lubricadas la herramienta y la pieza.

*на этапе выхода, чтобы избежать заклинивания из-за перегрева, необходимо использовать внешний подвод СОЖ, чтобы инструмент и заготовка охлаждались и смазывались.

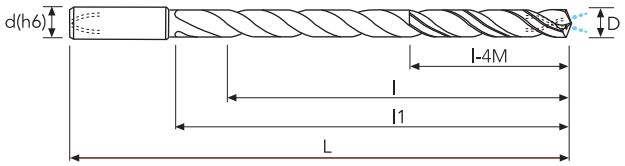
# 3520HL

4-margin lands, polished flutes



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | l-4M | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|
| **3.10*** | 0/-0.012 | 4 | 64 | 69 | 105 | 15.5 | 20 x D | 3520HL0310N | ○ |
| **3.20** | 0/-0.012 | 4 | 66 | 71 | 105 | 16 | 20 x D | 3520HL0320N | ● |
| **3.30** | 0/-0.012 | 4 | 68 | 73 | 110 | 16.5 | 20 x D | 3520HL0330N | ● |
| **3.40** | 0/-0.012 | 4 | 70 | 75 | 110 | 17 | 20 x D | 3520HL0340N | ○ |
| **3.50** | 0/-0.012 | 4 | 72 | 77 | 110 | 17.5 | 20 x D | 3520HL0350N | ● |
| **3.60** | 0/-0.012 | 4 | 74 | 79 | 115 | 18 | 20 x D | 3520HL0360N | ○ |
| **3.70** | 0/-0.012 | 4 | 76 | 82 | 115 | 18.5 | 20 x D | 3520HL0370N | ○ |
| **3.80** | 0/-0.012 | 4 | 78 | 84 | 120 | 19 | 20 x D | 3520HL0380N | ○ |
| **3.90** | 0/-0.012 | 4 | 80 | 86 | 120 | 19.5 | 20 x D | 3520HL0390N | ○ |
| **4.00** | 0/-0.012 | 4 | 82 | 88 | 125 | 20 | 20 x D | 3520HL0400N | ● |
| **4.10** | 0/-0.012 | 5 | 84 | 90 | 125 | 20.5 | 20 x D | 3520HL0410N | ○ |
| **4.20** | 0/-0.012 | 5 | 86 | 92 | 130 | 21 | 20 x D | 3520HL0420N | ○ |
| **4.30** | 0/-0.012 | 5 | 88 | 94 | 130 | 21.5 | 20 x D | 3520HL0430N | ○ |
| **4.40** | 0/-0.012 | 5 | 90 | 97 | 135 | 22 | 20 x D | 3520HL0440N | ○ |
| **4.50** | 0/-0.012 | 5 | 92 | 99 | 135 | 22.5 | 20 x D | 3520HL0450N | ● |
| **4.60** | 0/-0.012 | 5 | 94 | 101 | 140 | 23 | 20 x D | 3520HL0460N | ○ |
| **4.70** | 0/-0.012 | 5 | 96 | 103 | 140 | 23.5 | 20 x D | 3520HL0470N | ○ |
| **4.80** | 0/-0.012 | 5 | 98 | 105 | 140 | 24 | 20 x D | 3520HL0480N | ○ |
| **4.90** | 0/-0.012 | 5 | 100 | 107 | 145 | 24.5 | 20 x D | 3520HL0490N | ○ |
| **5.00** | 0/-0.012 | 5 | 102 | 110 | 145 | 25 | 20 x D | 3520HL0500N | ● |
| **5.10** | 0/-0.012 | 6 | 104 | 112 | 150 | 25.5 | 20 x D | 3520HL0510N | ○ |
| **5.20** | 0/-0.012 | 6 | 106 | 114 | 155 | 26 | 20 x D | 3520HL0520N | ○ |
| **5.30** | 0/-0.012 | 6 | 108 | 116 | 155 | 26.5 | 20 x D | 3520HL0530N | ○ |
| **5.40** | 0/-0.012 | 6 | 110 | 118 | 155 | 27 | 20 x D | 3520HL0540N | ○ |
| **5.50** | 0/-0.012 | 6 | 112 | 120 | 160 | 27.5 | 20 x D | 3520HL0550N | ● |
| **5.60** | 0/-0.012 | 6 | 114 | 122 | 160 | 28 | 20 x D | 3520HL0560N | ○ |
| **5.70** | 0/-0.012 | 6 | 116 | 125 | 165 | 28.5 | 20 x D | 3520HL0570N | ○ |
| **5.80** | 0/-0.012 | 6 | 118 | 127 | 165 | 29 | 20 x D | 3520HL0580N | ○ |
| **5.90** | 0/-0.012 | 6 | 120 | 129 | 170 | 29.5 | 20 x D | 3520HL0590N | ○ |
| **6.00** | 0/-0.012 | 6 | 122 | 131 | 170 | 30 | 20 x D | 3520HL0600N | ● |
| **6.10** | 0/-0.015 | 8 | 124 | 133 | 170 | 30.5 | 20 x D | 3520HL0610N | ○ |
| **6.20** | 0/-0.015 | 8 | 126 | 135 | 175 | 31 | 20 x D | 3520HL0620N | ○ |
| **6.30** | 0/-0.015 | 8 | 128 | 137 | 175 | 31.5 | 20 x D | 3520HL0630N | ○ |
| **6.40** | 0/-0.015 | 8 | 130 | 140 | 180 | 32 | 20 x D | 3520HL0640N | ○ |
| **6.50** | 0/-0.015 | 8 | 132 | 142 | 180 | 32.5 | 20 x D | 3520HL0650N | ● |
| **6.60** | 0/-0.015 | 8 | 134 | 144 | 185 | 33 | 20 x D | 3520HL0660N | ○ |
| **6.70** | 0/-0.015 | 8 | 136 | 146 | 185 | 33.5 | 20 x D | 3520HL0670N | ○ |
| **6.80** | 0/-0.015 | 8 | 138 | 148 | 185 | 34 | 20 x D | 3520HL0680N | ○ |
| **6.90** | 0/-0.015 | 8 | 140 | 150 | 190 | 34.5 | 20 x D | 3520HL0690N | ○ |

* Ø1÷Ø3 = 3520 SUH MINI page 152

● stock standard ○ non-standard stock ▽ stock exhaustion

# 3520HL

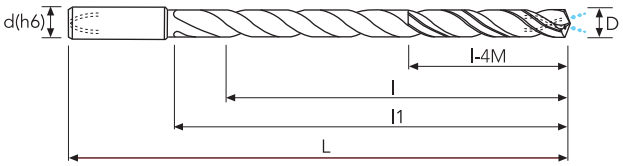
4-margin lands, polished flutes

20XD | OSAWA NORM | HL | MG PV250 | 135° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | l-4M | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|
| **7.00** | 0/-0.015 | 8 | 142 | 153 | 195 | 35 | 20 x D | 3520HL0700N | ● |
| **7.10** | 0/-0.015 | 8 | 144 | 155 | 195 | 35.5 | 20 x D | 3520HL0710N | ○ |
| **7.20** | 0/-0.015 | 8 | 146 | 157 | 200 | 36 | 20 x D | 3520HL0720N | ○ |
| **7.30** | 0/-0.015 | 8 | 148 | 159 | 200 | 36.5 | 20 x D | 3520HL0730N | ○ |
| **7.40** | 0/-0.015 | 8 | 150 | 161 | 200 | 37 | 20 x D | 3520HL0740N | ○ |
| **7.50** | 0/-0.015 | 8 | 152 | 163 | 205 | 37.5 | 20 x D | 3520HL0750N | ● |
| **7.60** | 0/-0.015 | 8 | 154 | 165 | 205 | 38 | 20 x D | 3520HL0760N | ○ |
| **7.70** | 0/-0.015 | 8 | 156 | 168 | 210 | 38.5 | 20 x D | 3520HL0770N | ○ |
| **7.80** | 0/-0.015 | 8 | 158 | 170 | 210 | 39 | 20 x D | 3520HL0780N | ○ |
| **7.90** | 0/-0.015 | 8 | 160 | 172 | 215 | 39.5 | 20 x D | 3520HL0790N | ○ |
| **8.00** | 0/-0.015 | 8 | 162 | 174 | 215 | 40 | 20 x D | 3520HL0800N | ● |
| **8.10** | 0/-0.015 | 10 | 164 | 176 | 220 | 40.5 | 20 x D | 3520HL0810N | ○ |
| **8.20** | 0/-0.015 | 10 | 166 | 178 | 220 | 41 | 20 x D | 3520HL0820N | ○ |
| **8.30** | 0/-0.015 | 10 | 168 | 180 | 225 | 41.5 | 20 x D | 3520HL0830N | ○ |
| **8.40** | 0/-0.015 | 10 | 170 | 183 | 225 | 42 | 20 x D | 3520HL0840N | ○ |
| **8.50** | 0/-0.015 | 10 | 172 | 185 | 230 | 42.5 | 20 x D | 3520HL0850N | ● |
| **8.60** | 0/-0.015 | 10 | 174 | 187 | 230 | 43 | 20 x D | 3520HL0860N | ○ |
| **8.70** | 0/-0.015 | 10 | 176 | 189 | 230 | 43.5 | 20 x D | 3520HL0870N | ○ |
| **8.80** | 0/-0.015 | 10 | 178 | 191 | 235 | 44 | 20 x D | 3520HL0880N | ○ |
| **8.90** | 0/-0.015 | 10 | 180 | 193 | 235 | 44.5 | 20 x D | 3520HL0890N | ○ |
| **9.00** | 0/-0.015 | 10 | 182 | 196 | 240 | 45 | 20 x D | 3520HL0900N | ● |
| **9.10** | 0/-0.015 | 10 | 184 | 198 | 240 | 45.5 | 20 x D | 3520HL0910N | ○ |
| **9.20** | 0/-0.015 | 10 | 186 | 200 | 245 | 46 | 20 x D | 3520HL0920N | ○ |
| **9.30** | 0/-0.015 | 10 | 188 | 202 | 245 | 46.5 | 20 x D | 3520HL0930N | ○ |
| **9.40** | 0/-0.015 | 10 | 190 | 204 | 245 | 47 | 20 x D | 3520HL0940N | ○ |
| **9.50** | 0/-0.015 | 10 | 192 | 206 | 250 | 47.5 | 20 x D | 3520HL0950N | ● |
| **9.60** | 0/-0.015 | 10 | 194 | 208 | 250 | 48 | 20 x D | 3520HL0960N | ○ |
| **9.70** | 0/-0.015 | 10 | 196 | 211 | 255 | 48.5 | 20 x D | 3520HL0970N | ○ |
| **9.80** | 0/-0.015 | 10 | 198 | 213 | 255 | 49 | 20 x D | 3520HL0980N | ○ |
| **9.90** | 0/-0.015 | 10 | 200 | 215 | 260 | 49.5 | 20 x D | 3520HL0990N | ○ |
| **10.00** | 0/-0.015 | 10 | 202 | 217 | 260 | 50 | 20 x D | 3520HL1000N | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 3520HL

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **65÷85** | **50÷70** | **40÷60** | **35÷55** | **40÷50** | **30÷40** |
| Ø RUN OUT <0.02mm | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| | **3.0** | 0.044 | 0.043 | 0.045 | 0.044 | 0.043 | 0.035 |
| | **3.5** | 0.054 | 0.053 | 0.054 | 0.053 | 0.052 | 0.042 |
| | **4.0** | 0.065 | 0.063 | 0.065 | 0.064 | 0.063 | 0.050 |
| | **4.5** | 0.075 | 0.075 | 0.077 | 0.076 | 0.072 | 0.057 |
| | **5.0** | 0.085 | 0.086 | 0.088 | 0.086 | 0.084 | 0.065 |
| | **5.5** | 0.098 | 0.097 | 0.102 | 0.100 | 0.097 | 0.075 |
| | **6.0** | 0.111 | 0.109 | 0.112 | 0.110 | 0.107 | 0.086 |
| | **6.5** | 0.125 | 0.123 | 0.130 | 0.128 | 0.120 | 0.098 |
| | **7.0** | 0.138 | 0.137 | 0.140 | 0.138 | 0.135 | 0.105 |
| | **7.5** | 0.151 | 0.152 | 0.156 | 0.154 | 0.145 | 0.121 |
| | **8.0** | 0.171 | 0.169 | 0.175 | 0.173 | 0.165 | 0.131 |
| | **8.5** | 0.177 | 0.172 | 0.179 | 0.176 | 0.171 | 0.137 |
| | **9.0** | 0.177 | 0.183 | 0.183 | 0.180 | 0.178 | 0.133 |
| | **9.5** | 0.186 | 0.186 | 0.189 | 0.187 | 0.182 | 0.139 |
| | **10.0** | 0.189 | 0.190 | 0.196 | 0.194 | 0.188 | 0.146 |

| | Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **40÷50** | **40÷50** | **35÷45** | | | |
| Ø RUN OUT <0.02mm | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| | **3.0** | 0.043 | 0.039 | 0.031 | | | |
| | **3.5** | 0.052 | 0.048 | 0.038 | | | |
| | **4.0** | 0.063 | 0.057 | 0.046 | | | |
| | **4.5** | 0.072 | 0.066 | 0.053 | | | |
| | **5.0** | 0.084 | 0.077 | 0.061 | | | |
| | **5.5** | 0.097 | 0.088 | 0.071 | | | |
| | **6.0** | 0.107 | 0.098 | 0.080 | | | |
| | **6.5** | 0.120 | 0.110 | 0.088 | | | |
| | **7.0** | 0.135 | 0.123 | 0.099 | | | |
| | **7.5** | 0.145 | 0.132 | 0.106 | | | |
| | **8.0** | 0.165 | 0.150 | 0.120 | | | |
| | **8.5** | 0.171 | 0.155 | 0.124 | | | |
| | **9.0** | 0.178 | 0.161 | 0.128 | | | |
| | **9.5** | 0.182 | 0.165 | 0.132 | | | |
| | **10.0** | 0.188 | 0.171 | 0.136 | | | |

*during the exit phase the use of external coolant supply is recommended to keep the tool and the workpiece cooled and lubricated to avoid failures due to overheating.

*nella fase di uscita, per evitare il grippaggio causa surriscaldamento, è necessario usare l'adduzione esterna del refrigerante per mantenere raffreddati e lubrificati l'utensile ed il pezzo in lavorazione.

*beim Herausfahren des Bohrers aus der Bohrung, muss beachtet werden, um das Einklemmen wegen Überhitzung zu verhindern, dass von Aussen Kühlmittel zugeführt wird um das Werkzeug und das Teil zu Kühlen und zu Schmieren.

*en phase de sortie, pour éviter le grippage dû à une surchauffe, il est nécessaire d'utiliser l'arrosage externe pour maintenir l'outil et la pièce refroidis et lubrifiés.

*en la fase de salida, para evitar el bloqueo debido al sobrecalentamiento, es necesario usar la aducción externa del refrigerante para mantener enfriadas y lubricadas la herramienta y la pieza.

*на этапе выхода, чтобы избежать заклинивания из-за перегрева, необходимо использовать внешний подвод СОЖ, чтобы инструмент и заготовка охлаждались и смазывались.

CUTTING PARAMETERS

# 3520HL




| Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| Vc (m/min) | **60÷80** | **55÷75** | **40÷60** | **40÷60** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3.0** | 0.047 | 0.045 | 0.047 | 0.047 | | |
| **3.5** | 0.057 | 0.055 | 0.057 | 0.056 | | |
| **4.0** | 0.067 | 0.065 | 0.068 | 0.067 | | |
| **4.5** | 0.079 | 0.077 | 0.081 | 0.079 | | |
| **5.0** | 0.092 | 0.089 | 0.092 | 0.090 | | |
| **5.5** | 0.103 | 0.101 | 0.106 | 0.105 | | |
| **6.0** | 0.116 | 0.112 | 0.117 | 0.115 | | |
| **6.5** | 0.130 | 0.127 | 0.135 | 0.133 | | |
| **7.0** | 0.146 | 0.144 | 0.146 | 0.144 | | |
| **7.5** | 0.163 | 0.158 | 0.163 | 0.160 | | |
| **8.0** | 0.178 | 0.173 | 0.182 | 0.180 | | |
| **8.5** | 0.185 | 0.175 | 0.186 | 0.183 | | |
| **9.0** | 0.186 | 0.184 | 0.190 | 0.188 | | |
| **9.5** | 0.196 | 0.188 | 0.195 | 0.193 | | |
| **10.0** | 0.200 | 0.191 | 0.200 | 0.199 | | |




| Material Group ISO 513 | N1 | N2 | N3 N4 | | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **115÷135** | **95÷115** | **85÷105** | | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| **3.0** | 0.058 | 0.057 | 0.056 | | | |
| **3.5** | 0.071 | 0.070 | 0.068 | | | |
| **4.0** | 0.084 | 0.083 | 0.081 | | | |
| **4.5** | 0.098 | 0.096 | 0.095 | | | |
| **5.0** | 0.114 | 0.111 | 0.110 | | | |
| **5.5** | 0.129 | 0.127 | 0.125 | | | |
| **6.0** | 0.147 | 0.142 | 0.141 | | | |
| **6.5** | 0.163 | 0.160 | 0.158 | | | |
| **7.0** | 0.182 | 0.177 | 0.177 | | | |
| **7.5** | 0.201 | 0.198 | 0.194 | | | |
| **8.0** | 0.222 | 0.217 | 0.214 | | | |
| **8.5** | 0.229 | 0.222 | 0.220 | | | |
| **9.0** | 0.238 | 0.232 | 0.226 | | | |
| **9.5** | 0.242 | 0.238 | 0.233 | | | |
| **10.0** | 0.253 | 0.246 | 0.241 | | | |

CUTTING PARAMETERS

# 3520HL




| Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| Vc (m/min) | **24÷28** | **20÷25** | **28÷32** | **25÷30** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3.0** | 0.037 | 0.030 | 0.050 | 0.044 | | |
| **3.5** | 0.044 | 0.037 | 0.058 | 0.052 | | |
| **4.0** | 0.052 | 0.045 | 0.069 | 0.063 | | |
| **4.5** | 0.062 | 0.050 | 0.081 | 0.070 | | |
| **5.0** | 0.069 | 0.056 | 0.093 | 0.080 | | |
| **5.5** | 0.078 | 0.063 | 0.109 | 0.094 | | |
| **6.0** | 0.093 | 0.071 | 0.129 | 0.113 | | |
| **6.5** | 0.102 | 0.077 | 0.142 | 0.123 | | |
| **7.0** | 0.112 | 0.083 | 0.157 | 0.136 | | |
| **7.5** | 0.125 | 0.095 | 0.171 | 0.150 | | |
| **8.0** | 0.129 | 0.110 | 0.188 | 0.167 | | |
| **8.5** | 0.139 | 0.110 | 0.198 | 0.163 | | |
| **9.0** | 0.150 | 0.122 | 0.192 | 0.173 | | |
| **9.5** | 0.145 | 0.117 | 0.205 | 0.168 | | |
| **10.0** | 0.156 | 0.125 | 0.200 | 0.180 | | |

*during the exit phase the use of external coolant supply is recommended to keep the tool and the workpiece cooled and lubricated to avoid failures due to overheating.

*nella fase di uscita, per evitare il grippaggio causa surriscaldamento, è necessario usare l'adduzione esterna del refrigerante per mantenere raffreddati e lubrificati l'utensile ed il pezzo in lavorazione.

*beim Herausfahren des Bohrers aus der Bohrung, muss beachtet werden, um das Einklemmen wegen Überhitzung zu verhindern, dass von Aussen Kühlmittel zugeführt wird um das Werkzeug und das Teil zu Kühlen und zu Schmieren.

*en phase de sortie, pour éviter le grippage dû à une surchauffe, il est nécessaire d'utiliser l'arrosage externe pour maintenir l'outil et la pièce refroidis et lubrifiés.

*en la fase de salida, para evitar el bloqueo debido al sobrecalentamiento, es necesario usar la aducción externa del refrigerante para mantener enfriadas y lubricadas la herramienta y la pieza.

*на этапе выхода, чтобы избежать заклинивания из-за перегрева, необходимо использовать внешний подвод СОЖ, чтобы инструмент и заготовка охлаждались и смазывались.

# 3525HL

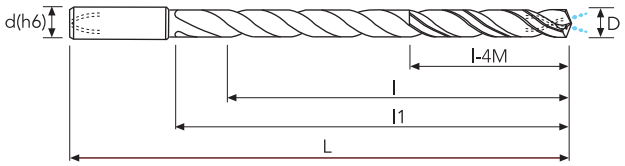
4-margin lands, polished flutes

25XD | OSAWA NORM | HL | MG PV250 | 135° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | l-4M | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|
| **3.10*** | 0/-0.012 | 4 | 79 | 83 | 120 | 15.5 | 25 x D | 3525HL0310N | ○ |
| **3.20** | 0/-0.012 | 4 | 81 | 86 | 120 | 16 | 25 x D | 3525HL0320N | ○ |
| **3.30** | 0/-0.012 | 4 | 84 | 88 | 125 | 16.5 | 25 x D | 3525HL0330N | ○ |
| **3.40** | 0/-0.012 | 4 | 86 | 91 | 125 | 17 | 25 x D | 3525HL0340N | ○ |
| **3.50** | 0/-0.012 | 4 | 89 | 94 | 130 | 17.5 | 25 x D | 3525HL0350N | ● |
| **3.60** | 0/-0.012 | 4 | 91 | 96 | 130 | 18 | 25 x D | 3525HL0360N | ○ |
| **3.70** | 0/-0.012 | 4 | 94 | 99 | 135 | 18.5 | 25 x D | 3525HL0370N | ○ |
| **3.80** | 0/-0.012 | 4 | 96 | 102 | 135 | 19 | 25 x D | 3525HL0380N | ○ |
| **3.90** | 0/-0.012 | 4 | 99 | 104 | 140 | 19.5 | 25 x D | 3525HL0390N | ○ |
| **4.00** | 0/-0.012 | 4 | 101 | 107 | 140 | 20 | 25 x D | 3525HL0400N | ● |
| **4.10** | 0/-0.012 | 5 | 104 | 110 | 145 | 20.5 | 25 x D | 3525HL0410N | ○ |
| **4.20** | 0/-0.012 | 5 | 106 | 112 | 150 | 21 | 25 x D | 3525HL0420N | ○ |
| **4.30** | 0/-0.012 | 5 | 109 | 115 | 150 | 21.5 | 25 x D | 3525HL0430N | ○ |
| **4.40** | 0/-0.012 | 5 | 111 | 118 | 155 | 22 | 25 x D | 3525HL0440N | ○ |
| **4.50** | 0/-0.012 | 5 | 114 | 120 | 155 | 22.5 | 25 x D | 3525HL0450N | ● |
| **4.60** | 0/-0.012 | 5 | 116 | 123 | 160 | 23 | 25 x D | 3525HL0460N | ○ |
| **4.70** | 0/-0.012 | 5 | 119 | 126 | 165 | 23.5 | 25 x D | 3525HL0470N | ○ |
| **4.80** | 0/-0.012 | 5 | 121 | 128 | 165 | 24 | 25 x D | 3525HL0480N | ○ |
| **4.90** | 0/-0.012 | 5 | 124 | 131 | 170 | 24.5 | 25 x D | 3525HL0490N | ○ |
| **5.00** | 0/-0.012 | 5 | 126 | 134 | 170 | 25 | 25 x D | 3525HL0500N | ● |
| **5.10** | 0/-0.012 | 6 | 129 | 136 | 175 | 25.5 | 25 x D | 3525HL0510N | ○ |
| **5.20** | 0/-0.012 | 6 | 131 | 139 | 180 | 26 | 25 x D | 3525HL0520N | ○ |
| **5.30** | 0/-0.012 | 6 | 134 | 141 | 180 | 26.5 | 25 x D | 3525HL0530N | ○ |
| **5.40** | 0/-0.012 | 6 | 136 | 144 | 185 | 27 | 25 x D | 3525HL0540N | ○ |
| **5.50** | 0/-0.012 | 6 | 139 | 147 | 185 | 27.5 | 25 x D | 3525HL0550N | ● |
| **5.60** | 0/-0.012 | 6 | 141 | 149 | 190 | 28 | 25 x D | 3525HL0560N | ○ |
| **5.70** | 0/-0.012 | 6 | 144 | 152 | 190 | 28.5 | 25 x D | 3525HL0570N | ○ |
| **5.80** | 0/-0.012 | 6 | 146 | 155 | 195 | 29 | 25 x D | 3525HL0580N | ○ |
| **5.90** | 0/-0.012 | 6 | 149 | 157 | 195 | 29.5 | 25 x D | 3525HL0590N | ○ |
| **6.00** | 0/-0.012 | 6 | 151 | 160 | 200 | 30 | 25 x D | 3525HL0600N | ● |
| **6.10** | 0/-0.015 | 8 | 154 | 163 | 200 | 30.5 | 25 x D | 3525HL0610N | ○ |
| **6.20** | 0/-0.015 | 8 | 156 | 165 | 205 | 31 | 25 x D | 3525HL0620N | ○ |
| **6.30** | 0/-0.015 | 8 | 159 | 168 | 205 | 31.5 | 25 x D | 3525HL0630N | ○ |
| **6.40** | 0/-0.015 | 8 | 161 | 171 | 210 | 32 | 25 x D | 3525HL0640N | ○ |
| **6.50** | 0/-0.015 | 8 | 164 | 173 | 210 | 32.5 | 25 x D | 3525HL0650N | ● |
| **6.60** | 0/-0.015 | 8 | 166 | 176 | 215 | 33 | 25 x D | 3525HL0660N | ○ |
| **6.70** | 0/-0.015 | 8 | 169 | 179 | 220 | 33.5 | 25 x D | 3525HL0670N | ○ |
| **6.80** | 0/-0.015 | 8 | 171 | 181 | 220 | 34 | 25 x D | 3525HL0680N | ○ |
| **6.90** | 0/-0.015 | 8 | 174 | 184 | 225 | 34.5 | 25 x D | 3525HL0690N | ○ |

* Ø1÷Ø3 = 3525 SUH MINI page 156

● stock standard ○ non-standard stock ▽ stock exhaustion

# 3525HL

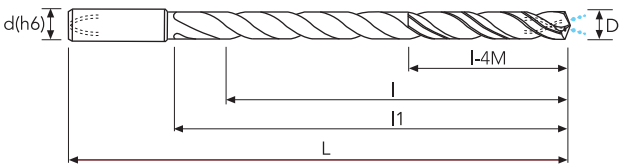
4-margin lands, polished flutes

25XD | OSAWA NORM | HL | MG PV250 | 135° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | l-4M | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|
| **7.00** | 0/-0.015 | 8 | 176 | 187 | 230 | 35 | 25 x D | 3525HL0700N | ● |
| **7.10** | 0/-0.015 | 8 | 179 | 189 | 230 | 35.5 | 25 x D | 3525HL0710N | ○ |
| **7.20** | 0/-0.015 | 8 | 181 | 192 | 235 | 36 | 25 x D | 3525HL0720N | ○ |
| **7.30** | 0/-0.015 | 8 | 184 | 194 | 235 | 36.5 | 25 x D | 3525HL0730N | ○ |
| **7.40** | 0/-0.015 | 8 | 186 | 197 | 240 | 37 | 25 x D | 3525HL0740N | ○ |
| **7.50** | 0/-0.015 | 8 | 189 | 200 | 240 | 37.5 | 25 x D | 3525HL0750N | ● |
| **7.60** | 0/-0.015 | 8 | 191 | 202 | 245 | 38 | 25 x D | 3525HL0760N | ○ |
| **7.70** | 0/-0.015 | 8 | 194 | 205 | 245 | 38.5 | 25 x D | 3525HL0770N | ○ |
| **7.80** | 0/-0.015 | 8 | 196 | 208 | 250 | 39 | 25 x D | 3525HL0780N | ○ |
| **7.90** | 0/-0.015 | 8 | 199 | 210 | 250 | 39.5 | 25 x D | 3525HL0790N | ○ |
| **8.00** | 0/-0.015 | 8 | 201 | 213 | 255 | 40 | 25 x D | 3525HL0800N | ● |
| **8.10** | 0/-0.015 | 10 | 204 | 216 | 260 | 40.5 | 25 x D | 3525HL0810N | ○ |
| **8.20** | 0/-0.015 | 10 | 206 | 218 | 260 | 41 | 25 x D | 3525HL0820N | ○ |
| **8.30** | 0/-0.015 | 10 | 209 | 221 | 265 | 41.5 | 25 x D | 3525HL0830N | ○ |
| **8.40** | 0/-0.015 | 10 | 211 | 224 | 265 | 42 | 25 x D | 3525HL0840N | ○ |
| **8.50** | 0/-0.015 | 10 | 214 | 226 | 270 | 42.5 | 25 x D | 3525HL0850N | ○ |
| **8.60** | 0/-0.015 | 10 | 216 | 229 | 270 | 43 | 25 x D | 3525HL0860N | ● |
| **8.70** | 0/-0.015 | 10 | 219 | 232 | 275 | 43.5 | 25 x D | 3525HL0870N | ○ |
| **8.80** | 0/-0.015 | 10 | 221 | 234 | 275 | 44 | 25 x D | 3525HL0880N | ○ |
| **8.90** | 0/-0.015 | 10 | 224 | 237 | 280 | 44.5 | 25 x D | 3525HL0890N | ○ |
| **9.00** | 0/-0.015 | 10 | 226 | 240 | 285 | 45 | 25 x D | 3525HL0900N | ● |
| **9.10** | 0/-0.015 | 10 | 229 | 242 | 285 | 45.5 | 25 x D | 3525HL0910N | ○ |
| **9.20** | 0/-0.015 | 10 | 231 | 245 | 290 | 46 | 25 x D | 3525HL0920N | ○ |
| **9.30** | 0/-0.015 | 10 | 234 | 247 | 290 | 46.5 | 25 x D | 3525HL0930N | ○ |
| **9.40** | 0/-0.015 | 10 | 236 | 250 | 295 | 47 | 25 x D | 3525HL0940N | ○ |
| **9.50** | 0/-0.015 | 10 | 239 | 253 | 295 | 47.5 | 25 x D | 3525HL0950N | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 3525HL




| Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|
| Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| Vc (m/min) | **60÷80** | **45÷65** | **40÷55** | **35÷50** | **35÷45** | **25÷35** |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| **3.0** | 0.040 | 0.041 | 0.042 | 0.041 | 0.035 | 0.037 |
| **3.5** | 0.049 | 0.050 | 0.051 | 0.050 | 0.044 | 0.045 |
| **4.0** | 0.059 | 0.060 | 0.061 | 0.060 | 0.053 | 0.054 |
| **4.5** | 0.070 | 0.071 | 0.072 | 0.071 | 0.063 | 0.062 |
| **5.0** | 0.082 | 0.082 | 0.086 | 0.084 | 0.072 | 0.070 |
| **5.5** | 0.094 | 0.094 | 0.098 | 0.097 | 0.081 | 0.081 |
| **6.0** | 0.107 | 0.106 | 0.109 | 0.107 | 0.096 | 0.095 |
| **6.5** | 0.120 | 0.118 | 0.124 | 0.122 | 0.104 | 0.103 |
| **7.0** | 0.135 | 0.132 | 0.141 | 0.139 | 0.119 | 0.119 |
| **7.5** | 0.153 | 0.148 | 0.152 | 0.150 | 0.130 | 0.130 |
| **8.0** | 0.169 | 0.167 | 0.173 | 0.170 | 0.150 | 0.143 |
| **8.5** | 0.177 | 0.167 | 0.174 | 0.171 | 0.153 | 0.139 |
| **9.0** | 0.179 | 0.168 | 0.175 | 0.172 | 0.156 | 0.146 |
| **9.5** | 0.187 | 0.167 | 0.176 | 0.174 | 0.147 | 0.150 |




| Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **35÷45** | **35÷45** | **25÷35** | | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| **3.0** | 0.035 | 0.035 | 0.036 | | | |
| **3.5** | 0.044 | 0.043 | 0.044 | | | |
| **4.0** | 0.053 | 0.051 | 0.052 | | | |
| **4.5** | 0.063 | 0.061 | 0.061 | | | |
| **5.0** | 0.072 | 0.071 | 0.069 | | | |
| **5.5** | 0.081 | 0.083 | 0.083 | | | |
| **6.0** | 0.096 | 0.095 | 0.092 | | | |
| **6.5** | 0.104 | 0.103 | 0.105 | | | |
| **7.0** | 0.119 | 0.118 | 0.114 | | | |
| **7.5** | 0.130 | 0.128 | 0.124 | | | |
| **8.0** | 0.150 | 0.141 | 0.136 | | | |
| **8.5** | 0.153 | 0.144 | 0.141 | | | |
| **9.0** | 0.156 | 0.147 | 0.146 | | | |
| **9.5** | 0.147 | 0.147 | 0.149 | | | |

*during the exit phase the use of external coolant supply is recommended to keep the tool and the workpiece cooled and lubricated to avoid failures due to overheating.

*nella fase di uscita, per evitare il grippaggio causa surriscaldamento, è necessario usare l'adduzione esterna del refrigerante per mantenere raffreddati e lubrificati l'utensile ed il pezzo in lavorazione.

*beim Herausfahren des Bohrers aus der Bohrung, muss beachtet werden, um das Einklemmen wegen Überhitzung zu verhindern, dass von Aussen Kühlmittel zugeführt wird um das Werkzeug und das Teil zu Kühlen und zu Schmieren.

*en phase de sortie, pour éviter le grippage dû à une surchauffe, il est nécessaire d'utiliser l'arrosage externe pour maintenir l'outil et la pièce refroidis et lubrifiés.

*en la fase de salida, para evitar el bloqueo debido al sobrecalentamiento, es necesario usar la aducción externa del refrigerante para mantener enfriadas y lubricadas la herramienta y la pieza.

*на этапе выхода, чтобы избежать заклинивания из-за перегрева, необходимо использовать внешний подвод СОЖ, чтобы инструмент и заготовка охлаждались и смазывались.

# 3525HL




| Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| Vc (m/min) | **55÷75** | **45÷65** | **35÷55** | **35÷55** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3.0** | 0.044 | 0.046 | 0.044 | 0.044 | | |
| **3.5** | 0.053 | 0.056 | 0.054 | 0.053 | | |
| **4.0** | 0.063 | 0.067 | 0.065 | 0.064 | | |
| **4.5** | 0.074 | 0.079 | 0.076 | 0.075 | | |
| **5.0** | 0.088 | 0.091 | 0.091 | 0.089 | | |
| **5.5** | 0.099 | 0.105 | 0.103 | 0.102 | | |
| **6.0** | 0.113 | 0.119 | 0.115 | 0.113 | | |
| **6.5** | 0.127 | 0.133 | 0.130 | 0.128 | | |
| **7.0** | 0.140 | 0.148 | 0.148 | 0.146 | | |
| **7.5** | 0.158 | 0.165 | 0.159 | 0.157 | | |
| **8.0** | 0.173 | 0.183 | 0.180 | 0.178 | | |
| **8.5** | 0.172 | 0.184 | 0.182 | 0.179 | | |
| **9.0** | 0.178 | 0.184 | 0.183 | 0.181 | | |
| **9.5** | 0.177 | 0.185 | 0.185 | 0.182 | | |




| Material Group ISO 513 | N1 | N2 | N3 N4 | | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **105÷125** | **85÷105** | **75÷95** | | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| **3.0** | 0.057 | 0.055 | 0.054 | | | |
| **3.5** | 0.070 | 0.068 | 0.066 | | | |
| **4.0** | 0.083 | 0.081 | 0.079 | | | |
| **4.5** | 0.097 | 0.095 | 0.093 | | | |
| **5.0** | 0.113 | 0.110 | 0.108 | | | |
| **5.5** | 0.129 | 0.126 | 0.125 | | | |
| **6.0** | 0.146 | 0.143 | 0.139 | | | |
| **6.5** | 0.164 | 0.160 | 0.157 | | | |
| **7.0** | 0.184 | 0.179 | 0.175 | | | |
| **7.5** | 0.201 | 0.198 | 0.194 | | | |
| **8.0** | 0.224 | 0.219 | 0.216 | | | |
| **8.5** | 0.229 | 0.221 | 0.218 | | | |
| **9.0** | 0.229 | 0.224 | 0.221 | | | |
| **9.5** | 0.235 | 0.225 | 0.225 | | | |

CUTTING PARAMETERS

# 3525HL




| Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| Vc (m/min) | **24÷28** | **20÷25** | **28÷32** | **25÷30** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3.0** | 0.033 | 0.026 | 0.047 | 0.041 | | |
| **3.5** | 0.040 | 0.033 | 0.055 | 0.048 | | |
| **4.0** | 0.048 | 0.040 | 0.065 | 0.058 | | |
| **4.5** | 0.057 | 0.044 | 0.077 | 0.066 | | |
| **5.0** | 0.064 | 0.050 | 0.088 | 0.075 | | |
| **5.5** | 0.072 | 0.057 | 0.104 | 0.089 | | |
| **6.0** | 0.087 | 0.064 | 0.124 | 0.106 | | |
| **6.5** | 0.095 | 0.069 | 0.136 | 0.117 | | |
| **7.0** | 0.104 | 0.075 | 0.150 | 0.129 | | |
| **7.5** | 0.117 | 0.086 | 0.164 | 0.142 | | |
| **8.0** | 0.121 | 0.100 | 0.181 | 0.158 | | |
| **8.5** | 0.127 | 0.095 | 0.192 | 0.154 | | |
| **9.0** | 0.135 | 0.100 | 0.188 | 0.164 | | |
| **9.5** | 0.130 | 0.100 | 0.191 | 0.155 | | |

*during the exit phase the use of external coolant supply is recommended to keep the tool and the workpiece cooled and lubricated to avoid failures due to overheating.

*nella fase di uscita, per evitare il grippaggio causa surriscaldamento, è necessario usare l'adduzione esterna del refrigerante per mantenere raffreddati e lubrificati l'utensile ed il pezzo in lavorazione.

*beim Herausfahren des Bohrers aus der Bohrung, muss beachtet werden, um das Einklemmen wegen Überhitzung zu verhindern, dass von Aussen Kühlmittel zugeführt wird um das Werkzeug und das Teil zu Kühlen und zu Schmieren.

*en phase de sortie, pour éviter le grippage dû à une surchauffe, il est nécessaire d'utiliser l'arrosage externe pour maintenir l'outil et la pièce refroidis et lubrifiés.

*en la fase de salida, para evitar el bloqueo debido al sobrecalentamiento, es necesario usar la aducción externa del refrigerante para mantener enfriadas y lubricadas la herramienta y la pieza.

*на этапе выхода, чтобы избежать заклинивания из-за перегрева, необходимо использовать внешний подвод СОЖ, чтобы инструмент и заготовка охлаждались и смазывались.

# 3530HL

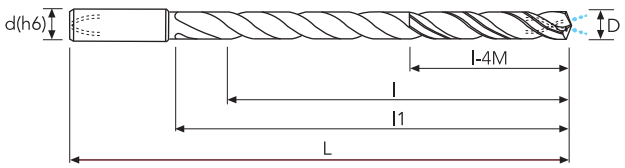
4-margin lands, polished flutes

30XD | OSAWA NORM | HL | MG PV250 | 135° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | l-4M | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|
| **3.10*** | 0/-0.012 | 4 | 94 | 99 | 135 | 15.5 | 30 x D | 3530HL0310N | ○ |
| **3.20** | 0/-0.012 | 4 | 97 | 102 | 135 | 16 | 30 x D | 3530HL0320N | ○ |
| **3.30** | 0/-0.012 | 4 | 100 | 105 | 140 | 16.5 | 30 x D | 3530HL0330N | ○ |
| **3.40** | 0/-0.012 | 4 | 103 | 108 | 145 | 17 | 30 x D | 3530HL0340N | ○ |
| **3.50** | 0/-0.012 | 4 | 106 | 111 | 145 | 17.5 | 30 x D | 3530HL0350N | ● |
| **3.60** | 0/-0.012 | 4 | 109 | 114 | 150 | 18 | 30 x D | 3530HL0360N | ○ |
| **3.70** | 0/-0.012 | 4 | 112 | 118 | 155 | 18.5 | 30 x D | 3530HL0370N | ○ |
| **3.80** | 0/-0.012 | 4 | 115 | 121 | 155 | 19 | 30 x D | 3530HL0380N | ○ |
| **3.90** | 0/-0.012 | 4 | 118 | 124 | 160 | 19.5 | 30 x D | 3530HL0390N | ○ |
| **4.00** | 0/-0.012 | 4 | 121 | 127 | 160 | 20 | 30 x D | 3530HL0400N | ● |
| **4.10** | 0/-0.012 | 5 | 124 | 130 | 165 | 20.5 | 30 x D | 3530HL0410N | ○ |
| **4.20** | 0/-0.012 | 5 | 127 | 133 | 170 | 21 | 30 x D | 3530HL0420N | ○ |
| **4.30** | 0/-0.012 | 5 | 130 | 136 | 175 | 21.5 | 30 x D | 3530HL0430N | ○ |
| **4.40** | 0/-0.012 | 5 | 133 | 140 | 175 | 22 | 30 x D | 3530HL0440N | ○ |
| **4.50** | 0/-0.012 | 5 | 136 | 143 | 180 | 22.5 | 30 x D | 3530HL0450N | ● |
| **4.60** | 0/-0.012 | 5 | 139 | 146 | 185 | 23 | 30 x D | 3530HL0460N | ○ |
| **4.70** | 0/-0.012 | 5 | 142 | 149 | 185 | 23.5 | 30 x D | 3530HL0470N | ○ |
| **4.80** | 0/-0.012 | 5 | 145 | 152 | 190 | 24 | 30 x D | 3530HL0480N | ○ |
| **4.90** | 0/-0.012 | 5 | 148 | 155 | 190 | 24.5 | 30 x D | 3530HL0490N | ○ |
| **5.00** | 0/-0.012 | 5 | 151 | 159 | 195 | 25 | 30 x D | 3530HL0500N | ● |
| **5.10** | 0/-0.012 | 6 | 154 | 162 | 200 | 25.5 | 30 x D | 3530HL0510N | ○ |
| **5.20** | 0/-0.012 | 6 | 157 | 165 | 205 | 26 | 30 x D | 3530HL0520N | ○ |
| **5.30** | 0/-0.012 | 6 | 160 | 168 | 205 | 26.5 | 30 x D | 3530HL0530N | ○ |
| **5.40** | 0/-0.012 | 6 | 163 | 171 | 210 | 27 | 30 x D | 3530HL0540N | ○ |
| **5.50** | 0/-0.012 | 6 | 166 | 174 | 215 | 27.5 | 30 x D | 3530HL0550N | ● |
| **5.60** | 0/-0.012 | 6 | 169 | 177 | 215 | 28 | 30 x D | 3530HL0560N | ○ |
| **5.70** | 0/-0.012 | 6 | 172 | 181 | 220 | 28.5 | 30 x D | 3530HL0570N | ○ |
| **5.80** | 0/-0.012 | 6 | 175 | 184 | 225 | 29 | 30 x D | 3530HL0580N | ○ |
| **5.90** | 0/-0.012 | 6 | 178 | 187 | 225 | 29.5 | 30 x D | 3530HL0590N | ○ |
| **6.00** | 0/-0.012 | 6 | 181 | 190 | 230 | 30 | 30 x D | 3530HL0600N | ● |
| **6.10** | 0/-0.015 | 8 | 184 | 193 | 230 | 30.5 | 30 x D | 3530HL0610N | ○ |
| **6.20** | 0/-0.015 | 8 | 187 | 196 | 135 | 31 | 30 x D | 3530HL0620N | ○ |
| **6.30** | 0/-0.015 | 8 | 190 | 199 | 240 | 31.5 | 30 x D | 3530HL0630N | ○ |
| **6.40** | 0/-0.015 | 8 | 193 | 203 | 240 | 32 | 30 x D | 3530HL0640N | ○ |
| **6.50** | 0/-0.015 | 8 | 196 | 206 | 245 | 32.5 | 30 x D | 3530HL0650N | ● |
| **6.60** | 0/-0.015 | 8 | 199 | 209 | 250 | 33 | 30 x D | 3530HL0660N | ○ |
| **6.70** | 0/-0.015 | 8 | 202 | 212 | 250 | 33.5 | 30 x D | 3530HL0670N | ○ |
| **6.80** | 0/-0.015 | 8 | 205 | 215 | 255 | 34 | 30 x D | 3530HL0680N | ○ |
| **6.90** | 0/-0.015 | 8 | 208 | 218 | 255 | 34.5 | 30 x D | 3530HL0690N | ○ |

* Ø1÷Ø3 = 3530 SUH MINI page 160

● stock standard ○ non-standard stock ▽ stock exhaustion

# 3530HL

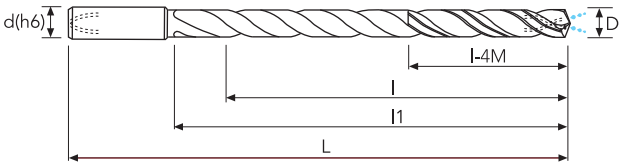
4-margin lands, polished flutes

30XD | OSAWA NORM | HL | MG PV250 | 135° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h7) | D Tol. | d(h6) | l | l1 | L | l-4M | drilling length | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|
| **7.00** | 0/-0.015 | 8 | 211 | 222 | 265 | 35 | 30 x D | 3530HL0700N | ● |
| **7.10** | 0/-0.015 | 8 | 214 | 225 | 265 | 35.5 | 30 x D | 3530HL0710N | ○ |
| **7.20** | 0/-0.015 | 8 | 217 | 228 | 270 | 36 | 30 x D | 3530HL0720N | ○ |
| **7.30** | 0/-0.015 | 8 | 220 | 231 | 270 | 36.5 | 30 x D | 3530HL0730N | ○ |
| **7.40** | 0/-0.015 | 8 | 223 | 234 | 275 | 37 | 30 x D | 3530HL0740N | ○ |
| **7.50** | 0/-0.015 | 8 | 226 | 237 | 280 | 37.5 | 30 x D | 3530HL0750N | ● |
| **7.60** | 0/-0.015 | 8 | 229 | 240 | 280 | 38 | 30 x D | 3530HL0760N | ○ |
| **7.70** | 0/-0.015 | 8 | 232 | 244 | 285 | 38.5 | 30 x D | 3530HL0770N | ○ |
| **7.80** | 0/-0.015 | 8 | 235 | 247 | 290 | 39 | 30 x D | 3530HL0780N | ○ |
| **7.90** | 0/-0.015 | 8 | 238 | 250 | 290 | 39.5 | 30 x D | 3530HL0790N | ○ |
| **8.00** | 0/-0.015 | 8 | 241 | 253 | 295 | 40 | 30 x D | 3530HL0800N | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 3530HL

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **60÷80** | **45÷65** | **40÷55** | **35÷50** | **35÷45** | **25÷35** |
|  | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| | **3.0** | 0.040 | 0.041 | 0.042 | 0.041 | 0.035 | 0.037 |
| | **3.5** | 0.049 | 0.050 | 0.051 | 0.050 | 0.044 | 0.045 |
| | **4.0** | 0.059 | 0.060 | 0.061 | 0.060 | 0.053 | 0.054 |
| | **4.5** | 0.070 | 0.071 | 0.072 | 0.071 | 0.063 | 0.062 |
| | **5.0** | 0.082 | 0.082 | 0.086 | 0.084 | 0.072 | 0.070 |
| | **5.5** | 0.094 | 0.094 | 0.098 | 0.097 | 0.081 | 0.081 |
| | **6.0** | 0.107 | 0.106 | 0.109 | 0.107 | 0.096 | 0.095 |
| | **6.5** | 0.120 | 0.118 | 0.124 | 0.122 | 0.104 | 0.103 |
| | **7.0** | 0.135 | 0.132 | 0.141 | 0.139 | 0.119 | 0.119 |
| | **7.5** | 0.153 | 0.148 | 0.152 | 0.150 | 0.130 | 0.130 |
| | **8.0** | 0.169 | 0.167 | 0.173 | 0.170 | 0.150 | 0.143 |

| | Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **35÷45** | **35÷45** | **25÷35** | | | |
|  | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| | **3.0** | 0.035 | 0.035 | 0.036 | | | |
| | **3.5** | 0.044 | 0.043 | 0.044 | | | |
| | **4.0** | 0.053 | 0.051 | 0.052 | | | |
| | **4.5** | 0.063 | 0.061 | 0.061 | | | |
| | **5.0** | 0.072 | 0.071 | 0.069 | | | |
| | **5.5** | 0.081 | 0.083 | 0.083 | | | |
| | **6.0** | 0.096 | 0.095 | 0.092 | | | |
| | **6.5** | 0.104 | 0.103 | 0.105 | | | |
| | **7.0** | 0.119 | 0.118 | 0.114 | | | |
| | **7.5** | 0.130 | 0.128 | 0.124 | | | |
| | **8.0** | 0.150 | 0.141 | 0.136 | | | |

*during the exit phase the use of external coolant supply is recommended to keep the tool and the workpiece cooled and lubricated to avoid failures due to overheating.

*nella fase di uscita, per evitare il grippaggio causa surriscaldamento, è necessario usare l'adduzione esterna del refrigerante per mantenere raffreddati e lubrificati l'utensile ed il pezzo in lavorazione.

*beim Herausfahren des Bohrers aus der Bohrung, muss beachtet werden, um das Einklemmen wegen Überhitzung zu verhindern, dass von Aussen Kühlmittel zugeführt wird um das Werkzeug und das Teil zu Kühlen und zu Schmieren.

*en phase de sortie, pour éviter le grippage dû à une surchauffe, il est nécessaire d'utiliser l'arrosage externe pour maintenir l'outil et la pièce refroidis et lubrifiés.

*en la fase de salida, para evitar el bloqueo debido al sobrecalentamiento, es necesario usar la aducción externa del refrigerante para mantener enfriadas y lubricadas la herramienta y la pieza.

*на этапе выхода, чтобы избежать заклинивания из-за перегрева, необходимо использовать внешний подвод СОЖ, чтобы инструмент и заготовка охлаждались и смазывались.

CUTTING PARAMETERS

# 3530HL




| Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| Vc (m/min) | **55÷75** | **45÷65** | **35÷55** | **35÷55** | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| **3.0** | 0.044 | 0.046 | 0.044 | 0.044 | | |
| **3.5** | 0.053 | 0.056 | 0.054 | 0.053 | | |
| **4.0** | 0.063 | 0.067 | 0.065 | 0.064 | | |
| **4.5** | 0.074 | 0.079 | 0.076 | 0.075 | | |
| **5.0** | 0.088 | 0.091 | 0.091 | 0.089 | | |
| **5.5** | 0.099 | 0.105 | 0.103 | 0.102 | | |
| **6.0** | 0.113 | 0.119 | 0.115 | 0.113 | | |
| **6.5** | 0.127 | 0.133 | 0.130 | 0.128 | | |
| **7.0** | 0.140 | 0.148 | 0.148 | 0.146 | | |
| **7.5** | 0.158 | 0.165 | 0.159 | 0.157 | | |
| **8.0** | 0.173 | 0.183 | 0.180 | 0.178 | | |




| Material Group ISO 513 | N1 | N2 | N3 N4 | | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **105÷125** | **85÷105** | **75÷95** | | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| **3.0** | 0.057 | 0.055 | 0.054 | | | |
| **3.5** | 0.070 | 0.068 | 0.066 | | | |
| **4.0** | 0.083 | 0.081 | 0.079 | | | |
| **4.5** | 0.097 | 0.095 | 0.093 | | | |
| **5.0** | 0.113 | 0.110 | 0.108 | | | |
| **5.5** | 0.129 | 0.126 | 0.125 | | | |
| **6.0** | 0.146 | 0.143 | 0.139 | | | |
| **6.5** | 0.164 | 0.160 | 0.157 | | | |
| **7.0** | 0.184 | 0.179 | 0.175 | | | |
| **7.5** | 0.201 | 0.198 | 0.194 | | | |
| **8.0** | 0.224 | 0.219 | 0.216 | | | |

# 3530HL

| | Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| | Vc (m/min) | **24÷28** | **20÷25** | **28÷32** | **25÷30** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| Ø RUN OUT <0.02mm | **3.0** | 0.033 | 0.026 | 0.047 | 0.041 | | |
| | **3.5** | 0.040 | 0.033 | 0.055 | 0.048 | | |
| | **4.0** | 0.048 | 0.040 | 0.065 | 0.058 | | |
| | **4.5** | 0.057 | 0.044 | 0.077 | 0.066 | | |
| | **5.0** | 0.064 | 0.050 | 0.088 | 0.075 | | |
| | **5.5** | 0.072 | 0.057 | 0.104 | 0.089 | | |
| | **6.0** | 0.087 | 0.064 | 0.124 | 0.106 | | |
| | **6.5** | 0.095 | 0.069 | 0.136 | 0.117 | | |
| | **7.0** | 0.104 | 0.075 | 0.150 | 0.129 | | |
| | **7.5** | 0.117 | 0.086 | 0.164 | 0.142 | | |
| | **8.0** | 0.121 | 0.100 | 0.181 | 0.158 | | |

*during the exit phase the use of external coolant supply is recommended to keep the tool and the workpiece cooled and lubricated to avoid failures due to overheating.

*nella fase di uscita, per evitare il grippaggio causa surriscaldamento, è necessario usare l'adduzione esterna del refrigerante per mantenere raffreddati e lubrificati l'utensile ed il pezzo in lavorazione.

*beim Herausfahren des Bohrers aus der Bohrung, muss beachtet werden, um das Einklemmen wegen Überhitzung zu verhindern, dass von Aussen Kühlmittel zugeführt wird um das Werkzeug und das Teil zu Kühlen und zu Schmieren.

*en phase de sortie, pour éviter le grippage dû à une surchauffe, il est nécessaire d'utiliser l'arrosage externe pour maintenir l'outil et la pièce refroidis et lubrifiés.

*en la fase de salida, para evitar el bloqueo debido al sobrecalentamiento, es necesario usar la aducción externa del refrigerante para mantener enfriadas y lubricadas la herramienta y la pieza.

*на этапе выхода, чтобы избежать заклинивания из-за перегрева, необходимо использовать внешний подвод СОЖ, чтобы инструмент и заготовка охлаждались и смазывались.





# TYPHOON HSD

## STEP DRILL FOR 90° CHAMFERING

- Chamfer drill for universal application ISO P, M, S.
- Punta svasatore per applicazione universale ISO P, M, S.
- Fasenbohrer für allgemeine Anwendungen auf ISO P, M, S.
- Fraise à chanfreiner pour application universelle ISO P, M, S.
- Broca de chaflanar universal ISO P, M, S.
- Фасочное сверло для универсального применения ISO P, M, S.

## TYPHOON HSD

STEP DRILL FOR 90° CHAMFERING





- Combined tool: boring and chamfering at the same time
- Straight edge geometry: stable cutting, produces relative small chips
- Flute design: wide flutes for better chip ejection
- Substrate and coating: specifically selected to perform on wide range of workpiece materials

- Outil combiné: alésage et chanfreinage en même temps
- Géométrie de bord droit: coupe stable, produit des copeaux relativement petits
- Conception de gougures: large gougure pour faciliter l'évacuation des copeaux
- Substrat et revêtement: spécialement sélectionnés pour fonctionner sur une large gamme de matière de pièces

- Utensile combinato: foratura e svasatura in un'unica operazione
- Tagliente diritto: garantisce stabilità e produce trucioli più corti
- Design delle gole: ampie per agevolare l'evacuazione dei trucioli
- Substrato e rivestimento: specifici per performare al meglio su una vasta gamma di materiali

- Herramienta mixta: taladrado y chaflanado al mismo tiempo
- Geometría filo recto: corte estable, produce virutas relativamente pequeñas
- Diseño canales: canales anchos para una mejor expulsión de viruta
- Sustrato y revestimiento: específicamente seleccionados para un óptimo rendimiento en una gran variedad de materiales

- Kombiwerkzeug: Bohren und Fasen in einem Arbeitsgang
- Gerade Schnittgeometrie: stabiles schneiden, erzeugt kleine Späne
- Nutenform: breite Nuten um die Späne besser abzuführen
- Substrat und Beschichtung: so ausgewählt um sehr flexibel auf unterschiedlichen Materialgruppen eingesetzt zu werden

- Комбинированное сверло: сверление и снятие фаски
- Прямая режущая кромка: гарантирует стабильность и получение более короткой стружки
- Конструкция канавки: широкая для облегчения удаления стружки
- Исходный материал  и покрытие: специально для работы с широким спектром материалов.

# 372HSD

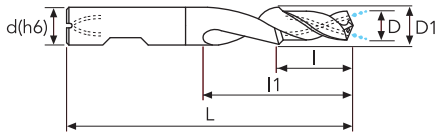
through coolant step drill for 90° chamfering,
weldon shank, universal application

3XD | OSAWA NORM | HSD | MG PV300 | 140° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | | | ★ | |

★ 1st choice ☆ suitable




| D(m7) | D Tol. | D1(h10) | D1 Tol. | d(h6) | l | l1 | L | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|
| **3.30** | +0.016/+0.004 | 5.00 | 0/-0.048 | 6 | 11 | 28 | 66 | 372HSD0330 | ● |
| **4.20** | +0.016/+0.004 | 6.00 | 0/-0.048 | 6 | 14 | 28 | 66 | 372HSD0420 | ● |
| **5.00** | +0.016/+0.004 | 8.00 | 0/-0.058 | 8 | 17 | 41 | 79 | 372HSD0500 | ● |
| **6.80** | +0.021/+0.006 | 10.00 | 0/-0.058 | 10 | 21 | 47 | 89 | 372HSD0680 | ● |
| **8.50** | +0.021/+0.006 | 12.00 | 0/-0.070 | 12 | 26 | 55 | 102 | 372HSD0850 | ● |
| **10.30** | +0.025/+0.007 | 14.00 | 0/-0.070 | 14 | 30 | 60 | 107 | 372HSD1030 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

## 372HSD




| Material Group ISO 513 | P1 P2 | P3 P4 | P7 | | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | | |
| Vc (m/min) | **80÷120** | **70÷110** | **40÷80** | | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| **3** | 0.130 | 0.130 | 0.075 | | | |
| **4** | 0.150 | 0.150 | 0.090 | | | |
| **5** | 0.170 | 0.170 | 0.100 | | | |
| **6** | 0.190 | 0.190 | 0.110 | | | |
| **7** | 0.220 | 0.220 | 0.120 | | | |
| **8** | 0.250 | 0.250 | 0.130 | | | |
| **9** | 0.280 | 0.280 | 0.140 | | | |
| **10** | 0.300 | 0.300 | 0.150 | | | |
| **11** | 0.310 | 0.310 | 0.155 | | | |
| **12** | 0.330 | 0.330 | 0.160 | | | |
| **13** | 0.340 | 0.340 | 0.165 | | | |
| **14** | 0.360 | 0.360 | 0.175 | | | |
| **15** | 0.380 | 0.380 | 0.180 | | | |
| **16** | 0.400 | 0.400 | 0.185 | | | |
| **17** | 0.410 | 0.410 | 0.195 | | | |
| **18** | 0.420 | 0.420 | 0.200 | | | |
| **19** | 0.420 | 0.420 | 0.200 | | | |
| **20** | 0.420 | 0.420 | 0.210 | | | |

## 372HSD




| Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | | | | |
| Vc (m/min) | **40÷80** | **40÷80** | **30÷60** | | | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| **3** | 0.075 | 0.055 | 0.055 | | | |
| **4** | 0.090 | 0.070 | 0.070 | | | |
| **5** | 0.100 | 0.075 | 0.075 | | | |
| **6** | 0.110 | 0.075 | 0.075 | | | |
| **7** | 0.120 | 0.080 | 0.080 | | | |
| **8** | 0.130 | 0.090 | 0.090 | | | |
| **9** | 0.140 | 0.095 | 0.095 | | | |
| **10** | 0.150 | 0.105 | 0.105 | | | |
| **11** | 0.155 | 0.115 | 0.115 | | | |
| **12** | 0.160 | 0.120 | 0.120 | | | |
| **13** | 0.165 | 0.125 | 0.125 | | | |
| **14** | 0.175 | 0.135 | 0.135 | | | |
| **15** | 0.180 | 0.135 | 0.135 | | | |
| **16** | 0.185 | 0.140 | 0.140 | | | |
| **17** | 0.195 | 0.145 | 0.145 | | | |
| **18** | 0.200 | 0.150 | 0.150 | | | |
| **19** | 0.200 | 0.160 | 0.160 | | | |
| **20** | 0.210 | 0.170 | 0.170 | | | |

# 372HSD

| | Material Group ISO 513 | S1 S2 | S3 | S5 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| | Vc (m/min) | **30÷50** | **30÷50** | **25÷45** | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| Ø RUN OUT <0.02mm | **3** | 0.030÷0.080 | 0.030÷0.070 | 0.030÷0.060 | | | |
| | **4** | 0.040÷0.100 | 0.040÷0.100 | 0.040÷0.080 | | | |
| | **5** | 0.050÷0.100 | 0.050÷0.100 | 0.040÷0.090 | | | |
| | **6** | 0.050÷0.100 | 0.050÷0.100 | 0.050÷0.100 | | | |
| | **7** | 0.050÷0.110 | 0.050÷0.110 | 0.050÷0.110 | | | |
| | **8** | 0.060÷0.120 | 0.060÷0.120 | 0.060÷0.110 | | | |
| | **9** | 0.060÷0.130 | 0.060÷0.130 | 0.060÷0.120 | | | |
| | **10** | 0.070÷0.140 | 0.070÷0.140 | 0.070÷0.120 | | | |
| | **11** | 0.080÷0.150 | 0.080÷0.150 | 0.080÷0.130 | | | |
| | **12** | 0.080÷0.160 | 0.080÷0.160 | 0.080÷0.140 | | | |
| | **13** | 0.080÷0.170 | 0.080÷0.170 | 0.080÷0.150 | | | |
| | **14** | 0.090÷0.180 | 0.090÷0.180 | 0.090÷0.160 | | | |
| | **15** | 0.090÷0.180 | 0.090÷0.180 | 0.090÷0.160 | | | |
| | **16** | 0.100÷0.180 | 0.100÷0.180 | 0.100÷0.160 | | | |
| | **17** | 0.100÷0.190 | 0.100÷0.190 | 0.100÷0.170 | | | |
| | **18** | 0.100÷0.200 | 0.100÷0.200 | 0.100÷0.180 | | | |
| | **19** | 0.110÷0.210 | 0.110÷0.210 | 0.110÷0.190 | | | |
| | **20** | 0.120÷0.220 | 0.120÷0.220 | 0.120÷0.200 | | | |





# C-SD-TA
## NC SPOTTING

90° - 120° starting drills for NC centering and chamfering on a wide range of materials.

Punte da centri a 90° e 120° per NC. Centratura e svasatura su una vasta gamma di materiali.

Anbohrer mit Spitzenwinkel 90° und 120° für NC Maschinen. Zentrierung und Ansenkung auf einem sehr breiten Spektrum von Materialien.

Forets à centrer et chanfreiner 90°-120°, pour une grande variété de matériaux.

Brocas para puntear y escariar 90°-120° sobre una gran variedad de materiales.

Центровочные свёрла с углами при вершине 90°-120° для сверления центровых отверстий и зенкования в широкой гамме материалов на станках с ЧПУ.

# C-SD-TA

solid carbide NC starting drills, 90°-120°

OSAWA NORM | SD | MG PV200 | 90-120° | 30°



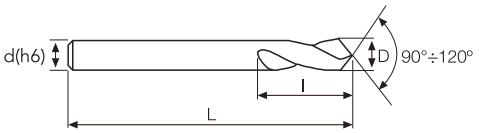
90°



120°

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ★ | ☆ | |

★ 1st choice ☆ suitable




| | | | | | | C-SD-TA 90° | | C-SD-TA 120° | |
|---|---|---|---|---|---|---|---|---|---|
| D(h6) | D Tol. | d(h6) | l | l1 | L | EDP No. | Stock | EDP No. | Stock |
| **6.00** | 0/-0.008 | 6 | 16 | | 50 | CSDTA060A | ● | CSDTA060B | ● |
| **8.00** | 0/-0.009 | 8 | 20 | | 64 | CSDTA080A | ● | CSDTA080B | ● |
| **10.00** | 0/-0.009 | 10 | 25 | | 70 | CSDTA100A | ● | CSDTA100B | ● |
| **12.00** | 0/-0.011 | 12 | 25 | | 75 | CSDTA120A | ● | CSDTA120B | ● |
| **16.00** | 0/-0.011 | 16 | 26 | | 90 | CSDTA160A | ● | CSDTA160B | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# C-SD-TA

| | Material Group ISO 513 | P1 P2 | P3 P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 900÷1200 N/mm² | 1200÷1400 N/mm² | | |
| | Vc (m/min) | **90÷110** | **70÷90** | **60÷80** | **50÷70** | **50÷70** | **20÷30** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| | **6** | 0.140 | 0.126 | 0.112 | 0.098 | 0.091 | 0.055 |
| | **7** | 0.160 | 0.144 | 0.128 | 0.112 | 0.104 | 0.062 |
| | **8** | 0.180 | 0.162 | 0.144 | 0.126 | 0.117 | 0.070 |
| | **9** | 0.200 | 0.180 | 0.160 | 0.140 | 0.130 | 0.078 |
| | **10** | 0.220 | 0.198 | 0.176 | 0.154 | 0.143 | 0.086 |
| | **11** | 0.240 | 0.216 | 0.192 | 0.168 | 0.156 | 0.094 |
| | **12** | 0.260 | 0.234 | 0.208 | 0.182 | 0.169 | 0.101 |
| | **13** | 0.280 | 0.252 | 0.224 | 0.196 | 0.182 | 0.109 |
| | **14** | 0.300 | 0.270 | 0.240 | 0.210 | 0.195 | 0.117 |
| | **15** | 0.320 | 0.288 | 0.256 | 0.224 | 0.208 | 0.125 |
| | **16** | 0.340 | 0.306 | 0.272 | 0.238 | 0.221 | 0.133 |

| | Material Group ISO 513 | M1 | M2 | M3 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **50÷70** | **40÷60** | **30÷40** | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| | **6** | 0.091 | 0.073 | 0.064 | | | |
| | **7** | 0.104 | 0.083 | 0.073 | | | |
| | **8** | 0.117 | 0.094 | 0.082 | | | |
| | **9** | 0.130 | 0.104 | 0.091 | | | |
| | **10** | 0.143 | 0.114 | 0.100 | | | |
| | **11** | 0.156 | 0.125 | 0.109 | | | |
| | **12** | 0.169 | 0.135 | 0.118 | | | |
| | **13** | 0.182 | 0.146 | 0.127 | | | |
| | **14** | 0.195 | 0.156 | 0.137 | | | |
| | **15** | 0.208 | 0.166 | 0.146 | | | |
| | **16** | 0.221 | 0.177 | 0.155 | | | |

| | Material Group ISO 513 | K1 | K2 | K3 | K4 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 150÷250 HB | 150÷350 HB | 120÷260 HB | 250÷500 HB | | |
| | Vc (m/min) | **90÷110** | **70÷90** | **60÷80** | **50÷70** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| | **6** | 0.140 | 0.126 | 0.112 | 0.098 | | |
| | **7** | 0.160 | 0.144 | 0.128 | 0.112 | | |
| | **8** | 0.180 | 0.162 | 0.144 | 0.126 | | |
| | **9** | 0.200 | 0.180 | 0.160 | 0.140 | | |
| | **10** | 0.220 | 0.198 | 0.176 | 0.154 | | |
| | **11** | 0.240 | 0.216 | 0.192 | 0.168 | | |
| | **12** | 0.260 | 0.234 | 0.208 | 0.182 | | |
| | **13** | 0.280 | 0.252 | 0.224 | 0.196 | | |
| | **14** | 0.300 | 0.270 | 0.240 | 0.210 | | |
| | **15** | 0.320 | 0.288 | 0.256 | 0.224 | | |
| | **16** | 0.340 | 0.306 | 0.272 | 0.238 | | |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

CUTTING PARAMETERS

# C-SD-TA

| | Material Group ISO 513 | N1 | N2 | N3 N4 | N5 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | **160÷200** | **140÷180** | **130÷170** | **160÷200** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| | **6** | 0.175 | 0.158 | 0.140 | 0.158 | | |
| | **7** | 0.200 | 0.180 | 0.160 | 0.180 | | |
| | **8** | 0.225 | 0.203 | 0.180 | 0.203 | | |
| | **9** | 0.250 | 0.225 | 0.200 | 0.225 | | |
| | **10** | 0.275 | 0.248 | 0.220 | 0.248 | | |
| | **11** | 0.300 | 0.270 | 0.240 | 0.270 | | |
| | **12** | 0.325 | 0.293 | 0.260 | 0.293 | | |
| | **13** | 0.350 | 0.315 | 0.280 | 0.315 | | |
| | **14** | 0.375 | 0.338 | 0.300 | 0.338 | | |
| | **15** | 0.400 | 0.360 | 0.320 | 0.360 | | |
| | **16** | 0.425 | 0.383 | 0.340 | 0.383 | | |

| | Material Group ISO 513 | S1 S2 | S3 | S4 | S5 | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | <35 HRC | 35÷45 HRC | | | | |
| | Vc (m/min) | **30÷50** | **20÷40** | **45÷65** | **35÷55** | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | |
| | **6** | 0.063 | 0.044 | 0.060 | 0.050 | | |
| | **7** | 0.072 | 0.050 | 0.068 | 0.058 | | |
| | **8** | 0.081 | 0.057 | 0.077 | 0.065 | | |
| | **9** | 0.090 | 0.063 | 0.086 | 0.072 | | |
| | **10** | 0.099 | 0.069 | 0.094 | 0.079 | | |
| | **11** | 0.108 | 0.076 | 0.103 | 0.086 | | |
| | **12** | 0.117 | 0.082 | 0.111 | 0.094 | | |
| | **13** | 0.126 | 0.088 | 0.120 | 0.101 | | |
| | **14** | 0.135 | 0.095 | 0.128 | 0.108 | | |
| | **15** | 0.144 | 0.101 | 0.137 | 0.115 | | |
| | **16** | 0.153 | 0.107 | 0.145 | 0.122 | | |

# HSS DRILLS 

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DIN1897 . 214
DIN338 . 223
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DIN1869 . 259
DIN345 . 265
DIN341 . 272
DIN1870 . 274

Legenda Verzeichnis Légende Leyenda Условные обозначения

| STOCK | | |
|---|---|---|
| ● | stock standard<br>stock standard<br>Standard Lager | stock standard<br>stock estándar<br>складская позиция |
| ○ | non-standard stock<br>stock non standard<br>nicht Standard Lager | stock non standard<br>stock no estándar<br>не складская позиция |
| ▽ | stock exhaustion<br>esaurimento stock<br>Vorraterschöpfung | épuisement du stock<br>agotamiento de stock<br>складские остатки |

| APPLICATION GUIDELINES INDICAZIONI PER L'APPLICAZIONE LEITFADEN ZUR ANWENDUNG<br>INDICATIONS POUR L'APPLICATION INDICACIONES PARA SU APLICACIÓN УКАЗАНИЯ ПО ПРИМЕНЕНИЮ | | |
|---|---|---|
| ★ | 1st choice<br>1a scelta<br>1. Wahl | 1er choix<br>1ª elección<br>1-й выбор |
| ☆ | suitable<br>adatto<br>geeignet | adapté<br>adecuado<br>пригоден |

| SHANK ATTACCO SCHAFT QUEUE MANGO ХВОСТОВИК | | |
|---|---|---|
|  | cylindrical shank<br>attacco cilindrico<br>zylindrischer Schaft | queue cylindrique<br>mango cilíndrico<br>цилиндрическое крепление |
|  | Morse Taper shank<br>attacco Cono Morse<br>MK Schaft | queue conique<br>mango Cono Morse<br>конус Морзе |

| GEOMETRY GEOMETRIA GEOMETRIE GÉOMÉTRIE GEOMETRÍA ГЕОМЕТРИЯ | | |
|---|---|---|
|  | high performance, selfcentering<br>alto rendimento, autocentrante<br>hochleistung, selbstzentrierende | haute performance, auto centreur<br>alto rendimiento, autocentrante<br>высокопроизводительные, самоцентрующиеся |
|  | for stainless steel and general application<br>per acciaio inossidabile e applicazioni generiche<br>für rostfreien Stahl und allgemeine Anwendung | pour acier inoxydable et applications génériques<br>para acero inoxidable y aplicaciones genéricas<br>для нержавеющих сталей и общего назначения |
|  | HSS general purpose<br>HSS uso generico<br>HSS allgemeine Anwendung | HSS applications génériques<br>HSS uso genérico<br>HSS общего назначения |
|  | HSS Tin Pointed | |
|  | HSS/Co Tin Pointed | |

Legenda Verzeichnis Légende Leyenda Условные обозначения

| GEOMETRY GEOMETRIA GEOMETRIE GÉOMÉTRIE GEOMETRÍA ГЕОМЕТРИЯ | | |
|---|---|---|
|   | for stainless steel and general application<br>per acciaio inossidabile e applicazioni generiche<br>für rostfreien Stahl und allgemeine Anwendung | pour acier inoxydable et applications génériques<br>para acero inoxidable y aplicaciones genéricas<br>для нержавеющих сталей и общего назначения |
|   | for deep holes<br>per fori profondi<br>für tiefe Löcher | pour trous profonds<br>para agujeros profundos<br>для глубоких отверстий |
|   | for brass<br>per ottone<br>für Messing | pour laiton<br>para latón<br>для латуни |
|   | for aluminium<br>per alluminio<br>für Aluminium | pour aluminium<br>para aluminio<br>для алюминия |

| MATERIAL MATERIALE WERKSTOFF MATIÈRE MATERIAL МАТЕРИАЛ | | |
|---|---|---|
|   | high speed steel<br>acciaio super rapido<br>Hochleistungsschnellschnittstahl | acier rapide<br>acero súper rápido<br>быстрорежущая сталь |
|   | high speed steel - 5% ÷ 8% Co<br>acciaio super rapido - 5% ÷ 8% Co<br>Hochleistungsschnellschnittstahl - 5% ÷ 8% Co | acier rapide - 5% ÷ 8% Co<br>acero súper rápido - 5% ÷ 8% Co<br>быстрорежущая сталь - 5% ÷ 8% Co |
|   | HSS/Co + EV | |

| SURFACE TREATMENT TRATTAMENTO SUPERFICIALE OBERFLÄCHENBEHANDLUNG<br>TRAITMENT DE SURFACE TRATAMIENTO SUPERFICIAL ОБРАБОТКА ПОВЕРХНОСТИ | | |
|---|---|---|
|   | uncoated<br>non rivestito<br>unbeschichtet | non revêtu<br>no revestido<br>без покрытия |
|   | vaporization<br>vaporizzazione<br>Dämpfung | traitment vapeur<br>vaporización<br>окисление |
|   | heat treatment<br>trattamento termico<br>thermische Behandlung | traitment thermique<br>tratamiento térmico<br>термическая обработка |

Legenda Verzeichnis Légende Leyenda Условные обозначения

| COATINGS RIVESTIMENTI BESCHICHTUNGEN REVÊTEMENTS RECUBRIMIENTOS ПОКРЫТИЕ | | TiN | PV10 | PV15 |
|---|---|---|---|---|
| hardness (HV)<br>durezza (HV)<br>Härte (HV) | dureté (HV)<br>dureza (HV)<br>твёрдость (HV) | 2300 | 3300 | TiAlN<br>+<br>WC/C |
| friction coefficient<br>coefficiente d'attrito<br>Reibungskoeffizient | coefficent de frottement<br>coeficiente de rozamiento<br>коэффициент трения | 0.4 | 0.35 | 0.2 |
| thickness (µ)<br>spessore (µ)<br>dicke (µ) | épaisseur (µ)<br>espesor (µ)<br>толщина (мкм) | 1÷4 | 1÷5 | 2÷5 |
| max working temperature (°C)<br>temperatura max (°C)<br>hochste Temperatur (°C) | température maximale (°C)<br>temperatura máx (°C)<br>макс. температура (°C) | 600° | 900° | 1000° |

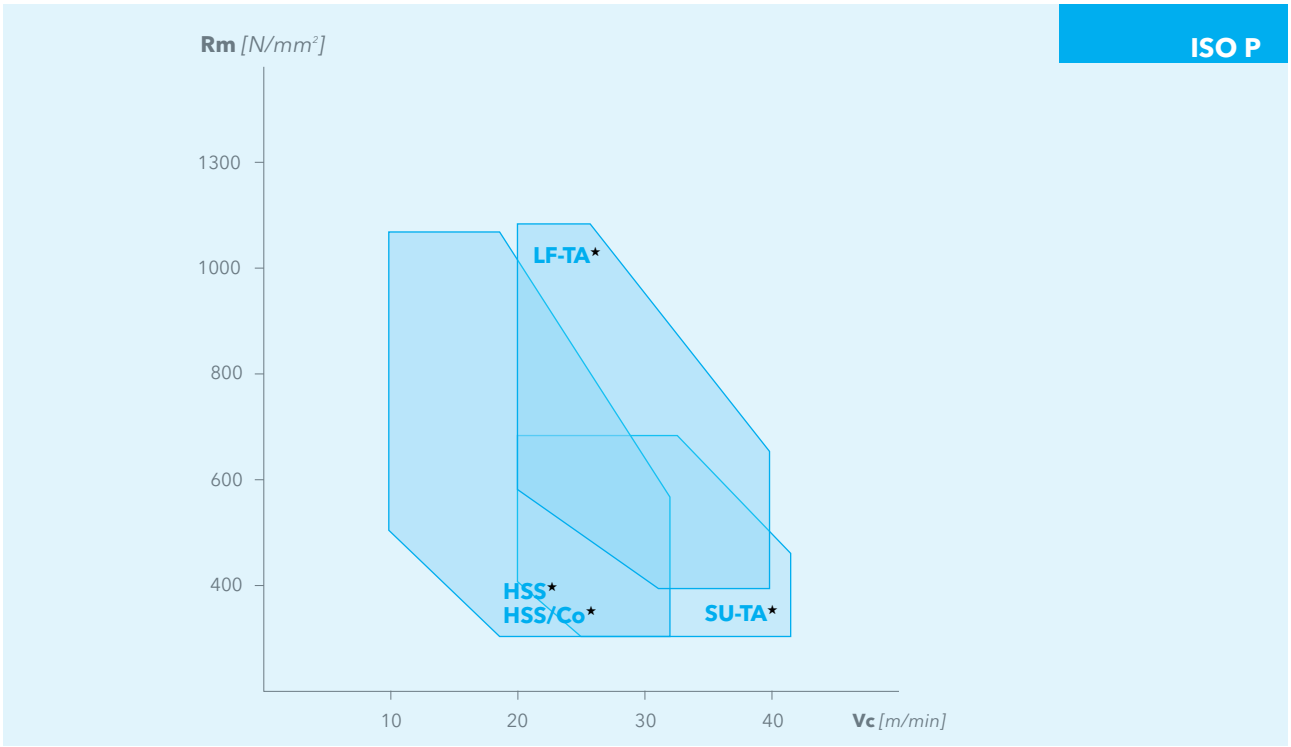
| | ITEM No. | PAGE | |
|---|---|---|---|
| LFTA high performance | **218LFTA** | 194 |  |
| | **238LFTA** | 198 |  |
| SUTA high performance | **980SUTA** | 204 |  |
| | **990SUTA** | 208 |  |
| HSS-HSS/Co general purpose | **118N** | 214 |  |
| | **218NVA** | 219 |  |
| | **1386STI** | 223 |  |
| | **138N** | 228 |  |
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| | **238NVA** | 247 |  |
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| | **234LSTH** | 256 |  |
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| | **2702LS** | 276 |  |

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| RANGE | DRILLING DEPTH | NORM | TYPE | MATERIAL / COATING | HRC | POINT ANGLE | HELIX ANGLE | CHAMFER | ISO P | ISO M | ISO K | ISO N | ISO S | ISO H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2-20 | extra short | DIN1897 | LF | HSS/Co PV10 | | 130° | 35°-40° | | ★ | ☆ | ★ | ☆ | | |
| 2-20 | short | DIN338 | LF | HSS/Co PV10 | | 130° | 35°-40° | | ★ | ☆ | ★ | ☆ | | |
| 2-13 | extra short | OSAWA | SU | HSSE PV10 | | 120° | 38° | | ★ | ★ | | ★ | ☆ | |
| 2-20 | short | OSAWA | SU | HSSE PV10 | | 120° | 38° | | ★ | ★ | | ★ | ☆ | |
| 1-16 | extra short | DIN1897 | N | HSS OX | | 118° | 25°-30° | | ★ | | ☆ | ☆ | | |
| 1-20 | extra short | DIN1897 | NH | HSS/Co HT | | 130° | 30° | | ★ | ★ | ☆ | ☆ | ☆ | |
| 1-13 | short | DIN338 | SPLIT POINT | HSS TiN | | 118° | 30° | | ★ | ☆ | ★ | ☆ | ☆ | |
| 0.2-20 | short | DIN338 | N | HSS OX | | 118° | 25°-30° | | ★ | | ☆ | ☆ | | |
| 1-16 | short | DIN338 | N | HSS TiN | | 118° | 25°-30° | | ★ | | ☆ | ☆ | | |
| 1.5-10 | short | DIN338 | H | HSS BR | | 118° | 12°-15° | | | | | ★ | | |
| 1.5-10 | short | DIN338 | W | HSS BR | | 130° | 35°-40° | | | | | ★ | | |
| 1-13 | short | DIN338 | SPLIT POINT | HSS/Co TiN | | 135° | 33° | | ★ | ★ | ★ | ☆ | ☆ | |
| 1-20 | short | DIN338 | NH | HSS/Co HT | | 130° | 30° | | ★ | ★ | ☆ | ☆ | ☆ | |
| 0.5-12 | long | DIN340 | NH | HSS/Co HT | | 130° | 30° | | ★ | ★ | ☆ | ☆ | ☆ | |
| 2-13 | long | DIN340 | LS | HSS/Co OX | | 130° | 35°-40° | | ★ | ☆ | ★ | | | |
| 2-13 | long | DIN340 | LS | HSS/Co PV15 | | 130° | 35°-40° | | ★ | ☆ | ★ | | | |
| 2-13 | extra long | DIN1869/1 | LS | HSS/Co BR | | 130° | 35°-40° | | ★ | ☆ | ★ | | | |
| 2-13 | extra long | DIN1869/1 | LS | HSS/Co PV15 | | 130° | 35°-40° | | ★ | ☆ | ★ | | | |
| 3-12 | extra long | DIN1869/2 | LS | HSS BR | | 130° | 35°-40° | | ★ | | ★ | | | |
| 3.5-12 | extra long | DIN1869/3 | LS | HSS BR | | 130° | 35°-40° | | ★ | | ★ | | | |
| 5-60 | short | DIN345 | N | HSS OX | | 118° | 25°-30° | | ★ | | ☆ | ☆ | | |
| 13-30 | short | DIN345 | N | HSS TiN | | 118° | 25°-30° | | ★ | | ☆ | ☆ | | |
| 13-30 | short | DIN345 | NH | HSS/Co OX | | 118° | 30° | | ★ | ★ | ☆ | ☆ | ☆ | |
| 13-30 | long | DIN341 | LS | HSS/Co OX | | 130° | 35°-40° | | ★ | ☆ | ★ | | | |
| 13-30 | extra long | DIN1870/1 | LS | HSS/Co OX | | 130° | 35°-40° | | ★ | ☆ | ★ | | | |
| 13-30 | extra long | DIN1870/2 | LS | HSS/Co OX | | 130° | 35°-40° | | ★ | ☆ | ★ | | | |

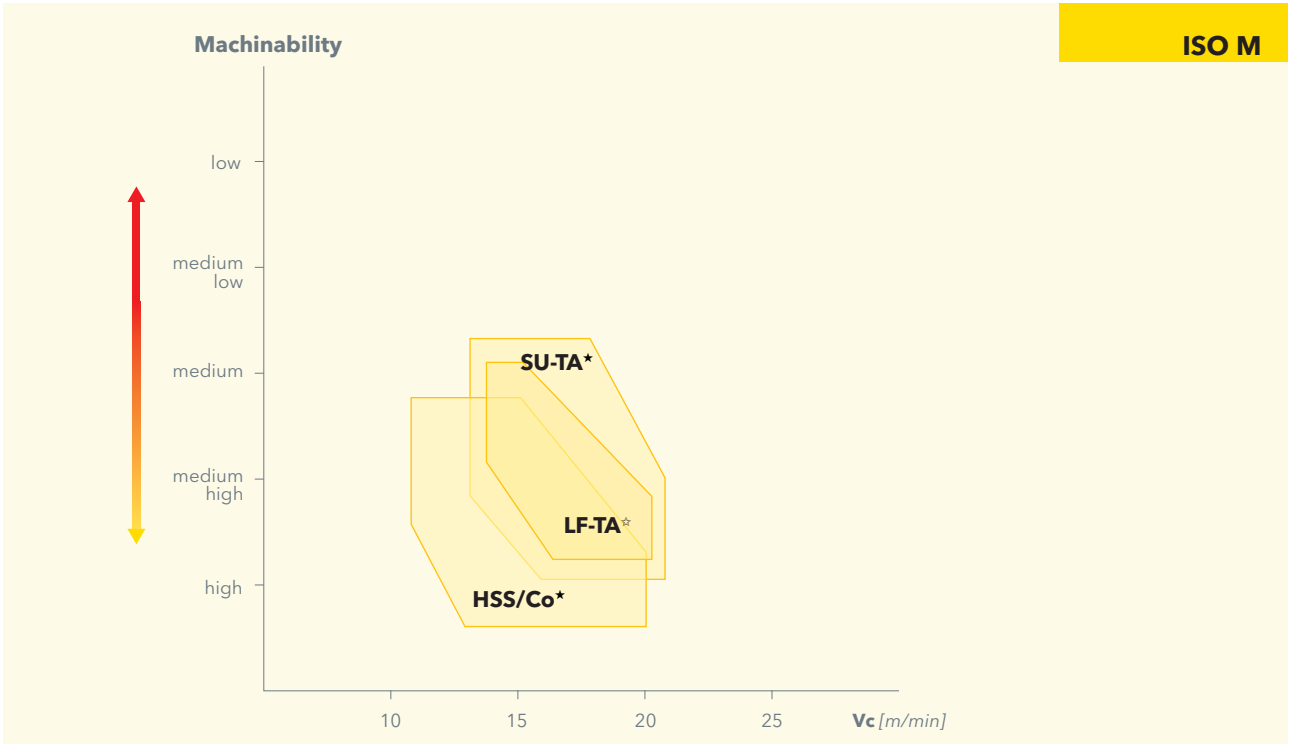
★ 1st choice ☆ suitable

## STEEL APPLICATION




★ 1st choice ☆ suitable

## STAINLESS STEEL APPLICATION

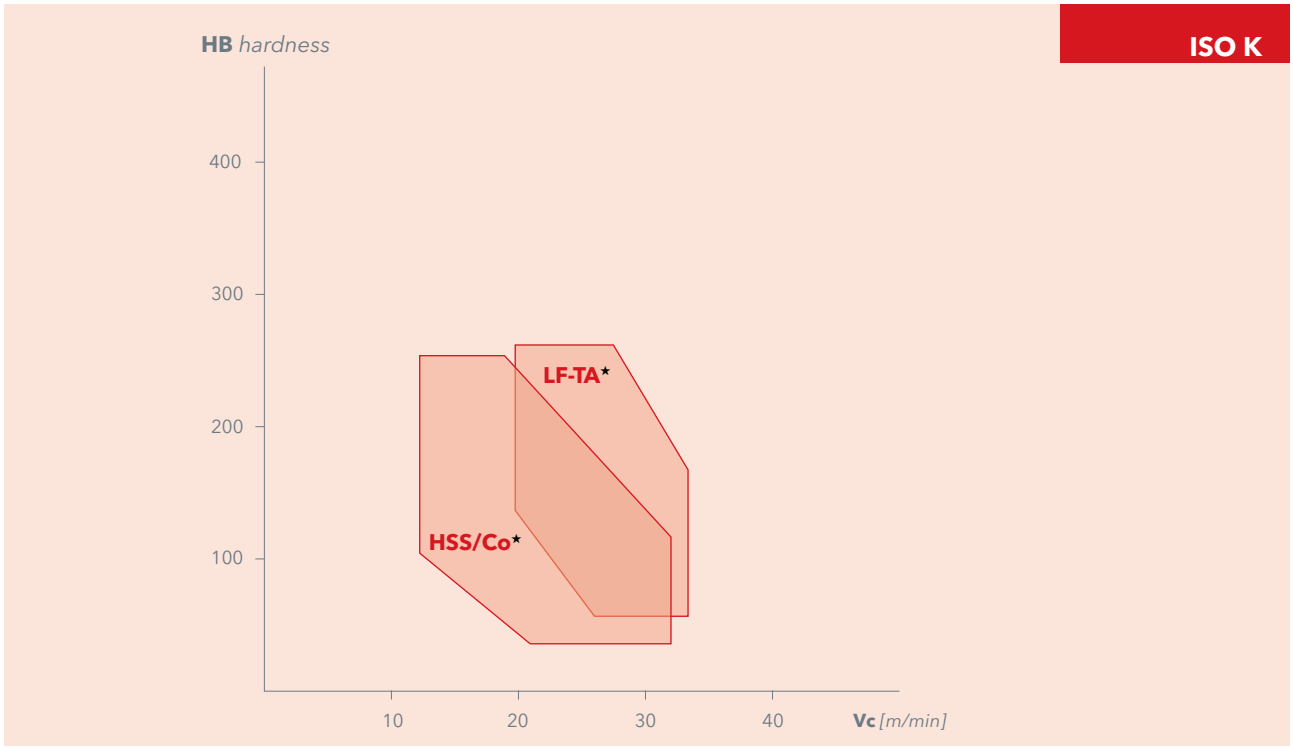



★ 1st choice ☆ suitable

LFTA : high performance (page 194)
SUTA : high performance (page 204)
HSS-HSS/Co : general purpose (page 214)

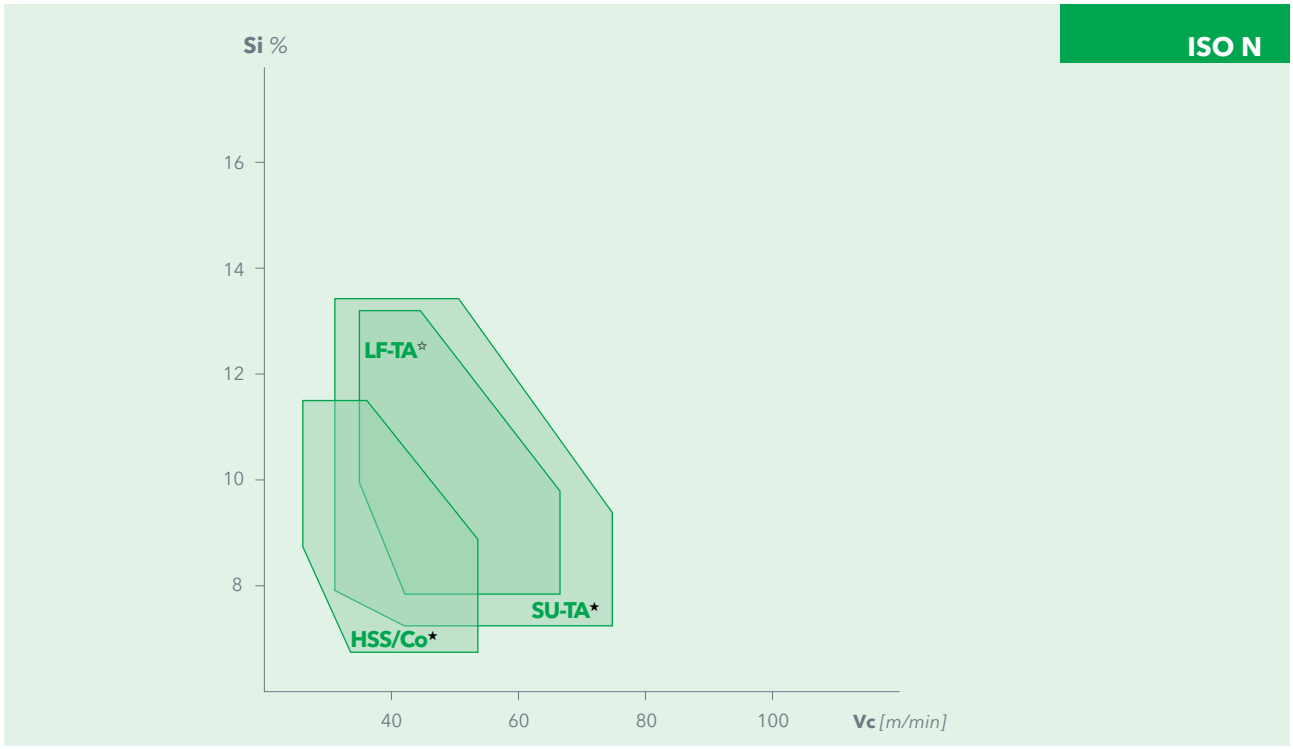
Grafici applicativi Anwendungsgrafiken Graphiques d'application Gráficos aplicativos Диаграммы

## CAST IRON APPLICATION




★ 1st choice ☆ suitable

## NON-FERROUS MATERIALS APPLICATION

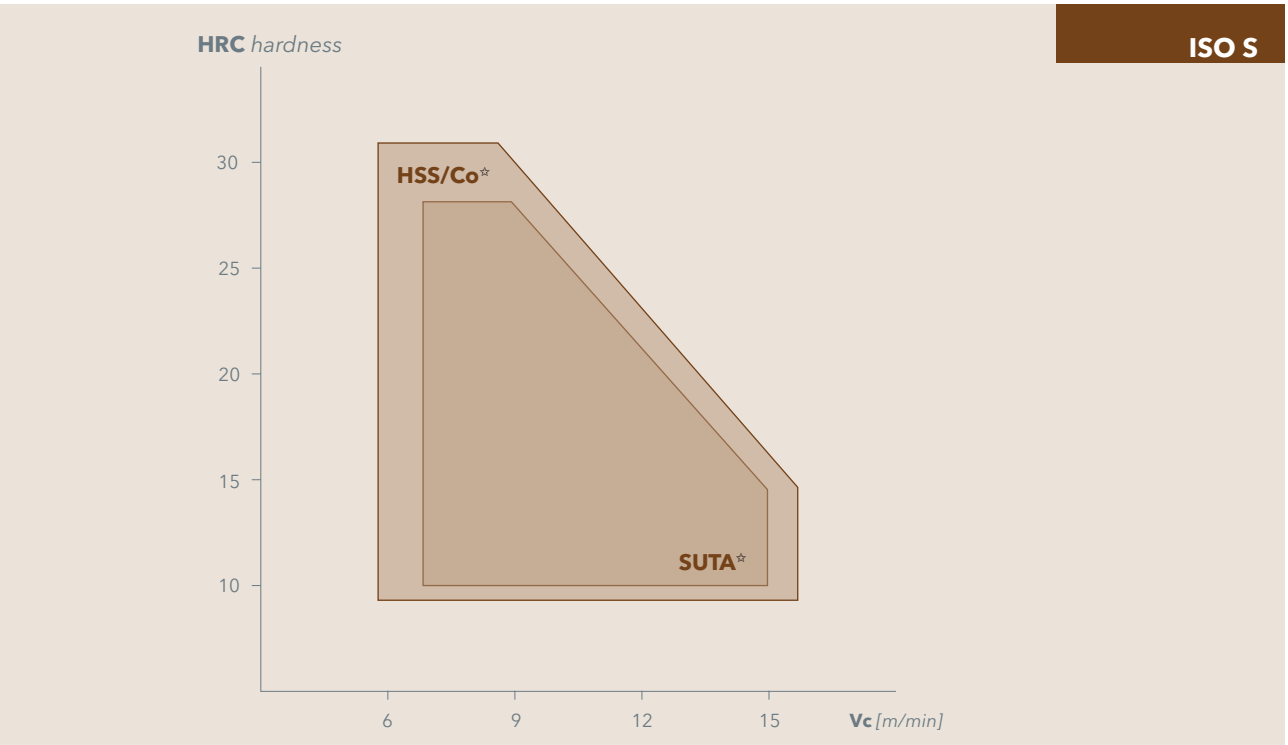



★ 1st choice ☆ suitable

LFTA : high performance (page 194)
SUTA : high performance (page 204)
HSS-HSS/Co : general purpose (page 214)

Grafici applicativi Anwendungsgrafiken Graphiques d'application Gráficos aplicativos Диаграммы

## SUPER ALLOYS APPLICATION




★ 1st choice ☆ suitable

SUTA : high performance (page 204)
HSS-HSS/Co : general purpose (page 214)



# LFTA
## HIGH PERFORMANCE

High performance and self-centering geometry. Featuring top quality HSS/Co+PV10 and very versatile cutting geometry, enables outstanding performance on a wide range of materials.

Alto rendimento e affilatura autocentrante. Costruita con HSS/Co+PV10 di alta qualità e caratterizzata da una geometria di taglio molto versatile, garantisce elevate prestazioni su una vasta gamma di materiali.

Hohe Leistungen und selbstzentrierende Schnittgeometrie. Aus hervorragendem HSS/Co mit PV10 Beschichtung. Dank der vielseitigen Geometrie, sind hohe Leistungen auf einem sehr breiten Spektrum von Materialien möglich.

Haute performance et affûtage auto-centré. Fabriquée en HSS/Co+PV10 de la plus haute qualité et caractérisée par une géométrie de coupe très polyvalente, elle garantit des performances excellentes dans une grande variété de matériaux.

Broca de alto rendimiento con afilado autocentrante. Fabricada en HSS/Co con recubrimiento PV10, gracias a su geometría de corte muy versátil, permite lograr un altísimo rendimiento en una gama muy amplia de materiales.

Высокопроизводительная и самоцентрующаяся геометрия. Использование HSS/Co высочайшего качества с покрытием PV10 и универсальная геометрия, позволяет получить повышенную производительность на широком спектре обрабатываемых материалов.

# 218LFTA

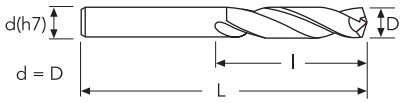
self-centering, general purpose, extra-short

DIN 1897 | LF | HSS/CO PV10 | 130° | 35-40°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d(h7) | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **2.00** | 0/-0.014 | 2 | 12 | 38 | 5 | P218LFTA0200 | ● |
| **2.10** | 0/-0.014 | 2.1 | 12 | 38 | 5 | P218LFTA0210 | ● |
| **2.20** | 0/-0.014 | 2.2 | 13 | 40 | 5 | P218LFTA0220 | ● |
| **2.30** | 0/-0.014 | 2.3 | 13 | 40 | 5 | P218LFTA0230 | ● |
| **2.40** | 0/-0.014 | 2.4 | 14 | 43 | 5 | P218LFTA0240 | ● |
| **2.50** | 0/-0.014 | 2.5 | 14 | 43 | 5 | P218LFTA0250 | ● |
| **2.60** | 0/-0.014 | 2.6 | 14 | 43 | 5 | P218LFTA0260 | ● |
| **2.70** | 0/-0.014 | 2.7 | 16 | 46 | 5 | P218LFTA0270 | ● |
| **2.80** | 0/-0.014 | 2.8 | 16 | 46 | 5 | P218LFTA0280 | ● |
| **2.90** | 0/-0.014 | 2.9 | 16 | 46 | 5 | P218LFTA0290 | ● |
| **3.00** | 0/-0.014 | 3 | 16 | 46 | 5 | P218LFTA0300 | ● |
| **3.10** | 0/-0.018 | 3.1 | 18 | 49 | 5 | P218LFTA0310 | ● |
| **3.20** | 0/-0.018 | 3.2 | 18 | 49 | 5 | P218LFTA0320 | ● |
| **3.30** | 0/-0.018 | 3.3 | 18 | 49 | 5 | P218LFTA0330 | ● |
| **3.40** | 0/-0.018 | 3.4 | 20 | 52 | 5 | P218LFTA0340 | ● |
| **3.50** | 0/-0.018 | 3.5 | 20 | 52 | 5 | P218LFTA0350 | ● |
| **3.60** | 0/-0.018 | 3.6 | 20 | 52 | 5 | P218LFTA0360 | ● |
| **3.70** | 0/-0.018 | 3.7 | 20 | 52 | 5 | P218LFTA0370 | ● |
| **3.80** | 0/-0.018 | 3.8 | 22 | 55 | 5 | P218LFTA0380 | ● |
| **3.90** | 0/-0.018 | 3.9 | 22 | 55 | 5 | P218LFTA0390 | ● |
| **4.00** | 0/-0.018 | 4 | 22 | 55 | 5 | P218LFTA0400 | ● |
| **4.10** | 0/-0.018 | 4.1 | 22 | 55 | 5 | P218LFTA0410 | ● |
| **4.20** | 0/-0.018 | 4.2 | 22 | 55 | 5 | P218LFTA0420 | ● |
| **4.30** | 0/-0.018 | 4.3 | 24 | 58 | 5 | P218LFTA0430 | ● |
| **4.40** | 0/-0.018 | 4.4 | 24 | 58 | 5 | P218LFTA0440 | ● |
| **4.50** | 0/-0.018 | 4.5 | 24 | 58 | 5 | P218LFTA0450 | ● |
| **4.60** | 0/-0.018 | 4.6 | 24 | 58 | 5 | P218LFTA0460 | ● |
| **4.70** | 0/-0.018 | 4.7 | 24 | 58 | 5 | P218LFTA0470 | ● |
| **4.80** | 0/-0.018 | 4.8 | 26 | 62 | 5 | P218LFTA0480 | ● |
| **4.90** | 0/-0.018 | 4.9 | 26 | 62 | 5 | P218LFTA0490 | ● |
| **5.00** | 0/-0.018 | 5 | 26 | 62 | 5 | P218LFTA0500 | ● |
| **5.10** | 0/-0.018 | 5.1 | 26 | 62 | 5 | P218LFTA0510 | ● |
| **5.20** | 0/-0.018 | 5.2 | 26 | 62 | 5 | P218LFTA0520 | ● |
| **5.30** | 0/-0.018 | 5.3 | 26 | 62 | 5 | P218LFTA0530 | ● |
| **5.40** | 0/-0.018 | 5.4 | 28 | 66 | 5 | P218LFTA0540 | ● |
| **5.50** | 0/-0.018 | 5.5 | 28 | 66 | 5 | P218LFTA0550 | ● |
| **5.60** | 0/-0.018 | 5.6 | 28 | 66 | 5 | P218LFTA0560 | ● |
| **5.70** | 0/-0.018 | 5.7 | 28 | 66 | 5 | P218LFTA0570 | ● |
| **5.80** | 0/-0.018 | 5.8 | 28 | 66 | 5 | P218LFTA0580 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 218LFTA

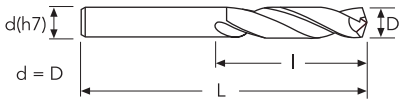
self-centering, general purpose, extra-short

DIN 1897 | LF | HSS/CO PV10 | 130° | 35-40°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d(h7) | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **5.90** | 0/-0.018 | 5.9 | 28 | 66 | 5 | P218LFTA0590 | ● |
| **6.00** | 0/-0.018 | 6 | 28 | 66 | 5 | P218LFTA0600 | ● |
| **6.10** | 0/-0.022 | 6.1 | 31 | 70 | 5 | P218LFTA0610 | ● |
| **6.20** | 0/-0.022 | 6.2 | 31 | 70 | 5 | P218LFTA0620 | ● |
| **6.30** | 0/-0.022 | 6.3 | 31 | 70 | 5 | P218LFTA0630 | ● |
| **6.40** | 0/-0.022 | 6.4 | 31 | 70 | 5 | P218LFTA0640 | ● |
| **6.50** | 0/-0.022 | 6.5 | 31 | 70 | 5 | P218LFTA0650 | ● |
| **6.60** | 0/-0.022 | 6.6 | 31 | 70 | 5 | P218LFTA0660 | ● |
| **6.70** | 0/-0.022 | 6.7 | 31 | 70 | 5 | P218LFTA0670 | ● |
| **6.80** | 0/-0.022 | 6.8 | 34 | 74 | 5 | P218LFTA0680 | ● |
| **6.90** | 0/-0.022 | 6.9 | 34 | 74 | 5 | P218LFTA0690 | ● |
| **7.00** | 0/-0.022 | 7 | 34 | 74 | 5 | P218LFTA0700 | ● |
| **7.10** | 0/-0.022 | 7.1 | 34 | 74 | 5 | P218LFTA0710 | ● |
| **7.20** | 0/-0.022 | 7.2 | 34 | 74 | 5 | P218LFTA0720 | ● |
| **7.30** | 0/-0.022 | 7.3 | 34 | 74 | 5 | P218LFTA0730 | ● |
| **7.40** | 0/-0.022 | 7.4 | 34 | 74 | 5 | P218LFTA0740 | ● |
| **7.50** | 0/-0.022 | 7.5 | 34 | 74 | 5 | P218LFTA0750 | ● |
| **7.60** | 0/-0.022 | 7.6 | 37 | 79 | 5 | P218LFTA0760 | ● |
| **7.70** | 0/-0.022 | 7.7 | 37 | 79 | 5 | P218LFTA0770 | ● |
| **7.80** | 0/-0.022 | 7.8 | 37 | 79 | 5 | P218LFTA0780 | ● |
| **7.90** | 0/-0.022 | 7.9 | 37 | 79 | 5 | P218LFTA0790 | ● |
| **8.00** | 0/-0.022 | 8 | 37 | 79 | 5 | P218LFTA0800 | ● |
| **8.10** | 0/-0.022 | 8.1 | 37 | 79 | 5 | P218LFTA0810 | ● |
| **8.20** | 0/-0.022 | 8.2 | 37 | 79 | 5 | P218LFTA0820 | ● |
| **8.30** | 0/-0.022 | 8.3 | 37 | 79 | 5 | P218LFTA0830 | ● |
| **8.40** | 0/-0.022 | 8.4 | 37 | 79 | 5 | P218LFTA0840 | ● |
| **8.50** | 0/-0.022 | 8.5 | 37 | 79 | 5 | P218LFTA0850 | ● |
| **8.60** | 0/-0.022 | 8.6 | 40 | 84 | 5 | P218LFTA0860 | ● |
| **8.70** | 0/-0.022 | 8.7 | 40 | 84 | 5 | P218LFTA0870 | ● |
| **8.80** | 0/-0.022 | 8.8 | 40 | 84 | 5 | P218LFTA0880 | ● |
| **8.90** | 0/-0.022 | 8.9 | 40 | 84 | 5 | P218LFTA0890 | ● |
| **9.00** | 0/-0.022 | 9 | 40 | 84 | 5 | P218LFTA0900 | ● |
| **9.10** | 0/-0.022 | 9.1 | 40 | 84 | 5 | P218LFTA0910 | ● |
| **9.20** | 0/-0.022 | 9.2 | 40 | 84 | 5 | P218LFTA0920 | ● |
| **9.30** | 0/-0.022 | 9.3 | 40 | 84 | 5 | P218LFTA0930 | ● |
| **9.40** | 0/-0.022 | 9.4 | 40 | 84 | 5 | P218LFTA0940 | ● |
| **9.50** | 0/-0.022 | 9.5 | 40 | 84 | 5 | P218LFTA0950 | ● |
| **9.60** | 0/-0.022 | 9.6 | 43 | 89 | 5 | P218LFTA0960 | ● |
| **9.70** | 0/-0.022 | 9.7 | 43 | 89 | 5 | P218LFTA0970 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 218LFTA

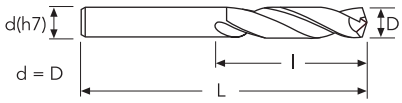
self-centering, general purpose, extra-short

DIN 1897 | LF | HSS/CO PV10 | 130° | 35-40°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d(h7) | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **9.80** | 0/-0.022 | 9.8 | 43 | 89 | 5 | P218LFTA0980 | ● |
| **9.90** | 0/-0.022 | 9.9 | 43 | 89 | 5 | P218LFTA0990 | ● |
| **10.00** | 0/-0.022 | 10 | 43 | 89 | 5 | P218LFTA1000 | ● |
| **10.20** | 0/-0.027 | 10.2 | 43 | 89 | 1 | P218LFTA1020 | ● |
| **10.30** | 0/-0.027 | 10.3 | 43 | 89 | 1 | P218LFTA1030 | ● |
| **10.50** | 0/-0.027 | 10.5 | 43 | 89 | 1 | P218LFTA1050 | ● |
| **10.80** | 0/-0.027 | 10.8 | 47 | 95 | 1 | P218LFTA1080 | ● |
| **11.00** | 0/-0.027 | 11 | 47 | 95 | 1 | P218LFTA1100 | ● |
| **11.20** | 0/-0.027 | 11.2 | 47 | 95 | 1 | P218LFTA1120 | ● |
| **11.30** | 0/-0.027 | 11.3 | 47 | 95 | 1 | P218LFTA1130 | ● |
| **11.50** | 0/-0.027 | 11.5 | 47 | 95 | 1 | P218LFTA1150 | ● |
| **11.80** | 0/-0.027 | 11.8 | 47 | 95 | 1 | P218LFTA1180 | ● |
| **12.00** | 0/-0.027 | 12 | 51 | 102 | 1 | P218LFTA1200 | ● |
| **12.20** | 0/-0.027 | 12.2 | 51 | 102 | 1 | P218LFTA1220 | ● |
| **12.50** | 0/-0.027 | 12.5 | 51 | 102 | 1 | P218LFTA1250 | ● |
| **12.80** | 0/-0.027 | 12.8 | 51 | 102 | 1 | P218LFTA1280 | ● |
| **13.00** | 0/-0.027 | 13 | 51 | 102 | 1 | P218LFTA1300 | ● |
| **13.30** | 0/-0.027 | 13.3 | 54 | 107 | 1 | P218LFTA1330 | ● |
| **13.50** | 0/-0.027 | 13.5 | 54 | 107 | 1 | P218LFTA1350 | ● |
| **13.80** | 0/-0.027 | 13.8 | 54 | 107 | 1 | P218LFTA1380 | ● |
| **14.00** | 0/-0.027 | 14 | 54 | 107 | 1 | P218LFTA1400 | ● |
| **14.50** | 0/-0.027 | 14.5 | 56 | 111 | 1 | P218LFTA1450 | ● |
| **14.80** | 0/-0.027 | 14.8 | 56 | 111 | 1 | P218LFTA1480 | ● |
| **15.00** | 0/-0.027 | 15 | 56 | 111 | 1 | P218LFTA1500 | ● |
| **15.30** | 0/-0.027 | 15.3 | 56 | 111 | 1 | P218LFTA1530 | ● |
| **15.50** | 0/-0.027 | 15.5 | 58 | 115 | 1 | P218LFTA1550 | ● |
| **15.80** | 0/-0.027 | 15.8 | 58 | 115 | 1 | P218LFTA1580 | ● |
| **16.00** | 0/-0.027 | 16 | 58 | 115 | 1 | P218LFTA1600 | ● |
| **16.50** | 0/-0.027 | 16.5 | 60 | 119 | 1 | P218LFTA1650 | ● |
| **17.00** | 0/-0.027 | 17 | 60 | 119 | 1 | P218LFTA1700 | ● |
| **17.50** | 0/-0.027 | 17.5 | 62 | 123 | 1 | P218LFTA1750 | ● |
| **18.00** | 0/-0.027 | 18 | 62 | 123 | 1 | P218LFTA1800 | ● |
| **18.50** | 0/-0.033 | 18.5 | 64 | 127 | 1 | P218LFTA1850 | ● |
| **19.00** | 0/-0.033 | 19 | 64 | 127 | 1 | P218LFTA1900 | ● |
| **19.50** | 0/-0.033 | 19.5 | 66 | 131 | 1 | P218LFTA1950 | ● |
| **20.00** | 0/-0.033 | 20 | 66 | 131 | 1 | P218LFTA2000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

## 218LFTA

| | Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 | K1 K2 | N1 N2 | N3 N4 | |
|---|---|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | 150÷350 HB | | | |
| | Vc (m/min) | **40÷50** | **30÷40** | **18÷22** | **18÷22** | **30÷40** | **65÷75** | **45÷55** | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **2** | 0.060 | 0.051 | 0.042 | 0.042 | 0.057 | 0.066 | 0.060 | |
| | **3** | 0.084 | 0.071 | 0.059 | 0.059 | 0.080 | 0.092 | 0.084 | |
| | **4** | 0.108 | 0.092 | 0.076 | 0.076 | 0.103 | 0.119 | 0.108 | |
| | **5** | 0.132 | 0.112 | 0.092 | 0.092 | 0.125 | 0.145 | 0.132 | |
| | **6** | 0.156 | 0.133 | 0.109 | 0.109 | 0.148 | 0.172 | 0.156 | |
| | **7** | 0.180 | 0.153 | 0.126 | 0.126 | 0.171 | 0.198 | 0.180 | |
| | **8** | 0.204 | 0.173 | 0.143 | 0.143 | 0.194 | 0.224 | 0.204 | |
| | **9** | 0.228 | 0.194 | 0.160 | 0.160 | 0.217 | 0.251 | 0.228 | |
| | **10** | 0.252 | 0.214 | 0.176 | 0.176 | 0.239 | 0.277 | 0.252 | |
| | **11** | 0.276 | 0.235 | 0.179 | 0.179 | 0.262 | 0.304 | 0.276 | |
| | **12** | 0.300 | 0.255 | 0.195 | 0.195 | 0.285 | 0.330 | 0.300 | |
| | **13** | 0.324 | 0.275 | 0.204 | 0.204 | 0.308 | 0.356 | 0.324 | |
| | **14** | 0.348 | 0.296 | 0.219 | 0.219 | 0.331 | 0.383 | 0.348 | |
| | **15** | 0.372 | 0.316 | 0.223 | 0.223 | 0.353 | 0.409 | 0.372 | |
| | **16** | 0.396 | 0.337 | 0.238 | 0.238 | 0.376 | 0.436 | 0.396 | |
| | **17** | 0.420 | 0.357 | 0.252 | 0.252 | 0.399 | 0.462 | 0.420 | |
| | **18** | 0.444 | 0.377 | 0.266 | 0.266 | 0.422 | 0.488 | 0.444 | |
| | **19** | 0.468 | 0.398 | 0.281 | 0.281 | 0.445 | 0.515 | 0.468 | |
| | **20** | 0.492 | 0.418 | 0.295 | 0.295 | 0.467 | 0.541 | 0.492 | |

# 238LFTA

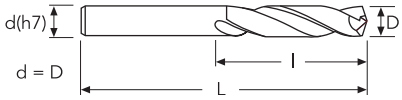
self-centering, general purpose, short

DIN 338 | LF | HSS/CO PV10 | 130° | 35-40°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d(h7) | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **2.00** | 0/-0.014 | 2 | 24 | 49 | 5 | P238LFTA0200 | ● |
| **2.10** | 0/-0.014 | 2.1 | 24 | 49 | 5 | P238LFTA0210 | ● |
| **2.20** | 0/-0.014 | 2.2 | 27 | 53 | 5 | P238LFTA0220 | ● |
| **2.30** | 0/-0.014 | 2.3 | 27 | 53 | 5 | P238LFTA0230 | ● |
| **2.40** | 0/-0.014 | 2.4 | 30 | 57 | 5 | P238LFTA0240 | ● |
| **2.50** | 0/-0.014 | 2.5 | 30 | 57 | 5 | P238LFTA0250 | ● |
| **2.60** | 0/-0.014 | 2.6 | 30 | 57 | 5 | P238LFTA0260 | ● |
| **2.70** | 0/-0.014 | 2.7 | 33 | 61 | 5 | P238LFTA0270 | ● |
| **2.80** | 0/-0.014 | 2.8 | 33 | 61 | 5 | P238LFTA0280 | ● |
| **2.90** | 0/-0.014 | 2.9 | 33 | 61 | 5 | P238LFTA0290 | ● |
| **3.00** | 0/-0.014 | 3 | 33 | 61 | 5 | P238LFTA0300 | ● |
| **3.10** | 0/-0.018 | 3.1 | 36 | 65 | 5 | P238LFTA0310 | ● |
| **3.20** | 0/-0.018 | 3.2 | 36 | 65 | 5 | P238LFTA0320 | ● |
| **3.30** | 0/-0.018 | 3.3 | 36 | 65 | 5 | P238LFTA0330 | ● |
| **3.40** | 0/-0.018 | 3.4 | 39 | 70 | 5 | P238LFTA0340 | ● |
| **3.50** | 0/-0.018 | 3.5 | 39 | 70 | 5 | P238LFTA0350 | ● |
| **3.60** | 0/-0.018 | 3.6 | 39 | 70 | 5 | P238LFTA0360 | ● |
| **3.70** | 0/-0.018 | 3.7 | 39 | 70 | 5 | P238LFTA0370 | ● |
| **3.80** | 0/-0.018 | 3.8 | 43 | 75 | 5 | P238LFTA0380 | ● |
| **3.90** | 0/-0.018 | 3.9 | 43 | 75 | 5 | P238LFTA0390 | ● |
| **4.00** | 0/-0.018 | 4 | 43 | 75 | 5 | P238LFTA0400 | ● |
| **4.10** | 0/-0.018 | 4.1 | 43 | 75 | 5 | P238LFTA0410 | ● |
| **4.20** | 0/-0.018 | 4.2 | 43 | 75 | 5 | P238LFTA0420 | ● |
| **4.30** | 0/-0.018 | 4.3 | 47 | 80 | 5 | P238LFTA0430 | ● |
| **4.40** | 0/-0.018 | 4.4 | 47 | 80 | 5 | P238LFTA0440 | ● |
| **4.50** | 0/-0.018 | 4.5 | 47 | 80 | 5 | P238LFTA0450 | ● |
| **4.60** | 0/-0.018 | 4.6 | 47 | 80 | 5 | P238LFTA0460 | ● |
| **4.70** | 0/-0.018 | 4.7 | 47 | 80 | 5 | P238LFTA0470 | ● |
| **4.80** | 0/-0.018 | 4.8 | 52 | 86 | 5 | P238LFTA0480 | ● |
| **4.90** | 0/-0.018 | 4.9 | 52 | 86 | 5 | P238LFTA0490 | ● |
| **5.00** | 0/-0.018 | 5 | 52 | 86 | 5 | P238LFTA0500 | ● |
| **5.10** | 0/-0.018 | 5.1 | 52 | 86 | 5 | P238LFTA0510 | ● |
| **5.20** | 0/-0.018 | 5.2 | 52 | 86 | 5 | P238LFTA0520 | ● |
| **5.30** | 0/-0.018 | 5.3 | 52 | 86 | 5 | P238LFTA0530 | ● |
| **5.40** | 0/-0.018 | 5.4 | 57 | 93 | 5 | P238LFTA0540 | ● |
| **5.50** | 0/-0.018 | 5.5 | 57 | 93 | 5 | P238LFTA0550 | ● |
| **5.60** | 0/-0.018 | 5.6 | 57 | 93 | 5 | P238LFTA0560 | ● |
| **5.70** | 0/-0.018 | 5.7 | 57 | 93 | 5 | P238LFTA0570 | ● |
| **5.80** | 0/-0.018 | 5.8 | 57 | 93 | 5 | P238LFTA0580 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

# 238LFTA

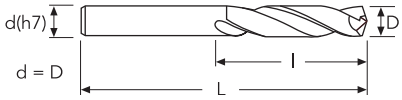
self-centering, general purpose, short

DIN 338 | LF | HSS/CO PV10 | 130° | 35-40°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d(h7) | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **5.90** | 0/-0.018 | 5.9 | 57 | 93 | 5 | P238LFTA0590 | ● |
| **6.00** | 0/-0.018 | 6 | 57 | 93 | 5 | P238LFTA0600 | ● |
| **6.10** | 0/-0.022 | 6.1 | 63 | 101 | 1 | P238LFTA0610 | ● |
| **6.20** | 0/-0.022 | 6.2 | 63 | 101 | 1 | P238LFTA0620 | ● |
| **6.30** | 0/-0.022 | 6.3 | 63 | 101 | 1 | P238LFTA0630 | ● |
| **6.40** | 0/-0.022 | 6.4 | 63 | 101 | 1 | P238LFTA0640 | ● |
| **6.50** | 0/-0.022 | 6.5 | 63 | 101 | 1 | P238LFTA0650 | ● |
| **6.60** | 0/-0.022 | 6.6 | 63 | 101 | 1 | P238LFTA0660 | ● |
| **6.70** | 0/-0.022 | 6.7 | 63 | 101 | 1 | P238LFTA0670 | ● |
| **6.80** | 0/-0.022 | 6.8 | 69 | 109 | 1 | P238LFTA0680 | ● |
| **6.90** | 0/-0.022 | 6.9 | 69 | 109 | 1 | P238LFTA0690 | ● |
| **7.00** | 0/-0.022 | 7 | 69 | 109 | 1 | P238LFTA0700 | ● |
| **7.10** | 0/-0.022 | 7.1 | 69 | 109 | 1 | P238LFTA0710 | ● |
| **7.20** | 0/-0.022 | 7.2 | 69 | 109 | 1 | P238LFTA0720 | ● |
| **7.30** | 0/-0.022 | 7.3 | 69 | 109 | 1 | P238LFTA0730 | ● |
| **7.40** | 0/-0.022 | 7.4 | 69 | 109 | 1 | P238LFTA0740 | ● |
| **7.50** | 0/-0.022 | 7.5 | 69 | 109 | 1 | P238LFTA0750 | ● |
| **7.60** | 0/-0.022 | 7.6 | 75 | 117 | 1 | P238LFTA0760 | ● |
| **7.70** | 0/-0.022 | 7.7 | 75 | 117 | 1 | P238LFTA0770 | ● |
| **7.80** | 0/-0.022 | 7.8 | 75 | 117 | 1 | P238LFTA0780 | ● |
| **7.90** | 0/-0.022 | 7.9 | 75 | 117 | 1 | P238LFTA0790 | ● |
| **8.00** | 0/-0.022 | 8 | 75 | 117 | 1 | P238LFTA0800 | ● |
| **8.10** | 0/-0.022 | 8.1 | 75 | 117 | 1 | P238LFTA0810 | ● |
| **8.20** | 0/-0.022 | 8.2 | 75 | 117 | 1 | P238LFTA0820 | ● |
| **8.30** | 0/-0.022 | 8.3 | 75 | 117 | 1 | P238LFTA0830 | ● |
| **8.40** | 0/-0.022 | 8.4 | 75 | 117 | 1 | P238LFTA0840 | ● |
| **8.50** | 0/-0.022 | 8.5 | 75 | 117 | 1 | P238LFTA0850 | ● |
| **8.60** | 0/-0.022 | 8.6 | 81 | 125 | 1 | P238LFTA0860 | ● |
| **8.70** | 0/-0.022 | 8.7 | 81 | 125 | 1 | P238LFTA0870 | ● |
| **8.80** | 0/-0.022 | 8.8 | 81 | 125 | 1 | P238LFTA0880 | ● |
| **8.90** | 0/-0.022 | 8.9 | 81 | 125 | 1 | P238LFTA0890 | ● |
| **9.00** | 0/-0.022 | 9 | 81 | 125 | 1 | P238LFTA0900 | ● |
| **9.10** | 0/-0.022 | 9.1 | 81 | 125 | 1 | P238LFTA0910 | ● |
| **9.20** | 0/-0.022 | 9.2 | 81 | 125 | 1 | P238LFTA0920 | ● |
| **9.30** | 0/-0.022 | 9.3 | 81 | 125 | 1 | P238LFTA0930 | ● |
| **9.40** | 0/-0.022 | 9.4 | 81 | 125 | 1 | P238LFTA0940 | ● |
| **9.50** | 0/-0.022 | 9.5 | 81 | 125 | 1 | P238LFTA0950 | ● |
| **9.60** | 0/-0.022 | 9.6 | 87 | 133 | 1 | P238LFTA0960 | ● |
| **9.70** | 0/-0.022 | 9.7 | 87 | 133 | 1 | P238LFTA0970 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 238LFTA

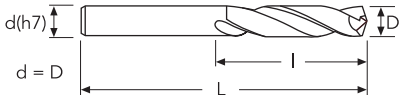
self-centering, general purpose, short

DIN 338 | LF | HSS/CO PV10 | 130° | 35-40°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d(h7) | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **9.80** | 0/-0.022 | 9.8 | 87 | 133 | 1 | P238LFTA0980 | ● |
| **9.90** | 0/-0.022 | 9.9 | 87 | 133 | 1 | P238LFTA0990 | ● |
| **10.00** | 0/-0.022 | 10 | 87 | 133 | 1 | P238LFTA1000 | ● |
| **10.20** | 0/-0.027 | 10.2 | 87 | 133 | 1 | P238LFTA1020 | ● |
| **10.30** | 0/-0.027 | 10.3 | 87 | 133 | 1 | P238LFTA1030 | ● |
| **10.50** | 0/-0.027 | 10.5 | 87 | 133 | 1 | P238LFTA1050 | ● |
| **10.80** | 0/-0.027 | 10.8 | 94 | 142 | 1 | P238LFTA1080 | ● |
| **11.00** | 0/-0.027 | 11 | 94 | 142 | 1 | P238LFTA1100 | ● |
| **11.20** | 0/-0.027 | 11.2 | 94 | 142 | 1 | P238LFTA1120 | ● |
| **11.30** | 0/-0.027 | 11.3 | 94 | 142 | 1 | P238LFTA1130 | ● |
| **11.50** | 0/-0.027 | 11.5 | 94 | 142 | 1 | P238LFTA1150 | ● |
| **11.80** | 0/-0.027 | 11.8 | 94 | 142 | 1 | P238LFTA1180 | ● |
| **12.00** | 0/-0.027 | 12 | 101 | 151 | 1 | P238LFTA1200 | ● |
| **12.20** | 0/-0.027 | 12.2 | 101 | 151 | 1 | P238LFTA1220 | ● |
| **12.50** | 0/-0.027 | 12.5 | 101 | 151 | 1 | P238LFTA1250 | ● |
| **12.80** | 0/-0.027 | 12.8 | 101 | 151 | 1 | P238LFTA1280 | ● |
| **13.00** | 0/-0.027 | 13 | 101 | 151 | 1 | P238LFTA1300 | ● |
| **13.30** | 0/-0.027 | 13.3 | 108 | 160 | 1 | P238LFTA1330 | ● |
| **13.50** | 0/-0.027 | 13.5 | 108 | 160 | 1 | P238LFTA1350 | ● |
| **13.80** | 0/-0.027 | 13.8 | 108 | 160 | 1 | P238LFTA1380 | ● |
| **14.00** | 0/-0.027 | 14 | 108 | 160 | 1 | P238LFTA1400 | ● |
| **14.50** | 0/-0.027 | 14.5 | 114 | 169 | 1 | P238LFTA1450 | ● |
| **14.80** | 0/-0.027 | 14.8 | 114 | 169 | 1 | P238LFTA1480 | ● |
| **15.00** | 0/-0.027 | 15 | 114 | 169 | 1 | P238LFTA1500 | ● |
| **15.30** | 0/-0.027 | 15.3 | 120 | 178 | 1 | P238LFTA1530 | ● |
| **15.50** | 0/-0.027 | 15.5 | 120 | 178 | 1 | P238LFTA1550 | ● |
| **15.80** | 0/-0.027 | 15.8 | 120 | 178 | 1 | P238LFTA1580 | ● |
| **16.00** | 0/-0.027 | 16 | 120 | 178 | 1 | P238LFTA1600 | ● |
| **16.50** | 0/-0.027 | 16.5 | 125 | 184 | 1 | P238LFTA1650 | ● |
| **17.00** | 0/-0.027 | 17 | 125 | 184 | 1 | P238LFTA1700 | ● |
| **17.50** | 0/-0.027 | 17.5 | 130 | 191 | 1 | P238LFTA1750 | ● |
| **18.00** | 0/-0.027 | 18 | 130 | 191 | 1 | P238LFTA1800 | ● |
| **18.50** | 0/-0.033 | 18.5 | 135 | 198 | 1 | P238LFTA1850 | ● |
| **19.00** | 0/-0.033 | 19 | 135 | 198 | 1 | P238LFTA1900 | ● |
| **19.50** | 0/-0.033 | 19.5 | 140 | 205 | 1 | P238LFTA1950 | ● |
| **20.00** | 0/-0.033 | 20 | 140 | 205 | 1 | P238LFTA2000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# 238LFTA

| | Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 | K1 K2 | N1 N2 | N3 N4 | |
|---|---|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | 150÷350 HB | | | |
| | Vc (m/min) | **30÷40** | **20÷30** | **14÷18** | **14÷18** | **25÷35** | **50÷60** | **35÷45** | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **2** | 0.054 | 0.046 | 0.038 | 0.038 | 0.051 | 0.059 | 0.054 | |
| | **3** | 0.076 | 0.064 | 0.053 | 0.053 | 0.072 | 0.083 | 0.076 | |
| | **4** | 0.097 | 0.083 | 0.068 | 0.068 | 0.092 | 0.107 | 0.097 | |
| | **5** | 0.119 | 0.101 | 0.083 | 0.083 | 0.113 | 0.131 | 0.119 | |
| | **6** | 0.140 | 0.119 | 0.098 | 0.098 | 0.133 | 0.154 | 0.140 | |
| | **7** | 0.162 | 0.138 | 0.113 | 0.113 | 0.154 | 0.178 | 0.162 | |
| | **8** | 0.184 | 0.156 | 0.129 | 0.129 | 0.174 | 0.202 | 0.184 | |
| | **9** | 0.205 | 0.174 | 0.144 | 0.144 | 0.195 | 0.226 | 0.205 | |
| | **10** | 0.227 | 0.193 | 0.159 | 0.159 | 0.215 | 0.249 | 0.227 | |
| | **11** | 0.248 | 0.211 | 0.161 | 0.161 | 0.236 | 0.273 | 0.248 | |
| | **12** | 0.270 | 0.230 | 0.176 | 0.176 | 0.257 | 0.297 | 0.270 | |
| | **13** | 0.292 | 0.248 | 0.184 | 0.184 | 0.277 | 0.321 | 0.292 | |
| | **14** | 0.313 | 0.266 | 0.197 | 0.197 | 0.298 | 0.345 | 0.313 | |
| | **15** | 0.335 | 0.285 | 0.201 | 0.201 | 0.318 | 0.368 | 0.335 | |
| | **16** | 0.356 | 0.303 | 0.214 | 0.214 | 0.339 | 0.392 | 0.356 | |
| | **17** | 0.378 | 0.321 | 0.227 | 0.227 | 0.359 | 0.416 | 0.378 | |
| | **18** | 0.400 | 0.340 | 0.240 | 0.240 | 0.380 | 0.440 | 0.400 | |
| | **19** | 0.421 | 0.358 | 0.253 | 0.253 | 0.400 | 0.463 | 0.421 | |
| | **20** | 0.443 | 0.376 | 0.266 | 0.266 | 0.421 | 0.487 | 0.443 | |





# SUTA
## HIGH PERFORMANCE

High performance and self-centering geometry. Featuring premium HSSE+PV10 coating and special edge design, enables very low cutting pressure and outstanding performance on stainless steel, steel and non-ferrous materials.

Alto rendimento e affilatura autocentrante. Costruita con i migliori HSSE+PV10 e speciale geometria del tagliente, garantisce un bassissimo sforzo di taglio e prestazioni eccezionali nella foratura di acciaio inossidabile, acciaio e materiali non ferrosi.

Hohe Leistungen und selbstzentrierende Schnittgeometrie. Aus hervorragendem HSSE mit PV10 Beschichtung. Dank des sehr geringen Schneiddrucks, sind unschlagbare Leistungen auf rostfreien Stählen, Stählen und NE-Metall-Werkstoffe möglich.

Haute performance et affûtage autocentré. Fabriquée avec les meilleurs HSSE+PV10 et une géométrie spécifique de l'arête, elle permet de minimiser les efforts de coupe en garantissant des performances exceptionnelles dans le perçage des aciers inoxydables, des aciers et des matériaux non ferreux.

Broca de alto rendimiento con afilado autocentrante. Fabricada en HSSE Premium con recubrimiento PV10 y geometría especial, minimiza el esfuerzo de corte y permite lograr un altísimo rendimiento en aceros inoxidables, aceros y materiales no ferrosos.

Высокопроизводительная и самоцентрующаяся геометрия. Высококачественная быстрорежущая сталь с покрытием PV10 и специальная геометрия режущих кромок обеспечивает низкие силы резания и непревзойденную производительность при работе по нержавеющей стали, конструкционной стали и цветным металлам.

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
**SUTA**
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 980SUTA

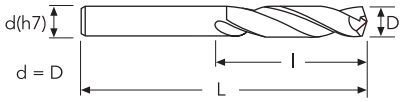
self centering, stainless steel, extra-short

OSAWA NORM | SU | HSSE PV10 | 120° | 38°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | | ★ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d(h7) | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **2.00** | 0/-0.014 | 2 | 12 | 44 | 1 | P980SUTA0200 | ● |
| **2.10** | 0/-0.014 | 2.1 | 12 | 44 | 1 | P980SUTA0210 | ● |
| **2.20** | 0/-0.014 | 2.2 | 13 | 45 | 1 | P980SUTA0220 | ● |
| **2.30** | 0/-0.014 | 2.3 | 13 | 45 | 1 | P980SUTA0230 | ● |
| **2.40** | 0/-0.014 | 2.4 | 14 | 46 | 1 | P980SUTA0240 | ● |
| **2.50** | 0/-0.014 | 2.5 | 14 | 46 | 1 | P980SUTA0250 | ● |
| **2.60** | 0/-0.014 | 2.6 | 14 | 46 | 1 | P980SUTA0260 | ● |
| **2.70** | 0/-0.014 | 2.7 | 16 | 48 | 1 | P980SUTA0270 | ● |
| **2.80** | 0/-0.014 | 2.8 | 16 | 48 | 1 | P980SUTA0280 | ● |
| **2.90** | 0/-0.014 | 2.9 | 16 | 48 | 1 | P980SUTA0290 | ● |
| **3.00** | 0/-0.014 | 3 | 16 | 48 | 1 | P980SUTA0300 | ● |
| **3.10** | 0/-0.018 | 3.1 | 18 | 50 | 1 | P980SUTA0310 | ● |
| **3.20** | 0/-0.018 | 3.2 | 18 | 50 | 1 | P980SUTA0320 | ● |
| **3.30** | 0/-0.018 | 3.3 | 18 | 50 | 1 | P980SUTA0330 | ● |
| **3.40** | 0/-0.018 | 3.4 | 20 | 52 | 1 | P980SUTA0340 | ● |
| **3.50** | 0/-0.018 | 3.5 | 20 | 52 | 1 | P980SUTA0350 | ● |
| **3.60** | 0/-0.018 | 3.6 | 20 | 52 | 1 | P980SUTA0360 | ● |
| **3.70** | 0/-0.018 | 3.7 | 20 | 52 | 1 | P980SUTA0370 | ● |
| **3.80** | 0/-0.018 | 3.8 | 22 | 54 | 1 | P980SUTA0380 | ● |
| **3.90** | 0/-0.018 | 3.9 | 22 | 54 | 1 | P980SUTA0390 | ● |
| **4.00** | 0/-0.018 | 4 | 22 | 54 | 1 | P980SUTA0400 | ● |
| **4.10** | 0/-0.018 | 4.1 | 22 | 66 | 1 | P980SUTA0410 | ● |
| **4.20** | 0/-0.018 | 4.2 | 22 | 66 | 1 | P980SUTA0420 | ● |
| **4.30** | 0/-0.018 | 4.3 | 24 | 68 | 1 | P980SUTA0430 | ● |
| **4.40** | 0/-0.018 | 4.4 | 24 | 68 | 1 | P980SUTA0440 | ● |
| **4.50** | 0/-0.018 | 4.5 | 24 | 68 | 1 | P980SUTA0450 | ● |
| **4.60** | 0/-0.018 | 4.6 | 24 | 68 | 1 | P980SUTA0460 | ● |
| **4.70** | 0/-0.018 | 4.7 | 24 | 68 | 1 | P980SUTA0470 | ● |
| **4.80** | 0/-0.018 | 4.8 | 26 | 70 | 1 | P980SUTA0480 | ● |
| **4.90** | 0/-0.018 | 4.9 | 26 | 70 | 1 | P980SUTA0490 | ● |
| **5.00** | 0/-0.018 | 5 | 26 | 70 | 1 | P980SUTA0500 | ● |
| **5.10** | 0/-0.018 | 5.1 | 26 | 70 | 1 | P980SUTA0510 | ● |
| **5.20** | 0/-0.018 | 5.2 | 26 | 70 | 1 | P980SUTA0520 | ● |
| **5.30** | 0/-0.018 | 5.3 | 26 | 70 | 1 | P980SUTA0530 | ● |
| **5.40** | 0/-0.018 | 5.4 | 28 | 72 | 1 | P980SUTA0540 | ● |
| **5.50** | 0/-0.018 | 5.5 | 28 | 72 | 1 | P980SUTA0550 | ● |
| **5.60** | 0/-0.018 | 5.6 | 28 | 72 | 1 | P980SUTA0560 | ● |
| **5.70** | 0/-0.018 | 5.7 | 28 | 72 | 1 | P980SUTA0570 | ● |
| **5.80** | 0/-0.018 | 5.8 | 28 | 72 | 1 | P980SUTA0580 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 980SUTA

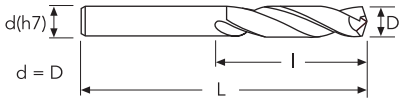
self centering, stainless steel, extra-short

OSAWA NORM | SU | HSSE PV10 | 120° | 38°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | | ★ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d(h7) | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **5.90** | 0/-0.018 | 5.9 | 28 | 72 | 1 | P980SUTA0590 | ● |
| **6.00** | 0/-0.018 | 6 | 28 | 72 | 1 | P980SUTA0600 | ● |
| **6.10** | 0/-0.022 | 6.1 | 31 | 75 | 1 | P980SUTA0610 | ● |
| **6.20** | 0/-0.022 | 6.2 | 31 | 75 | 1 | P980SUTA0620 | ● |
| **6.30** | 0/-0.022 | 6.3 | 31 | 75 | 1 | P980SUTA0630 | ● |
| **6.40** | 0/-0.022 | 6.4 | 31 | 75 | 1 | P980SUTA0640 | ● |
| **6.50** | 0/-0.022 | 6.5 | 31 | 75 | 1 | P980SUTA0650 | ● |
| **6.60** | 0/-0.022 | 6.6 | 31 | 75 | 1 | P980SUTA0660 | ● |
| **6.70** | 0/-0.022 | 6.7 | 31 | 75 | 1 | P980SUTA0670 | ● |
| **6.80** | 0/-0.022 | 6.8 | 34 | 78 | 1 | P980SUTA0680 | ● |
| **6.90** | 0/-0.022 | 6.9 | 34 | 78 | 1 | P980SUTA0690 | ● |
| **7.00** | 0/-0.022 | 7 | 34 | 78 | 1 | P980SUTA0700 | ● |
| **7.10** | 0/-0.022 | 7.1 | 34 | 78 | 1 | P980SUTA0710 | ● |
| **7.20** | 0/-0.022 | 7.2 | 34 | 78 | 1 | P980SUTA0720 | ● |
| **7.30** | 0/-0.022 | 7.3 | 34 | 78 | 1 | P980SUTA0730 | ● |
| **7.40** | 0/-0.022 | 7.4 | 34 | 78 | 1 | P980SUTA0740 | ● |
| **7.50** | 0/-0.022 | 7.5 | 34 | 78 | 1 | P980SUTA0750 | ● |
| **7.60** | 0/-0.022 | 7.6 | 37 | 81 | 1 | P980SUTA0760 | ● |
| **7.70** | 0/-0.022 | 7.7 | 37 | 81 | 1 | P980SUTA0770 | ● |
| **7.80** | 0/-0.022 | 7.8 | 37 | 81 | 1 | P980SUTA0780 | ● |
| **7.90** | 0/-0.022 | 7.9 | 37 | 81 | 1 | P980SUTA0790 | ● |
| **8.00** | 0/-0.022 | 8 | 37 | 81 | 1 | P980SUTA0800 | ● |
| **8.10** | 0/-0.022 | 8.1 | 37 | 87 | 1 | P980SUTA0810 | ● |
| **8.20** | 0/-0.022 | 8.2 | 37 | 87 | 1 | P980SUTA0820 | ● |
| **8.30** | 0/-0.022 | 8.3 | 37 | 87 | 1 | P980SUTA0830 | ● |
| **8.40** | 0/-0.022 | 8.4 | 37 | 87 | 1 | P980SUTA0840 | ● |
| **8.50** | 0/-0.022 | 8.5 | 37 | 87 | 1 | P980SUTA0850 | ● |
| **8.60** | 0/-0.022 | 8.6 | 40 | 90 | 1 | P980SUTA0860 | ● |
| **8.70** | 0/-0.022 | 8.7 | 40 | 90 | 1 | P980SUTA0870 | ● |
| **8.80** | 0/-0.022 | 8.8 | 40 | 90 | 1 | P980SUTA0880 | ● |
| **8.90** | 0/-0.022 | 8.9 | 40 | 90 | 1 | P980SUTA0890 | ● |
| **9.00** | 0/-0.022 | 9 | 40 | 90 | 1 | P980SUTA0900 | ● |
| **9.10** | 0/-0.022 | 9.1 | 40 | 90 | 1 | P980SUTA0910 | ● |
| **9.20** | 0/-0.022 | 9.2 | 40 | 90 | 1 | P980SUTA0920 | ● |
| **9.30** | 0/-0.022 | 9.3 | 40 | 90 | 1 | P980SUTA0930 | ● |
| **9.40** | 0/-0.022 | 9.4 | 40 | 90 | 1 | P980SUTA0940 | ● |
| **9.50** | 0/-0.022 | 9.5 | 40 | 90 | 1 | P980SUTA0950 | ● |
| **9.60** | 0/-0.022 | 9.6 | 43 | 93 | 1 | P980SUTA0960 | ● |
| **9.70** | 0/-0.022 | 9.7 | 43 | 93 | 1 | P980SUTA0970 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
**SUTA**
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 980SUTA

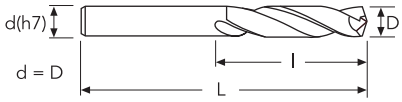
self centering, stainless steel, extra-short

OSAWA NORM | SU | HSSE PV10 | 120° | 38°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | | ★ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d(h7) | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **9.80** | 0/-0.022 | 9.8 | 43 | 93 | 1 | P980SUTA0980 | ● |
| **9.90** | 0/-0.022 | 9.9 | 43 | 93 | 1 | P980SUTA0990 | ● |
| **10.00** | 0/-0.022 | 10 | 43 | 93 | 1 | P980SUTA1000 | ● |
| **10.10** | 0/-0.022 | 10.1 | 43 | 100 | 1 | P980SUTA1010 | ● |
| **10.20** | 0/-0.022 | 10.2 | 43 | 100 | 1 | P980SUTA1020 | ● |
| **10.30** | 0/-0.022 | 10.3 | 43 | 100 | 1 | P980SUTA1030 | ● |
| **10.40** | 0/-0.022 | 10.4 | 43 | 100 | 1 | P980SUTA1040 | ● |
| **10.50** | 0/-0.022 | 10.5 | 43 | 100 | 1 | P980SUTA1050 | ● |
| **10.60** | 0/-0.022 | 10.6 | 43 | 100 | 1 | P980SUTA1060 | ● |
| **10.70** | 0/-0.022 | 10.7 | 47 | 104 | 1 | P980SUTA1070 | ● |
| **10.80** | 0/-0.022 | 10.8 | 47 | 104 | 1 | P980SUTA1080 | ● |
| **10.90** | 0/-0.022 | 10.9 | 47 | 104 | 1 | P980SUTA1090 | ● |
| **11.00** | 0/-0.022 | 11 | 47 | 104 | 1 | P980SUTA1100 | ● |
| **11.10** | 0/-0.022 | 11.1 | 47 | 104 | 1 | P980SUTA1110 | ● |
| **11.20** | 0/-0.022 | 11.2 | 47 | 104 | 1 | P980SUTA1120 | ● |
| **11.30** | 0/-0.022 | 11.3 | 47 | 104 | 1 | P980SUTA1130 | ● |
| **11.40** | 0/-0.022 | 11.4 | 47 | 104 | 1 | P980SUTA1140 | ● |
| **11.50** | 0/-0.022 | 11.5 | 47 | 104 | 1 | P980SUTA1150 | ● |
| **11.60** | 0/-0.022 | 11.6 | 47 | 104 | 1 | P980SUTA1160 | ● |
| **11.70** | 0/-0.022 | 11.7 | 47 | 104 | 1 | P980SUTA1170 | ● |
| **11.80** | 0/-0.022 | 11.8 | 47 | 104 | 1 | P980SUTA1180 | ● |
| **11.90** | 0/-0.022 | 11.9 | 51 | 108 | 1 | P980SUTA1190 | ● |
| **12.00** | 0/-0.022 | 12 | 51 | 108 | 1 | P980SUTA1200 | ● |
| **12.10** | 0/-0.022 | 12.1 | 51 | 108 | 1 | P980SUTA1210 | ● |
| **12.20** | 0/-0.022 | 12.2 | 51 | 108 | 1 | P980SUTA1220 | ● |
| **12.30** | 0/-0.022 | 12.3 | 51 | 108 | 1 | P980SUTA1230 | ● |
| **12.40** | 0/-0.022 | 12.4 | 51 | 108 | 1 | P980SUTA1240 | ● |
| **12.50** | 0/-0.022 | 12.5 | 51 | 108 | 1 | P980SUTA1250 | ● |
| **12.60** | 0/-0.022 | 12.6 | 51 | 108 | 1 | P980SUTA1260 | ● |
| **12.70** | 0/-0.022 | 12.7 | 51 | 108 | 1 | P980SUTA1270 | ● |
| **12.80** | 0/-0.022 | 12.8 | 51 | 108 | 1 | P980SUTA1280 | ● |
| **12.90** | 0/-0.022 | 12.9 | 51 | 108 | 1 | P980SUTA1290 | ● |
| **13.00** | 0/-0.022 | 13 | 51 | 108 | 1 | P980SUTA1300 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 980SUTA

| | Material Group ISO 513 | P1 P2 | P7 | M1 | M2 | N1 N2 N4 | N3 | S1 S2 | S4 |
|---|---|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 400÷700 N/mm² | | | | | <30 HRC | |
| | Vc (m/min) | **35÷45** | **18÷22** | **18÷22** | **12÷16** | **60÷80** | **30÷40** | **8÷12** | **12÷16** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **2** | 0.060 | 0.060 | 0.060 | 0.042 | 0.066 | 0.051 | 0.024 | 0.042 |
| | **3** | 0.080 | 0.080 | 0.080 | 0.056 | 0.088 | 0.068 | 0.032 | 0.056 |
| | **4** | 0.100 | 0.100 | 0.100 | 0.070 | 0.120 | 0.085 | 0.040 | 0.070 |
| | **5** | 0.120 | 0.120 | 0.120 | 0.084 | 0.144 | 0.102 | 0.060 | 0.084 |
| | **6** | 0.140 | 0.140 | 0.140 | 0.098 | 0.182 | 0.119 | 0.070 | 0.098 |
| | **7** | 0.160 | 0.160 | 0.160 | 0.112 | 0.208 | 0.136 | 0.096 | 0.128 |
| | **8** | 0.180 | 0.180 | 0.180 | 0.126 | 0.252 | 0.153 | 0.108 | 0.144 |
| | **9** | 0.200 | 0.200 | 0.200 | 0.140 | 0.280 | 0.170 | 0.120 | 0.160 |
| | **10** | 0.230 | 0.230 | 0.230 | 0.161 | 0.322 | 0.196 | 0.138 | 0.184 |
| | **11** | 0.260 | 0.260 | 0.260 | 0.169 | 0.364 | 0.221 | 0.156 | 0.208 |
| | **12** | 0.300 | 0.300 | 0.300 | 0.195 | 0.420 | 0.255 | 0.180 | 0.240 |
| | **13** | 0.340 | 0.340 | 0.340 | 0.221 | 0.476 | 0.289 | 0.204 | 0.272 |
| | **14** | 0.360 | 0.360 | 0.360 | 0.234 | 0.504 | 0.306 | 0.216 | 0.288 |
| | **15** | 0.380 | 0.380 | 0.380 | 0.247 | 0.532 | 0.323 | 0.228 | 0.304 |
| | **16** | 0.400 | 0.400 | 0.400 | 0.260 | 0.560 | 0.340 | 0.240 | 0.320 |
| | **17** | 0.425 | 0.425 | 0.425 | 0.276 | 0.595 | 0.361 | 0.255 | 0.340 |
| | **18** | 0.450 | 0.450 | 0.450 | 0.293 | 0.630 | 0.383 | 0.270 | 0.360 |
| | **19** | 0.460 | 0.460 | 0.460 | 0.299 | 0.644 | 0.391 | 0.276 | 0.368 |
| | **20** | 0.470 | 0.470 | 0.470 | 0.306 | 0.658 | 0.400 | 0.282 | 0.376 |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
**SUTA**
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 990SUTA

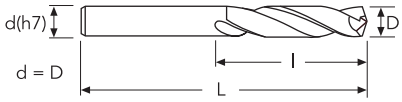
self centering, stainless steel, short

OSAWA NORM | SU | HSSE PV10 | 120° | 38°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | | ★ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d(h7) | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **2.00** | 0/-0.014 | 2 | 24 | 56 | 1 | P990SUTA0200 | ● |
| **2.10** | 0/-0.014 | 2.1 | 24 | 56 | 1 | P990SUTA0210 | ● |
| **2.20** | 0/-0.014 | 2.2 | 27 | 59 | 1 | P990SUTA0220 | ● |
| **2.30** | 0/-0.014 | 2.3 | 27 | 59 | 1 | P990SUTA0230 | ● |
| **2.40** | 0/-0.014 | 2.4 | 30 | 62 | 1 | P990SUTA0240 | ● |
| **2.50** | 0/-0.014 | 2.5 | 30 | 62 | 1 | P990SUTA0250 | ● |
| **2.60** | 0/-0.014 | 2.6 | 30 | 62 | 1 | P990SUTA0260 | ● |
| **2.70** | 0/-0.014 | 2.7 | 33 | 65 | 1 | P990SUTA0270 | ● |
| **2.80** | 0/-0.014 | 2.8 | 33 | 65 | 1 | P990SUTA0280 | ● |
| **2.90** | 0/-0.014 | 2.9 | 33 | 65 | 1 | P990SUTA0290 | ● |
| **3.00** | 0/-0.014 | 3 | 33 | 65 | 1 | P990SUTA0300 | ● |
| **3.10** | 0/-0.018 | 3.1 | 36 | 68 | 1 | P990SUTA0310 | ● |
| **3.20** | 0/-0.018 | 3.2 | 36 | 68 | 1 | P990SUTA0320 | ● |
| **3.30** | 0/-0.018 | 3.3 | 36 | 68 | 1 | P990SUTA0330 | ● |
| **3.40** | 0/-0.018 | 3.4 | 39 | 71 | 1 | P990SUTA0340 | ● |
| **3.50** | 0/-0.018 | 3.5 | 39 | 71 | 1 | P990SUTA0350 | ● |
| **3.60** | 0/-0.018 | 3.6 | 39 | 71 | 1 | P990SUTA0360 | ● |
| **3.70** | 0/-0.018 | 3.7 | 39 | 71 | 1 | P990SUTA0370 | ● |
| **3.80** | 0/-0.018 | 3.8 | 43 | 75 | 1 | P990SUTA0380 | ● |
| **3.90** | 0/-0.018 | 3.9 | 43 | 75 | 1 | P990SUTA0390 | ● |
| **4.00** | 0/-0.018 | 4 | 43 | 75 | 1 | P990SUTA0400 | ● |
| **4.10** | 0/-0.018 | 4.1 | 43 | 87 | 1 | P990SUTA0410 | ● |
| **4.20** | 0/-0.018 | 4.2 | 43 | 87 | 1 | P990SUTA0420 | ● |
| **4.30** | 0/-0.018 | 4.3 | 47 | 91 | 1 | P990SUTA0430 | ● |
| **4.40** | 0/-0.018 | 4.4 | 47 | 91 | 1 | P990SUTA0440 | ● |
| **4.50** | 0/-0.018 | 4.5 | 47 | 91 | 1 | P990SUTA0450 | ● |
| **4.60** | 0/-0.018 | 4.6 | 47 | 91 | 1 | P990SUTA0460 | ● |
| **4.70** | 0/-0.018 | 4.7 | 47 | 91 | 1 | P990SUTA0470 | ● |
| **4.80** | 0/-0.018 | 4.8 | 52 | 96 | 1 | P990SUTA0480 | ● |
| **4.90** | 0/-0.018 | 4.9 | 52 | 96 | 1 | P990SUTA0490 | ● |
| **5.00** | 0/-0.018 | 5 | 52 | 96 | 1 | P990SUTA0500 | ● |
| **5.10** | 0/-0.018 | 5.1 | 52 | 96 | 1 | P990SUTA0510 | ● |
| **5.20** | 0/-0.018 | 5.2 | 52 | 96 | 1 | P990SUTA0520 | ● |
| **5.30** | 0/-0.018 | 5.3 | 52 | 96 | 1 | P990SUTA0530 | ● |
| **5.40** | 0/-0.018 | 5.4 | 57 | 101 | 1 | P990SUTA0540 | ● |
| **5.50** | 0/-0.018 | 5.5 | 57 | 101 | 1 | P990SUTA0550 | ● |
| **5.60** | 0/-0.018 | 5.6 | 57 | 101 | 1 | P990SUTA0560 | ● |
| **5.70** | 0/-0.018 | 5.7 | 57 | 101 | 1 | P990SUTA0570 | ● |
| **5.80** | 0/-0.018 | 5.8 | 57 | 101 | 1 | P990SUTA0580 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

# 990SUTA

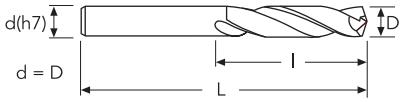
self centering, stainless steel, short

OSAWA NORM | SU | HSSE PV10 | 120° | 38°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | | ★ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d(h7) | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **5.90** | 0/-0.018 | 5.9 | 57 | 101 | 1 | P990SUTA0590 | ● |
| **6.00** | 0/-0.018 | 6 | 57 | 101 | 1 | P990SUTA0600 | ● |
| **6.10** | 0/-0.022 | 6.1 | 63 | 107 | 1 | P990SUTA0610 | ● |
| **6.20** | 0/-0.022 | 6.2 | 63 | 107 | 1 | P990SUTA0620 | ● |
| **6.30** | 0/-0.022 | 6.3 | 63 | 107 | 1 | P990SUTA0630 | ● |
| **6.40** | 0/-0.022 | 6.4 | 63 | 107 | 1 | P990SUTA0640 | ● |
| **6.50** | 0/-0.022 | 6.5 | 63 | 107 | 1 | P990SUTA0650 | ● |
| **6.60** | 0/-0.022 | 6.6 | 63 | 107 | 1 | P990SUTA0660 | ● |
| **6.70** | 0/-0.022 | 6.7 | 63 | 107 | 1 | P990SUTA0670 | ● |
| **6.80** | 0/-0.022 | 6.8 | 69 | 113 | 1 | P990SUTA0680 | ● |
| **6.90** | 0/-0.022 | 6.9 | 69 | 113 | 1 | P990SUTA0690 | ● |
| **7.00** | 0/-0.022 | 7 | 69 | 113 | 1 | P990SUTA0700 | ● |
| **7.10** | 0/-0.022 | 7.1 | 69 | 113 | 1 | P990SUTA0710 | ● |
| **7.20** | 0/-0.022 | 7.2 | 69 | 113 | 1 | P990SUTA0720 | ● |
| **7.30** | 0/-0.022 | 7.3 | 69 | 113 | 1 | P990SUTA0730 | ● |
| **7.40** | 0/-0.022 | 7.4 | 69 | 113 | 1 | P990SUTA0740 | ● |
| **7.50** | 0/-0.022 | 7.5 | 69 | 113 | 1 | P990SUTA0750 | ● |
| **7.60** | 0/-0.022 | 7.6 | 75 | 119 | 1 | P990SUTA0760 | ● |
| **7.70** | 0/-0.022 | 7.7 | 75 | 119 | 1 | P990SUTA0770 | ● |
| **7.80** | 0/-0.022 | 7.8 | 75 | 119 | 1 | P990SUTA0780 | ● |
| **7.90** | 0/-0.022 | 7.9 | 75 | 119 | 1 | P990SUTA0790 | ● |
| **8.00** | 0/-0.022 | 8 | 75 | 119 | 1 | P990SUTA0800 | ● |
| **8.10** | 0/-0.022 | 8.1 | 75 | 125 | 1 | P990SUTA0810 | ● |
| **8.20** | 0/-0.022 | 8.2 | 75 | 125 | 1 | P990SUTA0820 | ● |
| **8.30** | 0/-0.022 | 8.3 | 75 | 125 | 1 | P990SUTA0830 | ● |
| **8.40** | 0/-0.022 | 8.4 | 75 | 125 | 1 | P990SUTA0840 | ● |
| **8.50** | 0/-0.022 | 8.5 | 75 | 125 | 1 | P990SUTA0850 | ● |
| **8.60** | 0/-0.022 | 8.6 | 81 | 131 | 1 | P990SUTA0860 | ● |
| **8.70** | 0/-0.022 | 8.7 | 81 | 131 | 1 | P990SUTA0870 | ● |
| **8.80** | 0/-0.022 | 8.8 | 81 | 131 | 1 | P990SUTA0880 | ● |
| **8.90** | 0/-0.022 | 8.9 | 81 | 131 | 1 | P990SUTA0890 | ● |
| **9.00** | 0/-0.022 | 9 | 81 | 131 | 1 | P990SUTA0900 | ● |
| **9.10** | 0/-0.022 | 9.1 | 81 | 131 | 1 | P990SUTA0910 | ● |
| **9.20** | 0/-0.022 | 9.2 | 81 | 131 | 1 | P990SUTA0920 | ● |
| **9.30** | 0/-0.022 | 9.3 | 81 | 131 | 1 | P990SUTA0930 | ● |
| **9.40** | 0/-0.022 | 9.4 | 81 | 131 | 1 | P990SUTA0940 | ● |
| **9.50** | 0/-0.022 | 9.5 | 81 | 131 | 1 | P990SUTA0950 | ● |
| **9.60** | 0/-0.022 | 9.6 | 87 | 137 | 1 | P990SUTA0960 | ● |
| **9.70** | 0/-0.022 | 9.7 | 87 | 137 | 1 | P990SUTA0970 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 990SUTA

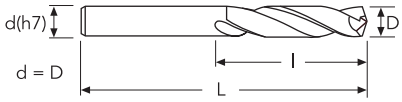
self centering, stainless steel, short

OSAWA NORM | SU | HSSE PV10 | 120° | 38°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | | ★ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d(h7) | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **9.80** | 0/-0.022 | 9.8 | 87 | 137 | 1 | P990SUTA0980 | ● |
| **9.90** | 0/-0.022 | 9.9 | 87 | 137 | 1 | P990SUTA0990 | ● |
| **10.00** | 0/-0.022 | 10 | 87 | 137 | 1 | P990SUTA1000 | ● |
| **10.10** | 0/-0.027 | 10.1 | 87 | 144 | 1 | P990SUTA1010 | ● |
| **10.20** | 0/-0.027 | 10.2 | 87 | 144 | 1 | P990SUTA1020 | ● |
| **10.30** | 0/-0.027 | 10.3 | 87 | 144 | 1 | P990SUTA1030 | ● |
| **10.40** | 0/-0.027 | 10.4 | 87 | 144 | 1 | P990SUTA1040 | ● |
| **10.50** | 0/-0.027 | 10.5 | 87 | 144 | 1 | P990SUTA1050 | ● |
| **10.60** | 0/-0.027 | 10.6 | 87 | 144 | 1 | P990SUTA1060 | ● |
| **10.70** | 0/-0.027 | 10.7 | 94 | 151 | 1 | P990SUTA1070 | ● |
| **10.80** | 0/-0.027 | 10.8 | 94 | 151 | 1 | P990SUTA1080 | ● |
| **10.90** | 0/-0.027 | 10.9 | 94 | 151 | 1 | P990SUTA1090 | ● |
| **11.00** | 0/-0.027 | 11 | 94 | 151 | 1 | P990SUTA1100 | ● |
| **11.10** | 0/-0.027 | 11.1 | 94 | 151 | 1 | P990SUTA1110 | ● |
| **11.20** | 0/-0.027 | 11.2 | 94 | 151 | 1 | P990SUTA1120 | ● |
| **11.30** | 0/-0.027 | 11.3 | 94 | 151 | 1 | P990SUTA1130 | ● |
| **11.40** | 0/-0.027 | 11.4 | 94 | 151 | 1 | P990SUTA1140 | ● |
| **11.50** | 0/-0.027 | 11.5 | 94 | 151 | 1 | P990SUTA1150 | ● |
| **11.60** | 0/-0.027 | 11.6 | 94 | 151 | 1 | P990SUTA1160 | ● |
| **11.70** | 0/-0.027 | 11.7 | 94 | 151 | 1 | P990SUTA1170 | ● |
| **11.80** | 0/-0.027 | 11.8 | 94 | 151 | 1 | P990SUTA1180 | ● |
| **11.90** | 0/-0.027 | 11.9 | 101 | 158 | 1 | P990SUTA1190 | ● |
| **12.00** | 0/-0.027 | 12 | 101 | 158 | 1 | P990SUTA1200 | ● |
| **12.10** | 0/-0.027 | 12.1 | 101 | 158 | 1 | P990SUTA1210 | ● |
| **12.20** | 0/-0.027 | 12.2 | 101 | 158 | 1 | P990SUTA1220 | ● |
| **12.30** | 0/-0.027 | 12.3 | 101 | 158 | 1 | P990SUTA1230 | ● |
| **12.40** | 0/-0.027 | 12.4 | 101 | 158 | 1 | P990SUTA1240 | ● |
| **12.50** | 0/-0.027 | 12.5 | 101 | 158 | 1 | P990SUTA1250 | ● |
| **12.60** | 0/-0.027 | 12.6 | 101 | 158 | 1 | P990SUTA1260 | ● |
| **12.70** | 0/-0.027 | 12.7 | 101 | 158 | 1 | P990SUTA1270 | ● |
| **12.80** | 0/-0.027 | 12.8 | 101 | 158 | 1 | P990SUTA1280 | ● |
| **12.90** | 0/-0.027 | 12.9 | 101 | 158 | 1 | P990SUTA1290 | ● |
| **13.00** | 0/-0.027 | 13 | 101 | 158 | 1 | P990SUTA1300 | ● |
| **13.50** | 0/-0.027 | 13.5 | 106 | 166 | 1 | P990SUTA1350 | ● |
| **14.00** | 0/-0.027 | 14 | 106 | 166 | 1 | P990SUTA1400 | ● |
| **14.10** | 0/-0.027 | 14.1 | 109 | 169 | 1 | P990SUTA1410 | ● |
| **14.50** | 0/-0.027 | 14.5 | 109 | 169 | 1 | P990SUTA1450 | ● |
| **15.00** | 0/-0.027 | 15 | 109 | 169 | 1 | P990SUTA1500 | ● |
| **15.50** | 0/-0.027 | 15.5 | 112 | 172 | 1 | P990SUTA1550 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 990SUTA

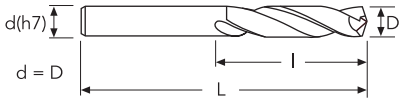
self centering, stainless steel, short

OSAWA NORM | SU | HSSE PV10 | 120° | 38°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | | ★ | ☆ | |

★ 1st choice ☆ suitable



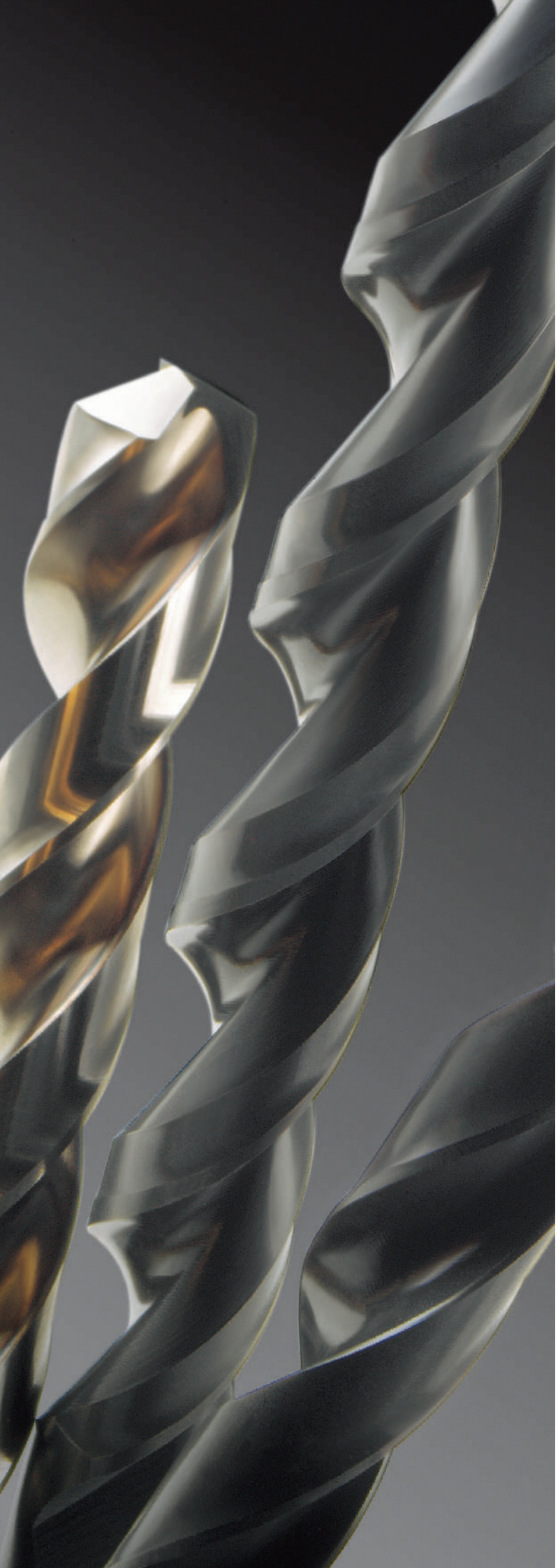

| D(h8) | D Tol. | d(h7) | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **15.60** | 0/-0.027 | 15.6 | 112 | 172 | 1 | P990SUTA1560 | ● |
| **16.00** | 0/-0.027 | 16 | 112 | 172 | 1 | P990SUTA1600 | ● |
| **16.50** | 0/-0.027 | 16.5 | 115 | 181 | 1 | P990SUTA1650 | ● |
| **17.00** | 0/-0.027 | 17 | 115 | 181 | 1 | P990SUTA1700 | ● |
| **17.50** | 0/-0.027 | 17.5 | 118 | 184 | 1 | P990SUTA1750 | ● |
| **17.6** | 0/-0.027 | 17.6 | 118 | 184 | 1 | P990SUTA1760 | ● |
| **18.00** | 0/-0.027 | 18 | 118 | 184 | 1 | P990SUTA1800 | ● |
| **18.50** | 0/-0.033 | 18.5 | 122 | 188 | 1 | P990SUTA1850 | ● |
| **19.00** | 0/-0.033 | 19 | 122 | 188 | 1 | P990SUTA1900 | ● |
| **19.50** | 0/-0.033 | 19.5 | 125 | 191 | 1 | P990SUTA1950 | ● |
| **20.00** | 0/-0.033 | 20 | 125 | 191 | 1 | P990SUTA2000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# 990SUTA

| | Material Group ISO 513 | P1 P2 | P7 | M1 | M2 | N1 N2 N4 | N3 | S1 S2 | S4 |
|---|---|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 400÷700 N/mm² | | | | | <30 HRC | |
| | Vc (m/min) | 35÷45 | 18÷22 | 18÷22 | 12÷16 | 60÷80 | 30÷40 | 8÷12 | 12÷16 |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | 2 | 0.057 | 0.057 | 0.057 | 0.040 | 0.063 | 0.048 | 0.023 | 0.040 |
| | 3 | 0.076 | 0.076 | 0.076 | 0.053 | 0.084 | 0.065 | 0.030 | 0.053 |
| | 4 | 0.095 | 0.095 | 0.095 | 0.067 | 0.105 | 0.081 | 0.038 | 0.067 |
| | 5 | 0.114 | 0.114 | 0.114 | 0.080 | 0.125 | 0.097 | 0.057 | 0.080 |
| | 6 | 0.133 | 0.133 | 0.133 | 0.093 | 0.146 | 0.113 | 0.067 | 0.093 |
| | 7 | 0.152 | 0.152 | 0.152 | 0.106 | 0.167 | 0.129 | 0.091 | 0.122 |
| | 8 | 0.171 | 0.171 | 0.171 | 0.120 | 0.188 | 0.145 | 0.103 | 0.137 |
| | 9 | 0.190 | 0.190 | 0.190 | 0.133 | 0.209 | 0.162 | 0.114 | 0.152 |
| | 10 | 0.219 | 0.219 | 0.219 | 0.153 | 0.240 | 0.186 | 0.131 | 0.175 |
| | 11 | 0.247 | 0.247 | 0.247 | 0.161 | 0.272 | 0.210 | 0.148 | 0.198 |
| | 12 | 0.285 | 0.285 | 0.285 | 0.185 | 0.314 | 0.242 | 0.171 | 0.228 |
| | 13 | 0.323 | 0.323 | 0.323 | 0.203 | 0.355 | 0.275 | 0.194 | 0.258 |
| | 14 | 0.342 | 0.342 | 0.342 | 0.215 | 0.376 | 0.291 | 0.205 | 0.274 |
| | 15 | 0.361 | 0.361 | 0.361 | 0.217 | 0.397 | 0.307 | 0.217 | 0.289 |
| | 16 | 0.380 | 0.380 | 0.380 | 0.228 | 0.418 | 0.323 | 0.228 | 0.304 |
| | 17 | 0.404 | 0.404 | 0.404 | 0.242 | 0.444 | 0.343 | 0.242 | 0.323 |
| | 18 | 0.428 | 0.428 | 0.428 | 0.257 | 0.470 | 0.363 | 0.257 | 0.342 |
| | 19 | 0.437 | 0.437 | 0.437 | 0.262 | 0.481 | 0.371 | 0.262 | 0.350 |
| | 20 | 0.447 | 0.447 | 0.447 | 0.268 | 0.491 | 0.380 | 0.268 | 0.357 |





# HSS-HSS/CO
## GENERAL PURPOSE

A wide variety of geometries and standards, as well as a profitable mix of performance and price.

Un'ampia varietà di geometrie e standard costruttivi, con una vantaggiosa combinazione di rendimento e convenienza, sono i punti di forza delle punte in HSS e HSS/Co Osawa.

Die breite Palette an Geometrien und genormten Baumaßen bieten eine außergewöhnlich vorteilhafte Verbindung von Preis und Leistung: unschlagbare Stärken der Osawa Bohrer aus HSS und HSS/Co.

La gamme de forets HSS et HSS/Co Osawa offre une grande variété de géométries standards permettant une combinaison très rentable de performance et de prix.

Una amplia variedad de geometrías y estándares de fabricación, y una ventajosa combinación de rendimiento y conveniencia, son los puntos de fuerza de las brocas HSS y HSS/Co Osawa.

Исходный материал наивысшего качества в комбинации с современным покрытием и специальной геометрией. Отличное сочетание производительности и стоимости.

# 118N

N type for general purpose, extra-short

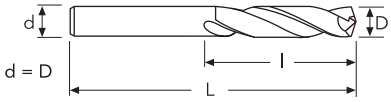


DIN 1897 | N | HSS OX * | 118° | 25-30°

* < Ø2 mm = BR

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ☆ | ☆ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **1.00** | 0/-0.014 | 1 | 6 | 26 | 10 | P118NB0100 | ● |
| **1.10** | 0/-0.014 | 1.1 | 7 | 28 | 10 | P118NB0110 | ● |
| **1.20** | 0/-0.014 | 1.2 | 8 | 30 | 10 | P118NB0120 | ● |
| **1.25** | 0/-0.014 | 1.25 | 8 | 30 | 10 | P118NB0125 | ● |
| **1.30** | 0/-0.014 | 1.3 | 8 | 30 | 10 | P118NB0130 | ● |
| **1.40** | 0/-0.014 | 1.4 | 9 | 32 | 10 | P118NB0140 | ● |
| **1.50** | 0/-0.014 | 1.5 | 9 | 32 | 10 | P118NB0150 | ● |
| **1.60** | 0/-0.014 | 1.6 | 10 | 34 | 10 | P118NB0160 | ● |
| **1.70** | 0/-0.014 | 1.7 | 10 | 34 | 10 | P118NB0170 | ● |
| **1.75** | 0/-0.014 | 1.75 | 11 | 36 | 10 | P118NB0175 | ● |
| **1.80** | 0/-0.014 | 1.8 | 11 | 36 | 10 | P118NB0180 | ● |
| **1.90** | 0/-0.014 | 1.9 | 11 | 36 | 10 | P118NB0190 | ● |
| **2.00** | 0/-0.014 | 2 | 12 | 38 | 10 | P118N0200 | ● |
| **2.10** | 0/-0.014 | 2.1 | 12 | 38 | 10 | P118N0210 | ● |
| **2.20** | 0/-0.014 | 2.2 | 13 | 40 | 10 | P118N0220 | ● |
| **2.25** | 0/-0.014 | 2.25 | 13 | 40 | 10 | P118N0225 | ● |
| **2.30** | 0/-0.014 | 2.3 | 13 | 40 | 10 | P118N0230 | ● |
| **2.40** | 0/-0.014 | 2.4 | 14 | 43 | 10 | P118N0240 | ● |
| **2.50** | 0/-0.014 | 2.5 | 14 | 43 | 10 | P118N0250 | ● |
| **2.60** | 0/-0.014 | 2.6 | 14 | 43 | 10 | P118N0260 | ● |
| **2.70** | 0/-0.014 | 2.7 | 16 | 46 | 10 | P118N0270 | ● |
| **2.75** | 0/-0.014 | 2.75 | 16 | 46 | 10 | P118N0275 | ● |
| **2.80** | 0/-0.014 | 2.8 | 16 | 46 | 10 | P118N0280 | ● |
| **2.90** | 0/-0.014 | 2.9 | 16 | 46 | 10 | P118N0290 | ● |
| **3.00** | 0/-0.014 | 3 | 16 | 46 | 10 | P118N0300 | ● |
| **3.10** | 0/-0.018 | 3.1 | 18 | 49 | 10 | P118N0310 | ● |
| **3.20** | 0/-0.018 | 3.2 | 18 | 49 | 10 | P118N0320 | ● |
| **3.25** | 0/-0.018 | 3.25 | 18 | 49 | 10 | P118N0325 | ● |
| **3.30** | 0/-0.018 | 3.3 | 18 | 49 | 10 | P118N0330 | ● |
| **3.40** | 0/-0.018 | 3.4 | 20 | 52 | 10 | P118N0340 | ● |
| **3.50** | 0/-0.018 | 3.5 | 20 | 52 | 10 | P118N0350 | ● |
| **3.60** | 0/-0.018 | 3.6 | 20 | 52 | 10 | P118N0360 | ● |
| **3.70** | 0/-0.018 | 3.7 | 20 | 52 | 10 | P118N0370 | ● |
| **3.75** | 0/-0.018 | 3.75 | 20 | 52 | 10 | P118N0375 | ● |
| **3.80** | 0/-0.018 | 3.8 | 22 | 55 | 10 | P118N0380 | ● |
| **3.90** | 0/-0.018 | 3.9 | 22 | 55 | 10 | P118N0390 | ● |
| **4.00** | 0/-0.018 | 4 | 22 | 55 | 10 | P118N0400 | ● |
| **4.10** | 0/-0.018 | 4.1 | 22 | 55 | 10 | P118N0410 | ● |
| **4.20** | 0/-0.018 | 4.2 | 22 | 55 | 10 | P118N0420 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 118N

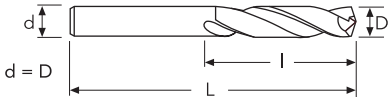
N type for general purpose, extra-short

DIN 1897 | N | HSS OX | 118° | 25-30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ☆ | ☆ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **4.25** | 0/-0.018 | 4.25 | 22 | 55 | 10 | P118N0425 | ● |
| **4.30** | 0/-0.018 | 4.3 | 24 | 58 | 10 | P118N0430 | ● |
| **4.40** | 0/-0.018 | 4.4 | 24 | 58 | 10 | P118N0440 | ○ |
| **4.50** | 0/-0.018 | 4.5 | 24 | 58 | 10 | P118N0450 | ● |
| **4.60** | 0/-0.018 | 4.6 | 24 | 58 | 10 | P118N0460 | ● |
| **4.70** | 0/-0.018 | 4.7 | 24 | 58 | 10 | P118N0470 | ● |
| **4.75** | 0/-0.018 | 4.75 | 24 | 58 | 10 | P118N0475 | ● |
| **4.80** | 0/-0.018 | 4.8 | 26 | 62 | 10 | P118N0480 | ● |
| **4.90** | 0/-0.018 | 4.9 | 26 | 62 | 10 | P118N0490 | ● |
| **5.00** | 0/-0.018 | 5 | 26 | 62 | 10 | P118N0500 | ● |
| **5.10** | 0/-0.018 | 5.1 | 26 | 62 | 10 | P118N0510 | ● |
| **5.20** | 0/-0.018 | 5.2 | 26 | 62 | 10 | P118N0520 | ● |
| **5.25** | 0/-0.018 | 5.25 | 26 | 62 | 10 | P118N0525 | ● |
| **5.30** | 0/-0.018 | 5.3 | 26 | 62 | 10 | P118N0530 | ● |
| **5.40** | 0/-0.018 | 5.4 | 28 | 66 | 10 | P118N0540 | ● |
| **5.50** | 0/-0.018 | 5.5 | 28 | 66 | 10 | P118N0550 | ● |
| **5.60** | 0/-0.018 | 5.6 | 28 | 66 | 10 | P118N0560 | ● |
| **5.70** | 0/-0.018 | 5.7 | 28 | 66 | 10 | P118N0570 | ● |
| **5.75** | 0/-0.018 | 5.75 | 28 | 66 | 10 | P118N0575 | ● |
| **5.80** | 0/-0.018 | 5.8 | 28 | 66 | 10 | P118N0580 | ● |
| **5.90** | 0/-0.018 | 5.9 | 28 | 66 | 10 | P118N0590 | ○ |
| **6.00** | 0/-0.018 | 6 | 28 | 66 | 10 | P118N0600 | ● |
| **6.10** | 0/-0.022 | 6.1 | 31 | 70 | 10 | P118N0610 | ● |
| **6.20** | 0/-0.022 | 6.2 | 31 | 70 | 10 | P118N0620 | ● |
| **6.25** | 0/-0.022 | 6.25 | 31 | 70 | 10 | P118N0625 | ● |
| **6.30** | 0/-0.022 | 6.3 | 31 | 70 | 10 | P118N0630 | ● |
| **6.40** | 0/-0.022 | 6.4 | 31 | 70 | 10 | P118N0640 | ● |
| **6.50** | 0/-0.022 | 6.5 | 31 | 70 | 10 | P118N0650 | ● |
| **6.60** | 0/-0.022 | 6.6 | 31 | 70 | 5 | P118N0660 | ○ |
| **6.70** | 0/-0.022 | 6.7 | 31 | 70 | 5 | P118N0670 | ● |
| **6.75** | 0/-0.022 | 6.75 | 34 | 74 | 5 | P118N0675 | ● |
| **6.80** | 0/-0.022 | 6.8 | 34 | 74 | 5 | P118N0680 | ● |
| **6.90** | 0/-0.022 | 6.9 | 34 | 74 | 5 | P118N0690 | ● |
| **7.00** | 0/-0.022 | 7 | 34 | 74 | 5 | P118N0700 | ● |
| **7.10** | 0/-0.022 | 7.1 | 34 | 74 | 5 | P118N0710 | ● |
| **7.20** | 0/-0.022 | 7.2 | 34 | 74 | 5 | P118N0720 | ● |
| **7.25** | 0/-0.022 | 7.25 | 34 | 74 | 5 | P118N0725 | ● |
| **7.30** | 0/-0.022 | 7.3 | 34 | 74 | 5 | P118N0730 | ● |
| **7.40** | 0/-0.022 | 7.4 | 34 | 74 | 5 | P118N0740 | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 118N

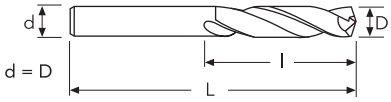
N type for general purpose, extra-short



DIN 1897 | N | HSS OX | 118° | 25-30°

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ☆ | ☆ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **7.50** | 0/-0.022 | 7.5 | 34 | 74 | 5 | P118N0750 | ● |
| **7.60** | 0/-0.022 | 7.6 | 37 | 79 | 5 | P118N0760 | ● |
| **7.70** | 0/-0.022 | 7.7 | 37 | 79 | 5 | P118N0770 | ○ |
| **7.75** | 0/-0.022 | 7.75 | 37 | 79 | 5 | P118N0775 | ● |
| **7.80** | 0/-0.022 | 7.8 | 37 | 79 | 5 | P118N0780 | ● |
| **7.90** | 0/-0.022 | 7.9 | 37 | 79 | 5 | P118N0790 | ○ |
| **8.00** | 0/-0.022 | 8 | 37 | 79 | 5 | P118N0800 | ● |
| **8.10** | 0/-0.022 | 8.1 | 37 | 79 | 5 | P118N0810 | ● |
| **8.20** | 0/-0.022 | 8.2 | 37 | 79 | 5 | P118N0820 | ● |
| **8.25** | 0/-0.022 | 8.25 | 37 | 79 | 5 | P118N0825 | ● |
| **8.30** | 0/-0.022 | 8.3 | 37 | 79 | 5 | P118N0830 | ○ |
| **8.40** | 0/-0.022 | 8.4 | 37 | 79 | 5 | P118N0840 | ○ |
| **8.50** | 0/-0.022 | 8.5 | 37 | 79 | 5 | P118N0850 | ● |
| **8.60** | 0/-0.022 | 8.6 | 40 | 84 | 5 | P118N0860 | ● |
| **8.70** | 0/-0.022 | 8.7 | 40 | 84 | 5 | P118N0870 | ○ |
| **8.75** | 0/-0.022 | 8.75 | 40 | 84 | 5 | P118N0875 | ● |
| **8.80** | 0/-0.022 | 8.8 | 40 | 84 | 5 | P118N0880 | ○ |
| **8.90** | 0/-0.022 | 8.9 | 40 | 84 | 5 | P118N0890 | ● |
| **9.00** | 0/-0.022 | 9 | 40 | 84 | 5 | P118N0900 | ● |
| **9.10** | 0/-0.022 | 9.1 | 40 | 84 | 5 | P118N0910 | ● |
| **9.20** | 0/-0.022 | 9.2 | 40 | 84 | 5 | P118N0920 | ○ |
| **9.25** | 0/-0.022 | 9.25 | 40 | 84 | 5 | P118N0925 | ○ |
| **9.30** | 0/-0.022 | 9.3 | 40 | 84 | 5 | P118N0930 | ○ |
| **9.40** | 0/-0.022 | 9.4 | 40 | 84 | 5 | P118N0940 | ○ |
| **9.50** | 0/-0.022 | 9.5 | 40 | 84 | 5 | P118N0950 | ● |
| **9.60** | 0/-0.022 | 9.6 | 43 | 89 | 5 | P118N0960 | ○ |
| **9.70** | 0/-0.022 | 9.7 | 43 | 89 | 5 | P118N0970 | ○ |
| **9.75** | 0/-0.022 | 9.75 | 43 | 89 | 5 | P118N0975 | ○ |
| **9.80** | 0/-0.022 | 9.8 | 43 | 89 | 5 | P118N0980 | ○ |
| **9.90** | 0/-0.022 | 9.9 | 43 | 89 | 5 | P118N0990 | ○ |
| **10.00** | 0/-0.022 | 10 | 43 | 89 | 5 | P118N1000 | ● |
| **10.25** | 0/-0.027 | 10.25 | 43 | 89 | 5 | P118N1025 | ● |
| **10.50** | 0/-0.027 | 10.5 | 43 | 89 | 5 | P118N1050 | ● |
| **10.75** | 0/-0.027 | 10.75 | 47 | 95 | 5 | P118N1075 | ● |
| **11.00** | 0/-0.027 | 11 | 47 | 95 | 5 | P118N1100 | ● |
| **11.25** | 0/-0.027 | 11.25 | 47 | 95 | 5 | P118N1125 | ● |
| **11.50** | 0/-0.027 | 11.5 | 47 | 95 | 5 | P118N1150 | ● |
| **11.75** | 0/-0.027 | 11.75 | 47 | 95 | 5 | P118N1175 | ● |
| **12.00** | 0/-0.027 | 12 | 51 | 102 | 5 | P118N1200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 118N

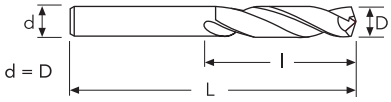
N type for general purpose, extra-short

DIN 1897 | N | HSS OX | 118° | 25-30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ☆ | ☆ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **12.25** | 0/-0.027 | 12.25 | 51 | 102 | 5 | P118N1225 | ● |
| **12.50** | 0/-0.027 | 12.5 | 51 | 102 | 5 | P118N1250 | ● |
| **12.75** | 0/-0.027 | 12.75 | 51 | 102 | 5 | P118N1275 | ● |
| **13.00** | 0/-0.027 | 13 | 51 | 102 | 5 | P118N1300 | ● |
| **13.25** | 0/-0.027 | 13.25 | 54 | 107 | 1 | P118N1325 | ● |
| **13.50** | 0/-0.027 | 13.5 | 54 | 107 | 1 | P118N1350 | ● |
| **13.75** | 0/-0.027 | 13.75 | 54 | 107 | 1 | P118N1375 | ● |
| **14.00** | 0/-0.027 | 14 | 54 | 107 | 1 | P118N1400 | ● |
| **14.25** | 0/-0.027 | 14.25 | 56 | 111 | 1 | P118N1425 | ● |
| **14.50** | 0/-0.027 | 14.5 | 56 | 111 | 1 | P118N1450 | ● |
| **14.75** | 0/-0.027 | 14.75 | 56 | 111 | 1 | P118N1475 | ● |
| **15.00** | 0/-0.027 | 15 | 56 | 111 | 1 | P118N1500 | ● |
| **15.25** | 0/-0.027 | 15.25 | 58 | 115 | 1 | P118N1525 | ● |
| **15.50** | 0/-0.027 | 15.5 | 58 | 115 | 1 | P118N1550 | ● |
| **15.75** | 0/-0.027 | 15.75 | 58 | 115 | 1 | P118N1575 | ○ |
| **16.00** | 0/-0.027 | 16 | 58 | 115 | 1 | P118N1600 | ● |

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# 118N

| | Material Group ISO 513 | P1 P2 | P3 P4 | K1 K2 | N1 N5 | N2 N3 N4 | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 150÷350 HB | | | |
| | Vc (m/min) | **25÷35** | **20÷30** | **25÷35** | **50÷70** | **40÷60** | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **1** | 0.017 | 0.014 | 0.019 | 0.024 | 0.017 | |
| | **1.5** | 0.035 | 0.030 | 0.039 | 0.049 | 0.035 | |
| | **2** | 0.050 | 0.043 | 0.055 | 0.070 | 0.050 | |
| | **2.5** | 0.070 | 0.060 | 0.077 | 0.098 | 0.070 | |
| | **3** | 0.080 | 0.068 | 0.088 | 0.112 | 0.080 | |
| | **3.5** | 0.090 | 0.077 | 0.099 | 0.126 | 0.090 | |
| | **4** | 0.100 | 0.085 | 0.110 | 0.140 | 0.100 | |
| | **5** | 0.110 | 0.094 | 0.121 | 0.154 | 0.110 | |
| | **6** | 0.120 | 0.102 | 0.132 | 0.168 | 0.120 | |
| | **7** | 0.130 | 0.111 | 0.143 | 0.182 | 0.130 | |
| | **8** | 0.140 | 0.119 | 0.154 | 0.196 | 0.140 | |
| | **9** | 0.160 | 0.136 | 0.176 | 0.224 | 0.160 | |
| | **10** | 0.170 | 0.145 | 0.187 | 0.238 | 0.170 | |
| | **11** | 0.180 | 0.153 | 0.198 | 0.252 | 0.180 | |
| | **12** | 0.190 | 0.162 | 0.209 | 0.266 | 0.190 | |
| | **13** | 0.200 | 0.170 | 0.220 | 0.280 | 0.200 | |
| | **14** | 0.210 | 0.179 | 0.231 | 0.294 | 0.210 | |
| | **15** | 0.220 | 0.187 | 0.242 | 0.308 | 0.220 | |
| | **16** | 0.240 | 0.204 | 0.264 | 0.336 | 0.240 | |

# 218NVA

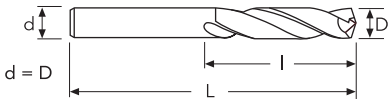
NVA type for tough materials, extra-short

DIN 1897 | NH | HSS/CO HT | 130° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **1.00** | 0/-0.014 | 1 | 6 | 26 | 10 | P218NVA0100 | ● |
| **1.10** | 0/-0.014 | 1.1 | 7 | 28 | 10 | P218NVA0110 | ● |
| **1.20** | 0/-0.014 | 1.2 | 8 | 30 | 10 | P218NVA0120 | ● |
| **1.30** | 0/-0.014 | 1.3 | 8 | 30 | 10 | P218NVA0130 | ● |
| **1.40** | 0/-0.014 | 1.4 | 9 | 32 | 10 | P218NVA0140 | ● |
| **1.50** | 0/-0.014 | 1.5 | 9 | 32 | 10 | P218NVA0150 | ● |
| **1.60** | 0/-0.014 | 1.6 | 10 | 34 | 10 | P218NVA0160 | ● |
| **1.70** | 0/-0.014 | 1.7 | 10 | 34 | 10 | P218NVA0170 | ● |
| **1.80** | 0/-0.014 | 1.8 | 11 | 36 | 10 | P218NVA0180 | ● |
| **1.90** | 0/-0.014 | 1.9 | 11 | 36 | 10 | P218NVA0190 | ● |
| **2.00** | 0/-0.014 | 2 | 12 | 38 | 10 | P218NVA0200 | ● |
| **2.10** | 0/-0.014 | 2.1 | 12 | 38 | 10 | P218NVA0210 | ● |
| **2.20** | 0/-0.014 | 2.2 | 13 | 40 | 10 | P218NVA0220 | ● |
| **2.30** | 0/-0.014 | 2.3 | 13 | 40 | 10 | P218NVA0230 | ● |
| **2.40** | 0/-0.014 | 2.4 | 14 | 43 | 10 | P218NVA0240 | ● |
| **2.50** | 0/-0.014 | 2.5 | 14 | 43 | 10 | P218NVA0250 | ● |
| **2.60** | 0/-0.014 | 2.6 | 14 | 43 | 10 | P218NVA0260 | ● |
| **2.70** | 0/-0.014 | 2.7 | 16 | 46 | 10 | P218NVA0270 | ● |
| **2.80** | 0/-0.014 | 2.8 | 16 | 46 | 10 | P218NVA0280 | ● |
| **2.90** | 0/-0.014 | 2.9 | 16 | 46 | 10 | P218NVA0290 | ● |
| **3.00** | 0/-0.014 | 3 | 16 | 46 | 10 | P218NVA0300 | ● |
| **3.10** | 0/-0.018 | 3.1 | 18 | 49 | 10 | P218NVA0310 | ● |
| **3.20** | 0/-0.018 | 3.2 | 18 | 49 | 10 | P218NVA0320 | ● |
| **3.30** | 0/-0.018 | 3.3 | 18 | 49 | 10 | P218NVA0330 | ● |
| **3.40** | 0/-0.018 | 3.4 | 20 | 52 | 10 | P218NVA0340 | ● |
| **3.50** | 0/-0.018 | 3.5 | 20 | 52 | 10 | P218NVA0350 | ● |
| **3.60** | 0/-0.018 | 3.6 | 20 | 52 | 10 | P218NVA0360 | ● |
| **3.70** | 0/-0.018 | 3.7 | 20 | 52 | 10 | P218NVA0370 | ● |
| **3.80** | 0/-0.018 | 3.8 | 22 | 55 | 10 | P218NVA0380 | ● |
| **3.90** | 0/-0.018 | 3.9 | 22 | 55 | 10 | P218NVA0390 | ● |
| **4.00** | 0/-0.018 | 4 | 22 | 55 | 10 | P218NVA0400 | ● |
| **4.10** | 0/-0.018 | 4.1 | 22 | 55 | 10 | P218NVA0410 | ● |
| **4.20** | 0/-0.018 | 4.2 | 22 | 55 | 10 | P218NVA0420 | ● |
| **4.30** | 0/-0.018 | 4.3 | 24 | 58 | 10 | P218NVA0430 | ● |
| **4.40** | 0/-0.018 | 4.4 | 24 | 58 | 10 | P218NVA0440 | ● |
| **4.50** | 0/-0.018 | 4.5 | 24 | 58 | 10 | P218NVA0450 | ● |
| **4.60** | 0/-0.018 | 4.6 | 24 | 58 | 10 | P218NVA0460 | ● |
| **4.70** | 0/-0.018 | 4.7 | 24 | 58 | 10 | P218NVA0470 | ● |
| **4.80** | 0/-0.018 | 4.8 | 26 | 62 | 10 | P218NVA0480 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
**HSS-HSS/CO**

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 218NVA

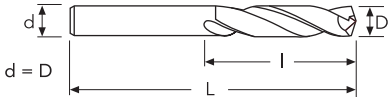
NVA type for tough materials, extra-short

DIN 1897 | NH | HSS/CO HT | 130° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **4.90** | 0/-0.018 | 4.9 | 26 | 62 | 10 | P218NVA0490 | ● |
| **5.00** | 0/-0.018 | 5 | 26 | 62 | 10 | P218NVA0500 | ● |
| **5.10** | 0/-0.018 | 5.1 | 26 | 62 | 10 | P218NVA0510 | ● |
| **5.20** | 0/-0.018 | 5.2 | 26 | 62 | 10 | P218NVA0520 | ● |
| **5.30** | 0/-0.018 | 5.3 | 26 | 62 | 10 | P218NVA0530 | ● |
| **5.40** | 0/-0.018 | 5.4 | 28 | 66 | 10 | P218NVA0540 | ● |
| **5.50** | 0/-0.018 | 5.5 | 28 | 66 | 10 | P218NVA0550 | ● |
| **5.60** | 0/-0.018 | 5.6 | 28 | 66 | 10 | P218NVA0560 | ● |
| **5.70** | 0/-0.018 | 5.7 | 28 | 66 | 10 | P218NVA0570 | ● |
| **5.80** | 0/-0.018 | 5.8 | 28 | 66 | 10 | P218NVA0580 | ● |
| **5.90** | 0/-0.018 | 5.9 | 28 | 66 | 10 | P218NVA0590 | ● |
| **6.00** | 0/-0.018 | 6 | 28 | 66 | 10 | P218NVA0600 | ● |
| **6.10** | 0/-0.022 | 6.1 | 31 | 70 | 10 | P218NVA0610 | ● |
| **6.20** | 0/-0.022 | 6.2 | 31 | 70 | 10 | P218NVA0620 | ● |
| **6.30** | 0/-0.022 | 6.3 | 31 | 70 | 10 | P218NVA0630 | ● |
| **6.40** | 0/-0.022 | 6.4 | 31 | 70 | 10 | P218NVA0640 | ● |
| **6.50** | 0/-0.022 | 6.5 | 31 | 70 | 10 | P218NVA0650 | ● |
| **6.60** | 0/-0.022 | 6.6 | 31 | 70 | 5 | P218NVA0660 | ● |
| **6.70** | 0/-0.022 | 6.7 | 31 | 70 | 5 | P218NVA0670 | ● |
| **6.80** | 0/-0.022 | 6.8 | 34 | 74 | 5 | P218NVA0680 | ● |
| **6.90** | 0/-0.022 | 6.9 | 34 | 74 | 5 | P218NVA0690 | ● |
| **7.00** | 0/-0.022 | 7 | 34 | 74 | 5 | P218NVA0700 | ● |
| **7.10** | 0/-0.022 | 7.1 | 34 | 74 | 5 | P218NVA0710 | ● |
| **7.20** | 0/-0.022 | 7.2 | 34 | 74 | 5 | P218NVA0720 | ● |
| **7.30** | 0/-0.022 | 7.3 | 34 | 74 | 5 | P218NVA0730 | ● |
| **7.40** | 0/-0.022 | 7.4 | 34 | 74 | 5 | P218NVA0740 | ● |
| **7.50** | 0/-0.022 | 7.5 | 34 | 74 | 5 | P218NVA0750 | ● |
| **7.60** | 0/-0.022 | 7.6 | 37 | 79 | 5 | P218NVA0760 | ● |
| **7.70** | 0/-0.022 | 7.7 | 37 | 79 | 5 | P218NVA0770 | ● |
| **7.80** | 0/-0.022 | 7.8 | 37 | 79 | 5 | P218NVA0780 | ● |
| **7.90** | 0/-0.022 | 7.9 | 37 | 79 | 5 | P218NVA0790 | ● |
| **8.00** | 0/-0.022 | 8 | 37 | 79 | 5 | P218NVA0800 | ● |
| **8.10** | 0/-0.022 | 8.1 | 37 | 79 | 5 | P218NVA0810 | ● |
| **8.20** | 0/-0.022 | 8.2 | 37 | 79 | 5 | P218NVA0820 | ● |
| **8.30** | 0/-0.022 | 8.3 | 37 | 79 | 5 | P218NVA0830 | ● |
| **8.40** | 0/-0.022 | 8.4 | 37 | 79 | 5 | P218NVA0840 | ● |
| **8.50** | 0/-0.022 | 8.5 | 37 | 79 | 5 | P218NVA0850 | ● |
| **8.60** | 0/-0.022 | 8.6 | 40 | 84 | 5 | P218NVA0860 | ● |
| **8.70** | 0/-0.022 | 8.7 | 40 | 84 | 5 | P218NVA0870 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 218NVA

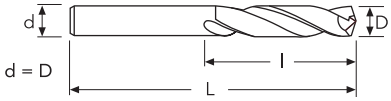
NVA type for tough materials, extra-short

DIN 1897 | NH | HSS/CO HT | 130° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **8.80** | 0/-0.022 | 8.8 | 40 | 84 | 5 | P218NVA0880 | ● |
| **8.90** | 0/-0.022 | 8.9 | 40 | 84 | 5 | P218NVA0890 | ● |
| **9.00** | 0/-0.022 | 9 | 40 | 84 | 5 | P218NVA0900 | ● |
| **9.10** | 0/-0.022 | 9.1 | 40 | 84 | 5 | P218NVA0910 | ● |
| **9.20** | 0/-0.022 | 9.2 | 40 | 84 | 5 | P218NVA0920 | ● |
| **9.30** | 0/-0.022 | 9.3 | 40 | 84 | 5 | P218NVA0930 | ● |
| **9.40** | 0/-0.022 | 9.4 | 40 | 84 | 5 | P218NVA0940 | ● |
| **9.50** | 0/-0.022 | 9.5 | 40 | 84 | 5 | P218NVA0950 | ● |
| **9.60** | 0/-0.022 | 9.6 | 43 | 89 | 5 | P218NVA0960 | ● |
| **9.70** | 0/-0.022 | 9.7 | 43 | 89 | 5 | P218NVA0970 | ● |
| **9.80** | 0/-0.022 | 9.8 | 43 | 89 | 5 | P218NVA0980 | ● |
| **9.90** | 0/-0.022 | 9.9 | 43 | 89 | 5 | P218NVA0990 | ● |
| **10.00** | 0/-0.022 | 10 | 43 | 89 | 5 | P218NVA1000 | ● |
| **10.20** | 0/-0.027 | 10.2 | 43 | 89 | 5 | P218NVA1020 | ● |
| **10.25** | 0/-0.027 | 10.25 | 43 | 89 | 5 | P218NVA1025 | ● |
| **10.50** | 0/-0.027 | 10.5 | 43 | 89 | 5 | P218NVA1050 | ● |
| **11.00** | 0/-0.027 | 11 | 47 | 95 | 5 | P218NVA1100 | ● |
| **11.50** | 0/-0.027 | 11.5 | 47 | 95 | 5 | P218NVA1150 | ● |
| **12.00** | 0/-0.027 | 12 | 51 | 102 | 5 | P218NVA1200 | ● |
| **12.50** | 0/-0.027 | 12.5 | 51 | 102 | 5 | P218NVA1250 | ● |
| **13.00** | 0/-0.027 | 13 | 51 | 102 | 5 | P218NVA1300 | ● |
| **13.50** | 0/-0.027 | 13.5 | 54 | 107 | 1 | P218NVA1350 | ● |
| **14.00** | 0/-0.027 | 14 | 54 | 107 | 1 | P218NVA1400 | ● |
| **14.50** | 0/-0.027 | 14.5 | 56 | 111 | 1 | P218NVA1450 | ● |
| **15.00** | 0/-0.027 | 15 | 56 | 111 | 1 | P218NVA1500 | ● |
| **15.50** | 0/-0.027 | 15.5 | 58 | 115 | 1 | P218NVA1550 | ● |
| **16.00** | 0/-0.027 | 16 | 58 | 115 | 1 | P218NVA1600 | ● |
| **16.50** | 0/-0.027 | 16.5 | 60 | 119 | 1 | P218NVA1650 | ● |
| **17.00** | 0/-0.027 | 17 | 60 | 119 | 1 | P218NVA1700 | ● |
| **17.50** | 0/-0.027 | 17.5 | 62 | 123 | 1 | P218NVA1750 | ● |
| **18.00** | 0/-0.027 | 18 | 62 | 123 | 1 | P218NVA1800 | ● |
| **18.50** | 0/-0.033 | 18.5 | 64 | 127 | 1 | P218NVA1850 | ● |
| **19.00** | 0/-0.033 | 19 | 64 | 127 | 1 | P218NVA1900 | ● |
| **19.50** | 0/-0.033 | 19.5 | 66 | 131 | 1 | P218NVA1950 | ● |
| **20.00** | 0/-0.033 | 20 | 66 | 131 | 1 | P218NVA2000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# 218NVA

| Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 M2 | M3 |
|---|---|---|---|---|---|
| Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | |
| Vc (m/min) | **25÷35** | **20÷30** | **12÷18** | **12÷18** | **8÷12** |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| **1** | 0.017 | 0.014 | 0.012 | 0.012 | 0.009 |
| **1.5** | 0.035 | 0.030 | 0.025 | 0.025 | 0.018 |
| **2** | 0.050 | 0.043 | 0.035 | 0.035 | 0.025 |
| **2.5** | 0.070 | 0.060 | 0.049 | 0.049 | 0.035 |
| **3** | 0.080 | 0.068 | 0.056 | 0.056 | 0.040 |
| **3.5** | 0.090 | 0.077 | 0.063 | 0.063 | 0.045 |
| **4** | 0.100 | 0.085 | 0.070 | 0.070 | 0.050 |
| **5** | 0.110 | 0.094 | 0.077 | 0.077 | 0.055 |
| **6** | 0.120 | 0.102 | 0.084 | 0.084 | 0.060 |
| **7** | 0.130 | 0.111 | 0.091 | 0.091 | 0.065 |
| **8** | 0.140 | 0.119 | 0.098 | 0.098 | 0.070 |
| **9** | 0.160 | 0.136 | 0.112 | 0.112 | 0.080 |
| **10** | 0.170 | 0.145 | 0.119 | 0.119 | 0.085 |
| **11** | 0.180 | 0.153 | 0.126 | 0.126 | 0.090 |
| **12** | 0.190 | 0.162 | 0.133 | 0.133 | 0.095 |
| **13** | 0.200 | 0.170 | 0.140 | 0.140 | 0.100 |
| **14** | 0.210 | 0.179 | 0.147 | 0.147 | 0.105 |
| **15** | 0.220 | 0.187 | 0.154 | 0.154 | 0.110 |
| **16** | 0.240 | 0.204 | 0.168 | 0.168 | 0.120 |
| **17** | 0.260 | 0.221 | 0.182 | 0.182 | 0.130 |
| **18** | 0.280 | 0.238 | 0.196 | 0.196 | 0.140 |
| **19** | 0.300 | 0.255 | 0.210 | 0.210 | 0.150 |
| **20** | 0.320 | 0.272 | 0.224 | 0.224 | 0.160 |

| Material Group ISO 513 | K1 | K3 | N1 N5 | N2 N3 N4 | S1 S2 S4 |
|---|---|---|---|---|---|
| Hardness/Rm | 150÷350 HB | <350 HB | | | <35 HRC |
| Vc (m/min) | **25÷35** | **20÷30** | **50÷70** | **40÷60** | **8÷12** |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| **1** | 0.019 | 0.013 | 0.024 | 0.017 | 0.007 |
| **1.5** | 0.039 | 0.026 | 0.049 | 0.035 | 0.014 |
| **2** | 0.055 | 0.038 | 0.070 | 0.050 | 0.020 |
| **2.5** | 0.077 | 0.053 | 0.098 | 0.070 | 0.028 |
| **3** | 0.088 | 0.060 | 0.112 | 0.080 | 0.032 |
| **3.5** | 0.099 | 0.068 | 0.126 | 0.090 | 0.036 |
| **4** | 0.110 | 0.075 | 0.140 | 0.100 | 0.040 |
| **5** | 0.121 | 0.083 | 0.154 | 0.110 | 0.044 |
| **6** | 0.132 | 0.090 | 0.168 | 0.120 | 0.048 |
| **7** | 0.143 | 0.098 | 0.182 | 0.130 | 0.052 |
| **8** | 0.154 | 0.105 | 0.196 | 0.140 | 0.056 |
| **9** | 0.176 | 0.120 | 0.224 | 0.160 | 0.064 |
| **10** | 0.187 | 0.128 | 0.238 | 0.170 | 0.068 |
| **11** | 0.198 | 0.135 | 0.252 | 0.180 | 0.072 |
| **12** | 0.209 | 0.143 | 0.266 | 0.190 | 0.076 |
| **13** | 0.220 | 0.150 | 0.280 | 0.200 | 0.080 |
| **14** | 0.231 | 0.158 | 0.294 | 0.210 | 0.084 |
| **15** | 0.242 | 0.165 | 0.308 | 0.220 | 0.088 |
| **16** | 0.264 | 0.180 | 0.336 | 0.240 | 0.096 |
| **17** | 0.286 | 0.195 | 0.364 | 0.260 | 0.104 |
| **18** | 0.308 | 0.210 | 0.392 | 0.280 | 0.112 |
| **19** | 0.330 | 0.225 | 0.420 | 0.300 | 0.120 |
| **20** | 0.352 | 0.240 | 0.448 | 0.320 | 0.128 |

# 1386STI

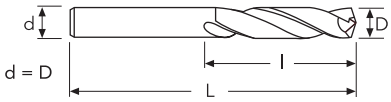
STI type for general purpose, split point, TiN pointed, short

DIN 338 | SPLIT POINT | HSS TiN | 118° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **1.00** | 0/-0.014 | 1 | 12 | 34 | 10 | P1385NTI0100 | ● |
| **1.10** | 0/-0.014 | 1.1 | 14 | 36 | 10 | P1385NTI0110 | ● |
| **1.20** | 0/-0.014 | 1.2 | 16 | 38 | 10 | P1385NTI0120 | ● |
| **1.30** | 0/-0.014 | 1.3 | 16 | 38 | 10 | P1385NTI0130 | ● |
| **1.40** | 0/-0.014 | 1.4 | 18 | 40 | 10 | P1385NTI0140 | ● |
| **1.50** | 0/-0.014 | 1.5 | 18 | 40 | 10 | P1385NTI0150 | ● |
| **1.60** | 0/-0.014 | 1.6 | 20 | 43 | 10 | P1386STI0160 | ● |
| **1.70** | 0/-0.014 | 1.7 | 20 | 43 | 10 | P1386STI0170 | ● |
| **1.80** | 0/-0.014 | 1.8 | 22 | 46 | 10 | P1386STI0180 | ● |
| **1.90** | 0/-0.014 | 1.9 | 22 | 46 | 10 | P1386STI0190 | ● |
| **2.00** | 0/-0.014 | 2 | 24 | 49 | 10 | P1386STI0200 | ● |
| **2.10** | 0/-0.014 | 2.1 | 24 | 49 | 10 | P1386STI0210 | ● |
| **2.20** | 0/-0.014 | 2.2 | 27 | 53 | 10 | P1386STI0220 | ● |
| **2.30** | 0/-0.014 | 2.3 | 27 | 53 | 10 | P1386STI0230 | ● |
| **2.40** | 0/-0.014 | 2.4 | 30 | 57 | 10 | P1386STI0240 | ● |
| **2.50** | 0/-0.014 | 2.5 | 30 | 57 | 10 | P1386STI0250 | ● |
| **2.60** | 0/-0.014 | 2.6 | 30 | 57 | 10 | P1386STI0260 | ● |
| **2.70** | 0/-0.014 | 2.7 | 33 | 61 | 10 | P1386STI0270 | ● |
| **2.80** | 0/-0.014 | 2.8 | 33 | 61 | 10 | P1386STI0280 | ● |
| **2.90** | 0/-0.014 | 2.9 | 33 | 61 | 10 | P1386STI0290 | ● |
| **3.00** | 0/-0.014 | 3 | 33 | 61 | 10 | P1386STI0300 | ● |
| **3.10** | 0/-0.018 | 3.1 | 36 | 65 | 10 | P1386STI0310 | ● |
| **3.20** | 0/-0.018 | 3.2 | 36 | 65 | 10 | P1386STI0320 | ● |
| **3.30** | 0/-0.018 | 3.3 | 36 | 65 | 10 | P1386STI0330 | ● |
| **3.40** | 0/-0.018 | 3.4 | 39 | 70 | 10 | P1386STI0340 | ● |
| **3.50** | 0/-0.018 | 3.5 | 39 | 70 | 10 | P1386STI0350 | ● |
| **3.60** | 0/-0.018 | 3.6 | 39 | 70 | 10 | P1386STI0360 | ● |
| **3.70** | 0/-0.018 | 3.7 | 39 | 70 | 10 | P1386STI0370 | ● |
| **3.80** | 0/-0.018 | 3.8 | 43 | 75 | 10 | P1386STI0380 | ● |
| **3.90** | 0/-0.018 | 3.9 | 43 | 75 | 10 | P1386STI0390 | ● |
| **4.00** | 0/-0.018 | 4 | 43 | 75 | 10 | P1386STI0400 | ● |
| **4.10** | 0/-0.018 | 4.1 | 43 | 75 | 10 | P1386STI0410 | ● |
| **4.20** | 0/-0.018 | 4.2 | 43 | 75 | 10 | P1386STI0420 | ● |
| **4.30** | 0/-0.018 | 4.3 | 47 | 80 | 10 | P1386STI0430 | ● |
| **4.40** | 0/-0.018 | 4.4 | 47 | 80 | 10 | P1386STI0440 | ● |
| **4.50** | 0/-0.018 | 4.5 | 47 | 80 | 10 | P1386STI0450 | ● |
| **4.60** | 0/-0.018 | 4.6 | 47 | 80 | 10 | P1386STI0460 | ● |
| **4.70** | 0/-0.018 | 4.7 | 47 | 80 | 10 | P1386STI0470 | ● |
| **4.80** | 0/-0.018 | 4.8 | 52 | 86 | 10 | P1386STI0480 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 1386STI

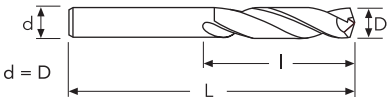
STI type for general purpose, split point, TiN pointed, short

DIN 338 | SPLIT POINT | HSS TiN | 118° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **4.90** | 0/-0.018 | 4.9 | 52 | 86 | 10 | P1386STI0490 | ● |
| **5.00** | 0/-0.018 | 5 | 52 | 86 | 10 | P1386STI0500 | ● |
| **5.10** | 0/-0.018 | 5.1 | 52 | 86 | 10 | P1386STI0510 | ● |
| **5.20** | 0/-0.018 | 5.2 | 52 | 86 | 10 | P1386STI0520 | ● |
| **5.30** | 0/-0.018 | 5.3 | 52 | 86 | 10 | P1386STI0530 | ● |
| **5.40** | 0/-0.018 | 5.4 | 57 | 93 | 10 | P1386STI0540 | ● |
| **5.50** | 0/-0.018 | 5.5 | 57 | 93 | 10 | P1386STI0550 | ● |
| **5.60** | 0/-0.018 | 5.6 | 57 | 93 | 10 | P1386STI0560 | ● |
| **5.70** | 0/-0.018 | 5.7 | 57 | 93 | 10 | P1386STI0570 | ● |
| **5.80** | 0/-0.018 | 5.8 | 57 | 93 | 10 | P1386STI0580 | ● |
| **5.90** | 0/-0.018 | 5.9 | 57 | 93 | 10 | P1386STI0590 | ● |
| **6.00** | 0/-0.018 | 6 | 57 | 93 | 10 | P1386STI0600 | ● |
| **6.10** | 0/-0.022 | 6.1 | 63 | 101 | 10 | P1386STI0610 | ● |
| **6.20** | 0/-0.022 | 6.2 | 63 | 101 | 10 | P1386STI0620 | ● |
| **6.30** | 0/-0.022 | 6.3 | 63 | 101 | 10 | P1386STI0630 | ● |
| **6.40** | 0/-0.022 | 6.4 | 63 | 101 | 10 | P1386STI0640 | ● |
| **6.50** | 0/-0.022 | 6.5 | 63 | 101 | 10 | P1386STI0650 | ● |
| **6.60** | 0/-0.022 | 6.6 | 63 | 101 | 5 | P1386STI0660 | ● |
| **6.70** | 0/-0.022 | 6.7 | 63 | 101 | 5 | P1386STI0670 | ● |
| **6.80** | 0/-0.022 | 6.8 | 69 | 109 | 5 | P1386STI0680 | ● |
| **6.90** | 0/-0.022 | 6.9 | 69 | 109 | 5 | P1386STI0690 | ● |
| **7.00** | 0/-0.022 | 7 | 69 | 109 | 5 | P1386STI0700 | ● |
| **7.10** | 0/-0.022 | 7.1 | 69 | 109 | 5 | P1386STI0710 | ● |
| **7.20** | 0/-0.022 | 7.2 | 69 | 109 | 5 | P1386STI0720 | ● |
| **7.30** | 0/-0.022 | 7.3 | 69 | 109 | 5 | P1386STI0730 | ● |
| **7.40** | 0/-0.022 | 7.4 | 69 | 109 | 5 | P1386STI0740 | ● |
| **7.50** | 0/-0.022 | 7.5 | 69 | 109 | 5 | P1386STI0750 | ● |
| **7.60** | 0/-0.022 | 7.6 | 75 | 117 | 5 | P1386STI0760 | ● |
| **7.70** | 0/-0.022 | 7.7 | 75 | 117 | 5 | P1386STI0770 | ● |
| **7.80** | 0/-0.022 | 7.8 | 75 | 117 | 5 | P1386STI0780 | ● |
| **7.90** | 0/-0.022 | 7.9 | 75 | 117 | 5 | P1386STI0790 | ● |
| **8.00** | 0/-0.022 | 8 | 75 | 117 | 5 | P1386STI0800 | ● |
| **8.10** | 0/-0.022 | 8.1 | 75 | 117 | 5 | P1386STI0810 | ● |
| **8.20** | 0/-0.022 | 8.2 | 75 | 117 | 5 | P1386STI0820 | ● |
| **8.30** | 0/-0.022 | 8.3 | 75 | 117 | 5 | P1386STI0830 | ● |
| **8.40** | 0/-0.022 | 8.4 | 75 | 117 | 5 | P1386STI0840 | ● |
| **8.50** | 0/-0.022 | 8.5 | 75 | 117 | 5 | P1386STI0850 | ● |
| **8.60** | 0/-0.022 | 8.6 | 81 | 125 | 5 | P1386STI0860 | ● |
| **8.70** | 0/-0.022 | 8.7 | 81 | 125 | 5 | P1386STI0870 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 1386STI

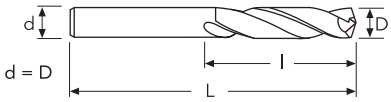
STI type for general purpose, split point, TiN pointed, short

DIN 338 | SPLIT POINT | HSS TiN | 118° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **8.80** | 0/-0.022 | 8.8 | 81 | 125 | 5 | P1386STI0880 | ● |
| **8.90** | 0/-0.022 | 8.9 | 81 | 125 | 5 | P1386STI0890 | ● |
| **9.00** | 0/-0.022 | 9 | 81 | 125 | 5 | P1386STI0900 | ● |
| **9.10** | 0/-0.022 | 9.1 | 81 | 125 | 5 | P1386STI0910 | ● |
| **9.20** | 0/-0.022 | 9.2 | 81 | 125 | 5 | P1386STI0920 | ● |
| **9.30** | 0/-0.022 | 9.3 | 81 | 125 | 5 | P1386STI0930 | ● |
| **9.40** | 0/-0.022 | 9.4 | 81 | 125 | 5 | P1386STI0940 | ● |
| **9.50** | 0/-0.022 | 9.5 | 81 | 125 | 5 | P1386STI0950 | ● |
| **9.60** | 0/-0.022 | 9.6 | 87 | 133 | 5 | P1386STI0960 | ● |
| **9.70** | 0/-0.022 | 9.7 | 87 | 133 | 5 | P1386STI0970 | ● |
| **9.80** | 0/-0.022 | 9.8 | 87 | 133 | 5 | P1386STI0980 | ● |
| **9.90** | 0/-0.022 | 9.9 | 87 | 133 | 5 | P1386STI0990 | ● |
| **10.00** | 0/-0.022 | 10 | 87 | 133 | 5 | P1386STI1000 | ● |
| **10.10** | 0/-0.027 | 10.1 | 87 | 133 | 5 | P1386STI1010 | ● |
| **10.20** | 0/-0.027 | 10.2 | 87 | 133 | 5 | P1386STI1020 | ● |
| **10.30** | 0/-0.027 | 10.3 | 87 | 133 | 5 | P1386STI1030 | ● |
| **10.40** | 0/-0.027 | 10.4 | 87 | 133 | 5 | P1386STI1040 | ● |
| **10.50** | 0/-0.027 | 10.5 | 87 | 133 | 5 | P1386STI1050 | ● |
| **10.60** | 0/-0.027 | 10.6 | 87 | 133 | 5 | P1386STI1060 | ● |
| **10.70** | 0/-0.027 | 10.7 | 94 | 142 | 5 | P1386STI1070 | ● |
| **10.80** | 0/-0.027 | 10.8 | 94 | 142 | 5 | P1386STI1080 | ● |
| **10.90** | 0/-0.027 | 10.9 | 94 | 142 | 5 | P1386STI1090 | ● |
| **11.00** | 0/-0.027 | 11 | 94 | 142 | 5 | P1386STI1100 | ● |
| **11.10** | 0/-0.027 | 11.1 | 94 | 142 | 5 | P1386STI1110 | ● |
| **11.20** | 0/-0.027 | 11.2 | 94 | 142 | 5 | P1386STI1120 | ● |
| **11.30** | 0/-0.027 | 11.3 | 94 | 142 | 5 | P1386STI1130 | ● |
| **11.40** | 0/-0.027 | 11.4 | 94 | 142 | 5 | P1386STI1140 | ● |
| **11.50** | 0/-0.027 | 11.5 | 94 | 142 | 5 | P1386STI1150 | ● |
| **11.60** | 0/-0.027 | 11.6 | 94 | 142 | 5 | P1386STI1160 | ● |
| **11.70** | 0/-0.027 | 11.7 | 94 | 142 | 5 | P1386STI1170 | ● |
| **11.80** | 0/-0.027 | 11.8 | 94 | 142 | 5 | P1386STI1180 | ● |
| **11.90** | 0/-0.027 | 11.9 | 101 | 151 | 5 | P1386STI1190 | ● |
| **12.00** | 0/-0.027 | 12 | 101 | 151 | 5 | P1386STI1200 | ● |
| **12.10** | 0/-0.027 | 12.1 | 101 | 151 | 5 | P1386STI1210 | ● |
| **12.20** | 0/-0.027 | 12.2 | 101 | 151 | 5 | P1386STI1220 | ● |
| **12.30** | 0/-0.027 | 12.3 | 101 | 151 | 5 | P1386STI1230 | ● |
| **12.40** | 0/-0.027 | 12.4 | 101 | 151 | 5 | P1386STI1240 | ● |
| **12.50** | 0/-0.027 | 12.5 | 101 | 151 | 5 | P1386STI1250 | ● |
| **12.60** | 0/-0.027 | 12.6 | 101 | 151 | 5 | P1386STI1260 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 1386STI

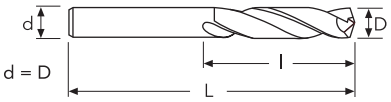
STI type for general purpose, split point, TiN pointed, short

DIN 338 | SPLIT POINT | HSS TiN | 118° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **12.70** | 0/-0.027 | 12.7 | 101 | 151 | 5 | P1386STI1270 | ● |
| **12.80** | 0/-0.027 | 12.8 | 101 | 151 | 5 | P1386STI1280 | ● |
| **12.90** | 0/-0.027 | 12.9 | 101 | 151 | 5 | P1386STI1290 | ● |
| **13.00** | 0/-0.027 | 13 | 101 | 151 | 5 | P1386STI1300 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion



**1386STIA01A**
Set 50 pcs.
1386STI DIN338 HSS TIN POINTED
Ø1 mm÷Ø5.9 mm x 0.1 mm



**1386STIA01B**
Set 41 pcs.
1386STI DIN338 HSS TIN POINTED
Ø6 mm÷Ø10 mm x 0.1 mm



**1386STIA05C**
Set 25 pcs.
1386STI DIN338 HSS TIN POINTED
Ø1 mm÷Ø13 mm x 0.5 mm

# 1386STI

| | Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 | K1 K2 | N1 N5 | N2 N3 N4 | S1 S2 S4 |
|---|---|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | 150÷350 HB | | | <35 HRC |
| | Vc (m/min) | **30÷40** | **25÷35** | **15÷25** | **15÷25** | **30÷40** | **60÷80** | **50÷70** | **12÷18** |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| | **1** | 0.017 | 0.014 | 0.012 | 0.012 | 0.019 | 0.024 | 0.017 | 0.007 |
| | **1.5** | 0.035 | 0.030 | 0.025 | 0.025 | 0.039 | 0.049 | 0.035 | 0.014 |
| | **2** | 0.050 | 0.043 | 0.035 | 0.035 | 0.055 | 0.070 | 0.050 | 0.020 |
| | **2.5** | 0.075 | 0.064 | 0.053 | 0.053 | 0.083 | 0.105 | 0.075 | 0.030 |
| | **3** | 0.090 | 0.077 | 0.063 | 0.063 | 0.099 | 0.126 | 0.090 | 0.036 |
| | **3.5** | 0.105 | 0.089 | 0.074 | 0.074 | 0.116 | 0.147 | 0.105 | 0.042 |
| | **4** | 0.110 | 0.094 | 0.077 | 0.077 | 0.121 | 0.154 | 0.110 | 0.044 |
| | **5** | 0.125 | 0.106 | 0.088 | 0.088 | 0.138 | 0.175 | 0.125 | 0.050 |
| | **6** | 0.160 | 0.136 | 0.112 | 0.112 | 0.176 | 0.224 | 0.160 | 0.064 |
| | **7** | 0.175 | 0.149 | 0.123 | 0.123 | 0.193 | 0.245 | 0.175 | 0.070 |
| | **8** | 0.200 | 0.170 | 0.140 | 0.140 | 0.220 | 0.280 | 0.200 | 0.080 |
| | **9** | 0.210 | 0.179 | 0.147 | 0.147 | 0.231 | 0.294 | 0.210 | 0.084 |
| | **10** | 0.220 | 0.187 | 0.154 | 0.154 | 0.242 | 0.308 | 0.220 | 0.088 |
| | **11** | 0.235 | 0.200 | 0.165 | 0.165 | 0.259 | 0.329 | 0.235 | 0.094 |
| | **12** | 0.250 | 0.213 | 0.175 | 0.175 | 0.275 | 0.350 | 0.250 | 0.100 |
| | **13** | 0.265 | 0.225 | 0.186 | 0.186 | 0.292 | 0.371 | 0.265 | 0.106 |

# 138N-138NTI

N type for general purpose, short (138N),
N type for general purpose, TiN coated, short (138NTI)




* < Ø2 mm = BR



138N

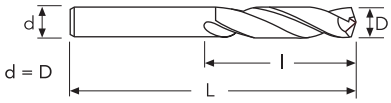


138NTI

**138NTI will be gradually replaced by 1386STI (page 233)**

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ☆ | ☆ | | |

★ 1st choice ☆ suitable




| | | | | | | 138N | | 138NTI | |
|---|---|---|---|---|---|---|---|---|---|
| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock | EDP No. | Stock |
| **0.20** | 0/-0.014 | 0.2 | 2.5 | 19 | 10 | P138NB0020 | ● | | |
| **0.30** | 0/-0.014 | 0.3 | 3 | 19 | 10 | P138NB0030 | ● | | |
| **0.40** | 0/-0.014 | 0.4 | 5 | 20 | 10 | P138NB0040 | ● | | |
| **0.50** | 0/-0.014 | 0.5 | 6 | 22 | 10 | P138NB0050 | ● | | |
| **0.60** | 0/-0.014 | 0.6 | 7 | 24 | 10 | P138NB0060 | ● | | |
| **0.70** | 0/-0.014 | 0.7 | 9 | 28 | 10 | P138NB0070 | ● | | |
| **0.80** | 0/-0.014 | 0.8 | 10 | 30 | 10 | P138NB0080 | ● | | |
| **0.90** | 0/-0.014 | 0.9 | 11 | 32 | 10 | P138NB0090 | ● | | |
| **1.00** | 0/-0.014 | 1 | 12 | 34 | 10 | P138NB0100 | ● | P138NTI0100 | ▽ |
| **1.10** | 0/-0.014 | 1.1 | 14 | 36 | 10 | P138NB0110 | ● | P138NTI0110 | ▽ |
| **1.20** | 0/-0.014 | 1.2 | 16 | 38 | 10 | P138NB0120 | ● | P138NTI0120 | ▽ |
| **1.25** | 0/-0.014 | 1.25 | 16 | 38 | 10 | P138NB0125 | ● | | |
| **1.30** | 0/-0.014 | 1.3 | 16 | 38 | 10 | P138NB0130 | ● | P138NTI0130 | ▽ |
| **1.40** | 0/-0.014 | 1.4 | 18 | 40 | 10 | P138NB0140 | ● | P138NTI0140 | ▽ |
| **1.50** | 0/-0.014 | 1.5 | 18 | 40 | 10 | P138NB0150 | ● | P138NTI0150 | ▽ |
| **1.60** | 0/-0.014 | 1.6 | 20 | 43 | 10 | P138NB0160 | ● | P138NTI0160 | ▽ |
| **1.70** | 0/-0.014 | 1.7 | 20 | 43 | 10 | P138NB0170 | ● | P138NTI0170 | ▽ |
| **1.75** | 0/-0.014 | 1.75 | 22 | 46 | 10 | P138NB0175 | ● | | |
| **1.80** | 0/-0.014 | 1.8 | 22 | 46 | 10 | P138NB0180 | ● | P138NTI0180 | ▽ |
| **1.90** | 0/-0.014 | 1.9 | 22 | 46 | 10 | P138NB0190 | ● | P138NTI0190 | ▽ |
| **2.00** | 0/-0.014 | 2 | 24 | 49 | 10 | P138N0200 | ● | P138NTI0200 | ▽ |
| **2.10** | 0/-0.014 | 2.1 | 24 | 49 | 10 | P138N0210 | ● | P138NTI0210 | ▽ |
| **2.20** | 0/-0.014 | 2.2 | 27 | 53 | 10 | P138N0220 | ● | P138NTI0220 | ▽ |
| **2.25** | 0/-0.014 | 2.25 | 27 | 53 | 10 | P138N0225 | ● | | |
| **2.30** | 0/-0.014 | 2.3 | 27 | 53 | 10 | P138N0230 | ● | P138NTI0230 | ▽ |
| **2.40** | 0/-0.014 | 2.4 | 30 | 57 | 10 | P138N0240 | ● | P138NTI0240 | ▽ |
| **2.50** | 0/-0.014 | 2.5 | 30 | 57 | 10 | P138N0250 | ● | P138NTI0250 | ▽ |
| **2.60** | 0/-0.014 | 2.6 | 30 | 57 | 10 | P138N0260 | ● | P138NTI0260 | ▽ |
| **2.70** | 0/-0.014 | 2.7 | 33 | 61 | 10 | P138N0270 | ● | P138NTI0270 | ▽ |
| **2.75** | 0/-0.014 | 2.75 | 33 | 61 | 10 | P138N0275 | ● | | |
| **2.80** | 0/-0.014 | 2.8 | 33 | 61 | 10 | P138N0280 | ● | P138NTI0280 | ▽ |
| **2.90** | 0/-0.014 | 2.9 | 33 | 61 | 10 | P138N0290 | ● | P138NTI0290 | ▽ |
| **3.00** | 0/-0.014 | 3 | 33 | 61 | 10 | P138N0300 | ● | P138NTI0300 | ▽ |
| **3.10** | 0/-0.018 | 3.1 | 36 | 65 | 10 | P138N0310 | ● | P138NTI0310 | ▽ |
| **3.20** | 0/-0.018 | 3.2 | 36 | 65 | 10 | P138N0320 | ● | P138NTI0320 | ▽ |
| **3.25** | 0/-0.018 | 3.25 | 36 | 65 | 10 | P138N0325 | ● | | |
| **3.30** | 0/-0.018 | 3.3 | 36 | 65 | 10 | P138N0330 | ● | P138NTI0330 | ▽ |
| **3.40** | 0/-0.018 | 3.4 | 39 | 70 | 10 | P138N0340 | ● | P138NTI0340 | ▽ |
| **3.50** | 0/-0.018 | 3.5 | 39 | 70 | 10 | P138N0350 | ● | P138NTI0350 | ▽ |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 138N-138NTI

N type for general purpose, short (138N),
N type for general purpose, TiN coated, short (138NTI)

DIN 338 | N | HSS OX | HSS TiN | 118° | 25-30°

138N 138NTI



138N

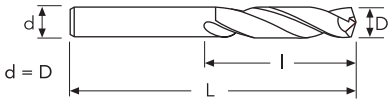


138NTI

**138NTI will be gradually replaced by 1386STI (page 233)**

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ☆ | ☆ | | |

★ 1st choice ☆ suitable

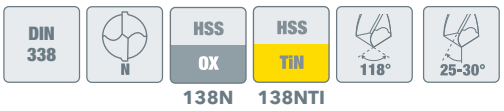



| | | | | | | 138N | | 138NTI | |
|---|---|---|---|---|---|---|---|---|---|
| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock | EDP No. | Stock |
| **3.60** | 0/-0.018 | 3.6 | 39 | 70 | 10 | P138N0360 | ● | P138NTI0360 | ▽ |
| **3.70** | 0/-0.018 | 3.7 | 39 | 70 | 10 | P138N0370 | ● | P138NTI0370 | ▽ |
| **3.75** | 0/-0.018 | 3.75 | 39 | 70 | 10 | P138N0375 | ● | | |
| **3.80** | 0/-0.018 | 3.8 | 43 | 75 | 10 | P138N0380 | ● | P138NTI0380 | ▽ |
| **3.90** | 0/-0.018 | 3.9 | 43 | 75 | 10 | P138N0390 | ● | P138NTI0390 | ▽ |
| **4.00** | 0/-0.018 | 4 | 43 | 75 | 10 | P138N0400 | ● | P138NTI0400 | ▽ |
| **4.10** | 0/-0.018 | 4.1 | 43 | 75 | 10 | P138N0410 | ● | P138NTI0410 | ▽ |
| **4.20** | 0/-0.018 | 4.2 | 43 | 75 | 10 | P138N0420 | ● | P138NTI0420 | ▽ |
| **4.25** | 0/-0.018 | 4.25 | 43 | 75 | 10 | P138N0425 | ● | | |
| **4.30** | 0/-0.018 | 4.3 | 47 | 80 | 10 | P138N0430 | ● | P138NTI0430 | ▽ |
| **4.40** | 0/-0.018 | 4.4 | 47 | 80 | 10 | P138N0440 | ● | P138NTI0440 | ▽ |
| **4.50** | 0/-0.018 | 4.5 | 47 | 80 | 10 | P138N0450 | ● | P138NTI0450 | ▽ |
| **4.60** | 0/-0.018 | 4.6 | 47 | 80 | 10 | P138N0460 | ● | P138NTI0460 | ▽ |
| **4.70** | 0/-0.018 | 4.7 | 47 | 80 | 10 | P138N0470 | ● | P138NTI0470 | ▽ |
| **4.75** | 0/-0.018 | 4.75 | 47 | 80 | 10 | P138N0475 | ● | | |
| **4.80** | 0/-0.018 | 4.8 | 52 | 86 | 10 | P138N0480 | ● | P138NTI0480 | ▽ |
| **4.90** | 0/-0.018 | 4.9 | 52 | 86 | 10 | P138N0490 | ● | P138NTI0490 | ▽ |
| **5.00** | 0/-0.018 | 5 | 52 | 86 | 10 | P138N0500 | ● | P138NTI0500 | ▽ |
| **5.10** | 0/-0.018 | 5.1 | 52 | 86 | 10 | P138N0510 | ● | P138NTI0510 | ▽ |
| **5.20** | 0/-0.018 | 5.2 | 52 | 86 | 10 | P138N0520 | ● | P138NTI0520 | ▽ |
| **5.25** | 0/-0.018 | 5.25 | 52 | 86 | 10 | P138N0525 | ● | | |
| **5.30** | 0/-0.018 | 5.3 | 52 | 86 | 10 | P138N0530 | ● | P138NTI0530 | ▽ |
| **5.40** | 0/-0.018 | 5.4 | 57 | 93 | 10 | P138N0540 | ● | P138NTI0540 | ▽ |
| **5.50** | 0/-0.018 | 5.5 | 57 | 93 | 10 | P138N0550 | ● | P138NTI0550 | ▽ |
| **5.60** | 0/-0.018 | 5.6 | 57 | 93 | 10 | P138N0560 | ● | P138NTI0560 | ▽ |
| **5.70** | 0/-0.018 | 5.7 | 57 | 93 | 10 | P138N0570 | ● | P138NTI0570 | ▽ |
| **5.75** | 0/-0.018 | 5.75 | 57 | 93 | 10 | P138N0575 | ● | | |
| **5.80** | 0/-0.018 | 5.8 | 57 | 93 | 10 | P138N0580 | ● | P138NTI0580 | ▽ |
| **5.90** | 0/-0.018 | 5.9 | 57 | 93 | 10 | P138N0590 | ● | P138NTI0590 | ▽ |
| **6.00** | 0/-0.018 | 6 | 57 | 93 | 10 | P138N0600 | ● | P138NTI0600 | ▽ |
| **6.10** | 0/-0.022 | 6.1 | 63 | 101 | 10 | P138N0610 | ● | P138NTI0610 | ▽ |
| **6.20** | 0/-0.022 | 6.2 | 63 | 101 | 10 | P138N0620 | ● | P138NTI0620 | ▽ |
| **6.25** | 0/-0.022 | 6.25 | 63 | 101 | 10 | P138N0625 | ● | | |
| **6.30** | 0/-0.022 | 6.3 | 63 | 101 | 10 | P138N0630 | ● | P138NTI0630 | ▽ |
| **6.40** | 0/-0.022 | 6.4 | 63 | 101 | 10 | P138N0640 | ● | P138NTI0640 | ▽ |
| **6.50** | 0/-0.022 | 6.5 | 63 | 101 | 10 | P138N0650 | ● | P138NTI0650 | ▽ |
| **6.60** | 0/-0.022 | 6.6 | 63 | 101 | 5 | P138N0660 | ● | P138NTI0660 | ▽ |
| **6.70** | 0/-0.022 | 6.7 | 63 | 101 | 5 | P138N0670 | ● | P138NTI0670 | ▽ |
| **6.75** | 0/-0.022 | 6.75 | 69 | 109 | 5 | P138N0675 | ● | | |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 138N-138NTI

N type for general purpose, short (138N),
N type for general purpose, TiN coated, short (138NTI)






138N

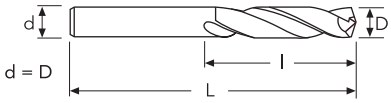


138NTI

**138NTI will be gradually replaced by 1386STI (page 233)**

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ☆ | ☆ | | |

★ 1st choice ☆ suitable




| | | | | | | 138N | | 138NTI | |
|---|---|---|---|---|---|---|---|---|---|
| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock | EDP No. | Stock |
| **6.80** | 0/-0.022 | 6.8 | 69 | 109 | 5 | P138N0680 | ● | P138NTI0680 | ▽ |
| **6.90** | 0/-0.022 | 6.9 | 69 | 109 | 5 | P138N0690 | ● | P138NTI0690 | ▽ |
| **7.00** | 0/-0.022 | 7 | 69 | 109 | 5 | P138N0700 | ● | P138NTI0700 | ▽ |
| **7.10** | 0/-0.022 | 7.1 | 69 | 109 | 5 | P138N0710 | ● | P138NTI0710 | ▽ |
| **7.20** | 0/-0.022 | 7.2 | 69 | 109 | 5 | P138N0720 | ● | P138NTI0720 | ▽ |
| **7.25** | 0/-0.022 | 7.25 | 69 | 109 | 5 | P138N0725 | ● | | |
| **7.30** | 0/-0.022 | 7.3 | 69 | 109 | 5 | P138N0730 | ● | P138NTI0730 | ▽ |
| **7.40** | 0/-0.022 | 7.4 | 69 | 109 | 5 | P138N0740 | ● | P138NTI0740 | ▽ |
| **7.50** | 0/-0.022 | 7.5 | 69 | 109 | 5 | P138N0750 | ● | P138NTI0750 | ▽ |
| **7.60** | 0/-0.022 | 7.6 | 75 | 117 | 5 | P138N0760 | ● | P138NTI0760 | ▽ |
| **7.70** | 0/-0.022 | 7.7 | 75 | 117 | 5 | P138N0770 | ● | P138NTI0770 | ▽ |
| **7.75** | 0/-0.022 | 7.75 | 75 | 117 | 5 | P138N0775 | ● | | |
| **7.80** | 0/-0.022 | 7.8 | 75 | 117 | 5 | P138N0780 | ● | P138NTI0780 | ▽ |
| **7.90** | 0/-0.022 | 7.9 | 75 | 117 | 5 | P138N0790 | ● | P138NTI0790 | ▽ |
| **8.00** | 0/-0.022 | 8 | 75 | 117 | 5 | P138N0800 | ● | P138NTI0800 | ▽ |
| **8.10** | 0/-0.022 | 8.1 | 75 | 117 | 5 | P138N0810 | ● | P138NTI0810 | ▽ |
| **8.20** | 0/-0.022 | 8.2 | 75 | 117 | 5 | P138N0820 | ● | P138NTI0820 | ▽ |
| **8.25** | 0/-0.022 | 8.25 | 75 | 117 | 5 | P138N0825 | ● | | |
| **8.30** | 0/-0.022 | 8.3 | 75 | 117 | 5 | P138N0830 | ● | P138NTI0830 | ▽ |
| **8.40** | 0/-0.022 | 8.4 | 75 | 117 | 5 | P138N0840 | ● | P138NTI0840 | ▽ |
| **8.50** | 0/-0.022 | 8.5 | 75 | 117 | 5 | P138N0850 | ● | P138NTI0850 | ▽ |
| **8.60** | 0/-0.022 | 8.6 | 81 | 125 | 5 | P138N0860 | ● | P138NTI0860 | ▽ |
| **8.70** | 0/-0.022 | 8.7 | 81 | 125 | 5 | P138N0870 | ● | P138NTI0870 | ▽ |
| **8.75** | 0/-0.022 | 8.75 | 81 | 125 | 5 | P138N0875 | ● | | |
| **8.80** | 0/-0.022 | 8.8 | 81 | 125 | 5 | P138N0880 | ● | P138NTI0880 | ▽ |
| **8.90** | 0/-0.022 | 8.9 | 81 | 125 | 5 | P138N0890 | ● | P138NTI0890 | ▽ |
| **9.00** | 0/-0.022 | 9 | 81 | 125 | 5 | P138N0900 | ● | P138NTI0900 | ▽ |
| **9.10** | 0/-0.022 | 9.1 | 81 | 125 | 5 | P138N0910 | ● | P138NTI0910 | ▽ |
| **9.20** | 0/-0.022 | 9.2 | 81 | 125 | 5 | P138N0920 | ● | P138NTI0920 | ▽ |
| **9.25** | 0/-0.022 | 9.25 | 81 | 125 | 5 | P138N0925 | ● | | |
| **9.30** | 0/-0.022 | 9.3 | 81 | 125 | 5 | P138N0930 | ● | P138NTI0930 | ▽ |
| **9.40** | 0/-0.022 | 9.4 | 81 | 125 | 5 | P138N0940 | ● | P138NTI0940 | ▽ |
| **9.50** | 0/-0.022 | 9.5 | 81 | 125 | 5 | P138N0950 | ● | P138NTI0950 | ▽ |
| **9.60** | 0/-0.022 | 9.6 | 87 | 133 | 5 | P138N0960 | ● | P138NTI0960 | ▽ |
| **9.70** | 0/-0.022 | 9.7 | 87 | 133 | 5 | P138N0970 | ● | P138NTI0970 | ▽ |
| **9.75** | 0/-0.022 | 9.75 | 87 | 133 | 5 | P138N0975 | ● | | |
| **9.80** | 0/-0.022 | 9.8 | 87 | 133 | 5 | P138N0980 | ● | P138NTI0980 | ▽ |
| **9.90** | 0/-0.022 | 9.9 | 87 | 133 | 5 | P138N0990 | ● | P138NTI0990 | ▽ |
| **10.00** | 0/-0.022 | 10 | 87 | 133 | 5 | P138N1000 | ● | P138NTI1000 | ▽ |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 138N-138NTI

N type for general purpose, short (138N),
N type for general purpose, TiN coated, short (138NTI)

DIN 338 | N | HSS OX | HSS TiN | 118° | 25-30°

138N 138NTI



138N

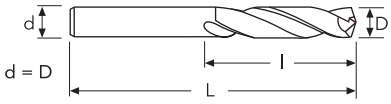


138NTI

**138NTI will be gradually replaced by 1386STI (page 233)**

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ☆ | ☆ | | |

★ 1st choice ☆ suitable

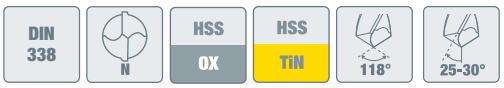



| | | | | | | 138N | | 138NTI | |
|---|---|---|---|---|---|---|---|---|---|
| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock | EDP No. | Stock |
| **10.10** | 0/-0.027 | 10.1 | 87 | 133 | 5 | P138N1010 | ● | | |
| **10.20** | 0/-0.027 | 10.2 | 87 | 133 | 5 | P138N1020 | ● | P138NTI1020 | ▽ |
| **10.25** | 0/-0.027 | 10.25 | 87 | 133 | 5 | P138N1025 | ● | | |
| **10.30** | 0/-0.027 | 10.3 | 87 | 133 | 5 | P138N1030 | ● | | |
| **10.40** | 0/-0.027 | 10.4 | 87 | 133 | 5 | P138N1040 | ● | | |
| **10.50** | 0/-0.027 | 10.5 | 87 | 133 | 5 | P138N1050 | ● | P138NTI1050 | ▽ |
| **10.60** | 0/-0.027 | 10.6 | 87 | 133 | 5 | P138N1060 | ● | | |
| **10.70** | 0/-0.027 | 10.7 | 94 | 142 | 5 | P138N1070 | ● | | |
| **10.75** | 0/-0.027 | 10.75 | 94 | 142 | 5 | P138N1075 | ● | | |
| **10.80** | 0/-0.027 | 10.8 | 94 | 142 | 5 | P138N1080 | ● | | |
| **10.90** | 0/-0.027 | 10.9 | 94 | 142 | 5 | P138N1090 | ● | | |
| **11.00** | 0/-0.027 | 11 | 94 | 142 | 5 | P138N1100 | ● | P138NTI1100 | ▽ |
| **11.10** | 0/-0.027 | 11.1 | 94 | 142 | 5 | P138N1110 | ● | | |
| **11.20** | 0/-0.027 | 11.2 | 94 | 142 | 5 | P138N1120 | ● | | |
| **11.25** | 0/-0.027 | 11.25 | 94 | 142 | 5 | P138N1125 | ● | | |
| **11.30** | 0/-0.027 | 11.3 | 94 | 142 | 5 | P138N1130 | ● | | |
| **11.40** | 0/-0.027 | 11.4 | 94 | 142 | 5 | P138N1140 | ● | | |
| **11.50** | 0/-0.027 | 11.5 | 94 | 142 | 5 | P138N1150 | ● | P138NTI1150 | ▽ |
| **11.60** | 0/-0.027 | 11.6 | 94 | 142 | 5 | P138N1160 | ● | | |
| **11.70** | 0/-0.027 | 11.7 | 94 | 142 | 5 | P138N1170 | ● | | |
| **11.75** | 0/-0.027 | 11.75 | 94 | 142 | 5 | P138N1175 | ● | | |
| **11.80** | 0/-0.027 | 11.8 | 94 | 142 | 5 | P138N1180 | ● | | |
| **11.90** | 0/-0.027 | 11.9 | 101 | 151 | 5 | P138N1190 | ● | | |
| **12.00** | 0/-0.027 | 12 | 101 | 151 | 5 | P138N1200 | ● | P138NTI1200 | ▽ |
| **12.10** | 0/-0.027 | 12.1 | 101 | 151 | 5 | P138N1210 | ● | | |
| **12.20** | 0/-0.027 | 12.2 | 101 | 151 | 5 | P138N1220 | ● | | |
| **12.25** | 0/-0.027 | 12.25 | 101 | 151 | 5 | P138N1225 | ● | | |
| **12.30** | 0/-0.027 | 12.3 | 101 | 151 | 5 | P138N1230 | ● | | |
| **12.40** | 0/-0.027 | 12.4 | 101 | 151 | 5 | P138N1240 | ● | | |
| **12.50** | 0/-0.027 | 12.5 | 101 | 151 | 5 | P138N1250 | ● | P138NTI1250 | ▽ |
| **12.60** | 0/-0.027 | 12.6 | 101 | 151 | 5 | P138N1260 | ● | | |
| **12.70** | 0/-0.027 | 12.7 | 101 | 151 | 5 | P138N1270 | ● | | |
| **12.75** | 0/-0.027 | 12.75 | 101 | 151 | 5 | P138N1275 | ● | | |
| **12.80** | 0/-0.027 | 12.8 | 101 | 151 | 5 | P138N1280 | ● | | |
| **12.90** | 0/-0.027 | 12.9 | 101 | 151 | 5 | P138N1290 | ● | | |
| **13.00** | 0/-0.027 | 13 | 101 | 151 | 5 | P138N1300 | ● | P138NTI1300 | ▽ |
| **13.25** | 0/-0.027 | 13.25 | 108 | 160 | 1 | P138N1325 | ● | | |
| **13.50** | 0/-0.027 | 13.5 | 108 | 160 | 1 | P138N1350 | ● | P138NTI1350 | ▽ |
| **13.75** | 0/-0.027 | 13.75 | 108 | 160 | 1 | P138N1375 | ● | | |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 138N-138NTI

N type for general purpose, short (138N),
N type for general purpose, TiN coated, short (138NTI)






138N

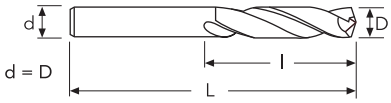


138NTI

**138NTI will be gradually replaced by 1386STI (page 239)**

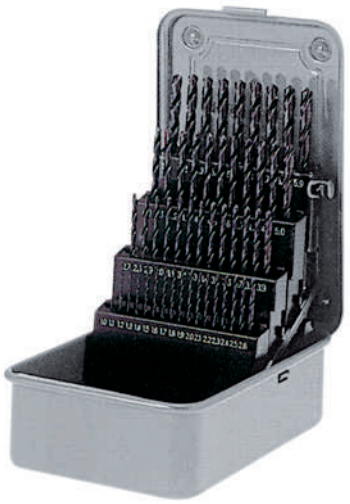
| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ☆ | ☆ | | |

★ 1st choice ☆ suitable




| | | | | | | 138N | | 138NTI | |
|---|---|---|---|---|---|---|---|---|---|
| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock | EDP No. | Stock |
| **14.00** | 0/-0.027 | 14 | 108 | 160 | 1 | P138N1400 | ● | P138NTI1400 | ▽ |
| **14.25** | 0/-0.027 | 14.25 | 114 | 169 | 1 | P138N1425 | ● | | |
| **14.50** | 0/-0.027 | 14.5 | 114 | 169 | 1 | P138N1450 | ● | P138NTI1450 | ▽ |
| **14.75** | 0/-0.027 | 14.75 | 114 | 169 | 1 | P138N1475 | ● | | |
| **15.00** | 0/-0.027 | 15 | 114 | 169 | 1 | P138N1500 | ● | P138NTI1500 | ▽ |
| **15.25** | 0/-0.027 | 15.25 | 120 | 178 | 1 | P138N1525 | ● | | |
| **15.50** | 0/-0.027 | 15.5 | 120 | 178 | 1 | P138N1550 | ● | P138NTI1550 | ▽ |
| **15.75** | 0/-0.027 | 15.75 | 120 | 178 | 1 | P138N1575 | ● | | |
| **16.00** | 0/-0.027 | 16 | 120 | 178 | 1 | P138N1600 | ● | P138NTI1600 | ▽ |
| **16.25** | 0/-0.027 | 16.25 | 125 | 184 | 1 | P138N1625 | ● | | |
| **16.50** | 0/-0.027 | 16.5 | 125 | 184 | 1 | P138N1650 | ● | | |
| **16.75** | 0/-0.027 | 16.75 | 125 | 184 | 1 | P138N1675 | ● | | |
| **17.00** | 0/-0.027 | 17 | 125 | 184 | 1 | P138N1700 | ● | | |
| **17.50** | 0/-0.027 | 17.5 | 130 | 191 | 1 | P138N1750 | ● | | |
| **18.00** | 0/-0.027 | 18 | 130 | 191 | 1 | P138N1800 | ● | | |
| **18.50** | 0/-0.033 | 18.5 | 135 | 198 | 1 | P138N1850 | ● | | |
| **19.00** | 0/-0.033 | 19 | 135 | 198 | 1 | P138N1900 | ● | | |
| **19.50** | 0/-0.033 | 19.5 | 140 | 205 | 1 | P138N1950 | ● | | |
| **20.00** | 0/-0.033 | 20 | 140 | 205 | 1 | P138N2000 | ● | | |

● stock standard ○ non-standard stock ▽ stock exhaustion



**138NA01A**
Set 50 pcs.
138N DIN338 HSS
Ø1 mm÷Ø5.9 mm x 0.1 mm



**138NA01B**
Set 41 pcs.
138N DIN338 HSS
Ø6 mm÷Ø10 mm x 0.1 mm



**138NA05C**
Set 25 pcs.
138N DIN338 HSS
Ø1 mm÷Ø13 mm x 0.5 mm

## 138N

| Material Group ISO 513 | P1 P2 | P3 P4 | K1 K2 | N1 N5 | N2 N3 N4 | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 150÷350 HB | | | |
| Vc (m/min) | **25÷35** | **20÷30** | **25÷35** | **50÷70** | **40÷60** | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| **0.2** | 0.007 | 0.006 | 0.008 | 0.010 | 0.007 | |
| **0.5** | 0.011 | 0.009 | 0.012 | 0.015 | 0.011 | |
| **0.8** | 0.013 | 0.011 | 0.014 | 0.018 | 0.013 | |
| **1** | 0.017 | 0.014 | 0.019 | 0.024 | 0.017 | |
| **1.5** | 0.035 | 0.030 | 0.039 | 0.049 | 0.035 | |
| **2** | 0.050 | 0.043 | 0.055 | 0.070 | 0.050 | |
| **2.5** | 0.060 | 0.051 | 0.066 | 0.084 | 0.060 | |
| **3** | 0.070 | 0.060 | 0.077 | 0.098 | 0.070 | |
| **3.5** | 0.080 | 0.068 | 0.088 | 0.112 | 0.080 | |
| **4** | 0.090 | 0.077 | 0.099 | 0.126 | 0.090 | |
| **5** | 0.100 | 0.085 | 0.110 | 0.140 | 0.100 | |
| **6** | 0.110 | 0.094 | 0.121 | 0.154 | 0.110 | |
| **7** | 0.120 | 0.102 | 0.132 | 0.168 | 0.120 | |
| **8** | 0.130 | 0.111 | 0.143 | 0.182 | 0.130 | |
| **9** | 0.140 | 0.119 | 0.154 | 0.196 | 0.140 | |
| **10** | 0.160 | 0.136 | 0.176 | 0.224 | 0.160 | |
| **11** | 0.170 | 0.145 | 0.187 | 0.238 | 0.170 | |
| **12** | 0.180 | 0.153 | 0.198 | 0.252 | 0.180 | |
| **13** | 0.190 | 0.162 | 0.209 | 0.266 | 0.190 | |
| **14** | 0.200 | 0.170 | 0.220 | 0.280 | 0.200 | |
| **15** | 0.210 | 0.179 | 0.231 | 0.294 | 0.210 | |
| **16** | 0.220 | 0.187 | 0.242 | 0.308 | 0.220 | |
| **17** | 0.230 | 0.196 | 0.253 | 0.322 | 0.230 | |
| **18** | 0.240 | 0.204 | 0.264 | 0.336 | 0.240 | |
| **19** | 0.250 | 0.213 | 0.275 | 0.350 | 0.250 | |
| **20** | 0.260 | 0.221 | 0.286 | 0.364 | 0.260 | |

## 138NTI

| Material Group ISO 513 | P1 P2 | P3 P4 | K1 K2 | N1 N5 | N2 N3 N4 | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 150÷350 HB | | | |
| Vc (m/min) | **30÷40** | **25÷35** | **30÷40** | **60÷80** | **50÷70** | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| **1** | 0.017 | 0.014 | 0.019 | 0.024 | 0.017 | |
| **1.5** | 0.035 | 0.030 | 0.039 | 0.049 | 0.035 | |
| **2** | 0.050 | 0.043 | 0.055 | 0.070 | 0.050 | |
| **2.5** | 0.060 | 0.051 | 0.066 | 0.084 | 0.060 | |
| **3** | 0.070 | 0.060 | 0.077 | 0.098 | 0.070 | |
| **3.5** | 0.080 | 0.068 | 0.088 | 0.112 | 0.080 | |
| **4** | 0.090 | 0.077 | 0.099 | 0.126 | 0.090 | |
| **5** | 0.100 | 0.085 | 0.110 | 0.140 | 0.100 | |
| **6** | 0.110 | 0.094 | 0.121 | 0.154 | 0.110 | |
| **7** | 0.120 | 0.102 | 0.132 | 0.168 | 0.120 | |
| **8** | 0.130 | 0.111 | 0.143 | 0.182 | 0.130 | |
| **9** | 0.140 | 0.119 | 0.154 | 0.196 | 0.140 | |
| **10** | 0.160 | 0.136 | 0.176 | 0.224 | 0.160 | |
| **11** | 0.170 | 0.145 | 0.187 | 0.238 | 0.170 | |
| **12** | 0.180 | 0.153 | 0.198 | 0.252 | 0.180 | |
| **13** | 0.190 | 0.162 | 0.209 | 0.266 | 0.190 | |
| **14** | 0.200 | 0.170 | 0.220 | 0.280 | 0.200 | |
| **15** | 0.210 | 0.179 | 0.231 | 0.294 | 0.210 | |
| **16** | 0.220 | 0.187 | 0.242 | 0.308 | 0.220 | |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
**HSS-HSS/CO**

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 138HB

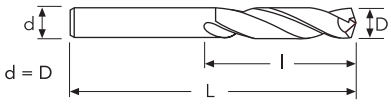
HB type for brass, short

DIN 338 | H | HSS BR | 118° | 12-15°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **1.50** | 0/-0.014 | 1.5 | 18 | 40 | 10 | P138HB0150 | ● |
| **1.60** | 0/-0.014 | 1.6 | 20 | 43 | 10 | P138HB0160 | ● |
| **1.70** | 0/-0.014 | 1.7 | 20 | 43 | 10 | P138HB0170 | ● |
| **1.80** | 0/-0.014 | 1.8 | 22 | 46 | 10 | P138HB0180 | ● |
| **1.90** | 0/-0.014 | 1.9 | 22 | 46 | 10 | P138HB0190 | ● |
| **2.00** | 0/-0.014 | 2 | 24 | 49 | 10 | P138HB0200 | ● |
| **2.10** | 0/-0.014 | 2.1 | 24 | 49 | 10 | P138HB0210 | ● |
| **2.20** | 0/-0.014 | 2.2 | 27 | 53 | 10 | P138HB0220 | ● |
| **2.30** | 0/-0.014 | 2.3 | 27 | 53 | 10 | P138HB0230 | ● |
| **2.40** | 0/-0.014 | 2.4 | 30 | 57 | 10 | P138HB0240 | ● |
| **2.50** | 0/-0.014 | 2.5 | 30 | 57 | 10 | P138HB0250 | ● |
| **2.60** | 0/-0.014 | 2.6 | 30 | 57 | 10 | P138HB0260 | ● |
| **2.70** | 0/-0.014 | 2.7 | 33 | 61 | 10 | P138HB0270 | ● |
| **2.80** | 0/-0.014 | 2.8 | 33 | 61 | 10 | P138HB0280 | ● |
| **2.90** | 0/-0.014 | 2.9 | 33 | 61 | 10 | P138HB0290 | ● |
| **3.00** | 0/-0.014 | 3 | 33 | 61 | 10 | P138HB0300 | ● |
| **3.10** | 0/-0.018 | 3.1 | 36 | 65 | 10 | P138HB0310 | ● |
| **3.20** | 0/-0.018 | 3.2 | 36 | 65 | 10 | P138HB0320 | ● |
| **3.30** | 0/-0.018 | 3.3 | 36 | 65 | 10 | P138HB0330 | ● |
| **3.40** | 0/-0.018 | 3.4 | 39 | 70 | 10 | P138HB0340 | ● |
| **3.50** | 0/-0.018 | 3.5 | 39 | 70 | 10 | P138HB0350 | ● |
| **3.60** | 0/-0.018 | 3.6 | 39 | 70 | 10 | P138HB0360 | ● |
| **3.70** | 0/-0.018 | 3.7 | 39 | 70 | 10 | P138HB0370 | ● |
| **3.80** | 0/-0.018 | 3.8 | 43 | 75 | 10 | P138HB0380 | ● |
| **3.90** | 0/-0.018 | 3.9 | 43 | 75 | 10 | P138HB0390 | ● |
| **4.00** | 0/-0.018 | 4 | 43 | 75 | 10 | P138HB0400 | ● |
| **4.10** | 0/-0.018 | 4.1 | 43 | 75 | 10 | P138HB0410 | ● |
| **4.20** | 0/-0.018 | 4.2 | 43 | 75 | 10 | P138HB0420 | ● |
| **4.30** | 0/-0.018 | 4.3 | 47 | 80 | 10 | P138HB0430 | ● |
| **4.40** | 0/-0.018 | 4.4 | 47 | 80 | 10 | P138HB0440 | ○ |
| **4.50** | 0/-0.018 | 4.5 | 47 | 80 | 10 | P138HB0450 | ● |
| **4.60** | 0/-0.018 | 4.6 | 47 | 80 | 10 | P138HB0460 | ● |
| **4.70** | 0/-0.018 | 4.7 | 47 | 80 | 10 | P138HB0470 | ● |
| **4.80** | 0/-0.018 | 4.8 | 52 | 86 | 10 | P138HB0480 | ● |
| **4.90** | 0/-0.018 | 4.9 | 52 | 86 | 10 | P138HB0490 | ○ |
| **5.00** | 0/-0.018 | 5 | 52 | 86 | 10 | P138HB0500 | ● |
| **5.10** | 0/-0.018 | 5.1 | 52 | 86 | 10 | P138HB0510 | ○ |
| **5.20** | 0/-0.018 | 5.2 | 52 | 86 | 10 | P138HB0520 | ○ |
| **5.30** | 0/-0.018 | 5.3 | 52 | 86 | 10 | P138HB0530 | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 138HB

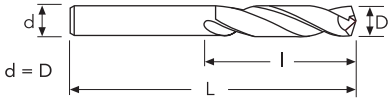
HB type for brass, short

DIN 338 | H | HSS BR | 118° | 12-15°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **5.40** | 0/-0.018 | 5.4 | 57 | 93 | 10 | P138HB0540 | ○ |
| **5.50** | 0/-0.018 | 5.5 | 57 | 93 | 10 | P138HB0550 | ● |
| **5.60** | 0/-0.018 | 5.6 | 57 | 93 | 10 | P138HB0560 | ○ |
| **5.70** | 0/-0.018 | 5.7 | 57 | 93 | 10 | P138HB0570 | ○ |
| **5.80** | 0/-0.018 | 5.8 | 57 | 93 | 10 | P138HB0580 | ○ |
| **5.90** | 0/-0.018 | 5.9 | 57 | 93 | 10 | P138HB0590 | ○ |
| **6.00** | 0/-0.018 | 6 | 57 | 93 | 10 | P138HB0600 | ● |
| **6.10** | 0/-0.022 | 6.1 | 63 | 101 | 10 | P138HB0610 | ○ |
| **6.20** | 0/-0.022 | 6.2 | 63 | 101 | 10 | P138HB0620 | ○ |
| **6.30** | 0/-0.022 | 6.3 | 63 | 101 | 10 | P138HB0630 | ○ |
| **6.40** | 0/-0.022 | 6.4 | 63 | 101 | 10 | P138HB0640 | ○ |
| **6.50** | 0/-0.022 | 6.5 | 63 | 101 | 10 | P138HB0650 | ● |
| **6.60** | 0/-0.022 | 6.6 | 63 | 101 | 5 | P138HB0660 | ○ |
| **6.70** | 0/-0.022 | 6.7 | 63 | 101 | 5 | P138HB0670 | ○ |
| **6.80** | 0/-0.022 | 6.8 | 69 | 109 | 5 | P138HB0680 | ○ |
| **6.90** | 0/-0.022 | 6.9 | 69 | 109 | 5 | P138HB0690 | ○ |
| **7.00** | 0/-0.022 | 7 | 69 | 109 | 5 | P138HB0700 | ● |
| **7.10** | 0/-0.022 | 7.1 | 69 | 109 | 5 | P138HB0710 | ○ |
| **7.20** | 0/-0.022 | 7.2 | 69 | 109 | 5 | P138HB0720 | ○ |
| **7.30** | 0/-0.022 | 7.3 | 69 | 109 | 5 | P138HB0730 | ○ |
| **7.40** | 0/-0.022 | 7.4 | 69 | 109 | 5 | P138HB0740 | ○ |
| **7.50** | 0/-0.022 | 7.5 | 69 | 109 | 5 | P138HB0750 | ● |
| **7.60** | 0/-0.022 | 7.6 | 75 | 117 | 5 | P138HB0760 | ○ |
| **7.70** | 0/-0.022 | 7.7 | 75 | 117 | 5 | P138HB0770 | ○ |
| **7.80** | 0/-0.022 | 7.8 | 75 | 117 | 5 | P138HB0780 | ● |
| **7.90** | 0/-0.022 | 7.9 | 75 | 117 | 5 | P138HB0790 | ○ |
| **8.00** | 0/-0.022 | 8 | 75 | 117 | 5 | P138HB0800 | ● |
| **8.10** | 0/-0.022 | 8.1 | 75 | 117 | 5 | P138HB0810 | ○ |
| **8.20** | 0/-0.022 | 8.2 | 75 | 117 | 5 | P138HB0820 | ○ |
| **8.30** | 0/-0.022 | 8.3 | 75 | 117 | 5 | P138HB0830 | ○ |
| **8.40** | 0/-0.022 | 8.4 | 75 | 117 | 5 | P138HB0840 | ○ |
| **8.50** | 0/-0.022 | 8.5 | 75 | 117 | 5 | P138HB0850 | ● |
| **8.60** | 0/-0.022 | 8.6 | 81 | 125 | 5 | P138HB0860 | ○ |
| **8.70** | 0/-0.022 | 8.7 | 81 | 125 | 5 | P138HB0870 | ○ |
| **8.80** | 0/-0.022 | 8.8 | 81 | 125 | 5 | P138HB0880 | ○ |
| **8.90** | 0/-0.022 | 8.9 | 81 | 125 | 5 | P138HB0890 | ○ |
| **9.00** | 0/-0.022 | 9 | 81 | 125 | 5 | P138HB0900 | ● |
| **9.10** | 0/-0.022 | 9.1 | 81 | 125 | 5 | P138HB0910 | ○ |
| **9.20** | 0/-0.022 | 9.2 | 81 | 125 | 5 | P138HB0920 | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 138HB

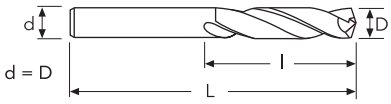
HB type for brass, short

DIN 338 | H | HSS BR | 118° | 12-15°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **9.30** | 0/-0.022 | 9.3 | 81 | 125 | 5 | P138HB0930 | ○ |
| **9.40** | 0/-0.022 | 9.4 | 81 | 125 | 5 | P138HB0940 | ○ |
| **9.50** | 0/-0.022 | 9.5 | 81 | 125 | 5 | P138HB0950 | ● |
| **9.60** | 0/-0.022 | 9.6 | 87 | 133 | 5 | P138HB0960 | ○ |
| **9.70** | 0/-0.022 | 9.7 | 87 | 133 | 5 | P138HB0970 | ○ |
| **9.80** | 0/-0.022 | 9.8 | 87 | 133 | 5 | P138HB0980 | ○ |
| **9.90** | 0/-0.022 | 9.9 | 87 | 133 | 5 | P138HB0990 | ○ |
| **10.00** | 0/-0.022 | 10 | 87 | 133 | 5 | P138HB1000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

## 138HB

| | Material Group ISO 513 | N4 | | | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | 40÷60 | | | | | |
| | D (mm) | fn (mm/rev) | | | | | |
| | 1.5 | 0.065 | | | | | |
| | 2 | 0.080 | | | | | |
| | 2.5 | 0.090 | | | | | |
| | 3 | 0.100 | | | | | |
| | 3.5 | 0.110 | | | | | |
| | 4 | 0.120 | | | | | |
| | 4.5 | 0.130 | | | | | |
| | 5 | 0.140 | | | | | |
| | 6 | 0.160 | | | | | |
| | 7 | 0.180 | | | | | |
| | 8 | 0.200 | | | | | |
| | 9 | 0.220 | | | | | |
| | 10 | 0.250 | | | | | |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
**HSS-HSS/CO**

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 138WB

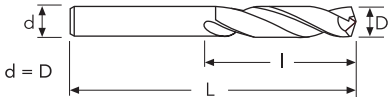
WB type for aluminium, short

DIN 338 | W | HSS / BR | 130° | 35-40°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **1.50** | 0/-0.014 | 1.5 | 18 | 40 | 10 | P138WB0150 | ● |
| **1.60** | 0/-0.014 | 1.6 | 20 | 43 | 10 | P138WB0160 | ○ |
| **1.70** | 0/-0.014 | 1.7 | 20 | 43 | 10 | P138WB0170 | ○ |
| **1.80** | 0/-0.014 | 1.8 | 22 | 46 | 10 | P138WB0180 | ○ |
| **1.90** | 0/-0.014 | 1.9 | 22 | 46 | 10 | P138WB0190 | ○ |
| **2.00** | 0/-0.014 | 2 | 24 | 49 | 10 | P138WB0200 | ● |
| **2.10** | 0/-0.014 | 2.1 | 24 | 49 | 10 | P138WB0210 | ○ |
| **2.20** | 0/-0.014 | 2.2 | 27 | 53 | 10 | P138WB0220 | ● |
| **2.30** | 0/-0.014 | 2.3 | 27 | 53 | 10 | P138WB0230 | ○ |
| **2.40** | 0/-0.014 | 2.4 | 30 | 57 | 10 | P138WB0240 | ● |
| **2.50** | 0/-0.014 | 2.5 | 30 | 57 | 10 | P138WB0250 | ● |
| **2.60** | 0/-0.014 | 2.6 | 30 | 57 | 10 | P138WB0260 | ● |
| **2.70** | 0/-0.014 | 2.7 | 33 | 61 | 10 | P138WB0270 | ○ |
| **2.80** | 0/-0.014 | 2.8 | 33 | 61 | 10 | P138WB0280 | ● |
| **2.90** | 0/-0.014 | 2.9 | 33 | 61 | 10 | P138WB0290 | ○ |
| **3.00** | 0/-0.014 | 3 | 33 | 61 | 10 | P138WB0300 | ● |
| **3.10** | 0/-0.018 | 3.1 | 36 | 65 | 10 | P138WB0310 | ● |
| **3.20** | 0/-0.018 | 3.2 | 36 | 65 | 10 | P138WB0320 | ● |
| **3.30** | 0/-0.018 | 3.3 | 36 | 65 | 10 | P138WB0330 | ● |
| **3.40** | 0/-0.018 | 3.4 | 39 | 70 | 10 | P138WB0340 | ● |
| **3.50** | 0/-0.018 | 3.5 | 39 | 70 | 10 | P138WB0350 | ● |
| **3.60** | 0/-0.018 | 3.6 | 39 | 70 | 10 | P138WB0360 | ● |
| **3.70** | 0/-0.018 | 3.7 | 39 | 70 | 10 | P138WB0370 | ● |
| **3.80** | 0/-0.018 | 3.8 | 43 | 75 | 10 | P138WB0380 | ● |
| **3.90** | 0/-0.018 | 3.9 | 43 | 75 | 10 | P138WB0390 | ● |
| **4.00** | 0/-0.018 | 4 | 43 | 75 | 10 | P138WB0400 | ● |
| **4.10** | 0/-0.018 | 4.1 | 43 | 75 | 10 | P138WB0410 | ● |
| **4.20** | 0/-0.018 | 4.2 | 43 | 75 | 10 | P138WB0420 | ● |
| **4.30** | 0/-0.018 | 4.3 | 47 | 80 | 10 | P138WB0430 | ○ |
| **4.40** | 0/-0.018 | 4.4 | 47 | 80 | 10 | P138WB0440 | ○ |
| **4.50** | 0/-0.018 | 4.5 | 47 | 80 | 10 | P138WB0450 | ● |
| **4.60** | 0/-0.018 | 4.6 | 47 | 80 | 10 | P138WB0460 | ● |
| **4.70** | 0/-0.018 | 4.7 | 47 | 80 | 10 | P138WB0470 | ○ |
| **4.80** | 0/-0.018 | 4.8 | 52 | 86 | 10 | P138WB0480 | ● |
| **4.90** | 0/-0.018 | 4.9 | 52 | 86 | 10 | P138WB0490 | ● |
| **5.00** | 0/-0.018 | 5 | 52 | 86 | 10 | P138WB0500 | ● |
| **5.10** | 0/-0.018 | 5.1 | 52 | 86 | 10 | P138WB0510 | ○ |
| **5.20** | 0/-0.018 | 5.2 | 52 | 86 | 10 | P138WB0520 | ● |
| **5.30** | 0/-0.018 | 5.3 | 52 | 86 | 10 | P138WB0530 | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 138WB

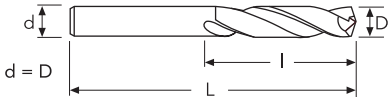
WB type for aluminium, short

DIN 338 | W | HSS BR | 130° | 35-40°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **5.40** | 0/-0.018 | 5.4 | 57 | 93 | 10 | P138WB0540 | ○ |
| **5.50** | 0/-0.018 | 5.5 | 57 | 93 | 10 | P138WB0550 | ● |
| **5.60** | 0/-0.018 | 5.6 | 57 | 93 | 10 | P138WB0560 | ● |
| **5.70** | 0/-0.018 | 5.7 | 57 | 93 | 10 | P138WB0570 | ○ |
| **5.80** | 0/-0.018 | 5.8 | 57 | 93 | 10 | P138WB0580 | ○ |
| **5.90** | 0/-0.018 | 5.9 | 57 | 93 | 10 | P138WB0590 | ○ |
| **6.00** | 0/-0.018 | 6 | 57 | 93 | 10 | P138WB0600 | ● |
| **6.10** | 0/-0.022 | 6.1 | 63 | 101 | 10 | P138WB0610 | ○ |
| **6.20** | 0/-0.022 | 6.2 | 63 | 101 | 10 | P138WB0620 | ○ |
| **6.30** | 0/-0.022 | 6.3 | 63 | 101 | 10 | P138WB0630 | ○ |
| **6.40** | 0/-0.022 | 6.4 | 63 | 101 | 10 | P138WB0640 | ○ |
| **6.50** | 0/-0.022 | 6.5 | 63 | 101 | 10 | P138WB0650 | ● |
| **6.60** | 0/-0.022 | 6.6 | 63 | 101 | 5 | P138WB0660 | ○ |
| **6.70** | 0/-0.022 | 6.7 | 63 | 101 | 5 | P138WB0670 | ○ |
| **6.80** | 0/-0.022 | 6.8 | 69 | 109 | 5 | P138WB0680 | ● |
| **6.90** | 0/-0.022 | 6.9 | 69 | 109 | 5 | P138WB0690 | ○ |
| **7.00** | 0/-0.022 | 7 | 69 | 109 | 5 | P138WB0700 | ● |
| **7.10** | 0/-0.022 | 7.1 | 69 | 109 | 5 | P138WB0710 | ○ |
| **7.20** | 0/-0.022 | 7.2 | 69 | 109 | 5 | P138WB0720 | ○ |
| **7.30** | 0/-0.022 | 7.3 | 69 | 109 | 5 | P138WB0730 | ○ |
| **7.40** | 0/-0.022 | 7.4 | 69 | 109 | 5 | P138WB0740 | ○ |
| **7.50** | 0/-0.022 | 7.5 | 69 | 109 | 5 | P138WB0750 | ● |
| **7.60** | 0/-0.022 | 7.6 | 75 | 117 | 5 | P138WB0760 | ○ |
| **7.70** | 0/-0.022 | 7.7 | 75 | 117 | 5 | P138WB0770 | ○ |
| **7.80** | 0/-0.022 | 7.8 | 75 | 117 | 5 | P138WB0780 | ○ |
| **7.90** | 0/-0.022 | 7.9 | 75 | 117 | 5 | P138WB0790 | ○ |
| **8.00** | 0/-0.022 | 8 | 75 | 117 | 5 | P138WB0800 | ● |
| **8.10** | 0/-0.022 | 8.1 | 75 | 117 | 5 | P138WB0810 | ○ |
| **8.20** | 0/-0.022 | 8.2 | 75 | 117 | 5 | P138WB0820 | ● |
| **8.30** | 0/-0.022 | 8.3 | 75 | 117 | 5 | P138WB0830 | ○ |
| **8.40** | 0/-0.022 | 8.4 | 75 | 117 | 5 | P138WB0840 | ○ |
| **8.50** | 0/-0.022 | 8.5 | 75 | 117 | 5 | P138WB0850 | ● |
| **8.60** | 0/-0.022 | 8.6 | 81 | 125 | 5 | P138WB0860 | ○ |
| **8.70** | 0/-0.022 | 8.7 | 81 | 125 | 5 | P138WB0870 | ○ |
| **8.80** | 0/-0.022 | 8.8 | 81 | 125 | 5 | P138WB0880 | ○ |
| **8.90** | 0/-0.022 | 8.9 | 81 | 125 | 5 | P138WB0890 | ○ |
| **9.00** | 0/-0.022 | 9 | 81 | 125 | 5 | P138WB0900 | ● |
| **9.10** | 0/-0.022 | 9.1 | 81 | 125 | 5 | P138WB0910 | ○ |
| **9.20** | 0/-0.022 | 9.2 | 81 | 125 | 5 | P138WB0920 | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 138WB

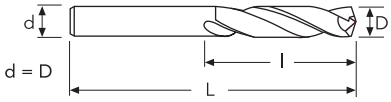
WB type for aluminium, short

DIN 338 | W | HSS / BR | 130° | 35-40°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **9.30** | 0/-0.022 | 9.3 | 81 | 125 | 5 | P138WB0930 | ○ |
| **9.40** | 0/-0.022 | 9.4 | 81 | 125 | 5 | P138WB0940 | ○ |
| **9.50** | 0/-0.022 | 9.5 | 81 | 125 | 5 | P138WB0950 | ● |
| **9.60** | 0/-0.022 | 9.6 | 87 | 133 | 5 | P138WB0960 | ○ |
| **9.70** | 0/-0.022 | 9.7 | 87 | 133 | 5 | P138WB0970 | ○ |
| **9.80** | 0/-0.022 | 9.8 | 87 | 133 | 5 | P138WB0980 | ○ |
| **9.90** | 0/-0.022 | 9.9 | 87 | 133 | 5 | P138WB0990 | ○ |
| **10.00** | 0/-0.022 | 10 | 87 | 133 | 5 | P138WB1000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

## 138WB

| | Material Group ISO 513 | N1 | N2 | N3 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | | |
| | Vc (m/min) | 40÷60 | 30÷50 | 25÷45 | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| | 1.5 | 0.070 | 0.063 | 0.060 | | | |
| | 2 | 0.080 | 0.072 | 0.068 | | | |
| | 2.5 | 0.090 | 0.081 | 0.077 | | | |
| | 3 | 0.100 | 0.090 | 0.085 | | | |
| | 3.5 | 0.110 | 0.099 | 0.094 | | | |
| | 4 | 0.120 | 0.108 | 0.102 | | | |
| | 4.5 | 0.130 | 0.117 | 0.111 | | | |
| | 5 | 0.140 | 0.126 | 0.119 | | | |
| | 6 | 0.160 | 0.144 | 0.136 | | | |
| | 7 | 0.180 | 0.162 | 0.153 | | | |
| | 8 | 0.200 | 0.180 | 0.170 | | | |
| | 9 | 0.220 | 0.198 | 0.187 | | | |
| | 10 | 0.250 | 0.225 | 0.213 | | | |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 2386STI

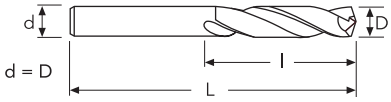
STI type for tough materials, split point, TiN pointed, short

DIN 338 | SPLIT POINT | HSS/Co TiN | 135° | 33°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **1.00** | 0/-0.014 | 1 | 12 | 34 | 10 | P2385NTI0100 | ● |
| **1.10** | 0/-0.014 | 1.1 | 14 | 36 | 10 | P2385NTI0110 | ● |
| **1.20** | 0/-0.014 | 1.2 | 16 | 38 | 10 | P2385NTI0120 | ● |
| **1.30** | 0/-0.014 | 1.3 | 16 | 38 | 10 | P2385NTI0130 | ● |
| **1.40** | 0/-0.014 | 1.4 | 18 | 40 | 10 | P2385NTI0140 | ● |
| **1.50** | 0/-0.014 | 1.5 | 18 | 40 | 10 | P2385NTI0150 | ● |
| **1.60** | 0/-0.014 | 1.6 | 20 | 43 | 10 | P2386STI0160 | ● |
| **1.70** | 0/-0.014 | 1.7 | 20 | 43 | 10 | P2386STI0170 | ● |
| **1.80** | 0/-0.014 | 1.8 | 22 | 46 | 10 | P2386STI0180 | ● |
| **1.90** | 0/-0.014 | 1.9 | 22 | 46 | 10 | P2386STI0190 | ● |
| **2.00** | 0/-0.014 | 2 | 24 | 49 | 10 | P2386STI0200 | ● |
| **2.10** | 0/-0.014 | 2.1 | 24 | 49 | 10 | P2386STI0210 | ● |
| **2.20** | 0/-0.014 | 2.2 | 27 | 53 | 10 | P2386STI0220 | ● |
| **2.30** | 0/-0.014 | 2.3 | 27 | 53 | 10 | P2386STI0230 | ● |
| **2.40** | 0/-0.014 | 2.4 | 30 | 57 | 10 | P2386STI0240 | ● |
| **2.50** | 0/-0.014 | 2.5 | 30 | 57 | 10 | P2386STI0250 | ● |
| **2.60** | 0/-0.014 | 2.6 | 30 | 57 | 10 | P2386STI0260 | ● |
| **2.70** | 0/-0.014 | 2.7 | 33 | 61 | 10 | P2386STI0270 | ● |
| **2.80** | 0/-0.014 | 2.8 | 33 | 61 | 10 | P2386STI0280 | ● |
| **2.90** | 0/-0.014 | 2.9 | 33 | 61 | 10 | P2386STI0290 | ● |
| **3.00** | 0/-0.014 | 3 | 33 | 61 | 10 | P2386STI0300 | ● |
| **3.10** | 0/-0.018 | 3.1 | 36 | 65 | 10 | P2386STI0310 | ● |
| **3.20** | 0/-0.018 | 3.2 | 36 | 65 | 10 | P2386STI0320 | ● |
| **3.30** | 0/-0.018 | 3.3 | 36 | 65 | 10 | P2386STI0330 | ● |
| **3.40** | 0/-0.018 | 3.4 | 39 | 70 | 10 | P2386STI0340 | ● |
| **3.50** | 0/-0.018 | 3.5 | 39 | 70 | 10 | P2386STI0350 | ● |
| **3.60** | 0/-0.018 | 3.6 | 39 | 70 | 10 | P2386STI0360 | ● |
| **3.70** | 0/-0.018 | 3.7 | 39 | 70 | 10 | P2386STI0370 | ● |
| **3.80** | 0/-0.018 | 3.8 | 43 | 75 | 10 | P2386STI0380 | ● |
| **3.90** | 0/-0.018 | 3.9 | 43 | 75 | 10 | P2386STI0390 | ● |
| **4.00** | 0/-0.018 | 4 | 43 | 75 | 10 | P2386STI0400 | ● |
| **4.10** | 0/-0.018 | 4.1 | 43 | 75 | 10 | P2386STI0410 | ● |
| **4.20** | 0/-0.018 | 4.2 | 43 | 75 | 10 | P2386STI0420 | ● |
| **4.30** | 0/-0.018 | 4.3 | 47 | 80 | 10 | P2386STI0430 | ● |
| **4.40** | 0/-0.018 | 4.4 | 47 | 80 | 10 | P2386STI0440 | ● |
| **4.50** | 0/-0.018 | 4.5 | 47 | 80 | 10 | P2386STI0450 | ● |
| **4.60** | 0/-0.018 | 4.6 | 47 | 80 | 10 | P2386STI0460 | ● |
| **4.70** | 0/-0.018 | 4.7 | 47 | 80 | 10 | P2386STI0470 | ● |
| **4.80** | 0/-0.018 | 4.8 | 52 | 86 | 10 | P2386STI0480 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 2386STI

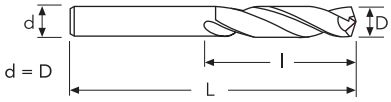
STI type for tough materials, split point, TiN pointed, short

DIN 338 | SPLIT POINT | HSS/Co TiN | 135° | 33°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **4.90** | 0/-0.018 | 4.9 | 52 | 86 | 10 | P2386STI0490 | ● |
| **5.00** | 0/-0.018 | 5 | 52 | 86 | 10 | P2386STI0500 | ● |
| **5.10** | 0/-0.018 | 5.1 | 52 | 86 | 10 | P2386STI0510 | ● |
| **5.20** | 0/-0.018 | 5.2 | 52 | 86 | 10 | P2386STI0520 | ● |
| **5.30** | 0/-0.018 | 5.3 | 52 | 86 | 10 | P2386STI0530 | ● |
| **5.40** | 0/-0.018 | 5.4 | 57 | 93 | 10 | P2386STI0540 | ● |
| **5.50** | 0/-0.018 | 5.5 | 57 | 93 | 10 | P2386STI0550 | ● |
| **5.60** | 0/-0.018 | 5.6 | 57 | 93 | 10 | P2386STI0560 | ● |
| **5.70** | 0/-0.018 | 5.7 | 57 | 93 | 10 | P2386STI0570 | ● |
| **5.80** | 0/-0.018 | 5.8 | 57 | 93 | 10 | P2386STI0580 | ● |
| **5.90** | 0/-0.018 | 5.9 | 57 | 93 | 10 | P2386STI0590 | ● |
| **6.00** | 0/-0.018 | 6 | 57 | 93 | 10 | P2386STI0600 | ● |
| **6.10** | 0/-0.022 | 6.1 | 63 | 101 | 10 | P2386STI0610 | ● |
| **6.20** | 0/-0.022 | 6.2 | 63 | 101 | 10 | P2386STI0620 | ● |
| **6.30** | 0/-0.022 | 6.3 | 63 | 101 | 10 | P2386STI0630 | ● |
| **6.40** | 0/-0.022 | 6.4 | 63 | 101 | 10 | P2386STI0640 | ● |
| **6.50** | 0/-0.022 | 6.5 | 63 | 101 | 10 | P2386STI0650 | ● |
| **6.60** | 0/-0.022 | 6.6 | 63 | 101 | 5 | P2386STI0660 | ● |
| **6.70** | 0/-0.022 | 6.7 | 63 | 101 | 5 | P2386STI0670 | ● |
| **6.80** | 0/-0.022 | 6.8 | 69 | 109 | 5 | P2386STI0680 | ● |
| **6.90** | 0/-0.022 | 6.9 | 69 | 109 | 5 | P2386STI0690 | ● |
| **7.00** | 0/-0.022 | 7 | 69 | 109 | 5 | P2386STI0700 | ● |
| **7.10** | 0/-0.022 | 7.1 | 69 | 109 | 5 | P2386STI0710 | ● |
| **7.20** | 0/-0.022 | 7.2 | 69 | 109 | 5 | P2386STI0720 | ● |
| **7.30** | 0/-0.022 | 7.3 | 69 | 109 | 5 | P2386STI0730 | ● |
| **7.40** | 0/-0.022 | 7.4 | 69 | 109 | 5 | P2386STI0740 | ● |
| **7.50** | 0/-0.022 | 7.5 | 69 | 109 | 5 | P2386STI0750 | ● |
| **7.60** | 0/-0.022 | 7.6 | 75 | 117 | 5 | P2386STI0760 | ● |
| **7.70** | 0/-0.022 | 7.7 | 75 | 117 | 5 | P2386STI0770 | ● |
| **7.80** | 0/-0.022 | 7.8 | 75 | 117 | 5 | P2386STI0780 | ● |
| **7.90** | 0/-0.022 | 7.9 | 75 | 117 | 5 | P2386STI0790 | ● |
| **8.00** | 0/-0.022 | 8 | 75 | 117 | 5 | P2386STI0800 | ● |
| **8.10** | 0/-0.022 | 8.1 | 75 | 117 | 5 | P2386STI0810 | ● |
| **8.20** | 0/-0.022 | 8.2 | 75 | 117 | 5 | P2386STI0820 | ● |
| **8.30** | 0/-0.022 | 8.3 | 75 | 117 | 5 | P2386STI0830 | ● |
| **8.40** | 0/-0.022 | 8.4 | 75 | 117 | 5 | P2386STI0840 | ● |
| **8.50** | 0/-0.022 | 8.5 | 75 | 117 | 5 | P2386STI0850 | ● |
| **8.60** | 0/-0.022 | 8.6 | 81 | 125 | 5 | P2386STI0860 | ● |
| **8.70** | 0/-0.022 | 8.7 | 81 | 125 | 5 | P2386STI0870 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 2386STI

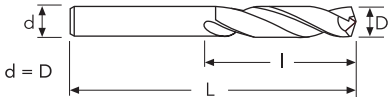
STI type for tough materials, split point, TiN pointed, short

DIN 338 | SPLIT POINT | HSS/Co TiN | 135° | 33°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **8.80** | 0/-0.022 | 8.8 | 81 | 125 | 5 | P2386STI0880 | ● |
| **8.90** | 0/-0.022 | 8.9 | 81 | 125 | 5 | P2386STI0890 | ● |
| **9.00** | 0/-0.022 | 9 | 81 | 125 | 5 | P2386STI0900 | ● |
| **9.10** | 0/-0.022 | 9.1 | 81 | 125 | 5 | P2386STI0910 | ● |
| **9.20** | 0/-0.022 | 9.2 | 81 | 125 | 5 | P2386STI0920 | ● |
| **9.30** | 0/-0.022 | 9.3 | 81 | 125 | 5 | P2386STI0930 | ● |
| **9.40** | 0/-0.022 | 9.4 | 81 | 125 | 5 | P2386STI0940 | ● |
| **9.50** | 0/-0.022 | 9.5 | 81 | 125 | 5 | P2386STI0950 | ● |
| **9.60** | 0/-0.022 | 9.6 | 87 | 133 | 5 | P2386STI0960 | ● |
| **9.70** | 0/-0.022 | 9.7 | 87 | 133 | 5 | P2386STI0970 | ● |
| **9.80** | 0/-0.022 | 9.8 | 87 | 133 | 5 | P2386STI0980 | ● |
| **9.90** | 0/-0.022 | 9.9 | 87 | 133 | 5 | P2386STI0990 | ● |
| **10.00** | 0/-0.022 | 10 | 87 | 133 | 5 | P2386STI1000 | ● |
| **10.10** | 0/-0.027 | 10.1 | 87 | 133 | 5 | P2386STI1010 | ● |
| **10.20** | 0/-0.027 | 10.2 | 87 | 133 | 5 | P2386STI1020 | ● |
| **10.30** | 0/-0.027 | 10.3 | 87 | 133 | 5 | P2386STI1030 | ● |
| **10.40** | 0/-0.027 | 10.4 | 87 | 133 | 5 | P2386STI1040 | ● |
| **10.50** | 0/-0.027 | 10.5 | 87 | 133 | 5 | P2386STI1050 | ● |
| **10.60** | 0/-0.027 | 10.6 | 87 | 133 | 5 | P2386STI1060 | ● |
| **10.70** | 0/-0.027 | 10.7 | 94 | 142 | 5 | P2386STI1070 | ● |
| **10.80** | 0/-0.027 | 10.8 | 94 | 142 | 5 | P2386STI1080 | ● |
| **10.90** | 0/-0.027 | 10.9 | 94 | 142 | 5 | P2386STI1090 | ● |
| **11.00** | 0/-0.027 | 11 | 94 | 142 | 5 | P2386STI1100 | ● |
| **11.10** | 0/-0.027 | 11.1 | 94 | 142 | 5 | P2386STI1110 | ● |
| **11.20** | 0/-0.027 | 11.2 | 94 | 142 | 5 | P2386STI1120 | ● |
| **11.30** | 0/-0.027 | 11.3 | 94 | 142 | 5 | P2386STI1130 | ● |
| **11.40** | 0/-0.027 | 11.4 | 94 | 142 | 5 | P2386STI1140 | ● |
| **11.50** | 0/-0.027 | 11.5 | 94 | 142 | 5 | P2386STI1150 | ● |
| **11.60** | 0/-0.027 | 11.6 | 94 | 142 | 5 | P2386STI1160 | ● |
| **11.70** | 0/-0.027 | 11.7 | 94 | 142 | 5 | P2386STI1170 | ● |
| **11.80** | 0/-0.027 | 11.8 | 94 | 142 | 5 | P2386STI1180 | ● |
| **11.90** | 0/-0.027 | 11.9 | 101 | 151 | 5 | P2386STI1190 | ● |
| **12.00** | 0/-0.027 | 12 | 101 | 151 | 5 | P2386STI1200 | ● |
| **12.10** | 0/-0.027 | 12.1 | 101 | 151 | 5 | P2386STI1210 | ● |
| **12.20** | 0/-0.027 | 12.2 | 101 | 151 | 5 | P2386STI1220 | ● |
| **12.30** | 0/-0.027 | 12.3 | 101 | 151 | 5 | P2386STI1230 | ● |
| **12.40** | 0/-0.027 | 12.4 | 101 | 151 | 5 | P2386STI1240 | ● |
| **12.50** | 0/-0.027 | 12.5 | 101 | 151 | 5 | P2386STI1250 | ● |
| **12.60** | 0/-0.027 | 12.6 | 101 | 151 | 5 | P2386STI1260 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 2386STI

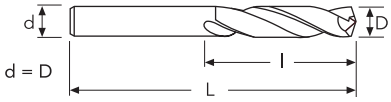
STI type for tough materials, split point, TiN pointed, short

DIN 338 | SPLIT POINT | HSS/Co TiN | 135° | 33°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **12.70** | 0/-0.027 | 12.7 | 101 | 151 | 5 | P2386STI1270 | ● |
| **12.80** | 0/-0.027 | 12.8 | 101 | 151 | 5 | P2386STI1280 | ● |
| **12.90** | 0/-0.027 | 12.9 | 101 | 151 | 5 | P2386STI1290 | ● |
| **13.00** | 0/-0.027 | 13 | 101 | 151 | 5 | P2386STI1300 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion



**2386STIA01A**
Set 50pcs.
2386STI DIN338 HSS/Co TIN POINTED
Ø1 mm÷Ø5.9 mm x 0.1 mm



**2386STIA01B**
Set 41pcs.
2386STI DIN338 HSS/Co TIN POINTED
Ø6 mm÷Ø10 mm x 0.1 mm



**2386STIA05C**
Set 25pcs.
2386STI DIN338 HSS/Co TIN POINTED
Ø1 mm÷Ø13 mm x 0.5 mm

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

CUTTING PARAMETERS

# 2386STI

| Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 | M2 |
|---|---|---|---|---|---|
| Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | |
| Vc (m/min) | **30÷40** | **25÷35** | **15÷25** | **15÷25** | **12÷18** |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| **1** | 0.017 | 0.014 | 0.012 | 0.012 | 0.009 |
| **1.5** | 0.035 | 0.030 | 0.025 | 0.025 | 0.018 |
| **2** | 0.050 | 0.043 | 0.035 | 0.035 | 0.025 |
| **2.5** | 0.075 | 0.064 | 0.053 | 0.053 | 0.038 |
| **3** | 0.090 | 0.077 | 0.063 | 0.063 | 0.045 |
| **3.5** | 0.105 | 0.089 | 0.074 | 0.074 | 0.053 |
| **4** | 0.110 | 0.094 | 0.077 | 0.077 | 0.055 |
| **5** | 0.125 | 0.106 | 0.088 | 0.088 | 0.063 |
| **6** | 0.160 | 0.136 | 0.112 | 0.112 | 0.080 |
| **7** | 0.175 | 0.149 | 0.123 | 0.123 | 0.088 |
| **8** | 0.200 | 0.170 | 0.140 | 0.140 | 0.100 |
| **9** | 0.210 | 0.179 | 0.147 | 0.147 | 0.105 |
| **10** | 0.220 | 0.187 | 0.154 | 0.154 | 0.110 |
| **11** | 0.235 | 0.200 | 0.165 | 0.165 | 0.118 |
| **12** | 0.250 | 0.213 | 0.175 | 0.175 | 0.125 |
| **13** | 0.265 | 0.225 | 0.186 | 0.186 | 0.133 |

| Material Group ISO 513 | K1 K2 | K3 K4 | N1 N5 | N2 N3 N4 | S1 S2 S4 |
|---|---|---|---|---|---|
| Hardness/Rm | 150÷350 HB | <350 HB | | | <35 HRC |
| Vc (m/min) | **30÷40** | **25÷35** | **60÷80** | **50÷70** | **12÷18** |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) |
| **1** | 0.019 | 0.013 | 0.024 | 0.017 | 0.007 |
| **1.5** | 0.039 | 0.026 | 0.049 | 0.035 | 0.014 |
| **2** | 0.055 | 0.038 | 0.070 | 0.050 | 0.020 |
| **2.5** | 0.083 | 0.056 | 0.105 | 0.075 | 0.030 |
| **3** | 0.099 | 0.068 | 0.126 | 0.090 | 0.036 |
| **3.5** | 0.116 | 0.079 | 0.147 | 0.105 | 0.042 |
| **4** | 0.121 | 0.083 | 0.154 | 0.110 | 0.044 |
| **5** | 0.138 | 0.094 | 0.175 | 0.125 | 0.050 |
| **6** | 0.176 | 0.120 | 0.224 | 0.160 | 0.064 |
| **7** | 0.193 | 0.131 | 0.245 | 0.175 | 0.070 |
| **8** | 0.220 | 0.150 | 0.280 | 0.200 | 0.080 |
| **9** | 0.231 | 0.158 | 0.294 | 0.210 | 0.084 |
| **10** | 0.242 | 0.165 | 0.308 | 0.220 | 0.088 |
| **11** | 0.259 | 0.176 | 0.329 | 0.235 | 0.094 |
| **12** | 0.275 | 0.188 | 0.350 | 0.250 | 0.100 |
| **13** | 0.292 | 0.199 | 0.371 | 0.265 | 0.106 |

# 238NVA

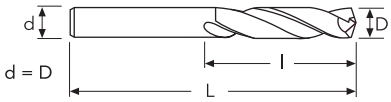
NVA type for tough materials, short

DIN 338 | NH | HSS/CO HT | 130° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **1.00** | 0/-0.014 | 1 | 12 | 34 | 10 | P238NVA0100 | ● |
| **1.10** | 0/-0.014 | 1.1 | 14 | 36 | 10 | P238NVA0110 | ● |
| **1.20** | 0/-0.014 | 1.2 | 16 | 38 | 10 | P238NVA0120 | ● |
| **1.25** | 0/-0.014 | 1.25 | 16 | 38 | 10 | P238NVA0125 | ● |
| **1.30** | 0/-0.014 | 1.3 | 16 | 38 | 10 | P238NVA0130 | ● |
| **1.40** | 0/-0.014 | 1.4 | 18 | 40 | 10 | P238NVA0140 | ● |
| **1.50** | 0/-0.014 | 1.5 | 18 | 40 | 10 | P238NVA0150 | ● |
| **1.60** | 0/-0.014 | 1.6 | 20 | 43 | 10 | P238NVA0160 | ● |
| **1.70** | 0/-0.014 | 1.7 | 20 | 43 | 10 | P238NVA0170 | ● |
| **1.75** | 0/-0.014 | 1.75 | 22 | 46 | 10 | P238NVA0175 | ● |
| **1.80** | 0/-0.014 | 1.8 | 22 | 46 | 10 | P238NVA0180 | ● |
| **1.90** | 0/-0.014 | 1.9 | 22 | 46 | 10 | P238NVA0190 | ● |
| **2.00** | 0/-0.014 | 2 | 24 | 49 | 10 | P238NVA0200 | ● |
| **2.10** | 0/-0.014 | 2.1 | 24 | 49 | 10 | P238NVA0210 | ● |
| **2.20** | 0/-0.014 | 2.2 | 27 | 53 | 10 | P238NVA0220 | ● |
| **2.25** | 0/-0.014 | 2.25 | 27 | 53 | 10 | P238NVA0225 | ● |
| **2.30** | 0/-0.014 | 2.3 | 27 | 53 | 10 | P238NVA0230 | ● |
| **2.40** | 0/-0.014 | 2.4 | 30 | 57 | 10 | P238NVA0240 | ● |
| **2.50** | 0/-0.014 | 2.5 | 30 | 57 | 10 | P238NVA0250 | ● |
| **2.60** | 0/-0.014 | 2.6 | 30 | 57 | 10 | P238NVA0260 | ● |
| **2.70** | 0/-0.014 | 2.7 | 33 | 61 | 10 | P238NVA0270 | ● |
| **2.75** | 0/-0.014 | 2.75 | 33 | 61 | 10 | P238NVA0275 | ● |
| **2.80** | 0/-0.014 | 2.8 | 33 | 61 | 10 | P238NVA0280 | ● |
| **2.90** | 0/-0.014 | 2.9 | 33 | 61 | 10 | P238NVA0290 | ● |
| **3.00** | 0/-0.014 | 3 | 33 | 61 | 10 | P238NVA0300 | ● |
| **3.10** | 0/-0.018 | 3.1 | 36 | 65 | 10 | P238NVA0310 | ● |
| **3.20** | 0/-0.018 | 3.2 | 36 | 65 | 10 | P238NVA0320 | ● |
| **3.25** | 0/-0.018 | 3.25 | 36 | 65 | 10 | P238NVA0325 | ● |
| **3.30** | 0/-0.018 | 3.3 | 36 | 65 | 10 | P238NVA0330 | ● |
| **3.40** | 0/-0.018 | 3.4 | 39 | 70 | 10 | P238NVA0340 | ● |
| **3.50** | 0/-0.018 | 3.5 | 39 | 70 | 10 | P238NVA0350 | ● |
| **3.60** | 0/-0.018 | 3.6 | 39 | 70 | 10 | P238NVA0360 | ● |
| **3.70** | 0/-0.018 | 3.7 | 39 | 70 | 10 | P238NVA0370 | ● |
| **3.75** | 0/-0.018 | 3.75 | 39 | 70 | 10 | P238NVA0375 | ● |
| **3.80** | 0/-0.018 | 3.8 | 43 | 75 | 10 | P238NVA0380 | ● |
| **3.90** | 0/-0.018 | 3.9 | 43 | 75 | 10 | P238NVA0390 | ● |
| **4.00** | 0/-0.018 | 4 | 43 | 75 | 10 | P238NVA0400 | ● |
| **4.10** | 0/-0.018 | 4.1 | 43 | 75 | 10 | P238NVA0410 | ● |
| **4.20** | 0/-0.018 | 4.2 | 43 | 75 | 10 | P238NVA0420 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
**HSS-HSS/CO**

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 238NVA

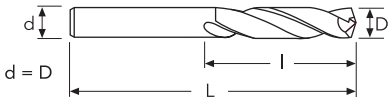
NVA type for tough materials, short

DIN 338 | NH | HSS/CO HT | 130° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **4.25** | 0/-0.018 | 4.25 | 43 | 75 | 10 | P238NVA0425 | ● |
| **4.30** | 0/-0.018 | 4.3 | 47 | 80 | 10 | P238NVA0430 | ● |
| **4.40** | 0/-0.018 | 4.4 | 47 | 80 | 10 | P238NVA0440 | ● |
| **4.50** | 0/-0.018 | 4.5 | 47 | 80 | 10 | P238NVA0450 | ● |
| **4.60** | 0/-0.018 | 4.6 | 47 | 80 | 10 | P238NVA0460 | ● |
| **4.70** | 0/-0.018 | 4.7 | 47 | 80 | 10 | P238NVA0470 | ● |
| **4.75** | 0/-0.018 | 4.75 | 47 | 80 | 10 | P238NVA0475 | ● |
| **4.80** | 0/-0.018 | 4.8 | 52 | 86 | 10 | P238NVA0480 | ● |
| **4.90** | 0/-0.018 | 4.9 | 52 | 86 | 10 | P238NVA0490 | ● |
| **5.00** | 0/-0.018 | 5 | 52 | 86 | 10 | P238NVA0500 | ● |
| **5.10** | 0/-0.018 | 5.1 | 52 | 86 | 10 | P238NVA0510 | ● |
| **5.20** | 0/-0.018 | 5.2 | 52 | 86 | 10 | P238NVA0520 | ● |
| **5.25** | 0/-0.018 | 5.25 | 52 | 86 | 10 | P238NVA0525 | ● |
| **5.30** | 0/-0.018 | 5.3 | 52 | 86 | 10 | P238NVA0530 | ● |
| **5.40** | 0/-0.018 | 5.4 | 57 | 93 | 10 | P238NVA0540 | ● |
| **5.50** | 0/-0.018 | 5.5 | 57 | 93 | 10 | P238NVA0550 | ● |
| **5.60** | 0/-0.018 | 5.6 | 57 | 93 | 10 | P238NVA0560 | ● |
| **5.70** | 0/-0.018 | 5.7 | 57 | 93 | 10 | P238NVA0570 | ● |
| **5.75** | 0/-0.018 | 5.75 | 57 | 93 | 10 | P238NVA0575 | ● |
| **5.80** | 0/-0.018 | 5.8 | 57 | 93 | 10 | P238NVA0580 | ● |
| **5.90** | 0/-0.018 | 5.9 | 57 | 93 | 10 | P238NVA0590 | ● |
| **6.00** | 0/-0.018 | 6 | 57 | 93 | 10 | P238NVA0600 | ● |
| **6.10** | 0/-0.022 | 6.1 | 63 | 101 | 10 | P238NVA0610 | ● |
| **6.20** | 0/-0.022 | 6.2 | 63 | 101 | 10 | P238NVA0620 | ● |
| **6.25** | 0/-0.022 | 6.25 | 63 | 101 | 10 | P238NVA0625 | ● |
| **6.30** | 0/-0.022 | 6.3 | 63 | 101 | 10 | P238NVA0630 | ● |
| **6.40** | 0/-0.022 | 6.4 | 63 | 101 | 10 | P238NVA0640 | ● |
| **6.50** | 0/-0.022 | 6.5 | 63 | 101 | 10 | P238NVA0650 | ● |
| **6.60** | 0/-0.022 | 6.6 | 63 | 101 | 5 | P238NVA0660 | ● |
| **6.70** | 0/-0.022 | 6.7 | 63 | 101 | 5 | P238NVA0670 | ● |
| **6.75** | 0/-0.022 | 6.75 | 69 | 109 | 5 | P238NVA0675 | ● |
| **6.80** | 0/-0.022 | 6.8 | 69 | 109 | 5 | P238NVA0680 | ● |
| **6.90** | 0/-0.022 | 6.9 | 69 | 109 | 5 | P238NVA0690 | ● |
| **7.00** | 0/-0.022 | 7 | 69 | 109 | 5 | P238NVA0700 | ● |
| **7.10** | 0/-0.022 | 7.1 | 69 | 109 | 5 | P238NVA0710 | ● |
| **7.20** | 0/-0.022 | 7.2 | 69 | 109 | 5 | P238NVA0720 | ● |
| **7.25** | 0/-0.022 | 7.25 | 69 | 109 | 5 | P238NVA0725 | ● |
| **7.30** | 0/-0.022 | 7.3 | 69 | 109 | 5 | P238NVA0730 | ● |
| **7.40** | 0/-0.022 | 7.4 | 69 | 109 | 5 | P238NVA0740 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 238NVA

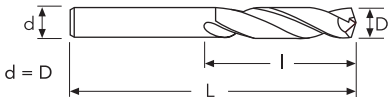
NVA type for tough materials, short

DIN 338 | NH | HSS/CO HT | 130° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **7.50** | 0/-0.022 | 7.5 | 69 | 109 | 5 | P238NVA0750 | ● |
| **7.60** | 0/-0.022 | 7.6 | 75 | 117 | 5 | P238NVA0760 | ● |
| **7.70** | 0/-0.022 | 7.7 | 75 | 117 | 5 | P238NVA0770 | ● |
| **7.75** | 0/-0.022 | 7.75 | 75 | 117 | 5 | P238NVA0775 | ● |
| **7.80** | 0/-0.022 | 7.8 | 75 | 117 | 5 | P238NVA0780 | ● |
| **7.90** | 0/-0.022 | 7.9 | 75 | 117 | 5 | P238NVA0790 | ● |
| **8.00** | 0/-0.022 | 8 | 75 | 117 | 5 | P238NVA0800 | ● |
| **8.10** | 0/-0.022 | 8.1 | 75 | 117 | 5 | P238NVA0810 | ● |
| **8.20** | 0/-0.022 | 8.2 | 75 | 117 | 5 | P238NVA0820 | ● |
| **8.25** | 0/-0.022 | 8.25 | 75 | 117 | 5 | P238NVA0825 | ● |
| **8.30** | 0/-0.022 | 8.3 | 75 | 117 | 5 | P238NVA0830 | ● |
| **8.40** | 0/-0.022 | 8.4 | 75 | 117 | 5 | P238NVA0840 | ● |
| **8.50** | 0/-0.022 | 8.5 | 75 | 117 | 5 | P238NVA0850 | ● |
| **8.60** | 0/-0.022 | 8.6 | 81 | 125 | 5 | P238NVA0860 | ● |
| **8.70** | 0/-0.022 | 8.7 | 81 | 125 | 5 | P238NVA0870 | ● |
| **8.75** | 0/-0.022 | 8.75 | 81 | 125 | 5 | P238NVA0875 | ● |
| **8.80** | 0/-0.022 | 8.8 | 81 | 125 | 5 | P238NVA0880 | ● |
| **8.90** | 0/-0.022 | 8.9 | 81 | 125 | 5 | P238NVA0890 | ● |
| **9.00** | 0/-0.022 | 9 | 81 | 125 | 5 | P238NVA0900 | ● |
| **9.10** | 0/-0.022 | 9.1 | 81 | 125 | 5 | P238NVA0910 | ● |
| **9.20** | 0/-0.022 | 9.2 | 81 | 125 | 5 | P238NVA0920 | ● |
| **9.25** | 0/-0.022 | 9.25 | 81 | 125 | 5 | P238NVA0925 | ● |
| **9.30** | 0/-0.022 | 9.3 | 81 | 125 | 5 | P238NVA0930 | ● |
| **9.40** | 0/-0.022 | 9.4 | 81 | 125 | 5 | P238NVA0940 | ● |
| **9.50** | 0/-0.022 | 9.5 | 81 | 125 | 5 | P238NVA0950 | ● |
| **9.60** | 0/-0.022 | 9.6 | 87 | 133 | 5 | P238NVA0960 | ● |
| **9.70** | 0/-0.022 | 9.7 | 87 | 133 | 5 | P238NVA0970 | ● |
| **9.75** | 0/-0.022 | 9.75 | 87 | 133 | 5 | P238NVA0975 | ● |
| **9.80** | 0/-0.022 | 9.8 | 87 | 133 | 5 | P238NVA0980 | ● |
| **9.90** | 0/-0.022 | 9.9 | 87 | 133 | 5 | P238NVA0990 | ● |
| **10.00** | 0/-0.022 | 10 | 87 | 133 | 5 | P238NVA1000 | ● |
| **10.20** | 0/-0.027 | 10.2 | 87 | 133 | 5 | P238NVA1020 | ● |
| **10.50** | 0/-0.027 | 10.5 | 87 | 133 | 5 | P238NVA1050 | ● |
| **11.00** | 0/-0.027 | 11 | 94 | 142 | 5 | P238NVA1100 | ● |
| **11.50** | 0/-0.027 | 11.5 | 94 | 142 | 5 | P238NVA1150 | ● |
| **12.00** | 0/-0.027 | 12 | 101 | 151 | 5 | P238NVA1200 | ● |
| **12.50** | 0/-0.027 | 12.5 | 101 | 151 | 5 | P238NVA1250 | ● |
| **13.00** | 0/-0.027 | 13 | 101 | 151 | 5 | P238NVA1300 | ● |
| **13.50** | 0/-0.027 | 13.5 | 108 | 160 | 1 | P238NVA1350 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 238NVA

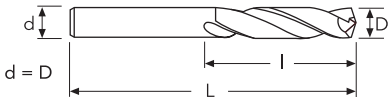
NVA type for tough materials, short

DIN 338 | NH | HSS/CO HT | 130° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **14.00** | 0/-0.027 | 14 | 108 | 160 | 1 | P238NVA1400 | ● |
| **14.50** | 0/-0.027 | 14.5 | 114 | 169 | 1 | P238NVA1450 | ● |
| **15.00** | 0/-0.027 | 15 | 114 | 169 | 1 | P238NVA1500 | ● |
| **15.50** | 0/-0.027 | 15.5 | 120 | 178 | 1 | P238NVA1550 | ● |
| **16.00** | 0/-0.027 | 16 | 120 | 178 | 1 | P238NVA1600 | ● |
| **16.50** | 0/-0.027 | 16.5 | 125 | 184 | 1 | P238NVA1650 | ● |
| **17.00** | 0/-0.027 | 17 | 125 | 184 | 1 | P238NVA1700 | ● |
| **17.50** | 0/-0.027 | 17.5 | 130 | 191 | 1 | P238NVA1750 | ● |
| **18.00** | 0/-0.027 | 18 | 130 | 191 | 1 | P238NVA1800 | ● |
| **18.50** | 0/-0.033 | 18.5 | 135 | 198 | 1 | P238NVA1850 | ● |
| **19.00** | 0/-0.033 | 19 | 135 | 198 | 1 | P238NVA1900 | ● |
| **19.50** | 0/-0.033 | 19.5 | 140 | 205 | 1 | P238NVA1950 | ○ |
| **20.00** | 0/-0.033 | 20 | 140 | 205 | 1 | P238NVA2000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion



**238NVAA01A**
Set 50pcs.
238NVA DIN338 HSS/Co
Ø1 mm÷Ø5.9 mm x 0.1 mm



**238NVAA01B**
Set 41pcs.
238NVA DIN338 HSS/Co
Ø6 mm÷Ø10 mm x 0.1 mm



**238NVAA05C**
Set 25pcs.
238NVA DIN338 HSS/Co
Ø1 mm÷Ø13 mm x 0.5 mm

# 238NVA

| Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 | M2 M3 | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | | |
| Vc (m/min) | **25÷35** | **20÷30** | **12÷18** | **12÷18** | **8÷12** | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| **1** | 0.017 | 0.014 | 0.012 | 0.012 | 0.009 | |
| **1.5** | 0.035 | 0.030 | 0.025 | 0.025 | 0.018 | |
| **2** | 0.050 | 0.043 | 0.035 | 0.035 | 0.025 | |
| **2.5** | 0.060 | 0.051 | 0.042 | 0.042 | 0.030 | |
| **3** | 0.070 | 0.060 | 0.049 | 0.049 | 0.035 | |
| **3.5** | 0.080 | 0.068 | 0.056 | 0.056 | 0.040 | |
| **4** | 0.090 | 0.077 | 0.063 | 0.063 | 0.045 | |
| **5** | 0.100 | 0.085 | 0.070 | 0.070 | 0.050 | |
| **6** | 0.110 | 0.094 | 0.077 | 0.077 | 0.055 | |
| **7** | 0.120 | 0.102 | 0.084 | 0.084 | 0.060 | |
| **8** | 0.130 | 0.111 | 0.091 | 0.091 | 0.065 | |
| **9** | 0.140 | 0.119 | 0.098 | 0.098 | 0.070 | |
| **10** | 0.160 | 0.136 | 0.112 | 0.112 | 0.080 | |
| **11** | 0.170 | 0.145 | 0.119 | 0.119 | 0.085 | |
| **12** | 0.180 | 0.153 | 0.126 | 0.126 | 0.090 | |
| **13** | 0.190 | 0.162 | 0.133 | 0.133 | 0.095 | |
| **14** | 0.200 | 0.170 | 0.140 | 0.140 | 0.100 | |
| **15** | 0.210 | 0.179 | 0.147 | 0.147 | 0.105 | |
| **16** | 0.220 | 0.187 | 0.154 | 0.154 | 0.110 | |
| **17** | 0.230 | 0.196 | 0.161 | 0.161 | 0.115 | |
| **18** | 0.240 | 0.204 | 0.168 | 0.168 | 0.120 | |
| **19** | 0.250 | 0.213 | 0.175 | 0.175 | 0.125 | |
| **20** | 0.260 | 0.221 | 0.182 | 0.182 | 0.130 | |

| Material Group ISO 513 | K1 K2 | K3 K4 | N1 N5 | N2 N3 N4 | S1 S2 S4 | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 150÷350 HB | <350 HB | | | <35 HRC | |
| Vc (m/min) | **25÷35** | **20÷30** | **50÷70** | **40÷60** | **8÷12** | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| **1** | 0.019 | 0.013 | 0.024 | 0.017 | 0.007 | |
| **1.5** | 0.039 | 0.026 | 0.049 | 0.035 | 0.014 | |
| **2** | 0.055 | 0.038 | 0.070 | 0.050 | 0.020 | |
| **2.5** | 0.066 | 0.045 | 0.084 | 0.060 | 0.024 | |
| **3** | 0.077 | 0.053 | 0.098 | 0.070 | 0.028 | |
| **3.5** | 0.088 | 0.060 | 0.112 | 0.080 | 0.032 | |
| **4** | 0.099 | 0.068 | 0.126 | 0.090 | 0.036 | |
| **5** | 0.110 | 0.075 | 0.140 | 0.100 | 0.040 | |
| **6** | 0.121 | 0.083 | 0.154 | 0.110 | 0.044 | |
| **7** | 0.132 | 0.090 | 0.168 | 0.120 | 0.048 | |
| **8** | 0.143 | 0.098 | 0.182 | 0.130 | 0.052 | |
| **9** | 0.154 | 0.105 | 0.196 | 0.140 | 0.056 | |
| **10** | 0.176 | 0.120 | 0.224 | 0.160 | 0.064 | |
| **11** | 0.187 | 0.128 | 0.238 | 0.170 | 0.068 | |
| **12** | 0.198 | 0.135 | 0.252 | 0.180 | 0.072 | |
| **13** | 0.209 | 0.143 | 0.266 | 0.190 | 0.076 | |
| **14** | 0.220 | 0.150 | 0.280 | 0.200 | 0.080 | |
| **15** | 0.231 | 0.158 | 0.294 | 0.210 | 0.084 | |
| **16** | 0.242 | 0.165 | 0.308 | 0.220 | 0.088 | |
| **17** | 0.253 | 0.173 | 0.322 | 0.230 | 0.092 | |
| **18** | 0.264 | 0.180 | 0.336 | 0.240 | 0.096 | |
| **19** | 0.275 | 0.188 | 0.350 | 0.250 | 0.100 | |
| **20** | 0.286 | 0.195 | 0.364 | 0.260 | 0.104 | |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 234NVA

NVA type for tough materials, long

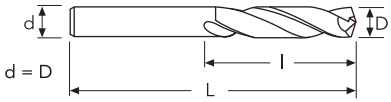


DIN 340 | NH | HSS/CO* HT | 130° | 30°

* < Ø2 mm = HSS BR

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **0.50** | 0/-0.014 | 0.5 | 12 | 32 | 10 | P134NB0050 | ● |
| **0.60** | 0/-0.014 | 0.6 | 15 | 35 | 10 | P134NB0060 | ● |
| **0.70** | 0/-0.014 | 0.7 | 21 | 42 | 10 | P134NB0070 | ● |
| **0.80** | 0/-0.014 | 0.8 | 25 | 46 | 10 | P134NB0080 | ● |
| **0.90** | 0/-0.014 | 0.9 | 29 | 51 | 10 | P134NB0090 | ● |
| **1.00** | 0/-0.014 | 1 | 33 | 56 | 10 | P134NB0100 | ● |
| **1.10** | 0/-0.014 | 1.1 | 37 | 60 | 10 | P134NB0110 | ● |
| **1.20** | 0/-0.014 | 1.2 | 41 | 65 | 10 | P134NB0120 | ● |
| **1.30** | 0/-0.014 | 1.3 | 41 | 65 | 10 | P134NB0130 | ● |
| **1.40** | 0/-0.014 | 1.4 | 45 | 70 | 10 | P134NB0140 | ● |
| **1.50** | 0/-0.014 | 1.5 | 45 | 70 | 10 | P134NB0150 | ● |
| **1.60** | 0/-0.014 | 1.6 | 50 | 76 | 10 | P134NB0160 | ● |
| **1.70** | 0/-0.014 | 1.7 | 50 | 76 | 10 | P134NB0170 | ● |
| **1.80** | 0/-0.014 | 1.8 | 53 | 80 | 10 | P134NB0180 | ● |
| **1.90** | 0/-0.014 | 1.9 | 53 | 80 | 10 | P134NB0190 | ● |
| **2.00** | 0/-0.014 | 2 | 56 | 85 | 10 | P234NVA0200 | ● |
| **2.10** | 0/-0.014 | 2.1 | 56 | 85 | 10 | P234NVA0210 | ● |
| **2.20** | 0/-0.014 | 2.2 | 59 | 90 | 10 | P234NVA0220 | ● |
| **2.30** | 0/-0.014 | 2.3 | 59 | 90 | 10 | P234NVA0230 | ● |
| **2.40** | 0/-0.014 | 2.4 | 62 | 95 | 10 | P234NVA0240 | ● |
| **2.50** | 0/-0.014 | 2.5 | 62 | 95 | 10 | P234NVA0250 | ● |
| **2.60** | 0/-0.014 | 2.6 | 62 | 95 | 10 | P234NVA0260 | ● |
| **2.70** | 0/-0.014 | 2.7 | 66 | 100 | 10 | P234NVA0270 | ● |
| **2.80** | 0/-0.014 | 2.8 | 66 | 100 | 10 | P234NVA0280 | ● |
| **2.90** | 0/-0.014 | 2.9 | 66 | 100 | 10 | P234NVA0290 | ● |
| **3.00** | 0/-0.014 | 3 | 66 | 100 | 10 | P234NVA0300 | ● |
| **3.10** | 0/-0.018 | 3.1 | 69 | 106 | 10 | P234NVA0310 | ● |
| **3.20** | 0/-0.018 | 3.2 | 69 | 106 | 10 | P234NVA0320 | ● |
| **3.30** | 0/-0.018 | 3.3 | 69 | 106 | 10 | P234NVA0330 | ● |
| **3.40** | 0/-0.018 | 3.4 | 73 | 112 | 10 | P234NVA0340 | ● |
| **3.50** | 0/-0.018 | 3.5 | 73 | 112 | 10 | P234NVA0350 | ● |
| **3.60** | 0/-0.018 | 3.6 | 73 | 112 | 10 | P234NVA0360 | ● |
| **3.70** | 0/-0.018 | 3.7 | 73 | 112 | 10 | P234NVA0370 | ● |
| **3.80** | 0/-0.018 | 3.8 | 78 | 119 | 10 | P234NVA0380 | ● |
| **3.90** | 0/-0.018 | 3.9 | 78 | 119 | 10 | P234NVA0390 | ● |
| **4.00** | 0/-0.018 | 4 | 78 | 119 | 10 | P234NVA0400 | ● |
| **4.10** | 0/-0.018 | 4.1 | 78 | 119 | 10 | P234NVA0410 | ● |
| **4.20** | 0/-0.018 | 4.2 | 78 | 119 | 10 | P234NVA0420 | ● |
| **4.30** | 0/-0.018 | 4.3 | 82 | 126 | 10 | P234NVA0430 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 234NVA

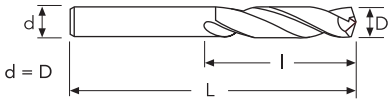
NVA type for tough materials, long

DIN 340 | NH | HSS/CO HT | 130° | 30°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **4.40** | 0/-0.018 | 4.4 | 82 | 126 | 10 | P234NVA0440 | ● |
| **4.50** | 0/-0.018 | 4.5 | 82 | 126 | 10 | P234NVA0450 | ● |
| **4.60** | 0/-0.018 | 4.6 | 82 | 126 | 10 | P234NVA0460 | ● |
| **4.70** | 0/-0.018 | 4.7 | 82 | 126 | 10 | P234NVA0470 | ● |
| **4.80** | 0/-0.018 | 4.8 | 87 | 132 | 10 | P234NVA0480 | ● |
| **4.90** | 0/-0.018 | 4.9 | 87 | 132 | 10 | P234NVA0490 | ● |
| **5.00** | 0/-0.018 | 5 | 87 | 132 | 10 | P234NVA0500 | ● |
| **5.10** | 0/-0.018 | 5.1 | 87 | 132 | 10 | P234NVA0510 | ● |
| **5.20** | 0/-0.018 | 5.2 | 87 | 132 | 10 | P234NVA0520 | ● |
| **5.30** | 0/-0.018 | 5.3 | 87 | 132 | 10 | P234NVA0530 | ● |
| **5.40** | 0/-0.018 | 5.4 | 91 | 139 | 10 | P234NVA0540 | ● |
| **5.50** | 0/-0.018 | 5.5 | 91 | 139 | 10 | P234NVA0550 | ● |
| **5.60** | 0/-0.018 | 5.6 | 91 | 139 | 10 | P234NVA0560 | ● |
| **5.70** | 0/-0.018 | 5.7 | 91 | 139 | 10 | P234NVA0570 | ● |
| **5.80** | 0/-0.018 | 5.8 | 91 | 139 | 10 | P234NVA0580 | ● |
| **5.90** | 0/-0.018 | 5.9 | 91 | 139 | 10 | P234NVA0590 | ● |
| **6.00** | 0/-0.018 | 6 | 91 | 139 | 10 | P234NVA0600 | ● |
| **6.10** | 0/-0.022 | 6.1 | 97 | 148 | 5 | P234NVA0610 | ● |
| **6.20** | 0/-0.022 | 6.2 | 97 | 148 | 5 | P234NVA0620 | ● |
| **6.30** | 0/-0.022 | 6.3 | 97 | 148 | 5 | P234NVA0630 | ● |
| **6.40** | 0/-0.022 | 6.4 | 97 | 148 | 5 | P234NVA0640 | ○ |
| **6.50** | 0/-0.022 | 6.5 | 97 | 148 | 5 | P234NVA0650 | ● |
| **6.60** | 0/-0.022 | 6.6 | 97 | 148 | 5 | P234NVA0660 | ● |
| **6.70** | 0/-0.022 | 6.7 | 97 | 148 | 5 | P234NVA0670 | ● |
| **6.80** | 0/-0.022 | 6.8 | 102 | 156 | 5 | P234NVA0680 | ● |
| **6.90** | 0/-0.022 | 6.9 | 102 | 156 | 5 | P234NVA0690 | ● |
| **7.00** | 0/-0.022 | 7 | 102 | 156 | 5 | P234NVA0700 | ● |
| **7.10** | 0/-0.022 | 7.1 | 102 | 156 | 5 | P234NVA0710 | ● |
| **7.20** | 0/-0.022 | 7.2 | 102 | 156 | 5 | P234NVA0720 | ● |
| **7.30** | 0/-0.022 | 7.3 | 102 | 156 | 5 | P234NVA0730 | ○ |
| **7.40** | 0/-0.022 | 7.4 | 102 | 156 | 5 | P234NVA0740 | ● |
| **7.50** | 0/-0.022 | 7.5 | 102 | 156 | 5 | P234NVA0750 | ● |
| **7.60** | 0/-0.022 | 7.6 | 109 | 165 | 5 | P234NVA0760 | ● |
| **7.70** | 0/-0.022 | 7.7 | 109 | 165 | 5 | P234NVA0770 | ● |
| **7.80** | 0/-0.022 | 7.8 | 109 | 165 | 5 | P234NVA0780 | ● |
| **7.90** | 0/-0.022 | 7.9 | 109 | 165 | 5 | P234NVA0790 | ● |
| **8.00** | 0/-0.022 | 8 | 109 | 165 | 5 | P234NVA0800 | ● |
| **8.10** | 0/-0.022 | 8.1 | 109 | 165 | 5 | P234NVA0810 | ● |
| **8.20** | 0/-0.022 | 8.2 | 109 | 165 | 5 | P234NVA0820 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

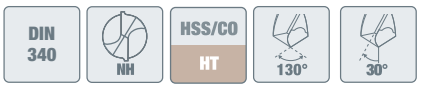
HSS END-MILLS

CARBIDE BURRS

# 234NVA

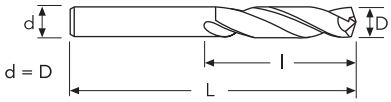
NVA type for tough materials, long






| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **8.30** | 0/-0.022 | 8.3 | 109 | 165 | 5 | P234NVA0830 | ● |
| **8.40** | 0/-0.022 | 8.4 | 109 | 165 | 5 | P234NVA0840 | ● |
| **8.50** | 0/-0.022 | 8.5 | 109 | 165 | 5 | P234NVA0850 | ● |
| **8.60** | 0/-0.022 | 8.6 | 115 | 175 | 5 | P234NVA0860 | ● |
| **8.70** | 0/-0.022 | 8.7 | 115 | 175 | 5 | P234NVA0870 | ● |
| **8.80** | 0/-0.022 | 8.8 | 115 | 175 | 5 | P234NVA0880 | ● |
| **8.90** | 0/-0.022 | 8.9 | 115 | 175 | 5 | P234NVA0890 | ● |
| **9.00** | 0/-0.022 | 9 | 115 | 175 | 5 | P234NVA0900 | ● |
| **9.10** | 0/-0.022 | 9.1 | 115 | 175 | 5 | P234NVA0910 | ● |
| **9.20** | 0/-0.022 | 9.2 | 115 | 175 | 5 | P234NVA0920 | ● |
| **9.30** | 0/-0.022 | 9.3 | 115 | 175 | 5 | P234NVA0930 | ● |
| **9.40** | 0/-0.022 | 9.4 | 115 | 175 | 5 | P234NVA0940 | ● |
| **9.50** | 0/-0.022 | 9.5 | 115 | 175 | 5 | P234NVA0950 | ● |
| **9.60** | 0/-0.022 | 9.6 | 121 | 184 | 5 | P234NVA0960 | ● |
| **9.70** | 0/-0.022 | 9.7 | 121 | 184 | 5 | P234NVA0970 | ● |
| **9.80** | 0/-0.022 | 9.8 | 121 | 184 | 5 | P234NVA0980 | ● |
| **9.90** | 0/-0.022 | 9.9 | 121 | 184 | 5 | P234NVA0990 | ● |
| **10.00** | 0/-0.022 | 10 | 121 | 184 | 5 | P234NVA1000 | ● |
| **10.20** | 0/-0.027 | 10.2 | 121 | 184 | 5 | P234NVA1020 | ● |
| **10.50** | 0/-0.027 | 10.5 | 121 | 184 | 5 | P234NVA1050 | ● |
| **10.80** | 0/-0.027 | 10.8 | 128 | 195 | 5 | P234NVA1080 | ● |
| **11.00** | 0/-0.027 | 11 | 128 | 195 | 5 | P234NVA1100 | ● |
| **11.20** | 0/-0.027 | 11.20 | 128 | 195 | 5 | P234NVA1120 | ● |
| **11.50** | 0/-0.027 | 11.5 | 128 | 195 | 5 | P234NVA1150 | ● |
| **11.80** | 0/-0.027 | 11.80 | 128 | 195 | 5 | P234NVA1180 | ● |
| **12.00** | 0/-0.027 | 12 | 134 | 205 | 5 | P234NVA1200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 234NVA

| | Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 | M2 M3 | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | | |
| | Vc (m/min) | **20÷30** | **15÷25** | **12÷16** | **12÷16** | **8÷12** | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **0.5** | 0.008 | 0.007 | 0.006 | 0.006 | 0.004 | |
| | **0.8** | 0.015 | 0.013 | 0.011 | 0.011 | 0.008 | |
| | **1** | 0.020 | 0.017 | 0.014 | 0.014 | 0.010 | |
| | **1.5** | 0.030 | 0.026 | 0.021 | 0.021 | 0.015 | |
| | **2** | 0.040 | 0.034 | 0.028 | 0.028 | 0.020 | |
| | **2.5** | 0.050 | 0.043 | 0.035 | 0.035 | 0.025 | |
| | **3** | 0.060 | 0.051 | 0.042 | 0.042 | 0.030 | |
| | **3.5** | 0.070 | 0.060 | 0.049 | 0.049 | 0.035 | |
| | **4** | 0.080 | 0.068 | 0.056 | 0.056 | 0.040 | |
| | **5** | 0.090 | 0.077 | 0.063 | 0.063 | 0.045 | |
| | **6** | 0.100 | 0.085 | 0.070 | 0.070 | 0.050 | |
| | **7** | 0.110 | 0.094 | 0.077 | 0.077 | 0.055 | |
| | **8** | 0.120 | 0.102 | 0.084 | 0.084 | 0.060 | |
| | **9** | 0.130 | 0.111 | 0.091 | 0.091 | 0.065 | |
| | **10** | 0.140 | 0.119 | 0.098 | 0.098 | 0.070 | |
| | **11** | 0.150 | 0.128 | 0.105 | 0.105 | 0.075 | |
| | **12** | 0.160 | 0.136 | 0.112 | 0.112 | 0.080 | |

| | Material Group ISO 513 | K1 K2 | K3 K4 | N1 N5 | N2 N3 N4 | S1 S2 S4 | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 150÷350 HB | <350 HB | | | <35 HRC | |
| | Vc (m/min) | **20÷30** | **20÷30** | **40÷60** | **30÷50** | **8÷12** | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **0.5** | 0.009 | 0.006 | 0.011 | 0.008 | 0.003 | |
| | **0.8** | 0.017 | 0.011 | 0.021 | 0.015 | 0.006 | |
| | **1** | 0.022 | 0.015 | 0.028 | 0.020 | 0.008 | |
| | **1.5** | 0.033 | 0.023 | 0.042 | 0.030 | 0.012 | |
| | **2** | 0.044 | 0.030 | 0.056 | 0.040 | 0.016 | |
| | **2.5** | 0.055 | 0.038 | 0.070 | 0.050 | 0.020 | |
| | **3** | 0.066 | 0.045 | 0.084 | 0.060 | 0.024 | |
| | **3.5** | 0.077 | 0.053 | 0.098 | 0.070 | 0.028 | |
| | **4** | 0.088 | 0.060 | 0.112 | 0.080 | 0.032 | |
| | **5** | 0.099 | 0.068 | 0.126 | 0.090 | 0.036 | |
| | **6** | 0.110 | 0.075 | 0.140 | 0.100 | 0.040 | |
| | **7** | 0.121 | 0.083 | 0.154 | 0.110 | 0.044 | |
| | **8** | 0.132 | 0.090 | 0.168 | 0.120 | 0.048 | |
| | **9** | 0.143 | 0.098 | 0.182 | 0.130 | 0.052 | |
| | **10** | 0.154 | 0.105 | 0.196 | 0.140 | 0.056 | |
| | **11** | 0.165 | 0.113 | 0.210 | 0.150 | 0.060 | |
| | **12** | 0.176 | 0.120 | 0.224 | 0.160 | 0.064 | |

# 234LS-234LSTH

LS type for deep holes, long (234LS),
LS type for deep holes, PV15 coated, long (234LSTH)

DIN 340 | LS | HSS/CO OX | HSS/CO PV15 | 130° | 35-40°

234LS 234LSTH



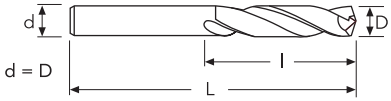
234LS



234LSTH

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | | | |

★ 1st choice ☆ suitable

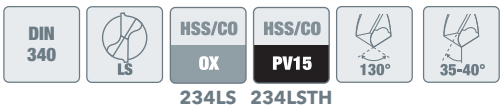



| | | | | | | 234LS | | 234LSTH | |
|---|---|---|---|---|---|---|---|---|---|
| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock | EDP No. | Stock |
| **2.00** | 0/-0.014 | 2 | 56 | 85 | 10 | P234LS0200 | ● | P234LSTH0200 | ● |
| **2.10** | 0/-0.014 | 2.1 | 56 | 85 | 10 | P234LS0210 | ● | P234LSTH0210 | ● |
| **2.20** | 0/-0.014 | 2.2 | 59 | 90 | 10 | P234LS0220 | ● | P234LSTH0220 | ● |
| **2.30** | 0/-0.014 | 2.3 | 59 | 90 | 10 | P234LS0230 | ● | P234LSTH0230 | ● |
| **2.40** | 0/-0.014 | 2.4 | 62 | 95 | 10 | P234LS0240 | ● | P234LSTH0240 | ● |
| **2.50** | 0/-0.014 | 2.5 | 62 | 95 | 10 | P234LS0250 | ● | P234LSTH0250 | ● |
| **2.60** | 0/-0.014 | 2.6 | 62 | 95 | 10 | P234LS0260 | ● | P234LSTH0260 | ● |
| **2.70** | 0/-0.014 | 2.7 | 66 | 100 | 10 | P234LS0270 | ● | P234LSTH0270 | ● |
| **2.80** | 0/-0.014 | 2.8 | 66 | 100 | 10 | P234LS0280 | ● | P234LSTH0280 | ● |
| **2.90** | 0/-0.014 | 2.9 | 66 | 100 | 10 | P234LS0290 | ● | P234LSTH0290 | ● |
| **3.00** | 0/-0.014 | 3 | 66 | 100 | 10 | P234LS0300 | ● | P234LSTH0300 | ● |
| **3.10** | 0/-0.018 | 3.1 | 69 | 106 | 10 | P234LS0310 | ● | P234LSTH0310 | ● |
| **3.20** | 0/-0.018 | 3.2 | 69 | 106 | 10 | P234LS0320 | ● | P234LSTH0320 | ● |
| **3.30** | 0/-0.018 | 3.3 | 69 | 106 | 10 | P234LS0330 | ● | P234LSTH0330 | ● |
| **3.40** | 0/-0.018 | 3.4 | 73 | 112 | 10 | P234LS0340 | ● | P234LSTH0340 | ● |
| **3.50** | 0/-0.018 | 3.5 | 73 | 112 | 10 | P234LS0350 | ● | P234LSTH0350 | ● |
| **3.60** | 0/-0.018 | 3.6 | 73 | 112 | 10 | P234LS0360 | ● | P234LSTH0360 | ● |
| **3.70** | 0/-0.018 | 3.7 | 73 | 112 | 10 | P234LS0370 | ● | P234LSTH0370 | ● |
| **3.80** | 0/-0.018 | 3.8 | 78 | 119 | 10 | P234LS0380 | ● | P234LSTH0380 | ● |
| **3.90** | 0/-0.018 | 3.9 | 78 | 119 | 10 | P234LS0390 | ● | P234LSTH0390 | ● |
| **4.00** | 0/-0.018 | 4 | 78 | 119 | 10 | P234LS0400 | ● | P234LSTH0400 | ● |
| **4.20** | 0/-0.018 | 4.2 | 78 | 119 | 10 | P234LS0420 | ● | P234LSTH0420 | ● |
| **4.50** | 0/-0.018 | 4.5 | 82 | 126 | 10 | P234LS0450 | ● | P234LSTH0450 | ● |
| **4.80** | 0/-0.018 | 4.8 | 87 | 132 | 10 | P234LS0480 | ● | P234LSTH0480 | ● |
| **5.00** | 0/-0.018 | 5 | 87 | 132 | 10 | P234LS0500 | ● | P234LSTH0500 | ● |
| **5.20** | 0/-0.018 | 5.2 | 87 | 132 | 10 | P234LS0520 | ● | P234LSTH0520 | ● |
| **5.50** | 0/-0.018 | 5.5 | 91 | 139 | 10 | P234LS0550 | ● | P234LSTH0550 | ● |
| **5.80** | 0/-0.018 | 5.8 | 91 | 139 | 10 | P234LS0580 | ● | P234LSTH0580 | ● |
| **6.00** | 0/-0.018 | 6 | 91 | 139 | 10 | P234LS0600 | ● | P234LSTH0600 | ● |
| **6.20** | 0/-0.022 | 6.2 | 97 | 148 | 5 | P234LS0620 | ● | P234LSTH0620 | ● |
| **6.50** | 0/-0.022 | 6.5 | 97 | 148 | 5 | P234LS0650 | ● | P234LSTH0650 | ● |
| **6.80** | 0/-0.022 | 6.8 | 102 | 156 | 5 | P234LS0680 | ● | P234LSTH0680 | ● |
| **7.00** | 0/-0.022 | 7 | 102 | 156 | 5 | P234LS0700 | ● | P234LSTH0700 | ● |
| **7.20** | 0/-0.022 | 7.2 | 102 | 156 | 5 | P234LS0720 | ● | | |
| **7.50** | 0/-0.022 | 7.5 | 102 | 156 | 5 | P234LS0750 | ● | P234LSTH0750 | ● |
| **7.80** | 0/-0.022 | 7.8 | 109 | 165 | 5 | P234LS0780 | ● | | |
| **8.00** | 0/-0.022 | 8 | 109 | 165 | 5 | P234LS0800 | ● | P234LSTH0800 | ● |
| **8.20** | 0/-0.022 | 8.2 | 109 | 165 | 5 | P234LS0820 | ● | | |
| **8.50** | 0/-0.022 | 8.5 | 109 | 165 | 5 | P234LS0850 | ● | P234LSTH0850 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 234LS-234LSTH

LS type for deep holes, long (234LS),
LS type for deep holes, PV15 coated, long (234LSTH)





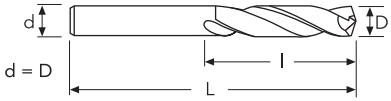

234LS



234LSTH

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | | | |

★ 1st choice ☆ suitable




| | | | | | | 234LS | | 234LSTH | |
|---|---|---|---|---|---|---|---|---|---|
| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock | EDP No. | Stock |
| **9.00** | 0/-0.022 | 9 | 115 | 175 | 5 | P234LS0900 | ● | P234LSTH0900 | ● |
| **9.50** | 0/-0.022 | 9.5 | 115 | 175 | 5 | P234LS0950 | ● | P234LSTH0950 | ● |
| **9.80** | 0/-0.022 | 9.8 | 121 | 184 | 5 | P234LS0980 | ● | | |
| **10.00** | 0/-0.022 | 10 | 121 | 184 | 5 | P234LS1000 | ● | P234LSTH1000 | ● |
| **10.50** | 0/-0.027 | 10.5 | 121 | 184 | 5 | P234LS1050 | ● | P234LSTH1050 | ● |
| **11.00** | 0/-0.027 | 11 | 128 | 195 | 5 | P234LS1100 | ● | P234LSTH1100 | ● |
| **11.50** | 0/-0.027 | 11.5 | 128 | 195 | 5 | P234LS1150 | ● | P234LSTH1150 | ● |
| **12.00** | 0/-0.027 | 12 | 134 | 205 | 5 | P234LS1200 | ● | P234LSTH1200 | ● |
| **12.50** | 0/-0.027 | 12.5 | 134 | 205 | 5 | P234LS1250 | ● | P234LSTH1250 | ● |
| **13.00** | 0/-0.027 | 13 | 134 | 205 | 5 | P234LS1300 | ● | P234LSTH1300 | ● |



● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

## 234LS

| | Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 | K1 K2 | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | 150÷350 HB | |
| | Vc (m/min) | **20÷30** | **15÷25** | **10÷14** | **10÷14** | **20÷30** | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **2** | 0.040 | 0.034 | 0.028 | 0.028 | 0.044 | |
| | **2.5** | 0.050 | 0.043 | 0.035 | 0.035 | 0.055 | |
| | **3** | 0.060 | 0.051 | 0.042 | 0.042 | 0.066 | |
| | **3.5** | 0.070 | 0.060 | 0.049 | 0.049 | 0.077 | |
| | **4** | 0.080 | 0.068 | 0.056 | 0.056 | 0.088 | |
| | **5** | 0.090 | 0.077 | 0.063 | 0.063 | 0.099 | |
| | **6** | 0.100 | 0.085 | 0.070 | 0.070 | 0.110 | |
| | **7** | 0.110 | 0.094 | 0.077 | 0.077 | 0.121 | |
| | **8** | 0.120 | 0.102 | 0.084 | 0.084 | 0.132 | |
| | **9** | 0.130 | 0.111 | 0.091 | 0.091 | 0.143 | |
| | **10** | 0.140 | 0.119 | 0.098 | 0.098 | 0.154 | |
| | **11** | 0.150 | 0.128 | 0.105 | 0.105 | 0.165 | |
| | **12** | 0.160 | 0.136 | 0.112 | 0.112 | 0.176 | |
| | **13** | 0.170 | 0.145 | 0.119 | 0.119 | 0.187 | |

## 234LSTH

| | Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 | K1 K2 | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | 150÷350 HB | |
| | Vc (m/min) | **25÷35** | **20÷30** | **16÷20** | **16÷20** | **25÷35** | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **2** | 0.040 | 0.034 | 0.028 | 0.028 | 0.044 | |
| | **2.5** | 0.050 | 0.043 | 0.035 | 0.035 | 0.055 | |
| | **3** | 0.060 | 0.051 | 0.042 | 0.042 | 0.066 | |
| | **3.5** | 0.070 | 0.060 | 0.049 | 0.049 | 0.077 | |
| | **4** | 0.080 | 0.068 | 0.056 | 0.056 | 0.088 | |
| | **5** | 0.090 | 0.077 | 0.063 | 0.063 | 0.099 | |
| | **6** | 0.100 | 0.085 | 0.070 | 0.070 | 0.110 | |
| | **7** | 0.110 | 0.094 | 0.077 | 0.077 | 0.121 | |
| | **8** | 0.120 | 0.102 | 0.084 | 0.084 | 0.132 | |
| | **9** | 0.130 | 0.111 | 0.091 | 0.091 | 0.143 | |
| | **10** | 0.140 | 0.119 | 0.098 | 0.098 | 0.154 | |
| | **11** | 0.150 | 0.128 | 0.105 | 0.105 | 0.165 | |
| | **12** | 0.160 | 0.136 | 0.112 | 0.112 | 0.176 | |
| | **13** | 0.170 | 0.145 | 0.119 | 0.119 | 0.187 | |

# 2691LS-2691LSTH

LS type for deep holes. extra-long/1 (2691LS);
LS type for deep holes. PV15 coated. extra-long/1 (2691LSTH)

DIN 1869/1 | LS | HSS/Co BR | HSS/CO PV15 | 130° | 35-40°

2691LS 2691LSTH



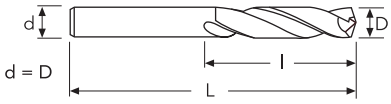
2691LS



2691LSTH

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | | | |

★ 1st choice ☆ suitable




| | | | | | | 2691LS | | 2691LSTH | |
|---|---|---|---|---|---|---|---|---|---|
| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock | EDP No. | Stock |
| **2.00** | 0/-0.014 | 2 | 85 | 125 | 10 | P2691LS0200 | ● | P2691LSTH0200 | ● |
| **2.50** | 0/-0.014 | 2.5 | 95 | 140 | 10 | P2691LS0250 | ● | P2691LSTH0250 | ● |
| **3.00** | 0/-0.014 | 3 | 100 | 150 | 10 | P2691LS0300 | ● | P2691LSTH0300 | ● |
| **3.50** | 0/-0.018 | 3.5 | 115 | 165 | 10 | P2691LS0350 | ● | P2691LSTH0350 | ● |
| **4.00** | 0/-0.018 | 4 | 120 | 175 | 10 | P2691LS0400 | ● | P2691LSTH0400 | ● |
| **4.50** | 0/-0.018 | 4.5 | 125 | 185 | 10 | P2691LS0450 | ● | P2691LSTH0450 | ● |
| **5.00** | 0/-0.018 | 5 | 135 | 195 | 10 | P2691LS0500 | ● | P2691LSTH0500 | ● |
| **5.50** | 0/-0.018 | 5.5 | 140 | 205 | 10 | P2691LS0550 | ● | P2691LSTH0550 | ● |
| **6.00** | 0/-0.018 | 6 | 140 | 205 | 10 | P2691LS0600 | ● | P2691LSTH0600 | ● |
| **6.50** | 0/-0.022 | 6.5 | 150 | 215 | 5 | P2691LS0650 | ● | P2691LSTH0650 | ● |
| **6.75** | 0/-0.022 | 6.75 | 155 | 225 | 5 | P2691LS0675 | ● | | |
| **7.00** | 0/-0.022 | 7 | 155 | 225 | 5 | P2691LS0700 | ● | P2691LSTH0700 | ● |
| **7.50** | 0/-0.022 | 7.5 | 155 | 225 | 5 | P2691LS0750 | ● | P2691LSTH0750 | ● |
| **8.00** | 0/-0.022 | 8 | 165 | 240 | 5 | P2691LS0800 | ● | P2691LSTH0800 | ● |
| **8.50** | 0/-0.022 | 8.5 | 165 | 240 | 5 | P2691LS0850 | ● | P2691LSTH0850 | ● |
| **9.00** | 0/-0.022 | 9 | 175 | 250 | 5 | P2691LS0900 | ● | P2691LSTH0900 | ● |
| **9.50** | 0/-0.022 | 9.5 | 175 | 250 | 5 | P2691LS0950 | ● | P2691LSTH0950 | ● |
| **10.00** | 0/-0.022 | 10 | 185 | 265 | 5 | P2691LS1000 | ● | P2691LSTH1000 | ● |
| **10.50** | 0/-0.027 | 10.5 | 185 | 265 | 5 | P2691LS1050 | ● | P2691LSTH1050 | ● |
| **11.00** | 0/-0.027 | 11 | 195 | 280 | 5 | P2691LS1100 | ● | P2691LSTH1100 | ● |
| **11.50** | 0/-0.027 | 11.5 | 195 | 280 | 5 | P2691LS1150 | ● | P2691LSTH1150 | ● |
| **12.00** | 0/-0.027 | 12 | 205 | 295 | 5 | P2691LS1200 | ● | P2691LSTH1200 | ● |
| **12.50** | 0/-0.027 | 12.5 | 205 | 295 | 5 | P2691LS1250 | ● | P2691LSTH1250 | ● |
| **13.00** | 0/-0.027 | 13 | 205 | 295 | 5 | P2691LS1300 | ● | P2691LSTH1300 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

## 2691LS

| | Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 | K1 K2 | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | 150÷350 HB | |
| | Vc (m/min) | **20÷24** | **16÷20** | **8÷12** | **8÷12** | **20÷24** | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **2** | 0.032 | 0.027 | 0.022 | 0.022 | 0.035 | |
| | **2.5** | 0.040 | 0.034 | 0.028 | 0.028 | 0.044 | |
| | **3** | 0.048 | 0.041 | 0.034 | 0.034 | 0.053 | |
| | **3.5** | 0.056 | 0.048 | 0.039 | 0.039 | 0.062 | |
| | **4** | 0.064 | 0.054 | 0.045 | 0.045 | 0.070 | |
| | **5** | 0.072 | 0.061 | 0.050 | 0.050 | 0.079 | |
| | **6** | 0.080 | 0.068 | 0.056 | 0.056 | 0.088 | |
| | **7** | 0.088 | 0.075 | 0.062 | 0.062 | 0.097 | |
| | **8** | 0.096 | 0.082 | 0.067 | 0.067 | 0.106 | |
| | **9** | 0.104 | 0.088 | 0.073 | 0.073 | 0.114 | |
| | **10** | 0.112 | 0.095 | 0.078 | 0.078 | 0.123 | |
| | **11** | 0.120 | 0.102 | 0.084 | 0.084 | 0.132 | |
| | **12** | 0.128 | 0.109 | 0.090 | 0.090 | 0.141 | |
| | **13** | 0.136 | 0.116 | 0.095 | 0.095 | 0.150 | |

## 2691LSTH

| | Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 | K1 K2 | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | 150÷350 HB | |
| | Vc (m/min) | **24÷28** | **20÷24** | **10÷14** | **10÷14** | **24÷28** | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **2** | 0.032 | 0.027 | 0.022 | 0.022 | 0.035 | |
| | **2.5** | 0.040 | 0.034 | 0.028 | 0.028 | 0.044 | |
| | **3** | 0.048 | 0.041 | 0.034 | 0.034 | 0.053 | |
| | **3.5** | 0.056 | 0.048 | 0.039 | 0.039 | 0.062 | |
| | **4** | 0.064 | 0.054 | 0.045 | 0.045 | 0.070 | |
| | **5** | 0.072 | 0.061 | 0.050 | 0.050 | 0.079 | |
| | **6** | 0.080 | 0.068 | 0.056 | 0.056 | 0.088 | |
| | **7** | 0.088 | 0.075 | 0.062 | 0.062 | 0.097 | |
| | **8** | 0.096 | 0.082 | 0.067 | 0.067 | 0.106 | |
| | **9** | 0.104 | 0.088 | 0.073 | 0.073 | 0.114 | |
| | **10** | 0.112 | 0.095 | 0.078 | 0.078 | 0.123 | |
| | **11** | 0.120 | 0.102 | 0.084 | 0.084 | 0.132 | |
| | **12** | 0.128 | 0.109 | 0.090 | 0.090 | 0.141 | |
| | **13** | 0.136 | 0.116 | 0.095 | 0.095 | 0.150 | |

# 1692LS

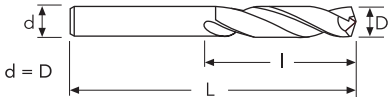
LS type for deep holes. extra-long/2

DIN 1869/2 | LS | HSS / BR | 130° | 35-40°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **3.00** | 0/-0.014 | 3 | 130 | 190 | 1 | P1692LS0300 | ● |
| **3.50** | 0/-0.018 | 3.5 | 145 | 210 | 1 | P1692LS0350 | ● |
| **4.00** | 0/-0.018 | 4 | 150 | 220 | 1 | P1692LS0400 | ● |
| **4.50** | 0/-0.018 | 4.5 | 160 | 235 | 1 | P1692LS0450 | ● |
| **5.00** | 0/-0.018 | 5 | 170 | 245 | 1 | P1692LS0500 | ● |
| **5.50** | 0/-0.018 | 5.5 | 180 | 260 | 1 | P1692LS0550 | ● |
| **6.00** | 0/-0.018 | 6 | 180 | 260 | 1 | P1692LS0600 | ● |
| **6.50** | 0/-0.022 | 6.5 | 190 | 275 | 1 | P1692LS0650 | ● |
| **7.00** | 0/-0.022 | 7 | 200 | 290 | 1 | P1692LS0700 | ● |
| **7.50** | 0/-0.022 | 7.5 | 200 | 290 | 1 | P1692LS0750 | ● |
| **8.00** | 0/-0.022 | 8 | 210 | 305 | 1 | P1692LS0800 | ● |
| **8.50** | 0/-0.022 | 8.5 | 210 | 305 | 1 | P1692LS0850 | ● |
| **9.00** | 0/-0.022 | 9 | 220 | 320 | 1 | P1692LS0900 | ● |
| **9.50** | 0/-0.022 | 9.5 | 220 | 320 | 1 | P1692LS0950 | ● |
| **10.00** | 0/-0.022 | 10 | 235 | 340 | 1 | P1692LS1000 | ● |
| **10.50** | 0/-0.027 | 10.5 | 235 | 340 | 1 | P1692LS1050 | ● |
| **11.00** | 0/-0.027 | 11 | 250 | 365 | 1 | P1692LS1100 | ● |
| **12.00** | 0/-0.027 | 12 | 260 | 375 | 1 | P1692LS1200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# 1692LS

| | Material Group ISO 513 | P1 P2 | P3 P4 | K1 K2 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 150÷350 HB | | | |
| | Vc (m/min) | **20÷24** | **16÷20** | **20÷24** | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| | **3.5** | 0.045 | 0.038 | 0.050 | | | |
| | **4** | 0.053 | 0.045 | 0.058 | | | |
| | **5** | 0.060 | 0.051 | 0.066 | | | |
| | **6** | 0.068 | 0.057 | 0.074 | | | |
| | **7** | 0.075 | 0.064 | 0.083 | | | |
| | **8** | 0.083 | 0.070 | 0.091 | | | |
| | **9** | 0.090 | 0.077 | 0.099 | | | |
| | **10** | 0.098 | 0.083 | 0.107 | | | |
| | **11** | 0.105 | 0.089 | 0.116 | | | |
| | **12** | 0.113 | 0.096 | 0.124 | | | |
| | **13** | 0.120 | 0.102 | 0.132 | | | |

# 1693LS

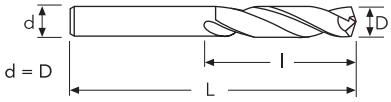
LS type for deep holes. extra-long/3

DIN 1869/3 | LS | HSS BR | 130° | 35-40°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | d | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **3.50** | 0/-0.018 | 3.5 | 180 | 265 | 1 | P1693LS0350 | ● |
| **4.00** | 0/-0.018 | 4 | 190 | 280 | 1 | P1693LS0400 | ● |
| **4.50** | 0/-0.018 | 4.5 | 200 | 295 | 1 | P1693LS0450 | ● |
| **5.00** | 0/-0.018 | 5 | 210 | 315 | 1 | P1693LS0500 | ● |
| **5.50** | 0/-0.018 | 5.5 | 225 | 330 | 1 | P1693LS0550 | ● |
| **6.00** | 0/-0.018 | 6 | 225 | 330 | 1 | P1693LS0600 | ● |
| **6.50** | 0/-0.022 | 6.5 | 235 | 350 | 1 | P1693LS0650 | ● |
| **7.00** | 0/-0.022 | 7 | 250 | 370 | 1 | P1693LS0700 | ● |
| **7.50** | 0/-0.022 | 7.5 | 250 | 370 | 1 | P1693LS0750 | ● |
| **8.00** | 0/-0.022 | 8 | 265 | 390 | 1 | P1693LS0800 | ● |
| **8.50** | 0/-0.022 | 8.5 | 265 | 390 | 1 | P1693LS0850 | ● |
| **9.00** | 0/-0.022 | 9 | 280 | 410 | 1 | P1693LS0900 | ● |
| **9.50** | 0/-0.022 | 9.5 | 280 | 410 | 1 | P1693LS0950 | ● |
| **10.00** | 0/-0.022 | 10 | 295 | 430 | 1 | P1693LS1000 | ● |
| **10.50** | 0/-0.027 | 10.5 | 295 | 430 | 1 | P1693LS1050 | ● |
| **11.00** | 0/-0.027 | 11 | 310 | 455 | 1 | P1693LS1100 | ● |
| **12.00** | 0/-0.027 | 12 | 330 | 480 | 1 | P1693LS1200 | ● |



● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# 1693LS

| | Material Group ISO 513 | P1 P2 | P3 P4 | K1 K2 | | | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 150÷350 HB | | | |
| | Vc (m/min) | **15÷25** | **10÷20** | **15÷25** | | | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | | | |
| | **3.5** | 0.045 | 0.038 | 0.050 | | | |
| | **4** | 0.053 | 0.045 | 0.058 | | | |
| | **5** | 0.060 | 0.051 | 0.066 | | | |
| | **6** | 0.068 | 0.057 | 0.074 | | | |
| | **7** | 0.075 | 0.064 | 0.083 | | | |
| | **8** | 0.083 | 0.070 | 0.091 | | | |
| | **9** | 0.090 | 0.077 | 0.099 | | | |
| | **10** | 0.098 | 0.083 | 0.107 | | | |
| | **11** | 0.105 | 0.089 | 0.116 | | | |
| | **12** | 0.113 | 0.096 | 0.124 | | | |
| | **13** | 0.120 | 0.102 | 0.132 | | | |

# 145N-145NTI

N type for general purpose. MT shank. short (145N).
N type for general purpose. MT shank. TiN coated. short (145NTI)

DIN 345 | N | HSS OX | HSS TiN | 118° | 25-30°

145N 145NTI



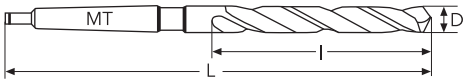
145N



145NTI

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ☆ | ☆ | | |

★ 1st choice ☆ suitable




| | | | | | | 145N | | 145NTI | |
|---|---|---|---|---|---|---|---|---|---|
| D(h8) | D Tol. | MT | l | L | PACKAGING | EDP No. | Stock | EDP No. | Stock |
| **5.00** | 0/-0.018 | 1 | 52 | 133 | 1 | P145N0500 | ● | | |
| **5.25** | 0/-0.018 | 1 | 52 | 133 | 1 | P145N0525 | ○ | | |
| **5.50** | 0/-0.018 | 1 | 57 | 138 | 1 | P145N0550 | ● | | |
| **5.75** | 0/-0.018 | 1 | 57 | 138 | 1 | P145N0575 | ○ | | |
| **6.00** | 0/-0.018 | 1 | 57 | 138 | 1 | P145N0600 | ● | | |
| **6.25** | 0/-0.022 | 1 | 63 | 144 | 1 | P145N0625 | ○ | | |
| **6.50** | 0/-0.022 | 1 | 63 | 144 | 1 | P145N0650 | ● | | |
| **6.75** | 0/-0.022 | 1 | 69 | 150 | 1 | P145N0675 | ● | | |
| **7.00** | 0/-0.022 | 1 | 69 | 150 | 1 | P145N0700 | ● | | |
| **7.25** | 0/-0.022 | 1 | 69 | 150 | 1 | P145N0725 | ○ | | |
| **7.50** | 0/-0.022 | 1 | 69 | 150 | 1 | P145N0750 | ● | | |
| **7.75** | 0/-0.022 | 1 | 75 | 156 | 1 | P145N0775 | ○ | | |
| **8.00** | 0/-0.022 | 1 | 75 | 156 | 1 | P145N0800 | ● | | |
| **8.25** | 0/-0.022 | 1 | 75 | 156 | 1 | P145N0825 | ○ | | |
| **8.50** | 0/-0.022 | 1 | 75 | 156 | 1 | P145N0850 | ● | | |
| **8.75** | 0/-0.022 | 1 | 81 | 162 | 1 | P145N0875 | ○ | | |
| **9.00** | 0/-0.022 | 1 | 81 | 162 | 1 | P145N0900 | ● | | |
| **9.25** | 0/-0.022 | 1 | 81 | 162 | 1 | P145N0925 | ○ | | |
| **9.50** | 0/-0.022 | 1 | 81 | 162 | 1 | P145N0950 | ● | | |
| **9.75** | 0/-0.022 | 1 | 87 | 168 | 1 | P145N0975 | ○ | | |
| **10.00** | 0/-0.022 | 1 | 87 | 168 | 1 | P145N1000 | ● | | |
| **10.25** | 0/-0.027 | 1 | 87 | 168 | 1 | P145N1025 | ● | | |
| **10.50** | 0/-0.027 | 1 | 87 | 168 | 1 | P145N1050 | ● | | |
| **10.75** | 0/-0.027 | 1 | 94 | 175 | 1 | P145N1075 | ○ | | |
| **11.00** | 0/-0.027 | 1 | 94 | 175 | 1 | P145N1100 | ● | | |
| **11.25** | 0/-0.027 | 1 | 94 | 175 | 1 | P145N1125 | ○ | | |
| **11.50** | 0/-0.027 | 1 | 94 | 175 | 1 | P145N1150 | ● | | |
| **11.75** | 0/-0.027 | 1 | 94 | 175 | 1 | P145N1175 | ○ | | |
| **12.00** | 0/-0.027 | 1 | 101 | 182 | 1 | P145N1200 | ● | | |
| **12.25** | 0/-0.027 | 1 | 101 | 182 | 1 | P145N1225 | ○ | | |
| **12.50** | 0/-0.027 | 1 | 101 | 182 | 1 | P145N1250 | ● | | |
| **12.75** | 0/-0.027 | 1 | 101 | 182 | 1 | P145N1275 | ○ | | |
| **13.00** | 0/-0.027 | 1 | 101 | 182 | 1 | P145N1300 | ● | P145NTI1300 | ● |
| **13.25** | 0/-0.027 | 1 | 108 | 189 | 1 | P145N1325 | ● | | |
| **13.50** | 0/-0.027 | 1 | 108 | 189 | 1 | P145N1350 | ● | P145NTI1350 | ● |
| **13.75** | 0/-0.027 | 1 | 108 | 189 | 1 | P145N1375 | ● | | |
| **14.00** | 0/-0.027 | 1 | 108 | 189 | 1 | P145N1400 | ● | P145NTI1400 | ● |
| **14.25** | 0/-0.027 | 2 | 114 | 212 | 1 | P145N1425 | ● | | |
| **14.50** | 0/-0.027 | 2 | 114 | 212 | 1 | P145N1450 | ● | P145NTI1450 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 145N-145NTI

N type for general purpose. MT shank. short (145N).
N type for general purpose. MT shank. TiN coated. short (145NTI)

DIN 345 | N | HSS OX (145N) | HSS TiN (145NTI) | 118° | 25-30°



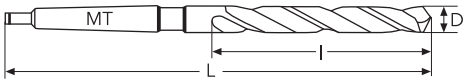
145N



145NTI

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ☆ | ☆ | | |

★ 1st choice ☆ suitable




| | | | | | | 145N | | 145NTI | |
|---|---|---|---|---|---|---|---|---|---|
| D(h8) | D Tol. | MT | l | L | PACKAGING | EDP No. | Stock | EDP No. | Stock |
| **14.75** | 0/-0.027 | 2 | 114 | 212 | 1 | P145N1475 | ● | | |
| **15.00** | 0/-0.027 | 2 | 114 | 212 | 1 | P145N1500 | ● | P145NTI1500 | ● |
| **15.25** | 0/-0.027 | 2 | 120 | 218 | 1 | P145N1525 | ● | | |
| **15.50** | 0/-0.027 | 2 | 120 | 218 | 1 | P145N1550 | ● | P145NTI1550 | ● |
| **15.75** | 0/-0.027 | 2 | 120 | 218 | 1 | P145N1575 | ● | | |
| **16.00** | 0/-0.027 | 2 | 120 | 218 | 1 | P145N1600 | ● | P145NTI1600 | ● |
| **16.25** | 0/-0.027 | 2 | 125 | 223 | 1 | P145N1625 | ● | | |
| **16.50** | 0/-0.027 | 2 | 125 | 223 | 1 | P145N1650 | ● | P145NTI1650 | ● |
| **16.75** | 0/-0.027 | 2 | 125 | 223 | 1 | P145N1675 | ● | | |
| **17.00** | 0/-0.027 | 2 | 125 | 223 | 1 | P145N1700 | ● | P145NTI1700 | ● |
| **17.25** | 0/-0.027 | 2 | 130 | 228 | 1 | P145N1725 | ● | | |
| **17.50** | 0/-0.027 | 2 | 130 | 228 | 1 | P145N1750 | ● | P145NTI1750 | ● |
| **17.75** | 0/-0.027 | 2 | 130 | 228 | 1 | P145N1775 | ● | | |
| **18.00** | 0/-0.027 | 2 | 130 | 228 | 1 | P145N1800 | ● | P145NTI1800 | ● |
| **18.25** | 0/-0.033 | 2 | 135 | 233 | 1 | P145N1825 | ● | | |
| **18.50** | 0/-0.033 | 2 | 135 | 233 | 1 | P145N1850 | ● | P145NTI1850 | ● |
| **18.75** | 0/-0.033 | 2 | 135 | 233 | 1 | P145N1875 | ● | | |
| **19.00** | 0/-0.033 | 2 | 135 | 233 | 1 | P145N1900 | ● | P145NTI1900 | ● |
| **19.25** | 0/-0.033 | 2 | 140 | 238 | 1 | P145N1925 | ● | | |
| **19.50** | 0/-0.033 | 2 | 140 | 238 | 1 | P145N1950 | ● | P145NTI1950 | ● |
| **19.75** | 0/-0.033 | 2 | 140 | 238 | 1 | P145N1975 | ● | | |
| **20.00** | 0/-0.033 | 2 | 140 | 238 | 1 | P145N2000 | ● | P145NTI2000 | ● |
| **20.25** | 0/-0.033 | 2 | 145 | 243 | 1 | P145N2025 | ● | | |
| **20.50** | 0/-0.033 | 2 | 145 | 243 | 1 | P145N2050 | ● | P145NTI2050 | ● |
| **20.75** | 0/-0.033 | 2 | 145 | 243 | 1 | P145N2075 | ● | | |
| **21.00** | 0/-0.033 | 2 | 145 | 243 | 1 | P145N2100 | ● | P145NTI2100 | ● |
| **21.25** | 0/-0.033 | 2 | 150 | 248 | 1 | P145N2125 | ● | | |
| **21.50** | 0/-0.033 | 2 | 150 | 248 | 1 | P145N2150 | ● | P145NTI2150 | ● |
| **21.75** | 0/-0.033 | 2 | 150 | 248 | 1 | P145N2175 | ● | | |
| **22.00** | 0/-0.033 | 2 | 150 | 248 | 1 | P145N2200 | ● | P145NTI2200 | ● |
| **22.25** | 0/-0.033 | 2 | 150 | 248 | 1 | P145N2225 | ● | | |
| **22.50** | 0/-0.033 | 2 | 155 | 253 | 1 | P145N2250 | ● | P145NTI2250 | ● |
| **22.75** | 0/-0.033 | 2 | 155 | 253 | 1 | P145N2275 | ● | | |
| **23.00** | 0/-0.033 | 2 | 155 | 253 | 1 | P145N2300 | ● | P145NTI2300 | ● |
| **23.25** | 0/-0.033 | 3 | 155 | 276 | 1 | P145N2325 | ● | | |
| **23.50** | 0/-0.033 | 3 | 155 | 276 | 1 | P145N2350 | ● | P145NTI2350 | ● |
| **23.75** | 0/-0.033 | 3 | 160 | 281 | 1 | P145N2375 | ● | | |
| **24.00** | 0/-0.033 | 3 | 160 | 281 | 1 | P145N2400 | ● | P145NTI2400 | ● |
| **24.25** | 0/-0.033 | 3 | 160 | 281 | 1 | P145N2425 | ● | | |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 145N-145NTI

N type for general purpose. MT shank. short (145N).
N type for general purpose. MT shank. TiN coated. short (145NTI)

DIN 345 | N | HSS OX | HSS TiN | 118° | 25-30°

145N 145NTI



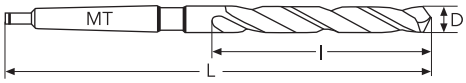
145N



145NTI

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ☆ | ☆ | | |

★ 1st choice ☆ suitable

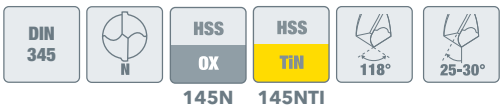



| | | | | | | 145N | | 145NTI | |
|---|---|---|---|---|---|---|---|---|---|
| D(h8) | D Tol. | MT | l | L | PACKAGING | EDP No. | Stock | EDP No. | Stock |
| **24.50** | 0/-0.033 | 3 | 160 | 281 | 1 | P145N2450 | ● | P145NTI2450 | ● |
| **24.75** | 0/-0.033 | 3 | 160 | 281 | 1 | P145N2475 | ● | | |
| **25.00** | 0/-0.033 | 3 | 160 | 281 | 1 | P145N2500 | ● | P145NTI2500 | ● |
| **25.25** | 0/-0.033 | 3 | 165 | 286 | 1 | P145N2525 | ○ | | |
| **25.50** | 0/-0.033 | 3 | 165 | 286 | 1 | P145N2550 | ● | | |
| **25.75** | 0/-0.033 | 3 | 165 | 286 | 1 | P145N2575 | ○ | | |
| **26.00** | 0/-0.033 | 3 | 165 | 286 | 1 | P145N2600 | ● | P145NTI2600 | ● |
| **26.25** | 0/-0.033 | 3 | 165 | 286 | 1 | P145N2625 | ○ | | |
| **26.50** | 0/-0.033 | 3 | 165 | 286 | 1 | P145N2650 | ● | | |
| **26.75** | 0/-0.033 | 3 | 170 | 291 | 1 | P145N2675 | ○ | | |
| **27.00** | 0/-0.033 | 3 | 170 | 291 | 1 | P145N2700 | ● | P145NTI2700 | ● |
| **27.25** | 0/-0.033 | 3 | 170 | 291 | 1 | P145N2725 | ○ | | |
| **27.50** | 0/-0.033 | 3 | 170 | 291 | 1 | P145N2750 | ● | | |
| **27.75** | 0/-0.033 | 3 | 170 | 291 | 1 | P145N2775 | ○ | | |
| **28.00** | 0/-0.033 | 3 | 170 | 291 | 1 | P145N2800 | ● | P145NTI2800 | ● |
| **28.25** | 0/-0.033 | 3 | 175 | 296 | 1 | P145N2825 | ○ | | |
| **28.50** | 0/-0.033 | 3 | 175 | 296 | 1 | P145N2850 | ● | | |
| **28.75** | 0/-0.033 | 3 | 175 | 296 | 1 | P145N2875 | ○ | | |
| **29.00** | 0/-0.033 | 3 | 175 | 296 | 1 | P145N2900 | ● | P145NTI2900 | ● |
| **29.25** | 0/-0.033 | 3 | 175 | 296 | 1 | P145N2925 | ○ | | |
| **29.50** | 0/-0.033 | 3 | 175 | 296 | 1 | P145N2950 | ● | | |
| **29.75** | 0/-0.033 | 3 | 175 | 296 | 1 | P145N2975 | ○ | | |
| **30.00** | 0/-0.033 | 3 | 175 | 296 | 1 | P145N3000 | ● | P145NTI3000 | ● |
| **30.25** | 0/-0.039 | 3 | 180 | 301 | 1 | P145N3025 | ○ | | |
| **30.50** | 0/-0.039 | 3 | 180 | 301 | 1 | P145N3050 | ● | | |
| **30.75** | 0/-0.039 | 3 | 180 | 301 | 1 | P145N3075 | ○ | | |
| **31.00** | 0/-0.039 | 3 | 180 | 301 | 1 | P145N3100 | ● | | |
| **31.25** | 0/-0.039 | 3 | 180 | 301 | 1 | P145N3125 | ○ | | |
| **31.50** | 0/-0.039 | 3 | 180 | 301 | 1 | P145N3150 | ● | | |
| **31.75** | 0/-0.039 | 3 | 185 | 306 | 1 | P145N3175 | ○ | | |
| **32.00** | 0/-0.039 | 4 | 185 | 334 | 1 | P145N3200 | ● | | |
| **32.50** | 0/-0.039 | 4 | 185 | 334 | 1 | P145N3250 | ● | | |
| **33.00** | 0/-0.039 | 4 | 185 | 334 | 1 | P145N3300 | ● | | |
| **33.50** | 0/-0.039 | 4 | 185 | 334 | 1 | P145N3350 | ● | | |
| **34.00** | 0/-0.039 | 4 | 190 | 339 | 1 | P145N3400 | ● | | |
| **34.50** | 0/-0.039 | 4 | 190 | 339 | 1 | P145N3450 | ● | | |
| **35.00** | 0/-0.039 | 4 | 190 | 339 | 1 | P145N3500 | ● | | |
| **35.50** | 0/-0.039 | 4 | 190 | 339 | 1 | P145N3550 | ● | | |
| **36.00** | 0/-0.039 | 4 | 195 | 344 | 1 | P145N3600 | ● | | |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 145N-145NTI

N type for general purpose. MT shank. short (145N).
N type for general purpose. MT shank. TiN coated. short (145NTI)





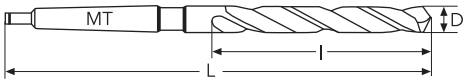

145N



145NTI

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ☆ | ☆ | | |

★ 1st choice ☆ suitable




| | | | | | | 145N | | 145NTI | |
|---|---|---|---|---|---|---|---|---|---|
| D(h8) | D Tol. | MT | l | L | PACKAGING | EDP No. | Stock | EDP No. | Stock |
| **36.50** | 0/-0.039 | 4 | 195 | 344 | 1 | P145N3650 | ● | | |
| **37.00** | 0/-0.039 | 4 | 195 | 344 | 1 | P145N3700 | ● | | |
| **37.50** | 0/-0.039 | 4 | 195 | 344 | 1 | P145N3750 | ● | | |
| **38.00** | 0/-0.039 | 4 | 200 | 349 | 1 | P145N3800 | ● | | |
| **38.50** | 0/-0.039 | 4 | 200 | 349 | 1 | P145N3850 | ● | | |
| **39.00** | 0/-0.039 | 4 | 200 | 349 | 1 | P145N3900 | ● | | |
| **39.50** | 0/-0.039 | 4 | 200 | 349 | 1 | P145N3950 | ● | | |
| **40.00** | 0/-0.039 | 4 | 200 | 349 | 1 | P145N4000 | ● | | |
| **40.50** | 0/-0.039 | 4 | 205 | 354 | 1 | P145N4050 | ● | | |
| **41.00** | 0/-0.039 | 4 | 205 | 354 | 1 | P145N4100 | ● | | |
| **42.00** | 0/-0.039 | 4 | 205 | 354 | 1 | P145N4200 | ● | | |
| **43.00** | 0/-0.039 | 4 | 210 | 359 | 1 | P145N4300 | ● | | |
| **44.00** | 0/-0.039 | 4 | 210 | 359 | 1 | P145N4400 | ● | | |
| **45.00** | 0/-0.039 | 4 | 210 | 359 | 1 | P145N4500 | ● | | |
| **46.00** | 0/-0.039 | 4 | 215 | 364 | 1 | P145N4600 | ● | | |
| **47.00** | 0/-0.039 | 4 | 215 | 364 | 1 | P145N4700 | ● | | |
| **48.00** | 0/-0.039 | 4 | 220 | 369 | 1 | P145N4800 | ● | | |
| **49.00** | 0/-0.039 | 4 | 220 | 369 | 1 | P145N4900 | ● | | |
| **50.00** | 0/-0.039 | 4 | 220 | 369 | 1 | P145N5000 | ● | | |
| **55.00** | 0/-0.046 | 5 | 230 | 417 | 1 | P145N5500 | ● | | |
| **60.00** | 0/-0.046 | 5 | 235 | 422 | 1 | P145N6000 | ● | | |

● stock standard ○ non-standard stock ▽ stock exhaustion

## 145N

| Material Group ISO 513 | P1 P2 | P3 P4 | K1 K2 | N1 N5 | N2 N3 N4 | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 150÷350 HB | | | |
| Vc (m/min) | **25÷35** | **20÷30** | **25÷35** | **50÷70** | **40÷60** | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| **5** | 0.100 | 0.085 | 0.110 | 0.140 | 0.100 | |
| **6** | 0.120 | 0.102 | 0.132 | 0.168 | 0.120 | |
| **7** | 0.140 | 0.119 | 0.154 | 0.196 | 0.140 | |
| **8** | 0.160 | 0.136 | 0.176 | 0.224 | 0.160 | |
| **9** | 0.180 | 0.153 | 0.198 | 0.252 | 0.180 | |
| **10** | 0.200 | 0.170 | 0.220 | 0.280 | 0.200 | |
| **11** | 0.208 | 0.177 | 0.229 | 0.291 | 0.208 | |
| **12** | 0.216 | 0.184 | 0.238 | 0.302 | 0.216 | |
| **13** | 0.224 | 0.190 | 0.246 | 0.314 | 0.224 | |
| **14** | 0.232 | 0.197 | 0.255 | 0.325 | 0.232 | |
| **15** | 0.240 | 0.204 | 0.264 | 0.336 | 0.240 | |
| **16** | 0.250 | 0.213 | 0.275 | 0.350 | 0.250 | |
| **17** | 0.265 | 0.225 | 0.292 | 0.371 | 0.265 | |
| **18** | 0.280 | 0.238 | 0.308 | 0.392 | 0.280 | |
| **19** | 0.295 | 0.251 | 0.325 | 0.413 | 0.295 | |
| **20** | 0.315 | 0.268 | 0.347 | 0.441 | 0.315 | |
| **22** | 0.330 | 0.281 | 0.363 | 0.462 | 0.330 | |
| **25** | 0.350 | 0.298 | 0.385 | 0.490 | 0.350 | |
| **27** | 0.370 | 0.315 | 0.407 | 0.518 | 0.370 | |
| **30** | 0.400 | 0.340 | 0.440 | 0.560 | 0.400 | |
| **35** | 0.450 | 0.383 | 0.495 | 0.630 | 0.450 | |
| **40** | 0.500 | 0.425 | 0.550 | 0.700 | 0.500 | |
| **45** | 0.560 | 0.476 | 0.616 | 0.784 | 0.560 | |
| **50** | 0.630 | 0.536 | 0.693 | 0.882 | 0.630 | |
| **55** | 0.700 | 0.595 | 0.770 | 0.980 | 0.700 | |
| **60** | 0.800 | 0.680 | 0.880 | 1.120 | 0.800 | |

## 145NTI

| Material Group ISO 513 | P1 P2 | P3 P4 | K1 K2 | N1 N5 | N2 N3 N4 | |
|---|---|---|---|---|---|---|
| Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | 150÷350 HB | | | |
| Vc (m/min) | **30÷40** | **25÷35** | **30÷40** | **60÷80** | **50÷70** | |
| D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| **13** | 0.224 | 0.190 | 0.246 | 0.314 | 0.224 | |
| **14** | 0.232 | 0.197 | 0.255 | 0.325 | 0.232 | |
| **15** | 0.240 | 0.204 | 0.264 | 0.336 | 0.240 | |
| **16** | 0.250 | 0.213 | 0.275 | 0.350 | 0.250 | |
| **17** | 0.265 | 0.225 | 0.292 | 0.371 | 0.265 | |
| **18** | 0.280 | 0.238 | 0.308 | 0.392 | 0.280 | |
| **19** | 0.295 | 0.251 | 0.325 | 0.413 | 0.295 | |
| **20** | 0.315 | 0.268 | 0.347 | 0.441 | 0.315 | |
| **22** | 0.330 | 0.281 | 0.363 | 0.462 | 0.330 | |
| **25** | 0.350 | 0.298 | 0.385 | 0.490 | 0.350 | |
| **27** | 0.370 | 0.315 | 0.407 | 0.518 | 0.370 | |
| **30** | 0.400 | 0.340 | 0.440 | 0.560 | 0.400 | |

# 245N

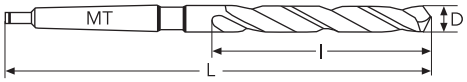
N type for tough materials. MT shank. short



DIN 345 | NH | HSS/CO OX | 118° | 30°

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ☆ | ☆ | ☆ | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | MT | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **13.00** | 0/-0.027 | 1 | 101 | 182 | 1 | P245N1300 | ● |
| **13.50** | 0/-0.027 | 1 | 108 | 189 | 1 | P245N1350 | ● |
| **14.00** | 0/-0.027 | 1 | 108 | 189 | 1 | P245N1400 | ● |
| **14.50** | 0/-0.027 | 2 | 114 | 212 | 1 | P245N1450 | ● |
| **15.00** | 0/-0.027 | 2 | 114 | 212 | 1 | P245N1500 | ● |
| **15.50** | 0/-0.027 | 2 | 120 | 218 | 1 | P245N1550 | ● |
| **16.00** | 0/-0.027 | 2 | 120 | 218 | 1 | P245N1600 | ● |
| **16.50** | 0/-0.027 | 2 | 125 | 223 | 1 | P245N1650 | ● |
| **17.00** | 0/-0.027 | 2 | 125 | 223 | 1 | P245N1700 | ● |
| **17.50** | 0/-0.027 | 2 | 130 | 228 | 1 | P245N1750 | ● |
| **18.00** | 0/-0.027 | 2 | 130 | 228 | 1 | P245N1800 | ● |
| **18.50** | 0/-0.033 | 2 | 135 | 233 | 1 | P245N1850 | ● |
| **19.00** | 0/-0.033 | 2 | 135 | 233 | 1 | P245N1900 | ● |
| **19.50** | 0/-0.033 | 2 | 140 | 238 | 1 | P245N1950 | ● |
| **20.00** | 0/-0.033 | 2 | 140 | 238 | 1 | P245N2000 | ● |
| **20.50** | 0/-0.033 | 2 | 145 | 243 | 1 | P245N2050 | ● |
| **21.00** | 0/-0.033 | 2 | 145 | 243 | 1 | P245N2100 | ● |
| **21.50** | 0/-0.033 | 2 | 150 | 248 | 1 | P245N2150 | ● |
| **22.00** | 0/-0.033 | 2 | 150 | 248 | 1 | P245N2200 | ● |
| **22.50** | 0/-0.033 | 2 | 155 | 253 | 1 | P245N2250 | ● |
| **23.00** | 0/-0.033 | 2 | 155 | 253 | 1 | P245N2300 | ● |
| **23.50** | 0/-0.033 | 3 | 155 | 276 | 1 | P245N2350 | ● |
| **24.00** | 0/-0.033 | 3 | 160 | 281 | 1 | P245N2400 | ● |
| **24.50** | 0/-0.033 | 3 | 160 | 281 | 1 | P245N2450 | ● |
| **25.00** | 0/-0.033 | 3 | 160 | 281 | 1 | P245N2500 | ● |
| **26.00** | 0/-0.033 | 3 | 165 | 286 | 1 | P245N2600 | ● |
| **27.00** | 0/-0.033 | 3 | 170 | 291 | 1 | P245N2700 | ● |
| **28.00** | 0/-0.033 | 3 | 170 | 291 | 1 | P245N2800 | ● |
| **29.00** | 0/-0.033 | 3 | 175 | 296 | 1 | P245N2900 | ● |
| **30.00** | 0/-0.033 | 3 | 175 | 296 | 1 | P245N3000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 245N

| | Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 | M2 M3 | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | | |
| | Vc (m/min) | **25÷35** | **20÷30** | **12÷18** | **12÷18** | **8÷12** | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **13** | 0.224 | 0.190 | 0.157 | 0.157 | 0.112 | |
| | **14** | 0.232 | 0.197 | 0.162 | 0.162 | 0.116 | |
| | **15** | 0.240 | 0.204 | 0.168 | 0.168 | 0.120 | |
| | **16** | 0.250 | 0.213 | 0.175 | 0.175 | 0.125 | |
| | **17** | 0.265 | 0.225 | 0.186 | 0.186 | 0.133 | |
| | **18** | 0.280 | 0.238 | 0.196 | 0.196 | 0.140 | |
| | **19** | 0.295 | 0.251 | 0.207 | 0.207 | 0.148 | |
| | **20** | 0.315 | 0.268 | 0.221 | 0.221 | 0.158 | |
| | **22** | 0.330 | 0.281 | 0.231 | 0.231 | 0.165 | |
| | **25** | 0.350 | 0.298 | 0.245 | 0.245 | 0.175 | |
| | **27** | 0.370 | 0.315 | 0.259 | 0.259 | 0.185 | |
| | **30** | 0.400 | 0.340 | 0.280 | 0.280 | 0.200 | |

| | Material Group ISO 513 | K1 K2 | K3 K4 | N1 N5 | N2 N3 N4 | S1 S2 S4 | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 150÷350 HB | <350 HB | | | <35 HRC | |
| | Vc (m/min) | **25÷35** | **20÷30** | **50÷70** | **40÷60** | **8÷12** | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **13** | 0.246 | 0.168 | 0.314 | 0.224 | 0.090 | |
| | **14** | 0.255 | 0.174 | 0.325 | 0.232 | 0.093 | |
| | **15** | 0.264 | 0.180 | 0.336 | 0.240 | 0.096 | |
| | **16** | 0.275 | 0.188 | 0.350 | 0.250 | 0.100 | |
| | **17** | 0.292 | 0.199 | 0.371 | 0.265 | 0.106 | |
| | **18** | 0.308 | 0.210 | 0.392 | 0.280 | 0.112 | |
| | **19** | 0.325 | 0.221 | 0.413 | 0.295 | 0.118 | |
| | **20** | 0.347 | 0.236 | 0.441 | 0.315 | 0.126 | |
| | **22** | 0.363 | 0.248 | 0.462 | 0.330 | 0.132 | |
| | **25** | 0.385 | 0.263 | 0.490 | 0.350 | 0.140 | |
| | **27** | 0.407 | 0.278 | 0.518 | 0.370 | 0.148 | |
| | **30** | 0.440 | 0.300 | 0.560 | 0.400 | 0.160 | |

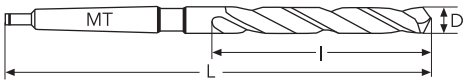
# 241LS

LS type for deep holes. MT shank. long



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | MT | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **13.00** | 0/-0.027 | 1 | 134 | 215 | 1 | P241LS1300 | ● |
| **14.00** | 0/-0.027 | 1 | 142 | 223 | 1 | P241LS1400 | ● |
| **14.50** | 0/-0.027 | 2 | 147 | 245 | 1 | P241LS1450 | ● |
| **15.00** | 0/-0.027 | 2 | 147 | 245 | 1 | P241LS1500 | ● |
| **15.50** | 0/-0.027 | 2 | 153 | 251 | 1 | P241LS1550 | ● |
| **16.00** | 0/-0.027 | 2 | 153 | 251 | 1 | P241LS1600 | ● |
| **16.50** | 0/-0.027 | 2 | 159 | 257 | 1 | P241LS1650 | ● |
| **17.00** | 0/-0.027 | 2 | 159 | 257 | 1 | P241LS1700 | ● |
| **17.50** | 0/-0.027 | 2 | 165 | 263 | 1 | P241LS1750 | ● |
| **18.00** | 0/-0.027 | 2 | 165 | 263 | 1 | P241LS1800 | ● |
| **18.50** | 0/-0.033 | 2 | 171 | 269 | 1 | P241LS1850 | ● |
| **19.00** | 0/-0.033 | 2 | 171 | 269 | 1 | P241LS1900 | ● |
| **19.50** | 0/-0.033 | 2 | 177 | 275 | 1 | P241LS1950 | ● |
| **20.00** | 0/-0.033 | 2 | 177 | 275 | 1 | P241LS2000 | ● |
| **21.00** | 0/-0.033 | 2 | 184 | 282 | 1 | P241LS2100 | ● |
| **22.00** | 0/-0.033 | 2 | 191 | 289 | 1 | P241LS2200 | ● |
| **23.00** | 0/-0.033 | 2 | 198 | 296 | 1 | P241LS2300 | ● |
| **24.00** | 0/-0.033 | 3 | 206 | 327 | 1 | P241LS2400 | ● |
| **25.00** | 0/-0.033 | 3 | 206 | 327 | 1 | P241LS2500 | ● |
| **26.00** | 0/-0.033 | 3 | 214 | 335 | 1 | P241LS2600 | ● |
| **27.00** | 0/-0.033 | 3 | 222 | 343 | 1 | P241LS2700 | ▽ |
| **29.00** | 0/-0.033 | 3 | 230 | 351 | 1 | P241LS2900 | ● |
| **30.00** | 0/-0.033 | 3 | 230 | 351 | 1 | P241LS3000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 241LS

| | Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 | K1 K2 | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | 150÷350 HB | |
| | Vc (m/min) | **15÷25** | **10÷20** | **10÷14** | **10÷14** | **20÷30** | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **13** | 0.160 | 0.136 | 0.112 | 0.112 | 0.176 | |
| | **14** | 0.170 | 0.145 | 0.119 | 0.119 | 0.187 | |
| | **15** | 0.180 | 0.153 | 0.126 | 0.126 | 0.198 | |
| | **16** | 0.200 | 0.170 | 0.140 | 0.140 | 0.220 | |
| | **17** | 0.190 | 0.162 | 0.133 | 0.133 | 0.209 | |
| | **18** | 0.205 | 0.174 | 0.144 | 0.144 | 0.226 | |
| | **19** | 0.220 | 0.187 | 0.154 | 0.154 | 0.242 | |
| | **20** | 0.235 | 0.200 | 0.165 | 0.165 | 0.259 | |
| | **21** | 0.250 | 0.213 | 0.175 | 0.175 | 0.275 | |
| | **22** | 0.265 | 0.225 | 0.186 | 0.186 | 0.292 | |
| | **23** | 0.280 | 0.238 | 0.196 | 0.196 | 0.308 | |
| | **24** | 0.295 | 0.251 | 0.207 | 0.207 | 0.325 | |
| | **25** | 0.310 | 0.264 | 0.217 | 0.217 | 0.341 | |
| | **26** | 0.325 | 0.276 | 0.228 | 0.228 | 0.358 | |
| | **27** | 0.340 | 0.289 | 0.238 | 0.238 | 0.374 | |
| | **28** | 0.355 | 0.302 | 0.249 | 0.249 | 0.391 | |
| | **29** | 0.370 | 0.315 | 0.259 | 0.259 | 0.407 | |
| | **30** | 0.385 | 0.327 | 0.270 | 0.270 | 0.424 | |

# 2701LS

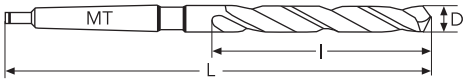
LS type for deep holes. MT shank. extra-long/1

DIN 1870/1 | LS | HSS/CO OX | 130° | 35-40°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | MT | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **13.00** | 0/-0.027 | 1 | 205 | 310 | 1 | P2701LS1300 | ● |
| **13.50** | 0/-0.027 | 1 | 220 | 325 | 1 | P2701LS1350 | ● |
| **14.00** | 0/-0.027 | 1 | 220 | 325 | 1 | P2701LS1400 | ● |
| **14.50** | 0/-0.027 | 2 | 220 | 340 | 1 | P2701LS1450 | ● |
| **15.00** | 0/-0.027 | 2 | 220 | 340 | 1 | P2701LS1500 | ● |
| **15.50** | 0/-0.027 | 2 | 230 | 355 | 1 | P2701LS1550 | ● |
| **16.00** | 0/-0.027 | 2 | 230 | 355 | 1 | P2701LS1600 | ● |
| **16.50** | 0/-0.027 | 2 | 230 | 355 | 1 | P2701LS1650 | ● |
| **17.00** | 0/-0.027 | 2 | 230 | 355 | 1 | P2701LS1700 | ● |
| **17.50** | 0/-0.027 | 2 | 245 | 370 | 1 | P2701LS1750 | ● |
| **18.00** | 0/-0.027 | 2 | 245 | 370 | 1 | P2701LS1800 | ● |
| **18.50** | 0/-0.033 | 2 | 245 | 370 | 1 | P2701LS1850 | ● |
| **19.00** | 0/-0.033 | 2 | 245 | 370 | 1 | P2701LS1900 | ● |
| **19.50** | 0/-0.033 | 2 | 260 | 385 | 1 | P2701LS1950 | ● |
| **20.00** | 0/-0.033 | 2 | 260 | 385 | 1 | P2701LS2000 | ● |
| **21.00** | 0/-0.033 | 2 | 260 | 385 | 1 | P2701LS2100 | ● |
| **22.00** | 0/-0.033 | 2 | 270 | 405 | 1 | P2701LS2200 | ● |
| **23.00** | 0/-0.033 | 2 | 270 | 405 | 1 | P2701LS2300 | ● |
| **24.00** | 0/-0.033 | 3 | 290 | 440 | 1 | P2701LS2400 | ● |
| **25.00** | 0/-0.033 | 3 | 290 | 440 | 1 | P2701LS2500 | ● |
| **26.00** | 0/-0.033 | 3 | 290 | 440 | 1 | P2701LS2600 | ● |
| **27.00** | 0/-0.033 | 3 | 305 | 460 | 1 | P2701LS2700 | ● |
| **28.00** | 0/-0.033 | 3 | 305 | 460 | 1 | P2701LS2800 | ● |
| **29.00** | 0/-0.033 | 3 | 305 | 460 | 1 | P2701LS2900 | ● |
| **30.00** | 0/-0.033 | 3 | 305 | 460 | 1 | P2701LS3000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 2701LS

| | Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 | K1 K2 | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | | | 150÷350 HB | |
| | Vc (m/min) | **20÷24** | **16÷20** | **8÷12** | **8÷12** | **20÷24** | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **13** | 0.140 | 0.119 | 0.098 | 0.098 | 0.154 | |
| | **14** | 0.150 | 0.128 | 0.105 | 0.105 | 0.165 | |
| | **15** | 0.160 | 0.136 | 0.112 | 0.112 | 0.176 | |
| | **16** | 0.180 | 0.153 | 0.126 | 0.126 | 0.198 | |
| | **17** | 0.190 | 0.162 | 0.133 | 0.133 | 0.209 | |
| | **18** | 0.200 | 0.170 | 0.140 | 0.140 | 0.220 | |
| | **19** | 0.210 | 0.179 | 0.147 | 0.147 | 0.231 | |
| | **20** | 0.220 | 0.187 | 0.154 | 0.154 | 0.242 | |
| | **21** | 0.220 | 0.187 | 0.154 | 0.154 | 0.242 | |
| | **22** | 0.230 | 0.196 | 0.161 | 0.161 | 0.253 | |
| | **23** | 0.250 | 0.213 | 0.175 | 0.175 | 0.275 | |
| | **24** | 0.260 | 0.221 | 0.182 | 0.182 | 0.286 | |
| | **25** | 0.280 | 0.238 | 0.196 | 0.196 | 0.308 | |
| | **26** | 0.290 | 0.247 | 0.203 | 0.203 | 0.319 | |
| | **27** | 0.300 | 0.255 | 0.210 | 0.210 | 0.330 | |
| | **28** | 0.310 | 0.264 | 0.217 | 0.217 | 0.341 | |
| | **29** | 0.325 | 0.276 | 0.228 | 0.228 | 0.358 | |
| | **30** | 0.340 | 0.289 | 0.238 | 0.238 | 0.374 | |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
**HSS-HSS/CO**

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# 2702LS

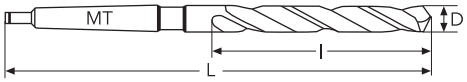
LS type for deep holes. MT shank. extra-long/2

DIN 1870/2 | LS | HSS/CO OX | 130° | 35-40°



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | | | |

★ 1st choice ☆ suitable




| D(h8) | D Tol. | MT | l | L | PACKAGING | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **13.00** | 0/-0.027 | 1 | 260 | 395 | 1 | P2702LS1300 | ● |
| **14.00** | 0/-0.027 | 1 | 275 | 410 | 1 | P2702LS1400 | ● |
| **14.50** | 0/-0.027 | 2 | 275 | 425 | 1 | P2702LS1450 | ● |
| **15.00** | 0/-0.027 | 2 | 275 | 425 | 1 | P2702LS1500 | ● |
| **15.50** | 0/-0.027 | 2 | 295 | 445 | 1 | P2702LS1550 | ● |
| **16.00** | 0/-0.027 | 2 | 295 | 445 | 1 | P2702LS1600 | ● |
| **16.50** | 0/-0.027 | 2 | 295 | 445 | 1 | P2702LS1650 | ● |
| **17.00** | 0/-0.027 | 2 | 295 | 445 | 1 | P2702LS1700 | ● |
| **17.50** | 0/-0.027 | 2 | 310 | 465 | 1 | P2702LS1750 | ● |
| **18.00** | 0/-0.027 | 2 | 310 | 465 | 1 | P2702LS1800 | ● |
| **18.50** | 0/-0.033 | 2 | 310 | 465 | 1 | P2702LS1850 | ● |
| **19.00** | 0/-0.033 | 2 | 310 | 465 | 1 | P2702LS1900 | ● |
| **19.50** | 0/-0.033 | 2 | 325 | 490 | 1 | P2702LS1950 | ● |
| **20.00** | 0/-0.033 | 2 | 325 | 490 | 1 | P2702LS2000 | ● |
| **21.00** | 0/-0.033 | 2 | 325 | 490 | 1 | P2702LS2100 | ● |
| **22.00** | 0/-0.033 | 2 | 345 | 515 | 1 | P2702LS2200 | ● |
| **23.00** | 0/-0.033 | 2 | 345 | 515 | 1 | P2702LS2300 | ● |
| **24.00** | 0/-0.033 | 3 | 365 | 555 | 1 | P2702LS2400 | ● |
| **25.00** | 0/-0.033 | 3 | 365 | 555 | 1 | P2702LS2500 | ● |
| **26.00** | 0/-0.033 | 3 | 365 | 555 | 1 | P2702LS2600 | ● |
| **27.00** | 0/-0.033 | 3 | 385 | 580 | 1 | P2702LS2700 | ● |
| **28.00** | 0/-0.033 | 3 | 385 | 580 | 1 | P2702LS2800 | ● |
| **29.00** | 0/-0.033 | 3 | 385 | 580 | 1 | P2702LS2900 | ● |
| **30.00** | 0/-0.033 | 3 | 385 | 580 | 1 | P2702LS3000 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# 2702LS

| | Material Group ISO 513 | P1 P2 | P3 P4 | P7 | M1 | K1 K2 | |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | 500÷700 N/mm² | 600÷1000 N/mm² | <700 N/mm² | <750 N/mm² | 150÷350 HB | |
| | Vc (m/min) | **20÷24** | **16÷20** | **8÷12** | **8÷12** | **20÷24** | |
| | D (mm) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | fn (mm/rev) | |
| | **13** | 0.130 | 0.111 | 0.091 | 0.091 | 0.143 | |
| | **14** | 0.140 | 0.119 | 0.098 | 0.098 | 0.154 | |
| | **15** | 0.150 | 0.128 | 0.105 | 0.105 | 0.165 | |
| | **16** | 0.160 | 0.136 | 0.112 | 0.112 | 0.176 | |
| | **17** | 0.170 | 0.145 | 0.119 | 0.119 | 0.187 | |
| | **18** | 0.180 | 0.153 | 0.126 | 0.126 | 0.198 | |
| | **19** | 0.190 | 0.162 | 0.133 | 0.133 | 0.209 | |
| | **20** | 0.200 | 0.170 | 0.140 | 0.140 | 0.220 | |
| | **21** | 0.210 | 0.179 | 0.147 | 0.147 | 0.231 | |
| | **22** | 0.220 | 0.187 | 0.154 | 0.154 | 0.242 | |
| | **23** | 0.230 | 0.196 | 0.161 | 0.161 | 0.253 | |
| | **24** | 0.240 | 0.204 | 0.168 | 0.168 | 0.264 | |
| | **25** | 0.250 | 0.213 | 0.175 | 0.175 | 0.275 | |
| | **26** | 0.270 | 0.230 | 0.189 | 0.189 | 0.297 | |
| | **27** | 0.280 | 0.238 | 0.196 | 0.196 | 0.308 | |
| | **28** | 0.290 | 0.247 | 0.203 | 0.203 | 0.319 | |
| | **29** | 0.300 | 0.255 | 0.210 | 0.210 | 0.330 | |
| | **30** | 0.310 | 0.264 | 0.217 | 0.217 | 0.341 | |

# CARBIDE END MILLS

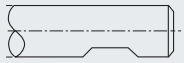



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MEF . 463
ALU . 477
MEX/MH . 503
UH/MH . 563

Legenda Verzeichnis Légende Leyenda Условные обозначения

| STOCK | | |
|---|---|---|
| ● | stock standard<br>stock standard<br>Standard Lager | stock standard<br>stock estándar<br>складская позиция |
| ○ | non-standard stock<br>stock non standard<br>nicht Standard Lager | stock non standard<br>stock no estándar<br>не складская позиция |
| ▽ | stock exhaustion<br>esaurimento stock<br>Vorraterschöpfung | épuisement du stock<br>agotamiento de stock<br>складские остатки |

| APPLICATION GUIDELINES INDICAZIONI PER L'APPLICAZIONE LEITFADEN ZUR ANWENDUNG<br>INDICATIONS POUR L'APPLICATION INDICACIONES PARA SU APLICACIÓN УКАЗАНИЯ ПО ПРИМЕНЕНИЮ | | |
|---|---|---|
| ★ | 1st choice<br>1a scelta<br>1. Wahl | 1er choix<br>1ª elección<br>1-й выбор |
| ☆ | suitable<br>adatto<br>geeignet | adapté<br>adecuado<br>пригоден |

| SHANK ATTACCO SCHAFT QUEUE MANGO ХВОСТОВИК | | |
|---|---|---|
|  | cylindrical shank<br>attacco cilindrico<br>zylindrischer Schaft | queue cylindrique<br>mango cilíndrico<br>цилиндрическое крепление |
|  | Weldon | |

| MILLING STRATEGY STRATEGIA DI FRESATURA FRÄSSTRATEGIE<br>STRATÉGIES DE FRAISAGE ESTRATEGIA DE FRESADO СТРАТЕГИЯ ФРЕЗЕРОВАНИЯ | | |
|---|---|---|
|  | slotting<br>fresatura di cave<br>Nutfräsen | rainurage<br>ranurado<br>фрезерование канавок |
|   | side milling<br>contornatura<br>Konturfräsen | contournage<br>perfiladura<br>фрезерование по контуру |
|  | 3D machining<br>fresatura 3D<br>3D-Bearbeitung | fraisage 3D<br>fresado 3D<br>3D фрезерование |
|  | square rib<br>nervatura piana<br>Flachrippen | rainurage<br>nervio plano<br>прямоугольное оребрение |
|  | copying<br>copiatura<br>Kopieren | copiage<br>copia<br>копирование |
|  | round rib<br>nervatura raggiata<br>Rundrippen | rainurage rayonné<br>nervio radiado<br>радиальное оребрение |

Legenda Verzeichnis Légende Leyenda Условные обозначения

| MILLING STRATEGY · STRATEGIA DI FRESATURA · FRÄSSTRATEGIE · STRATÉGIES DE FRAISAGE · ESTRATEGIA DE FRESADO · СТРАТЕГИЯ ФРЕЗЕРОВАНИЯ | | |
|---|---|---|
| HELICAL | helical<br>interpolazione elicoidale<br>Helixinterpolation | interpolation hélicoïdale<br>interpolación helicoidal<br>винтовая интерполяция |
| RAMPING | ramping<br>entrata in rampa<br>Rampen | entrée en ramping<br>entrada en rampa<br>фрезерование под углом |
| VERTICAL | vertical<br>fresatura assiale<br>Vertikalfräsen | fraisage axial<br>fresado axial<br>осевое фрезерование |
| DRILLING | drilling<br>foratura<br>Bohren | perçage<br>taladro<br>сверление |
| TROCHOIDAL | trochoidal<br>fresatura trocoidale<br>trochoidales Fräsen | fraisage trochoïdal<br>fresado trocoidal<br>трохоидальное фрезерование |

| APPLICATION RANGE · GAMMA DI APPLICAZIONE · ANWENDUNGSBEREICH · GAMME D'APPLICATION · RANGO DE APLICACIÓN · ОБЛАСТЬ ПРИМЕНЕНИЯ | | |
|---|---|---|
| N | general purpose<br>uso generico<br>allgemeine Anwendung | applications génériques<br>uso genérico<br>общего назначения |
| HF UNI | < 40 HRC variable helix and unequal pitch<br>< 40 HRC elica variabile e passo differenziato<br>< 40 HRC ungleicher Teilung und Winkel | < 40 HRC hélice et pas différencié<br>< 40 HRC hélice variable y paso diferenciado<br>< 40 HRC переменный завиток и дифференциальная кромка |
| HF HARD | 30÷55 HRC unequal pitch<br>30÷55 HRC passo differenziato<br>30÷55 HRC ungleicher Teilung | 30÷55 HRC pas différencié<br>30÷55 HRC paso diferenciado<br>30÷55 HRC неодинаковый шаг режущих кромок |
| MEF | for stainless steel<br>per acciaio inossidabile<br>für rostfreien Stahl | pour acier inoxydable<br>para acero inoxidable<br>для нержавеющих сталей |
| ALU | for aluminium<br>per alluminio<br>für Aluminium | pour aluminium<br>para aluminio<br>для алюминия |
| HF ALU | unequal pitch (UP) for Aluminium<br>passo differenziato (UP) per alluminio<br>ungleiche Teilung (UP) für Aluminium | pas différencié (UP) pour aluminium<br>paso diferenciado (UP) para aluminio<br>неравномерный шаг (UP) для алюминия |
| MEX | 30÷55 HRC general purpose and hardened steel<br>30÷55 HRC uso generico e acciaio temprato<br>30÷55 HRC allgemeine Anwendung und gehärtete Stähle | 30÷55 HRC utilisation générale et aciers trempés<br>30÷55 HRC mecanizado genérico y acero templado<br>30÷55 HRC общее назначение и для закалённых сталей |
| MH | 30÷70 HRC general purpose and hardened steel<br>30÷70 HRC uso generico e acciaio temprato<br>30÷70 HRC allgemeine Anwendung und gehärtete Stähle | 30÷70 HRC utilisation générale et aciers trempés<br>30÷70 HRC mecanizado genérico y acero templado<br>30÷70 HRC общее назначение и для закалённых сталей |
| UH | < 70 HRC for hardened steel<br>< 70 HRC per acciai temprati<br>< 70 HRC für Hartstahl | < 70 HRC pour acier trempé<br>< 70 HRC para aceros templados<br>< 70 HRC для закалённых сталей |

Legenda Verzeichnis Légende Leyenda Условные обозначения

| TYPE TIPO TYP TYPE TIPO ТИП | | |
|---|---|---|
|  | sharp corner<br>spigolo vivo<br>scharfe Kante | arête vive<br>borde puntiagudo<br>острая кромка |
|  | 45° chamfer<br>smusso a 45°<br>45° abgeschrägt | biseau à 45°<br>chaflán a 45°<br>фаска 45° |
|  | 45° chamfer + radius<br>smusso a 45° + raggio<br>45° abgeschrägt + Radius | biseau à 45° + rayon<br>chaflán a 45° + radio<br>фаска 45° + радиус |
|  | corner radius<br>torica<br>Eckradius | torique<br>tórica<br>с радиусом при вершине |
|  | ball nose<br>raggiata<br>runder Stirn | bout hémisphérique<br>fresa de bola<br>сферическая |
|  | high feed<br>alto avanzamento<br>hoher Vorschub | haute vitesse<br>alto avance<br>высокая подача |

| NR. OF FLUTES N. DI TAGLIENTI ANZAHL DER SCHNEIDEN NOMBRE DE DENTS N. DE LABIOS КОЛИЧЕСТВО РЕЖУЩИХ КРОМОК | | |
|---|---|---|
|  | single flute<br>monotagliente<br>Einzelschneide | monocoupe<br>monofilo<br>1 зуб |
|  | 2 flutes<br>2 taglienti<br>2 Schneiden | 2 arêtes de coupe<br>2 filos<br>2 зуба |
|  | 3 flutes<br>3 taglienti<br>3 Schneiden | 3 arêtes de coupe<br>3 filos<br>3 зуба |
|  | 3 flutes unequal pitch<br>3 taglienti passo differenziato<br>3 Schneiden ungleiche Teilung | 3 arêtes de coupe pas différencié<br>3 filos paso diferenciado<br>3 зуба с неравномерным шагом |
|  | 4 flutes<br>4 taglienti<br>4 Schneiden | 4 arêtes de coupe<br>4 filos<br>4 зуба |
|  | 4 flutes unequal pitch<br>4 taglienti passo differenziato<br>4 Schneiden ungleiche Teilung | 4 arêtes de coupe pas différencié<br>4 filos paso diferenciado<br>4 зуба с неравномерным шагом |
|  | 5 flutes<br>5 taglienti<br>5 Schneiden | 5 arêtes de coupe<br>5 filos<br>5 зуба |
|  | 6 flutes<br>6 taglienti<br>6 Schneiden | 6 arêtes de coupe<br>6 filos<br>6 зуба |

Legenda Verzeichnis Légende Leyenda Условные обозначения

## CHIPBREAKER STYLE TIPO DI ROMPITRUCIOLO SPÄNEBRECHER TYP TYPE DE BRISE-COPEAUX TIPO DE ROMPEVIRUTAS ТИП СТРУЖКОЛОМА

| | | |
|---|---|---|
| NR COARSE | roughing coarse pitch<br>sgrossare passo grosso<br>Schruppfräser Regelgewinde | ébauche pas gros<br>desbaste paso grueso<br>черновая с крупным шагом |
| HR FINE | roughing fine pitch<br>sgrossare passo fine<br>Schruppfräser Feingewinde | ébauche pas fin<br>desbaste paso fino<br>черновая с мелким шагом |

## MATERIAL MATERIALE WERKSTOFF MATIÈRE MATERIAL МАТЕРИАЛ

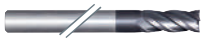
| | | |
|---|---|---|
| NMG | nano micrograin<br>nano micrograna<br>nano Mikrokörnung | nano micrograin<br>nano micrograno<br>нано микрозернистый твёрдый сплав |
| UMG | ultra fine micrograin<br>micrograna ultra fine<br>ultrafeine Mikrokörnung | micrograin ultra-fin<br>micrograno ultra fino<br>ультра микрозернистый твёрдый сплав |
| MG | micrograin<br>micrograna<br>Mikrokörnung | micrograin<br>micrograno<br>микрозернистый твёрдый сплав |

## SURFACE TREATMENT TRATTAMENTO SUPERFICIALE OBERFLÄCHENBEHANDLUNG TRAITMENT DE SURFACE TRATAMIENTO SUPERFICIAL ОБРАБОТКА ПОВЕРХНОСТИ

| | | |
|---|---|---|
| BR | uncoated<br>non rivestito<br>unbeschichtet | non revêtu<br>no revestido<br>без покрытия |
| POLISHED | polished<br>lappato<br>geläppt | poli<br>pulido<br>полированный |

## COATINGS RIVESTIMENTI BESCHICHTUNGEN REVÊTEMENTS RECUBRIMIENTOS ПОКРЫТИЕ

| | | PV200 | PV300 | ENDLESS | ENDLESS ORANGE | MH COAT | UH RED |
|---|---|---|---|---|---|---|---|
| hardness (HV)<br>durezza (HV)<br>Härte (HV) | dureté (HV)<br>dureza (HV)<br>твёрдость (HV) | 3300 | 3300 | 3300 | 3300 | 3600 | 3600 |
| friction coefficient<br>coefficiente d'attrito<br>Reibungskoeffizient | coefficent de frottement<br>coeficiente de rozamiento<br>коэффициент трения | 0.3 | 0.3 | 0.3 | 0.35 | 0.3 | 0.35 |
| thickness (µ)<br>spessore (µ)<br>dicke (µ) | epaisseur (µ)<br>espesor (µ)<br>толщина (мкм) | 3 | 2.5÷3.5 | 2.5÷3.5 | 2.5÷3.5 | 2.5÷3.5 | 2.5÷3.5 |
| max working temperature (°C)<br>temperatura max (°C)<br>hochste Temperatur (°C) | température maximale (°C)<br>temperatura máx (°C)<br>макс. температура (°C) | 950° | 1100° | 900° | 1000° | 1300° | 1200° |

| | ITEM No. | PAGE | |
|---|---|---|---|
| G2 general purpose, square | **GB205** | 298 |  |
| | **G2CS2** | 300 |  |
| | **G2WS2** | 302 |  |
| | **G2210** | 304 |  |
| | **G2211** | 304 |  |
| | **G2212** | 304 |  |
| | **GB305** | 307 |  |
| | **G2CSH3** | 309 |  |
| | **G2WSH3** | 311 |  |
| | **G2310** | 313 |  |
| | **G2311** | 313 |  |
| | **G2312** | 313 |  |
| | **GB405** | 315 |  |
| | **G2CS4** | 317 |  |
| | **G2WS4** | 319 |  |
| | **G2410** | 321 |  |
| | **G2411** | 321 |  |
| | **G2412** | 321 |  |
| | **G2413** | 321 |  |
| | **G2CSHM** | 323 |  |
| G2 general purpose, roughing | **G2CSFR** | 325 |  |
| | **G2WSFR** | 327 |  |
| G2 general purpose, corner radius | **G2CS2R** | 329 |  |
| | **G2CS4R** | 331 |  |
| | **G2CL4R** | 333 |  |
| G2 general purpose, ball nose | **GB255** | 335 |  |
| | **G2CSB2** | 337 |  |

| RANGE | NORM | TYPE | MATERIAL / COATING | HRC | HELIX ANGLE | GEOMETRY | Z | ISO P | ISO M | ISO K | ISO N | ISO S | ISO H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-12 | OSAWA | N | MG BR | <45 | 30° | SQUARE | 2 | ★ | ☆ | ★ | ☆ | | |
| 1-20 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 2 | ★ | ☆ | ★ | ☆ | | |
| 3-20 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 2 | ★ | ☆ | ★ | ☆ | | |
| 2-6 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 2 | ★ | ☆ | ★ | ☆ | | |
| 5-12 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 2 | ★ | ☆ | ★ | ☆ | | |
| 8-16 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 2 | ★ | ☆ | ★ | ☆ | | |
| 1-12 | OSAWA | N | MG BR | <45 | 45° | SQUARE | 3 | ★ | ☆ | ★ | ☆ | | |
| 1-20 | OSAWA | N | MG PV200 | <45 | 45° | SQUARE | 3 | ★ | ☆ | ★ | ☆ | | |
| 3-20 | OSAWA | N | MG PV200 | <45 | 45° | SQUARE | 3 | ★ | ☆ | ★ | ☆ | | |
| 2-6 | OSAWA | N | MG PV200 | <45 | 45° | SQUARE | 3 | ★ | ☆ | ★ | ☆ | | |
| 4-12 | OSAWA | N | MG PV200 | <45 | 45° | SQUARE | 3 | ★ | ☆ | ★ | ☆ | | |
| 8-20 | OSAWA | N | MG PV200 | <45 | 45° | SQUARE | 3 | ★ | ☆ | ★ | ☆ | | |
| 1-12 | OSAWA | N | MG BR | <45 | 30° | SQUARE | 4 | ★ | ☆ | ★ | ☆ | | |
| 1-25 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 4 | ★ | ☆ | ★ | ☆ | | |
| 3-20 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 4 | ★ | ☆ | ★ | ☆ | | |
| 2-6 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 4 | ★ | ☆ | ★ | ☆ | | |
| 3-12 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 4 | ★ | ☆ | ★ | ☆ | | |
| 8-20 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 4 | ★ | ☆ | ★ | ☆ | | |
| 16-20 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 4 | ★ | ☆ | ★ | ☆ | | |
| 6-20 | OSAWA | N | MG PV200 | <45 | 45° | SQUARE | 6 | ★ | ☆ | ★ | ☆ | | |
| 4-20 | OSAWA | N - HR | MG PV200 | <45 | 30° | SQUARE | 3-4 | ★ | ☆ | ★ | ☆ | | |
| 6-20 | OSAWA | N - HR | MG PV200 | <45 | 30° | SQUARE | 3-4 | ★ | ☆ | ★ | ☆ | | |
| 1-12 | OSAWA | N | MG PV200 | <45 | 30° | CORNER RADIUS | 2 | ★ | ☆ | ★ | ☆ | | |
| 1-12 | OSAWA | N | MG PV200 | <45 | 30° | CORNER RADIUS | 4 | ★ | ☆ | ★ | ☆ | | |
| 2-12 | OSAWA | N | MG PV200 | <45 | 30° | CORNER RADIUS | 4 | ★ | ☆ | ★ | ☆ | | |
| 1-12 | OSAWA | N | MG BR | <45 | 30° | BALL NOSE | 2 | ★ | ☆ | ★ | ☆ | | |
| 1-20 | OSAWA | N | MG PV200 | <45 | 30° | BALL NOSE | 2 | ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

| | ITEM No. | PAGE | |
|---|---|---|---|
| G2 general purpose, ball nose | **G2250** | 339 |  |
| | **G2251** | 339 |  |
| | **G2CSB4** | 341 |  |
| MDTA general purpose, square | **MDTACS2** | 344 |  |
| | **MDTA210** | 346 |  |
| | **MDCL2** | 348 |  |
| | **MDTACS3** | 350 |  |
| | **MDTAWSH3** | 352 |  |
| | **MDTACS4** | 354 |  |
| | **MDTA410** | 356 |  |
| | **MDCL4** | 358 |  |
| MDTA general purpose, roughing | **MDTAUPR** | 360 |  |
| MDTA general purpose, ball nose | **MDTACSB2** | 362 |  |
| | **MDTA250** | 364 |  |
| HF UNI < 40 HRC, 45° chamfer | **HF840** | 370 |  |
| | **HF440** | 374 |  |
| | **HF441** | 379 |  |
| HF UNI < 40 HRC, roughing | **HF844** | 385 |  |
| | **HF444** | 389 |  |
| | **HF445** | 393 |  |
| HF UNI < 40 HRC, corner radius | **HF342** | 398 |  |
| | **HF842** | 401 |  |
| | **HF442** | 405 |  |
| | **HF443** | 410 |  |
| | **HF542** | 415 |  |
| | **HF942** | 418 |  |
| | **HF943** | 422 |  |

Indice grafico Auswahlhilfe Indice graphique Índice gráfico Руководство по выбору

| RANGE | NORM | TYPE | MATERIAL / COATING | HRC | HELIX ANGLE | GEOMETRY | Z | ISO P | ISO M | ISO K | ISO N | ISO S | ISO H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-12 | OSAWA | N | MG PV200 | <45 | 30° | BALL NOSE | 2 | ★ | ☆ | ★ | ☆ | | |
| 6-20 | OSAWA | N | MG PV200 | <45 | 30° | BALL NOSE | 2 | ★ | ☆ | ★ | ☆ | | |
| 1-20 | OSAWA | N | MG PV200 | <45 | 30° | BALL NOSE | 4 | ★ | ☆ | ★ | ☆ | | |
| 1-20 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 2 | ★ | ☆ | ★ | ☆ | | |
| 3-12 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 2 | ★ | ☆ | ★ | ☆ | | |
| 3-12 | OSAWA | N | MG BR | <45 | 30° | SQUARE | 2 | ★ | ☆ | ★ | ☆ | | |
| 1-20 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 3 | ★ | ☆ | ★ | ☆ | | |
| 3-20 | OSAWA | N | MG PV200 | <45 | 45° | SQUARE | 3 | ★ | ☆ | ★ | ☆ | | |
| 1-20 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 4 | ★ | ☆ | ★ | ☆ | | |
| 3-16 | OSAWA | N | MG PV200 | <45 | 30° | SQUARE | 4 | ★ | ☆ | ★ | ☆ | | |
| 3-20 | OSAWA | N | MG BR | <45 | 30° | SQUARE | 4 | ★ | ☆ | ★ | ☆ | | |
| 6-20 | OSAWA | N - UP - NR | MG PV200 | <45 | 40° | C45° | 3-4 | ★ | ☆ | ★ | | | |
| 1-12 | OSAWA | N | MG PV200 | <45 | 30° | BALL NOSE | 2 | ★ | ☆ | ★ | ☆ | | |
| 3-12 | OSAWA | N | MG PV200 | <45 | 30° | BALL NOSE | 2 | ★ | ☆ | ★ | ☆ | | |
| 3-20 | OSAWA | VH/UP | MG PV300 | <40 | 36°/39° | CHAMFER 45° | 4 | ★ | ★ | ★ | | ★ | |
| 3-20 | OSAWA | VH/UP | MG PV300 | <40 | 36°/39° | CHAMFER 45° | 4 | ★ | ★ | ★ | | ★ | |
| 3-20 | OSAWA | VH/UP | MG PV300 | <40 | 36°/39° | CHAMFER 45° | 4 | ★ | ★ | ★ | | ★ | |
| 6-20 | OSAWA | VH/UP - HR | MG PV300 | <40 | 36°/39° | CHAMFER 45° | 4 | ★ | ★ | ★ | | ★ | |
| 6-20 | OSAWA | VH/UP - HR | MG PV300 | <40 | 36°/39° | CHAMFER 45° | 4 | ★ | ★ | ★ | | ★ | |
| 6-20 | OSAWA | VH/UP - HR | MG PV300 | <40 | 36°/39° | CHAMFER 45° | 4 | ★ | ★ | ★ | | ★ | |
| 3-12 | OSAWA | VH/UP | MG PV300 | <40 | 36°/39° | CORNER RADIUS | 4 | ★ | ★ | ★ | | ★ | |
| 4-20 | OSAWA | VH/UP | MG PV300 | <40 | 36°/39° | CORNER RADIUS | 4 | ★ | ★ | ★ | | ★ | |
| 3-20 | OSAWA | VH/UP | MG PV300 | <40 | 36°/39° | CORNER RADIUS | 4 | ★ | ★ | ★ | | ★ | |
| 3-20 | OSAWA | VH/UP | MG PV300 | <40 | 36°/39° | CORNER RADIUS | 4 | ★ | ★ | ★ | | ★ | |
| 6-20 | OSAWA | VH/UP | MG PV300 | <40 | 36°/39° | CORNER RADIUS | 4 | ★ | ★ | ★ | | ★ | |
| 4-20 | OSAWA | VH/UP | MG PV300 | <40 | 36°/39° | CORNER RADIUS | 4 | ★ | ★ | ★ | | ★ | |
| 4-20 | OSAWA | VH/UP | MG PV300 | <40 | 36°/39° | CORNER RADIUS | 4 | ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

| | ITEM No. | PAGE | |
|---|---|---|---|
| HF UNI < 40 HRC, corner radius | **HF642** | 426 |  |
| | **HF643** | 429 |  |
| | **HF742** | 432 |  |
| | **HF743** | 435 |  |
| HF UNI SC < 40 HRC, 45° chamfer + corner radius | **HF871** | 438 |  |
| HF HARD 30÷55 HRC, 45° chamfer | **HF850** | 443 |  |
| | **HF450** | 447 |  |
| | **HF451** | 451 |  |
| HF HARD 30÷55 HRC, corner radius | **HF852** | 455 |  |
| | **HF452** | 459 |  |
| MEF stainless steel and super alloys, square | **MEFCS2** | 464 |  |
| | **MEFCSH3** | 466 |  |
| | **MEFCS4** | 468 |  |
| | **MEF600** | 470 |  |
| MEF stainless steel and super alloys, roughing | **MEF901** | 472 |  |
| | **MEF902** | 474 |  |
| ALU unequal pitch, square | **HFAL4** | 478 |  |
| ALU unequal pitch, corner radius | **HFAL3** | 481 |  |
| | **HFA53** | 484 |  |
| ALU square | **MDCSA1** | 487 |  |
| | **MDCSA2** | 489 |  |
| | **MDCSA3** | 492 |  |
| | **MDA310** | 494 |  |
| | **MDA311** | 494 |  |
| | **MDA312** | 494 |  |
| | **MDCSAM** | 497 |  |
| ALU corner radius | **MCA212R** | 499 |  |

| RANGE | NORM | TYPE | MATERIAL / COATING | HRC | HELIX ANGLE | GEOMETRY | Z | ISO P | ISO M | ISO K | ISO N | ISO S | ISO H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4-20 | OSAWA | VH | MG PV300 | <40 | 36°/37°/38° | CORNER RADIUS | 5 | ★ | ★ | ★ | | ★ | |
| 4-20 | OSAWA | VH | MG PV300 | <40 | 36°/37°/38° | CORNER RADIUS | 5 | ★ | ★ | ★ | | ★ | |
| 6-20 | OSAWA | VH | MG PV300 | <40 | 36°/37°/38° | CORNER RADIUS | 5 | ★ | ★ | ★ | | ★ | |
| 6-20 | OSAWA | VH | MG PV300 | <40 | 36°/37°/38° | CORNER RADIUS | 5 | ★ | ★ | ★ | | ★ | |
| 1-20 | OSAWA | VH/UP | MG PV300 | <40 | 36°/39° | CR+C45° | 4 | ★ | ★ | ★ | | ★ | |
| 3-20 | OSAWA | UP | MG PV300 | 35÷55 | 40° | CHAMFER 45° | 4 | ★ | ★ | ★ | | ★ | ★ |
| 3-20 | OSAWA | UP | MG PV300 | 35÷55 | 40° | CHAMFER 45° | 4 | ★ | ★ | ★ | | ★ | ★ |
| 3-20 | OSAWA | UP | MG PV300 | 35÷55 | 40° | CHAMFER 45° | 4 | ★ | ★ | ★ | | ★ | ★ |
| 4-20 | OSAWA | UP | MG PV300 | 35÷55 | 40° | CORNER RADIUS | 4 | ★ | ★ | ★ | | ★ | ★ |
| 3-20 | OSAWA | UP | MG PV300 | 35÷55 | 40° | CORNER RADIUS | 4 | ★ | ★ | ★ | | ★ | ★ |
| 1-16 | OSAWA | VA | UMG ENDLESS | <45 | 35° | SQUARE | 2 | ★ | ★ | | | ★ | |
| 6-20 | OSAWA | VA | UMG ENDLESS | <45 | 50° | SQUARE | 3 | ★ | ★ | | | ★ | |
| 2-20 | OSAWA | VA | UMG ENDLESS | <45 | 35° | SQUARE | 4 | ★ | ★ | | | ★ | |
| 6-20 | OSAWA | VA | UMG ENDLESS | <45 | 50° | SQUARE | 6-8 | ★ | ★ | | | ★ | |
| 4-20 | OSAWA | VA - HR | UMG ENDLESS | <45 | 45° | SQUARE | 3-6 | ★ | ★ | | | ★ | |
| 6-20 | OSAWA | VA - HR | UMG ENDLESS | <45 | 45° | SQUARE | 4-6 | ★ | ★ | | | ★ | |
| 3-20 | OSAWA | UP ALU | MG BR | | 40° | SQUARE | 4 | | | | ★ | | |
| 2-20 | OSAWA | UP ALU | MG POLISHED | | 30° | CORNER RADIUS | 3 | | | | ★ | | |
| 3-20 | OSAWA | UP ALU | MG BR | | 30° | CORNER RADIUS | 3 | | | | ★ | | |
| 2-12 | OSAWA | ALU | MG POLISHED | | 25° | SQUARE | 1 | | | | ★ | | |
| 1-20 | OSAWA | ALU | MG POLISHED | | 45° | SQUARE | 2 | | | | ★ | | |
| 1-20 | OSAWA | ALU | MG POLISHED | | 55° | SQUARE | 3 | | | | ★ | | |
| 3-6 | OSAWA | ALU | MG POLISHED | | 55° | SQUARE | 3 | | | | ★ | | |
| 3-12 | OSAWA | ALU | MG POLISHED | | 55° | SQUARE | 3 | | | | ★ | | |
| 8-20 | OSAWA | ALU | MG POLISHED | | 55° | SQUARE | 3 | | | | ★ | | |
| 6-12 | OSAWA | ALU | MG POLISHED | | 50° | SQUARE | 6 | | | | ★ | | |
| 2-12 | OSAWA | ALU | MG PV200 | | 25° | CORNER RADIUS | 2 | | | | ★ | | |

★ 1st choice ☆ suitable

| | ITEM No. | PAGE | |
|---|---|---|---|
| ALU ball nose | **MDCAB2** | 501 |  |
| MEX 30÷55 HRC, square | **MEXM2** | 504 |  |
| | **MEXM2SC** | 506 |  |
| | **MEXLN2** | 508 |  |
| | **MEXCS2** | 513 |  |
| | **MEXCL2** | 515 |  |
| MEX 30÷55 HRC, square | **MEX400** | 517 |  |
| | **MEXCL4** | 519 |  |
| | **MEXCSHM** | 521 |  |
| | **MEXCLHM** | 523 |  |
| MEX 30÷55 HRC, roughing | **MEXCSFR** | 525 |  |
| MEX 30÷55 HRC, corner radius | **MEXLN2R** | 527 |  |
| | **MEXLS2R** | 533 |  |
| | **MEXCS4R** | 535 |  |
| | **MEX410R** | 538 |  |
| | **MEXLS4R** | 540 |  |
| | **MEX610R** | 542 |  |
| | **MEX611R** | 544 |  |
| MEX 30÷55 HRC and MH 30÷70 HRC, ball nose | **MHMB204** | 546 |  |
| | **MHMB206** | 548 |  |
| | **MHLNB2** | 550 |  |
| | **MHCRB2** | 555 |  |
| | **MEXCSB2** | 557 |  |
| | **MEXCLSB2** | 559 |  |
| | **MEX253** | 561 |  |
| UH < 70 HRC, square | **UHM204** | 564 |  |
| | **UHLN2** | 566 |  |

| RANGE | NORM | TYPE | MATERIAL / COATING | HRC | HELIX ANGLE | GEOMETRY | Z | ISO P | ISO M | ISO K | ISO N | ISO S | ISO H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-12 | OSAWA | ALU | MG POLISHED | | 40° | BALL NOSE | 2 | | | | ★ | | |
| 0.3-2 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 40° | SQUARE | 2 | ★ | | ★ | | | ★ |
| 0.2-0.9 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 40° | SQUARE | 2 | ★ | | ★ | | | ★ |
| 0.2-4 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 40° | SQUARE | 2 | ★ | | ★ | | | ★ |
| 1-20 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 40° | SQUARE | 2 | ★ | | ★ | | | ★ |
| 1-12 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 40° | SQUARE | 2 | ★ | | ★ | | | ★ |
| 1-25 | OSAWA | MEX UP | UMG ENDLESS ORANGE | <55 | 40° | SQUARE | 4 | ★ | | ★ | | | ★ |
| 2-25 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 30°-40° | SQUARE | 4 | ★ | | ★ | | | ★ |
| 3-20 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 50° | SQUARE | 6-8 | ★ | | ★ | | | ★ |
| 3-20 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 50° | SQUARE | 6-8 | ★ | | ★ | | | ★ |
| 6-20 | OSAWA | MEX - HR | UMG ENDLESS ORANGE | <55 | 20° | SQUARE | 3-4 | ★ | | ★ | | | ★ |
| 0.3-4 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 40° | CORNER RADIUS | 2 | ★ | | ★ | | | ★ |
| 2-16 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 40° | CORNER RADIUS | 2 | ★ | | ★ | | | ★ |
| 1-20 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 40° | CORNER RADIUS | 4 | ★ | | ★ | | | ★ |
| 2-12 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 30° | CORNER RADIUS | 4 | ★ | | ★ | | | ★ |
| 2-16 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 40° | CORNER RADIUS | 4 | ★ | | ★ | | | ★ |
| 6-12 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 45° | CORNER RADIUS | 6 | ★ | | ★ | | | ★ |
| 6-12 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 45° | CORNER RADIUS | 6 | ★ | | ★ | | | ★ |
| 0.2-2 | OSAWA | MH | NMG MH COAT | 30÷70 | 30° | BALL NOSE | 2 | ★ | | ★ | | | ★ |
| 0.2-0.8 | OSAWA | MH | NMG MH COAT | 30÷70 | 30° | BALL NOSE | 2 | ★ | | ★ | | | ★ |
| 0.2-4 | OSAWA | MH | NMG MH COAT | 30÷70 | 30° | BALL NOSE | 2 | ★ | | ★ | | | ★ |
| 0.5-2 | OSAWA | MH | NMG MH COAT | 30÷70 | 30° | BALL NOSE | 2 | ★ | | ★ | | | ★ |
| 1-20 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 30° | BALL NOSE | 2 | ★ | | ★ | | | ★ |
| 1-20 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 30° | BALL NOSE | 2 | ★ | | ★ | | | ★ |
| 1-20 | OSAWA | MEX | UMG ENDLESS ORANGE | <55 | 30° | BALL NOSE | 2 | ★ | | ★ | | | ★ |
| 0.1-0.9 | OSAWA | UH | NMG UH RED | <70 | 40° | SQUARE | 2 | ☆ | | ☆ | | | ★ |
| 0.2-4 | OSAWA | UH | NMG UH RED | <70 | 40° | SQUARE | 2 | ☆ | | ☆ | | | ★ |

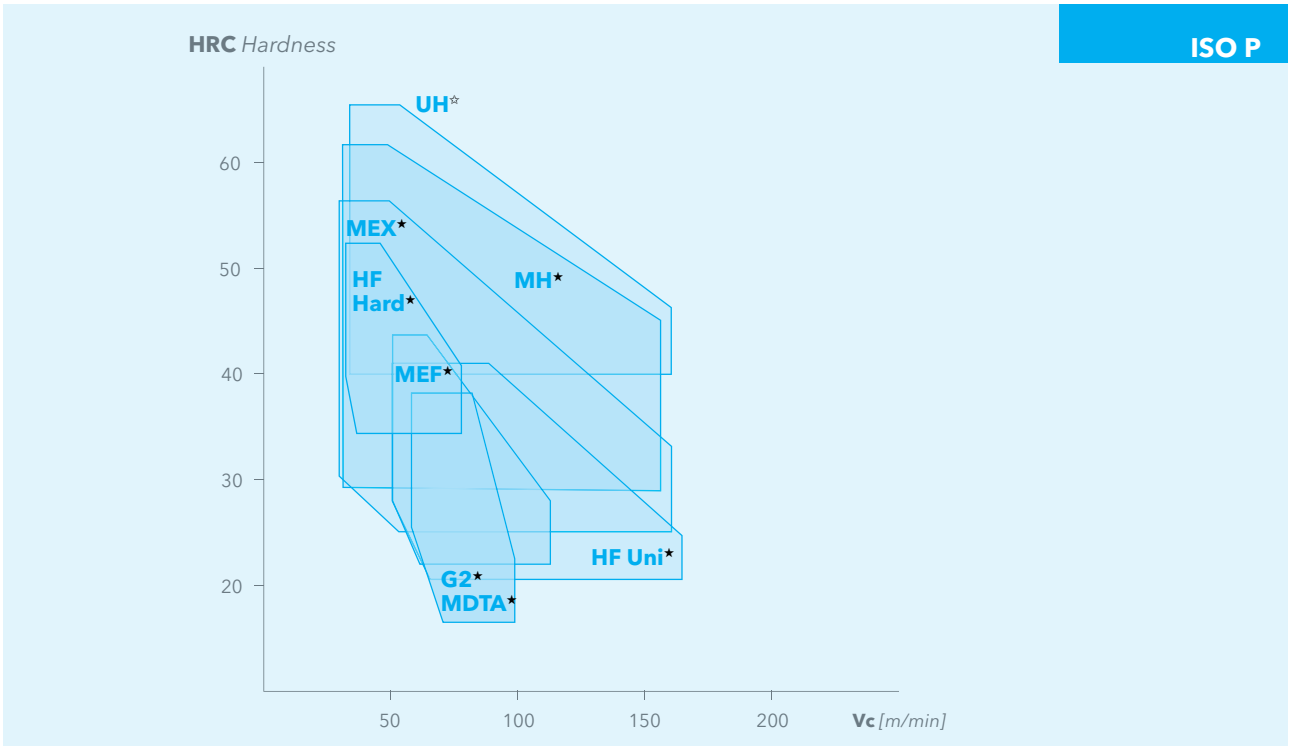
★ 1st choice ☆ suitable

| | ITEM No. | PAGE | |
|---|---|---|---|
| UH < 70 HRC, square | **UH600** | 571 |  |
| | **UH612** | 573 |  |
| UH < 70 HRC, corner radius | **UHM206** | 575 |  |
| | **UH211** | 577 |  |
| | **UH212** | 579 |  |
| | **UHCS2** | 584 |  |
| | **UHF4LN** | 586 |  |
| | **UHF-RT** | 590 |  |
| | **UHF4** | 592 |  |
| | **UHCS4** | 594 |  |
| | **UH410** | 596 |  |
| | **UH411** | 599 |  |
| | **UH412** | 601 |  |
| | **UH413** | 603 |  |
| | **UH610R** | 605 |  |
| | **UH611R** | 607 |  |
| UH < 70 HRC and MH 30÷70 HRC, ball nose | **MHMB204** | 609 |  |
| | **MHMB206** | 611 |  |
| | **MHLNB2** | 613 |  |
| | **MHCRB2** | 618 |  |
| | **UHCSB2** | 620 |  |
| | **UH250** | 622 |  |
| | **UH253** | 624 |  |

| RANGE | NORM | TYPE | MATERIAL / COATING | HRC | HELIX ANGLE | GEOMETRY | Z | ISO P | ISO M | ISO K | ISO N | ISO S | ISO H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3-20 | OSAWA | UH | NMG UH RED | <70 | 50° | SQUARE | 6-8 | ☆ | | ☆ | | | ★ |
| 3-20 | OSAWA | UH | NMG UH RED | <70 | 50° | SQUARE | 6-8 | ☆ | | ☆ | | | ★ |
| 0.3-2 | OSAWA | UH | NMG UH RED | <70 | 40° | CORNER RADIUS | 2 | ☆ | | ☆ | | | ★ |
| 1-6 | OSAWA | UH | NMG UH RED | <70 | 40° | CORNER RADIUS | 2 | ☆ | | ☆ | | | ★ |
| 0.2-4 | OSAWA | UH | NMG UH RED | <70 | 40° | CORNER RADIUS | 2 | ☆ | | ☆ | | | ★ |
| 1-12 | OSAWA | UH | NMG UH RED | <70 | 40° | CORNER RADIUS | 2 | ☆ | | ☆ | | | ★ |
| 1-4 | OSAWA | UP – UH | NMG UH RED | <70 | 25° | CORNER RADIUS | 4 | ☆ | | ☆ | | | ★ |
| 2-12 | OSAWA | UH | NMG UH RED | <70 | 25° | CORNER RADIUS | 4-6 | ☆ | | ☆ | | | ★ |
| 2-12 | OSAWA | UH | NMG UH RED | <70 | 25° | CORNER RADIUS | 4 | ☆ | | ☆ | | | ★ |
| 1-12 | OSAWA | UH | NMG UH RED | <70 | 40° | CORNER RADIUS | 4 | ☆ | | ☆ | | | ★ |
| 1-20 | OSAWA | UH | NMG UH RED | <70 | 40° | CORNER RADIUS | 4 | ☆ | | ☆ | | | ★ |
| 3-12 | OSAWA | UH | NMG UH RED | <70 | 40° | CORNER RADIUS | 4 | ☆ | | ☆ | | | ★ |
| 2-12 | OSAWA | UH | NMG UH RED | <70 | 40° | CORNER RADIUS | 4 | ☆ | | ☆ | | | ★ |
| 6-16 | OSAWA | UH | NMG UH RED | <70 | 40° | CORNER RADIUS | 4 | ☆ | | ☆ | | | ★ |
| 6-12 | OSAWA | UH | NMG UH RED | <70 | 50° | CORNER RADIUS | 6 | ☆ | | ☆ | | | ★ |
| 6-20 | OSAWA | UH | NMG UH RED | <70 | 50° | CORNER RADIUS | 6 | ☆ | | ☆ | | | ★ |
| 0.2-0.8 | OSAWA | MH | NMG MH COAT | 30÷70 | 30° | BALL NOSE | 2 | ☆ | | ☆ | | | ★ |
| 0.4-0.8 | OSAWA | MH | NMG MH COAT | 30÷70 | 30° | BALL NOSE | 2 | ☆ | | ☆ | | | ★ |
| 0.2-4 | OSAWA | MH | NMG MH COAT | 30÷70 | 30° | BALL NOSE | 2 | ☆ | | ☆ | | | ★ |
| 0.5-2 | OSAWA | MH | NMG MH COAT | 30÷70 | 30° | BALL NOSE | 2 | ☆ | | ☆ | | | ★ |
| 1-20 | OSAWA | UH | NMG UH RED | <70 | 30° | BALL NOSE | 2 | ☆ | | ☆ | | | ★ |
| 1-20 | OSAWA | UH | NMG UH RED | <70 | 30° | BALL NOSE | 2 | ☆ | | ☆ | | | ★ |
| 1-20 | OSAWA | UH | NMG UH RED | <70 | 30° | BALL NOSE | 2 | ☆ | | ☆ | | | ★ |

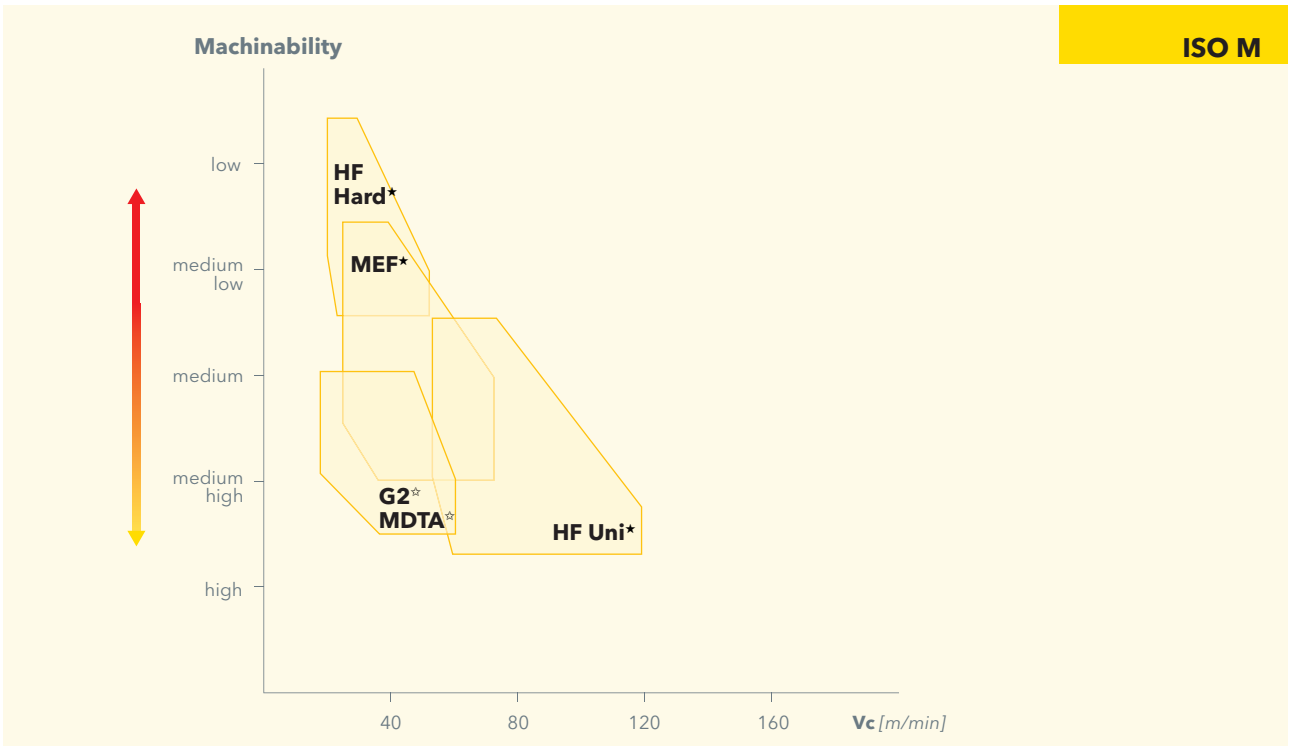
★ 1st choice ☆ suitable

## STEEL APPLICATION




★ 1st choice ☆ suitable

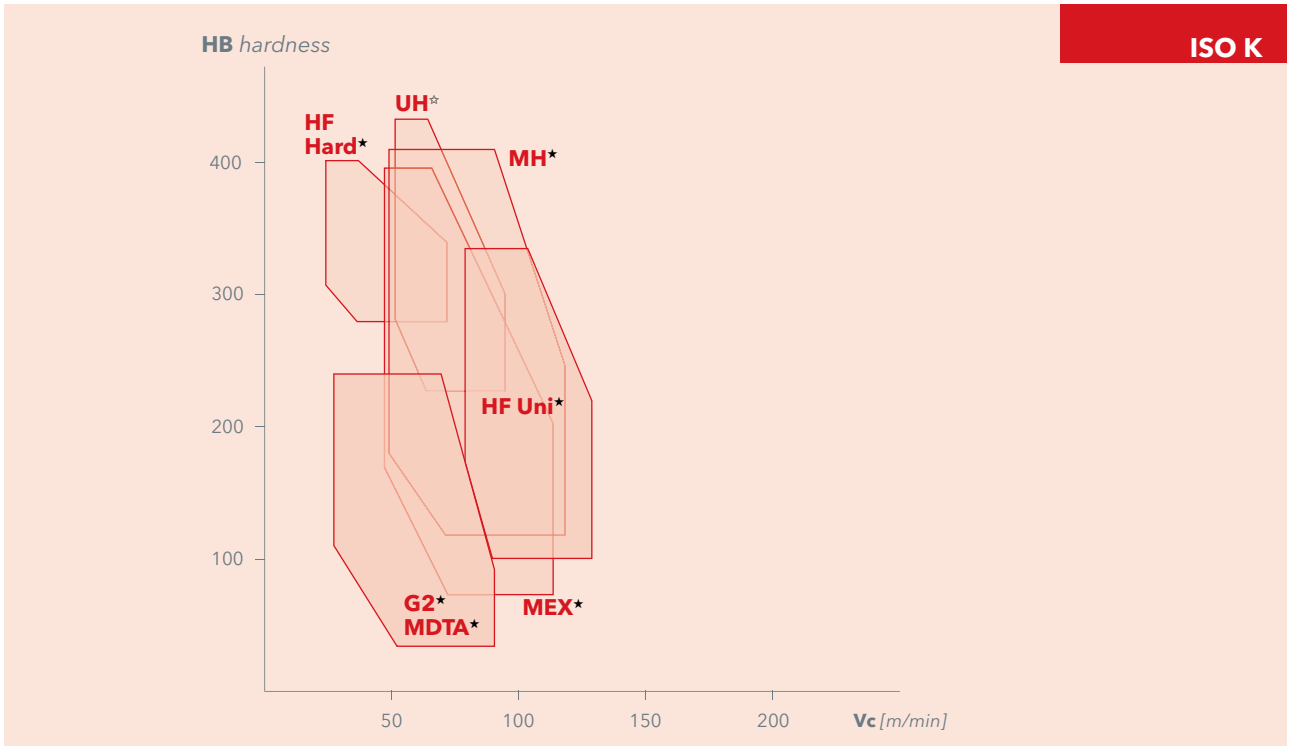
## STAINLESS STEEL APPLICATION




★ 1st choice ☆ suitable

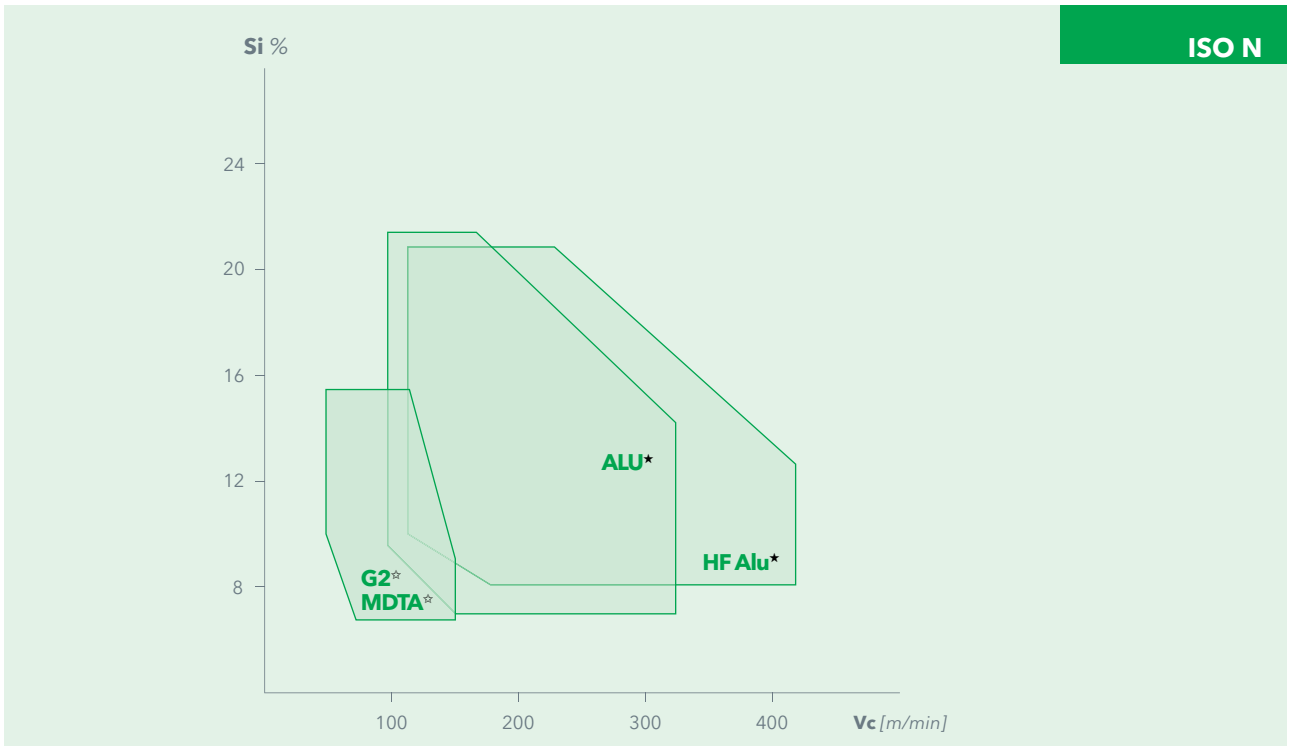
G2 : general purpose (page 298)
MDTA : general purpose (page 344)
HF UNI : universal purpose (page 370)
HF HARD : special purpose (page 443)
MEF : special purpose (page 464)
MEX : special purpose (page 504)
MH : special purpose (page 546/609)
UH :special purpose (page 564)

## CAST IRON APPLICATION




★ 1st choice ☆ suitable

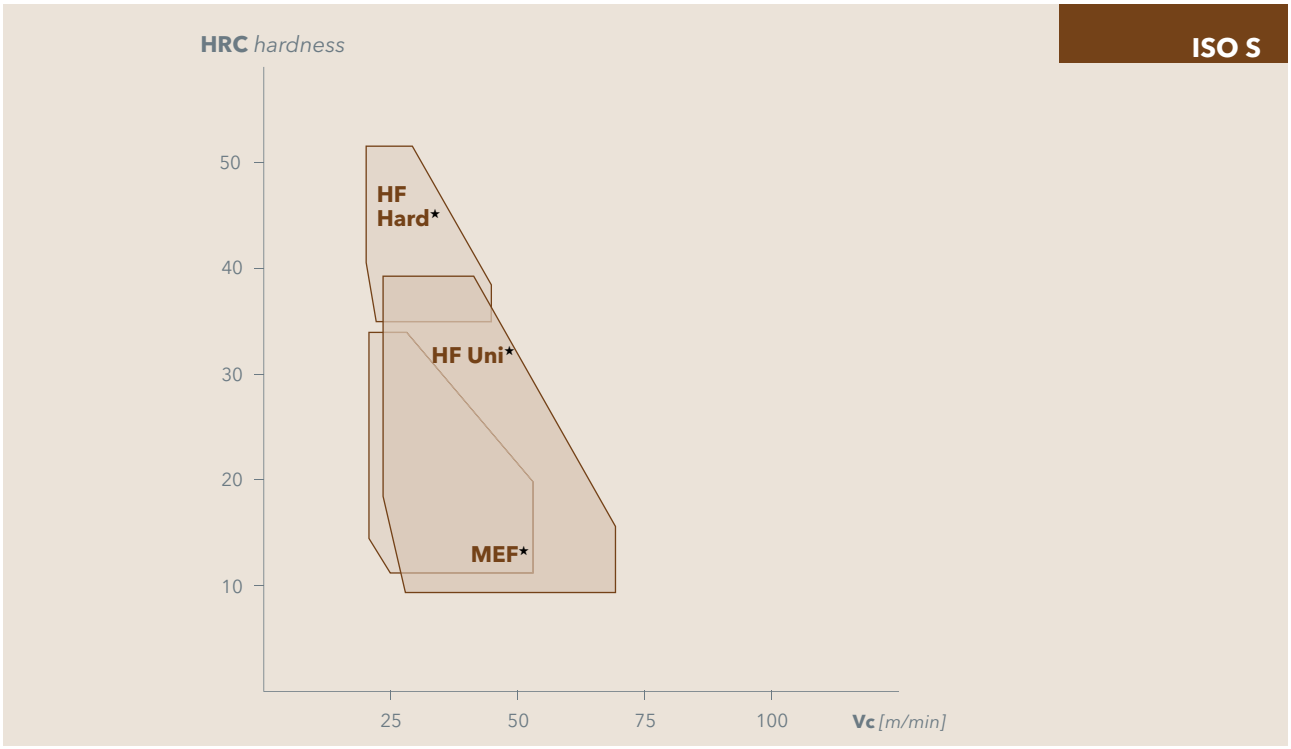
## NON-FERROUS MATERIALS APPLICATION




★ 1st choice ☆ suitable

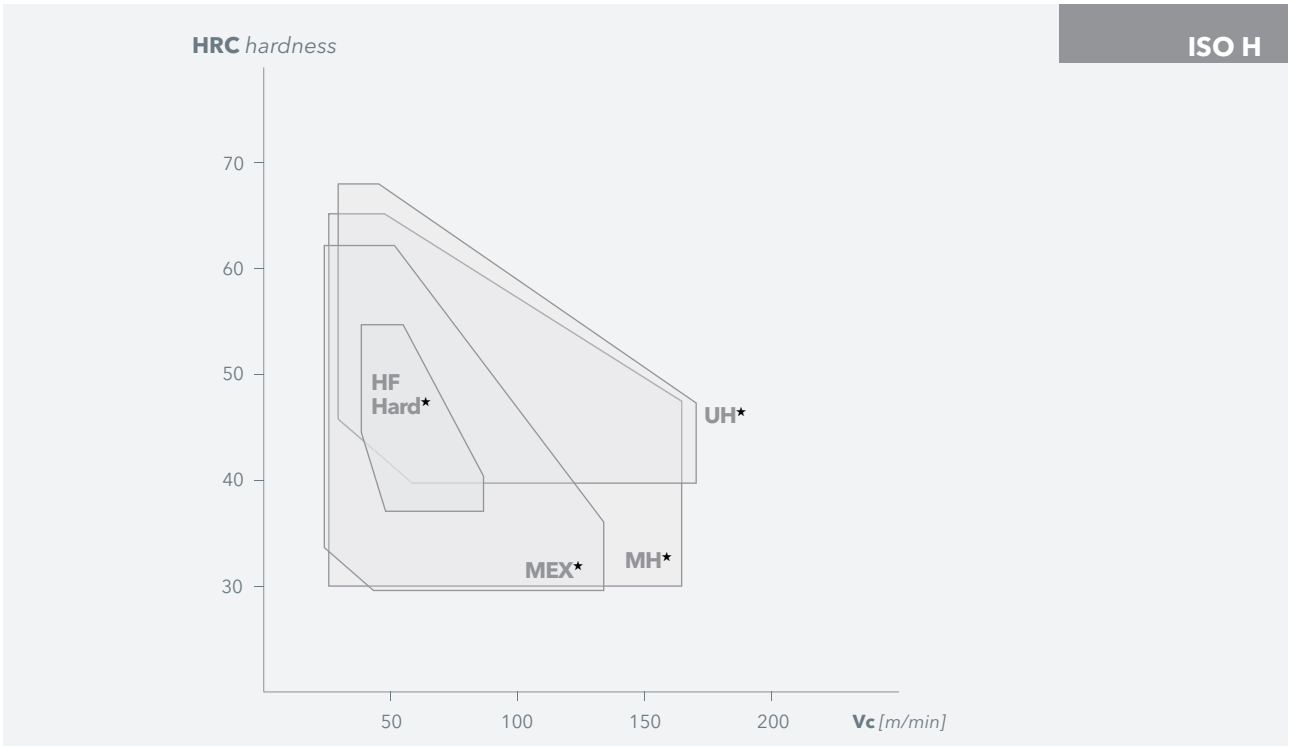
G2 : general purpose (page 298)
MDTA : general purpose (page 344)
HF UNI : universal purpose (page 370)
HF HARD : special purpose (page 443)
ALU : special purpose (page 478)
MEX : special purpose (page 504)
MH : special purpose (page 546/609)
UH :special purpose (page 564)

## SUPER ALLOYS APPLICATION




★ 1st choice ☆ suitable

## HARDENED STEEL APPLICATION




★ 1st choice ☆ suitable

HF UNI : universal purpose (page 370)
HF HARD : special purpose (page 443)
MEF : special purpose (page 464)
MEX : special purpose (page 504)
MH : special purpose (page 546/609)
UH :special purpose (page 564)





# G2
## GENERAL PURPOSE

Range of general-purpose endmills, featuring new cutting geometries and innovative coatings for enhanced performance. The answer given by Osawa to the market demand for higher performance tools. Thanks to a fully optimized manufacturing process and to large production batches the G2 range excels in the cost-performance ratio.

Gamma di frese per uso generico, dotate di geometria di taglio e rivestimenti innovativi per garantire prestazioni ancora più elevate. La risposta di Osawa ad un mercato che chiede utensili sempre più performanti e competitivi. L'innovazione nei processi produttivi consente alla gamma G2 di eccellere nel rapporto qualità-prezzo.

Produktpalette von Fräser für allgemeine Anwendungen, ausgestattet mit einer Schnittgeometrie und innovativen Beschichtungen zur Gewährleistung noch höheren Leistungen. Die Antwort von Osawa auf einen Markt, der immer leistungsstärkere und wettbewerbsfähigere Werkzeuge fordert. Dank der Innovation der Produktionsprozesse zeichnet sich die Produktreihe G2 durch ein außergewöhnliches Preis-Leistungsverhältnis aus.

Gamme de fraises pour un usage général, dotées de géométrie de coupe et de revêtements innovants pour garantir des prestations encore plus élevées. C'est la réponse d'Osawa à un marché qui nécessite d'outils de plus en plus performants et compétitifs. L'innovation des processus de production permet à la gamme G2 d'avoir un rapport qualité-prix excellent.

Gama de fresas para uso genérico, provistas de geometría de corte y revestimientos innovadores para garantizar prestaciones aún más elevadas. La respuesta de Osawa a un mercado que pide herramientas cada vez con mayor rendimiento y más competitivas. La innovación en los procesos de producción permite a la gama G2 sobresalir en la relación calidad-precio.

Ассортимент фрез общего назначения, с новой геометрией и покрытиями, гарантирующими высокоэффективную работу. Это ответ компании Osawa на запросы рынка, который требует всё более конкурентоспособные инструменты с высокими эксплуатационными характеристиками. Инновации в производственных процессах и большие изготавливаемые партии позволяют серии G2 иметь превосходное соотношение цена-качество.

# GB205

cylindrical shank, 2 flutes

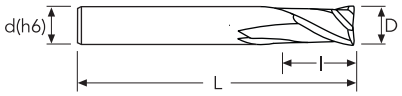
OSAWA NORM | N | MG / BR | <45 HRC | 30° | SQUARE | Z2



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | | | 4 | 3 | | 50 | 2 | GB205010 | ● |
| **1.5** | 0/-0.020 | | | 4 | 4.5 | | 50 | 2 | GB205015 | ● |
| **2** | 0/-0.020 | | | 4 | 6 | | 50 | 2 | GB205020 | ● |
| **3** | 0/-0.020 | | | 4 | 8 | | 50 | 2 | GB205030 | ● |
| **4** | 0/-0.020 | | | 4 | 11 | | 50 | 2 | GB205040 | ● |
| **5** | 0/-0.020 | | | 6 | 13 | | 50 | 2 | GB205050 | ● |
| **6** | 0/-0.020 | | | 6 | 15 | | 50 | 2 | GB205060 | ● |
| **8** | 0/-0.025 | | | 8 | 20 | | 60 | 2 | GB205080 | ● |
| **10** | 0/-0.025 | | | 10 | 30 | | 75 | 2 | GB205100 | ● |
| **12** | 0/-0.025 | | | 12 | 30 | | 75 | 2 | GB205120 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# GB205

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.3D x D** | **0.5D x D** |
| | Vc (m/min) | **50÷60** | **30÷50** | **20÷40** | **70÷90** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.004 | 0.003 | 0.003 | 0.005 |
| | **2** | 0.007 | 0.006 | 0.005 | 0.009 |
| | **3** | 0.010 | 0.009 | 0.008 | 0.013 |
| | **4** | 0.014 | 0.012 | 0.011 | 0.018 |
| | **5** | 0.018 | 0.015 | 0.014 | 0.023 |
| | **6** | 0.023 | 0.020 | 0.017 | 0.030 |
| | **8** | 0.030 | 0.026 | 0.023 | 0.039 |
| | **10** | 0.038 | 0.032 | 0.029 | 0.049 |
| | **12** | 0.045 | 0.038 | 0.034 | 0.059 |

< D3 mm: ap = 0.2D

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.2D** | **1.5D x 0.3D** |
| | Vc (m/min) | **50÷60** | **30÷50** | **20÷40** | **70÷90** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.004 | 0.004 | 0.003 | 0.006 |
| | **2** | 0.009 | 0.007 | 0.007 | 0.011 |
| | **3** | 0.013 | 0.011 | 0.009 | 0.016 |
| | **4** | 0.018 | 0.015 | 0.013 | 0.023 |
| | **5** | 0.023 | 0.019 | 0.017 | 0.029 |
| | **6** | 0.029 | 0.024 | 0.022 | 0.037 |
| | **8** | 0.038 | 0.032 | 0.028 | 0.049 |
| | **10** | 0.048 | 0.040 | 0.036 | 0.062 |
| | **12** | 0.056 | 0.048 | 0.042 | 0.073 |

< D3 mm: ae = 0.2D

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **D x D** | **D x D** | **D x D** | **D x D** |
| | Vc (m/min) | **40÷50** | **30÷40** | **20÷30** | **60÷80** |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.002 | 0.002 | 0.002 | 0.003 |
| | **2** | 0.004 | 0.004 | 0.003 | 0.006 |
| | **3** | 0.006 | 0.005 | 0.005 | 0.008 |
| | **4** | 0.009 | 0.007 | 0.007 | 0.011 |
| | **5** | 0.011 | 0.010 | 0.008 | 0.015 |
| | **6** | 0.014 | 0.012 | 0.011 | 0.019 |
| | **8** | 0.019 | 0.016 | 0.014 | 0.024 |
| | **10** | 0.024 | 0.020 | 0.018 | 0.031 |
| | **12** | 0.028 | 0.024 | 0.021 | 0.037 |

< D3 mm: ap = 0.5D

# G2CS2

cylindrical shank, 2 flutes

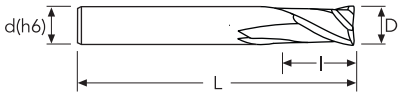
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z2



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | | | 4 | 3 | | 50 | 2 | G2CS2010 | ● |
| **1.5** | 0/-0.020 | | | 4 | 4.5 | | 50 | 2 | G2CS2015 | ● |
| **2** | 0/-0.020 | | | 4 | 6 | | 50 | 2 | G2CS2020 | ● |
| **2.5** | 0/-0.020 | | | 4 | 7 | | 50 | 2 | G2CS2025 | ● |
| **3** | 0/-0.020 | | | 4 | 8 | | 50 | 2 | G2CS2030 | ● |
| **3.5** | 0/-0.020 | | | 4 | 10 | | 50 | 2 | G2CS2035 | ● |
| **4** | 0/-0.020 | | | 4 | 11 | | 50 | 2 | G2CS2040 | ● |
| **4.5** | 0/-0.020 | | | 6 | 13 | | 50 | 2 | G2CS2045 | ● |
| **5** | 0/-0.020 | | | 6 | 13 | | 50 | 2 | G2CS2050 | ● |
| **5.5** | 0/-0.020 | | | 6 | 13 | | 50 | 2 | G2CS2055 | ● |
| **6** | 0/-0.020 | | | 6 | 15 | | 50 | 2 | G2CS2060 | ● |
| **6.5** | 0/-0.025 | | | 8 | 17 | | 60 | 2 | G2CS2065 | ● |
| **7** | 0/-0.025 | | | 8 | 17 | | 60 | 2 | G2CS2070 | ● |
| **7.5** | 0/-0.025 | | | 8 | 17 | | 60 | 2 | G2CS2075 | ● |
| **8** | 0/-0.025 | | | 8 | 20 | | 60 | 2 | G2CS2080 | ● |
| **8.5** | 0/-0.025 | | | 10 | 23 | | 75 | 2 | G2CS2085 | ● |
| **9** | 0/-0.025 | | | 10 | 23 | | 75 | 2 | G2CS2090 | ● |
| **10** | 0/-0.025 | | | 10 | 30 | | 75 | 2 | G2CS2100 | ● |
| **10.5** | 0/-0.025 | | | 12 | 25 | | 75 | 2 | G2CS2105 | ● |
| **11** | 0/-0.025 | | | 12 | 28 | | 75 | 2 | G2CS2110 | ● |
| **12** | 0/-0.025 | | | 12 | 30 | | 75 | 2 | G2CS2120 | ● |
| **13** | 0/-0.030 | | | 16 | 33 | | 100 | 2 | G2CS2130 | ● |
| **14** | 0/-0.030 | | | 14 | 26 | | 83 | 2 | G2CS2140 | ● |
| **15** | 0/-0.030 | | | 16 | 40 | | 100 | 2 | G2CS2150 | ● |
| **16** | 0/-0.030 | | | 16 | 32 | | 92 | 2 | G2CS2160 | ● |
| **17** | 0/-0.030 | | | 20 | 40 | | 100 | 2 | G2CS2170 | ● |
| **18** | 0/-0.030 | | | 20 | 40 | | 100 | 2 | G2CS2180 | ● |
| **20** | 0/-0.030 | | | 20 | 40 | | 100 | 2 | G2CS2200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# G2CS2

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **100÷120** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.004 | 0.003 | 0.003 | 0.005 |
| | **2** | 0.008 | 0.007 | 0.006 | 0.010 |
| | **3** | 0.012 | 0.010 | 0.009 | 0.016 |
| | **4** | 0.016 | 0.014 | 0.012 | 0.021 |
| | **5** | 0.020 | 0.017 | 0.015 | 0.026 |
| | **6** | 0.025 | 0.021 | 0.019 | 0.033 |
| | **8** | 0.032 | 0.027 | 0.024 | 0.042 |
| | **10** | 0.038 | 0.032 | 0.029 | 0.049 |
| | **12** | 0.045 | 0.038 | 0.034 | 0.059 |
| | **14** | 0.052 | 0.044 | 0.039 | 0.068 |
| | **16** | 0.060 | 0.051 | 0.045 | 0.078 |
| | **18** | 0.070 | 0.060 | 0.053 | 0.091 |
| | **20** | 0.080 | 0.068 | 0.060 | 0.104 |

< D3 mm: ap = 0.2D

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.5D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **100÷120** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.005 | 0.004 | 0.004 | 0.006 |
| | **2** | 0.010 | 0.008 | 0.007 | 0.012 |
| | **3** | 0.014 | 0.012 | 0.011 | 0.019 |
| | **4** | 0.019 | 0.016 | 0.014 | 0.025 |
| | **5** | 0.024 | 0.020 | 0.018 | 0.031 |
| | **6** | 0.030 | 0.026 | 0.023 | 0.039 |
| | **8** | 0.038 | 0.033 | 0.029 | 0.050 |
| | **10** | 0.046 | 0.039 | 0.034 | 0.059 |
| | **12** | 0.054 | 0.046 | 0.041 | 0.070 |
| | **14** | 0.062 | 0.053 | 0.047 | 0.081 |
| | **16** | 0.072 | 0.061 | 0.054 | 0.094 |
| | **18** | 0.084 | 0.071 | 0.063 | 0.109 |
| | **20** | 0.096 | 0.082 | 0.072 | 0.125 |

< D3 mm: ae = 0.2D

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **D x D** | **D x D** | **D x D** | **D x D** |
| | Vc (m/min) | **70÷90** | **40÷60** | **25÷35** | **80÷100** |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.002 | 0.002 | 0.002 | 0.003 |
| | **2** | 0.005 | 0.004 | 0.004 | 0.006 |
| | **3** | 0.007 | 0.006 | 0.005 | 0.009 |
| | **4** | 0.010 | 0.008 | 0.007 | 0.012 |
| | **5** | 0.012 | 0.010 | 0.009 | 0.016 |
| | **6** | 0.015 | 0.013 | 0.011 | 0.020 |
| | **8** | 0.019 | 0.016 | 0.014 | 0.025 |
| | **10** | 0.023 | 0.019 | 0.017 | 0.030 |
| | **12** | 0.027 | 0.023 | 0.020 | 0.035 |
| | **14** | 0.031 | 0.027 | 0.023 | 0.041 |
| | **16** | 0.036 | 0.031 | 0.027 | 0.047 |
| | **18** | 0.042 | 0.036 | 0.032 | 0.055 |
| | **20** | 0.048 | 0.041 | 0.036 | 0.062 |

< D3 mm: ap = 0.5D

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# G2WS2

weldon shank, 2 flutes

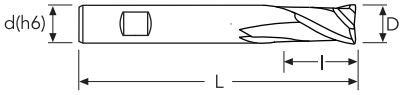
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z2



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.020 | | | 6 | 8 | | 57 | 2 | G2WS2030 | ● |
| **4** | 0/-0.020 | | | 6 | 11 | | 57 | 2 | G2WS2040 | ● |
| **5** | 0/-0.020 | | | 6 | 13 | | 57 | 2 | G2WS2050 | ● |
| **6** | 0/-0.020 | | | 6 | 13 | | 57 | 2 | G2WS2060 | ● |
| **8** | 0/-0.025 | | | 8 | 19 | | 63 | 2 | G2WS2080 | ● |
| **10** | 0/-0.025 | | | 10 | 22 | | 72 | 2 | G2WS2100 | ● |
| **12** | 0/-0.025 | | | 12 | 26 | | 83 | 2 | G2WS2120 | ● |
| **14** | 0/-0.030 | | | 14 | 26 | | 83 | 2 | G2WS2140 | ● |
| **16** | 0/-0.030 | | | 16 | 32 | | 92 | 2 | G2WS2160 | ● |
| **20** | 0/-0.030 | | | 20 | 38 | | 104 | 2 | G2WS2200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# G2WS2

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **100÷120** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.012 | 0.010 | 0.009 | 0.016 |
| | **4** | 0.016 | 0.014 | 0.012 | 0.021 |
| | **5** | 0.020 | 0.017 | 0.015 | 0.026 |
| | **6** | 0.025 | 0.021 | 0.019 | 0.033 |
| | **8** | 0.032 | 0.027 | 0.024 | 0.042 |
| | **10** | 0.038 | 0.032 | 0.029 | 0.049 |
| | **12** | 0.045 | 0.038 | 0.034 | 0.059 |
| | **14** | 0.052 | 0.044 | 0.039 | 0.068 |
| | **16** | 0.060 | 0.051 | 0.045 | 0.078 |
| | **18** | 0.070 | 0.060 | 0.053 | 0.091 |
| | **20** | 0.080 | 0.068 | 0.060 | 0.104 |

< D3 mm: ap = 0.2D

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.5D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **100÷120** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.014 | 0.012 | 0.011 | 0.019 |
| | **4** | 0.019 | 0.016 | 0.014 | 0.025 |
| | **5** | 0.024 | 0.020 | 0.018 | 0.031 |
| | **6** | 0.030 | 0.026 | 0.023 | 0.039 |
| | **8** | 0.038 | 0.033 | 0.029 | 0.050 |
| | **10** | 0.046 | 0.039 | 0.034 | 0.059 |
| | **12** | 0.054 | 0.046 | 0.041 | 0.070 |
| | **14** | 0.062 | 0.053 | 0.047 | 0.081 |
| | **16** | 0.072 | 0.061 | 0.054 | 0.094 |
| | **18** | 0.084 | 0.071 | 0.063 | 0.109 |
| | **20** | 0.096 | 0.082 | 0.072 | 0.125 |

< D3 mm: ae = 0.2D

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **D x D** | **D x D** | **D x D** | **D x D** |
| | Vc (m/min) | **70÷90** | **40÷60** | **25÷35** | **80÷100** |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.007 | 0.006 | 0.005 | 0.009 |
| | **4** | 0.010 | 0.008 | 0.007 | 0.012 |
| | **5** | 0.012 | 0.010 | 0.009 | 0.016 |
| | **6** | 0.015 | 0.013 | 0.011 | 0.020 |
| | **8** | 0.019 | 0.016 | 0.014 | 0.025 |
| | **10** | 0.023 | 0.019 | 0.017 | 0.030 |
| | **12** | 0.027 | 0.023 | 0.020 | 0.035 |
| | **14** | 0.031 | 0.027 | 0.023 | 0.041 |
| | **16** | 0.036 | 0.031 | 0.027 | 0.047 |
| | **18** | 0.042 | 0.036 | 0.032 | 0.055 |
| | **20** | 0.048 | 0.041 | 0.036 | 0.062 |

< D3 mm: ap = 0.5D

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

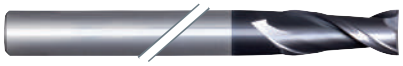
# G2210-11-12

cylindrical shank, 2 flutes, long

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z2



G2210

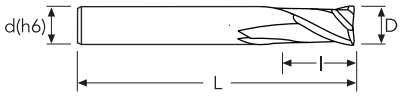


G2211-G2212

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.030 | | | 4 | 9 | | 75 | 2 | G2210020 | ● |
| **3** | 0/-0.030 | | | 4 | 15 | | 75 | 2 | G2210030 | ● |
| **4** | 0/-0.030 | | | 4 | 20 | | 75 | 2 | G2210040 | ● |
| **5** | 0/-0.030 | | | 6 | 25 | | 75 | 2 | G2210050 | ● |
| **6** | 0/-0.030 | | | 6 | 25 | | 75 | 2 | G2210060 | ● |
| | | | | | | | | | | |
| **5** | 0/-0.030 | | | 6 | 30 | | 100 | 2 | G2211050 | ● |
| **6** | 0/-0.030 | | | 6 | 30 | | 100 | 2 | G2211060 | ● |
| **8** | 0/-0.035 | | | 8 | 35 | | 100 | 2 | G2211080 | ● |
| **10** | 0/-0.035 | | | 10 | 40 | | 100 | 2 | G2211100 | ● |
| **12** | 0/-0.035 | | | 12 | 45 | | 100 | 2 | G2211120 | ● |
| | | | | | | | | | | |
| **8** | 0/-0.035 | | | 8 | 40 | | 150 | 2 | G2212080 | ● |
| **10** | 0/-0.035 | | | 10 | 50 | | 150 | 2 | G2212100 | ● |
| **12** | 0/-0.035 | | | 12 | 50 | | 150 | 2 | G2212120 | ● |
| **16** | 0/-0.040 | | | 16 | 70 | | 150 | 2 | G2212160 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# G2210-G2211

| SLOTTING | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **70÷90** | **45÷65** | **30÷50** | **80÷120** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **2** | 0.007 | 0.006 | 0.005 | 0.009 |
| | **3** | 0.010 | 0.009 | 0.008 | 0.013 |
| | **4** | 0.014 | 0.012 | 0.011 | 0.018 |
| | **5** | 0.018 | 0.015 | 0.014 | 0.023 |
| | **6** | 0.023 | 0.019 | 0.017 | 0.029 |
| | **8** | 0.030 | 0.026 | 0.023 | 0.039 |
| | **10** | 0.035 | 0.030 | 0.026 | 0.046 |
| | **12** | 0.041 | 0.035 | 0.031 | 0.053 |

< D3 mm: ap = 0.2D

| SIDE MILLING | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.5D** |
| | Vc (m/min) | **70÷90** | **45÷65** | **30÷50** | **80÷120** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **2** | 0.008 | 0.007 | 0.006 | 0.011 |
| | **3** | 0.012 | 0.010 | 0.009 | 0.016 |
| | **4** | 0.017 | 0.014 | 0.013 | 0.022 |
| | **5** | 0.022 | 0.018 | 0.016 | 0.028 |
| | **6** | 0.027 | 0.023 | 0.020 | 0.035 |
| | **8** | 0.036 | 0.031 | 0.027 | 0.047 |
| | **10** | 0.042 | 0.036 | 0.032 | 0.055 |
| | **12** | 0.049 | 0.042 | 0.037 | 0.064 |

< D3 mm: ae = 0.2D

| DRILLING | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **D x D** | **D x D** | **D x D** | **D x D** |
| | Vc (m/min) | **60÷80** | **40÷60** | **25÷35** | **70÷100** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **2** | 0.004 | 0.004 | 0.003 | 0.005 |
| | **3** | 0.006 | 0.005 | 0.005 | 0.008 |
| | **4** | 0.008 | 0.007 | 0.006 | 0.011 |
| | **5** | 0.011 | 0.009 | 0.008 | 0.014 |
| | **6** | 0.014 | 0.011 | 0.010 | 0.018 |
| | **8** | 0.018 | 0.015 | 0.014 | 0.023 |
| | **10** | 0.021 | 0.018 | 0.016 | 0.027 |
| | **12** | 0.025 | 0.021 | 0.018 | 0.032 |

< D3 mm: ap = 0.5D

INFO
CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA
HSS DRILLS
LFTA
SUTA
HSS-HSS/CO
CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH
HSS END-MILLS
CARBIDE BURRS

CUTTING PARAMETERS

# G2212




| Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| ap x ae | **0.3D x D** | **0.3D x D** | **0.3D x D** | **0.3D x D** |
| Vc (m/min) | **55÷75** | **40÷60** | **20÷40** | **70÷90** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **8** | 0.026 | 0.022 | 0.020 | 0.034 |
| **10** | 0.032 | 0.027 | 0.024 | 0.042 |
| **12** | 0.036 | 0.031 | 0.027 | 0.047 |
| **14** | 0.042 | 0.036 | 0.032 | 0.055 |
| **16** | 0.048 | 0.041 | 0.036 | 0.062 |




| Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** |
| Vc (m/min) | **55÷75** | **40÷60** | **20÷40** | **70÷90** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **8** | 0.031 | 0.027 | 0.023 | 0.041 |
| **10** | 0.038 | 0.033 | 0.029 | 0.050 |
| **12** | 0.043 | 0.037 | 0.032 | 0.056 |
| **14** | 0.050 | 0.043 | 0.038 | 0.066 |
| **16** | 0.058 | 0.049 | 0.043 | 0.075 |




| Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| ap x ae | **D x D** | **D x D** | **D x D** | **D x D** |
| Vc (m/min) | **50÷70** | **35÷55** | **20÷30** | **60÷80** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **8** | 0.016 | 0.013 | 0.012 | 0.020 |
| **10** | 0.019 | 0.016 | 0.014 | 0.025 |
| **12** | 0.022 | 0.018 | 0.016 | 0.028 |
| **14** | 0.025 | 0.021 | 0.019 | 0.033 |
| **16** | 0.029 | 0.024 | 0.022 | 0.037 |

OSAWA

# GB305

cylindrical shank, 3 flutes

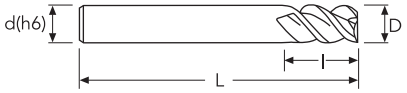
OSAWA NORM | N | MG / BR | <45 HRC | 45° | SQUARE | Z3



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | | | 4 | 3 | | 50 | 3 | GB305010 | ● |
| **1.5** | 0/-0.020 | | | 4 | 4.5 | | 50 | 3 | GB305015 | ● |
| **2** | 0/-0.020 | | | 4 | 6 | | 50 | 3 | GB305020 | ● |
| **3** | 0/-0.020 | | | 4 | 8 | | 50 | 3 | GB305030 | ● |
| **4** | 0/-0.020 | | | 4 | 11 | | 50 | 3 | GB305040 | ● |
| **5** | 0/-0.020 | | | 6 | 13 | | 50 | 3 | GB305050 | ● |
| **6** | 0/-0.020 | | | 6 | 15 | | 50 | 3 | GB305060 | ● |
| **8** | 0/-0.025 | | | 8 | 20 | | 60 | 3 | GB305080 | ● |
| **10** | 0/-0.025 | | | 10 | 30 | | 75 | 3 | GB305100 | ● |
| **12** | 0/-0.025 | | | 12 | 30 | | 75 | 3 | GB305120 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# GB305

| SLOTTING | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **50÷60** | **30÷50** | **20÷40** | **70÷90** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.003 | 0.003 | 0.002 | 0.004 |
| | **2** | 0.006 | 0.005 | 0.004 | 0.008 |
| | **3** | 0.009 | 0.007 | 0.006 | 0.011 |
| | **4** | 0.012 | 0.010 | 0.009 | 0.016 |
| | **5** | 0.015 | 0.013 | 0.012 | 0.020 |
| | **6** | 0.020 | 0.017 | 0.015 | 0.026 |
| | **8** | 0.026 | 0.022 | 0.019 | 0.033 |
| | **10** | 0.032 | 0.028 | 0.024 | 0.042 |
| | **12** | 0.038 | 0.033 | 0.029 | 0.050 |

< D3 mm: ap = 0.2D

| SIDE MILLING | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** |
| | Vc (m/min) | **50÷70** | **40÷60** | **20÷40** | **80÷100** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.004 | 0.003 | 0.003 | 0.005 |
| | **2** | 0.007 | 0.006 | 0.005 | 0.009 |
| | **3** | 0.010 | 0.009 | 0.008 | 0.013 |
| | **4** | 0.014 | 0.012 | 0.011 | 0.019 |
| | **5** | 0.018 | 0.016 | 0.014 | 0.024 |
| | **6** | 0.024 | 0.020 | 0.018 | 0.031 |
| | **8** | 0.031 | 0.026 | 0.023 | 0.040 |
| | **10** | 0.039 | 0.033 | 0.029 | 0.051 |
| | **12** | 0.046 | 0.039 | 0.035 | 0.060 |

< D3 mm: ae = 0.1D

# G2CSH3

cylindrical shank, 3 flutes

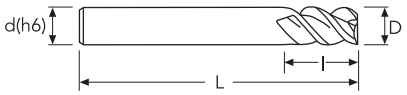
OSAWA NORM | N | MG PV200 | <45 HRC | 45° | SQUARE | Z3



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | | | 4 | 3 | | 50 | 3 | G2CSH3010 | ● |
| **1.5** | 0/-0.020 | | | 4 | 4.5 | | 50 | 3 | G2CSH3015 | ● |
| **2** | 0/-0.020 | | | 4 | 6 | | 50 | 3 | G2CSH3020 | ● |
| **2.5** | 0/-0.020 | | | 4 | 7 | | 50 | 3 | G2CSH3025 | ● |
| **3** | 0/-0.020 | | | 4 | 8 | | 50 | 3 | G2CSH3030 | ● |
| **3.5** | 0/-0.020 | | | 4 | 10 | | 50 | 3 | G2CSH3035 | ● |
| **4** | 0/-0.020 | | | 4 | 11 | | 50 | 3 | G2CSH3040 | ● |
| **4.5** | 0/-0.020 | | | 6 | 13 | | 50 | 3 | G2CSH3045 | ● |
| **5** | 0/-0.020 | | | 6 | 13 | | 50 | 3 | G2CSH3050 | ● |
| **5.5** | 0/-0.020 | | | 6 | 13 | | 50 | 3 | G2CSH3055 | ● |
| **6** | 0/-0.020 | | | 6 | 15 | | 50 | 3 | G2CSH3060 | ● |
| **6.5** | 0/-0.025 | | | 8 | 17 | | 60 | 3 | G2CSH3065 | ● |
| **7** | 0/-0.025 | | | 8 | 17 | | 60 | 3 | G2CSH3070 | ● |
| **7.5** | 0/-0.025 | | | 8 | 17 | | 60 | 3 | G2CSH3075 | ● |
| **8** | 0/-0.025 | | | 8 | 20 | | 60 | 3 | G2CSH3080 | ● |
| **8.5** | 0/-0.025 | | | 10 | 23 | | 75 | 3 | G2CSH3085 | ● |
| **9** | 0/-0.025 | | | 10 | 23 | | 75 | 3 | G2CSH3090 | ● |
| **10** | 0/-0.025 | | | 10 | 30 | | 75 | 3 | G2CSH3100 | ● |
| **11** | 0/-0.025 | | | 12 | 28 | | 75 | 3 | G2CSH3110 | ● |
| **12** | 0/-0.025 | | | 12 | 30 | | 75 | 3 | G2CSH3120 | ● |
| **14** | 0/-0.030 | | | 14 | 26 | | 83 | 3 | G2CSH3140 | ● |
| **16** | 0/-0.030 | | | 16 | 32 | | 92 | 3 | G2CSH3160 | ● |
| **18** | 0/-0.030 | | | 20 | 40 | | 100 | 3 | G2CSH3180 | ● |
| **20** | 0/-0.030 | | | 20 | 40 | | 100 | 3 | G2CSH3200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# G2CSH3

| SLOTTING | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **80÷120** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.003 | 0.003 | 0.002 | 0.004 |
| | **2** | 0.006 | 0.005 | 0.005 | 0.008 |
| | **3** | 0.009 | 0.008 | 0.007 | 0.012 |
| | **4** | 0.013 | 0.011 | 0.009 | 0.016 |
| | **5** | 0.016 | 0.013 | 0.012 | 0.020 |
| | **6** | 0.019 | 0.016 | 0.014 | 0.024 |
| | **8** | 0.025 | 0.021 | 0.019 | 0.033 |
| | **10** | 0.031 | 0.027 | 0.023 | 0.041 |
| | **12** | 0.040 | 0.034 | 0.030 | 0.052 |
| | **14** | 0.046 | 0.039 | 0.035 | 0.060 |
| | **16** | 0.056 | 0.048 | 0.042 | 0.073 |
| | **18** | 0.065 | 0.055 | 0.049 | 0.085 |
| | **20** | 0.075 | 0.064 | 0.056 | 0.098 |

< D3 mm: ap = 0.2D

| SIDE MILLING | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** |
| | Vc (m/min) | **90÷110** | **60÷80** | **40÷60** | **110÷130** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.004 | 0.003 | 0.003 | 0.005 |
| | **2** | 0.008 | 0.006 | 0.006 | 0.010 |
| | **3** | 0.011 | 0.010 | 0.008 | 0.015 |
| | **4** | 0.015 | 0.013 | 0.011 | 0.020 |
| | **5** | 0.019 | 0.016 | 0.014 | 0.024 |
| | **6** | 0.023 | 0.019 | 0.017 | 0.029 |
| | **8** | 0.030 | 0.026 | 0.023 | 0.039 |
| | **10** | 0.038 | 0.032 | 0.028 | 0.049 |
| | **12** | 0.048 | 0.041 | 0.036 | 0.062 |
| | **14** | 0.056 | 0.047 | 0.042 | 0.072 |
| | **16** | 0.068 | 0.057 | 0.051 | 0.088 |
| | **18** | 0.078 | 0.066 | 0.059 | 0.101 |
| | **20** | 0.090 | 0.077 | 0.068 | 0.117 |

< D3 mm: ae = 0.1D

OSAWA

# G2WSH3

weldon shank, 3 flutes

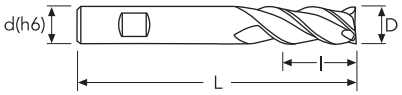
OSAWA NORM | N | MG PV200 | <45 HRC | 45° | SQUARE | Z3



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.020 | | | 6 | 8 | | 57 | 3 | G2WSH3030 | ● |
| **4** | 0/-0.020 | | | 6 | 11 | | 57 | 3 | G2WSH3040 | ● |
| **5** | 0/-0.020 | | | 6 | 13 | | 57 | 3 | G2WSH3050 | ● |
| **6** | 0/-0.020 | | | 6 | 13 | | 57 | 3 | G2WSH3060 | ● |
| **8** | 0/-0.025 | | | 8 | 19 | | 63 | 3 | G2WSH3080 | ● |
| **10** | 0/-0.025 | | | 10 | 22 | | 72 | 3 | G2WSH3100 | ● |
| **12** | 0/-0.025 | | | 12 | 26 | | 83 | 3 | G2WSH3120 | ● |
| **14** | 0/-0.030 | | | 14 | 26 | | 83 | 3 | G2WSH3140 | ● |
| **16** | 0/-0.030 | | | 16 | 32 | | 92 | 3 | G2WSH3160 | ● |
| **20** | 0/-0.030 | | | 20 | 38 | | 104 | 3 | G2WSH3200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

CUTTING PARAMETERS

# G2WSH3

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **80÷120** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.009 | 0.008 | 0.007 | 0.012 |
| | **4** | 0.013 | 0.011 | 0.009 | 0.016 |
| | **5** | 0.016 | 0.013 | 0.012 | 0.020 |
| | **6** | 0.019 | 0.016 | 0.014 | 0.024 |
| | **8** | 0.025 | 0.021 | 0.019 | 0.033 |
| | **10** | 0.031 | 0.027 | 0.023 | 0.041 |
| | **12** | 0.040 | 0.034 | 0.030 | 0.052 |
| | **14** | 0.046 | 0.039 | 0.035 | 0.060 |
| | **16** | 0.056 | 0.048 | 0.042 | 0.073 |
| | **18** | 0.065 | 0.055 | 0.049 | 0.085 |
| | **20** | 0.075 | 0.064 | 0.056 | 0.098 |

< D3 mm: ap = 0.2D

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** |
| | Vc (m/min) | **90÷110** | **60÷80** | **40÷60** | **110÷130** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.011 | 0.010 | 0.008 | 0.015 |
| | **4** | 0.015 | 0.013 | 0.011 | 0.020 |
| | **5** | 0.019 | 0.016 | 0.014 | 0.024 |
| | **6** | 0.023 | 0.019 | 0.017 | 0.029 |
| | **8** | 0.030 | 0.026 | 0.023 | 0.039 |
| | **10** | 0.038 | 0.032 | 0.028 | 0.049 |
| | **12** | 0.048 | 0.041 | 0.036 | 0.062 |
| | **14** | 0.056 | 0.047 | 0.042 | 0.072 |
| | **16** | 0.068 | 0.057 | 0.051 | 0.088 |
| | **18** | 0.078 | 0.066 | 0.059 | 0.101 |
| | **20** | 0.090 | 0.077 | 0.068 | 0.117 |

< D3 mm: ae = 0.1D

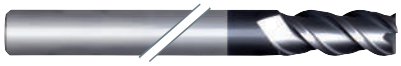
# G2310-11-12

cylindrical shank, 3 flutes, long

OSAWA NORM | N | MG PV200 | <45 HRC | 45° | SQUARE | Z3



G2310

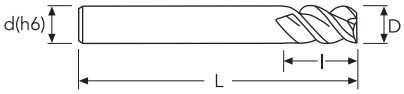


G2311-G2312

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.030 | | | 4 | 9 | | 75 | 3 | G2310020 | ● |
| **3** | 0/-0.030 | | | 4 | 15 | | 75 | 3 | G2310030 | ● |
| **4** | 0/-0.030 | | | 4 | 20 | | 75 | 3 | G2310040 | ● |
| **5** | 0/-0.030 | | | 6 | 25 | | 75 | 3 | G2310050 | ● |
| **6** | 0/-0.030 | | | 6 | 25 | | 75 | 3 | G2310060 | ● |
| | | | | | | | | | | |
| **4** | 0/-0.030 | | | 6 | 25 | | 100 | 3 | G2311040 | ● |
| **5** | 0/-0.030 | | | 6 | 30 | | 100 | 3 | G2311050 | ● |
| **6** | 0/-0.030 | | | 6 | 30 | | 100 | 3 | G2311060 | ● |
| **7** | 0/-0.030 | | | 8 | 35 | | 100 | 3 | G2311070 | ● |
| **8** | 0/-0.035 | | | 8 | 35 | | 100 | 3 | G2311080 | ● |
| **9** | 0/-0.035 | | | 10 | 40 | | 100 | 3 | G2311090 | ● |
| **10** | 0/-0.035 | | | 10 | 40 | | 100 | 3 | G2311100 | ● |
| **11** | 0/-0.035 | | | 12 | 45 | | 100 | 3 | G2311110 | ● |
| **12** | 0/-0.035 | | | 12 | 45 | | 100 | 3 | G2311120 | ● |
| | | | | | | | | | | |
| **8** | 0/-0.035 | | | 8 | 40 | | 150 | 3 | G2312080 | ● |
| **10** | 0/-0.035 | | | 10 | 50 | | 150 | 3 | G2312100 | ● |
| **12** | 0/-0.035 | | | 12 | 50 | | 150 | 3 | G2312120 | ● |
| **16** | 0/-0.040 | | | 16 | 70 | | 150 | 3 | G2312160 | ● |
| **20** | 0/-0.040 | | | 20 | 80 | | 150 | 3 | G2312200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

## G2310-G2311

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **60÷80** | **35÷55** | **25÷35** | **80÷100** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **2** | 0.006 | 0.005 | 0.004 | 0.007 |
| | **3** | 0.008 | 0.007 | 0.006 | 0.011 |
| | **4** | 0.011 | 0.010 | 0.008 | 0.015 |
| | **5** | 0.014 | 0.012 | 0.011 | 0.018 |
| | **6** | 0.017 | 0.014 | 0.013 | 0.022 |
| | **8** | 0.023 | 0.019 | 0.017 | 0.029 |
| | **10** | 0.028 | 0.024 | 0.021 | 0.037 |
| | **12** | 0.036 | 0.031 | 0.027 | 0.047 |

< D3 mm: ap = 0.2D

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** |
| | Vc (m/min) | **70÷90** | **45÷65** | **30÷50** | **80÷120** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **2** | 0.007 | 0.006 | 0.005 | 0.009 |
| | **3** | 0.011 | 0.009 | 0.008 | 0.014 |
| | **4** | 0.014 | 0.012 | 0.011 | 0.018 |
| | **5** | 0.018 | 0.015 | 0.013 | 0.023 |
| | **6** | 0.021 | 0.018 | 0.016 | 0.027 |
| | **8** | 0.028 | 0.024 | 0.021 | 0.037 |
| | **10** | 0.035 | 0.030 | 0.026 | 0.046 |
| | **12** | 0.045 | 0.038 | 0.034 | 0.059 |

< D3 mm: ae = 0.1D

## G2312

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** |
| | Vc (m/min) | **55÷75** | **40÷60** | **20÷40** | **70÷90** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **8** | 0.020 | 0.017 | 0.015 | 0.026 |
| | **10** | 0.025 | 0.021 | 0.019 | 0.033 |
| | **12** | 0.032 | 0.027 | 0.024 | 0.042 |
| | **14** | 0.037 | 0.031 | 0.028 | 0.048 |
| | **16** | 0.045 | 0.038 | 0.034 | 0.059 |

# GB405

cylindrical shank, 4 flutes

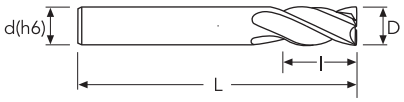
OSAWA NORM | N | MG / BR | <45 HRC | 30° | SQUARE | Z4



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | | | 4 | 3 | | 50 | 4 | GB405010 | ● |
| **1.5** | 0/-0.020 | | | 4 | 4.5 | | 50 | 4 | GB405015 | ● |
| **2** | 0/-0.020 | | | 4 | 6 | | 50 | 4 | GB405020 | ● |
| **3** | 0/-0.020 | | | 4 | 8 | | 50 | 4 | GB405030 | ● |
| **4** | 0/-0.020 | | | 4 | 11 | | 50 | 4 | GB405040 | ● |
| **5** | 0/-0.020 | | | 6 | 13 | | 50 | 4 | GB405050 | ● |
| **6** | 0/-0.020 | | | 6 | 15 | | 50 | 4 | GB405060 | ● |
| **8** | 0/-0.025 | | | 8 | 20 | | 60 | 4 | GB405080 | ● |
| **10** | 0/-0.025 | | | 10 | 30 | | 75 | 4 | GB405100 | ● |
| **12** | 0/-0.025 | | | 12 | 30 | | 75 | 4 | GB405120 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

## GB405

| SIDE MILLING | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.2D** | **1.5D x 0.2D** | **1.5D x 0.2D** | **1.5D x 0.2D** |
| | Vc (m/min) | **50÷70** | **40÷50** | **20÷40** | **80÷100** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.003 | 0.003 | 0.002 | 0.004 |
| | **2** | 0.006 | 0.006 | 0.005 | 0.008 |
| | **3** | 0.010 | 0.008 | 0.007 | 0.013 |
| | **4** | 0.013 | 0.011 | 0.010 | 0.017 |
| | **5** | 0.016 | 0.014 | 0.012 | 0.021 |
| | **6** | 0.020 | 0.017 | 0.015 | 0.026 |
| | **8** | 0.026 | 0.022 | 0.019 | 0.034 |
| | **10** | 0.031 | 0.026 | 0.023 | 0.040 |
| | **12** | 0.036 | 0.031 | 0.027 | 0.047 |

< D3 mm: ae = 0.1D

# G2CS4

cylindrical shank, 4 flutes

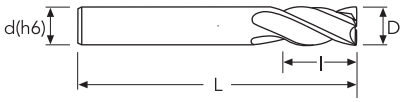
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z4



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | | | 4 | 3 | | 50 | 4 | G2CS4010 | ● |
| **1.5** | 0/-0.020 | | | 4 | 4.5 | | 50 | 4 | G2CS4015 | ● |
| **2** | 0/-0.020 | | | 4 | 6 | | 50 | 4 | G2CS4020 | ● |
| **2.5** | 0/-0.020 | | | 4 | 7 | | 50 | 4 | G2CS4025 | ● |
| **3** | 0/-0.020 | | | 4 | 8 | | 50 | 4 | G2CS4030 | ● |
| **3.5** | 0/-0.020 | | | 4 | 10 | | 50 | 4 | G2CS4035 | ● |
| **4** | 0/-0.020 | | | 4 | 11 | | 50 | 4 | G2CS4040 | ● |
| **4.5** | 0/-0.020 | | | 6 | 13 | | 50 | 4 | G2CS4045 | ● |
| **5** | 0/-0.020 | | | 6 | 13 | | 50 | 4 | G2CS4050 | ● |
| **5.5** | 0/-0.020 | | | 6 | 13 | | 50 | 4 | G2CS4055 | ● |
| **6** | 0/-0.020 | | | 6 | 15 | | 50 | 4 | G2CS4060 | ● |
| **6.5** | 0/-0.025 | | | 8 | 17 | | 60 | 4 | G2CS4065 | ● |
| **7** | 0/-0.025 | | | 8 | 17 | | 60 | 4 | G2CS4070 | ● |
| **7.5** | 0/-0.025 | | | 8 | 17 | | 60 | 4 | G2CS4075 | ● |
| **8** | 0/-0.025 | | | 8 | 20 | | 60 | 4 | G2CS4080 | ● |
| **8.5** | 0/-0.025 | | | 10 | 23 | | 75 | 4 | G2CS4085 | ● |
| **9** | 0/-0.025 | | | 10 | 23 | | 75 | 4 | G2CS4090 | ● |
| **9.5** | 0/-0.025 | | | 10 | 25 | | 75 | 4 | G2CS4095 | ● |
| **10** | 0/-0.025 | | | 10 | 30 | | 75 | 4 | G2CS4100 | ● |
| **10.5** | 0/-0.025 | | | 12 | 25 | | 75 | 4 | G2CS4105 | ● |
| **11** | 0/-0.025 | | | 12 | 30 | | 75 | 4 | G2CS4110 | ● |
| **11.5** | 0/-0.025 | | | 12 | 28 | | 75 | 4 | G2CS4115 | ● |
| **12** | 0/-0.025 | | | 12 | 30 | | 75 | 4 | G2CS4120 | ● |
| **12.5** | 0/-0.030 | | | 14 | 26 | | 83 | 4 | G2CS4125 | ● |
| **13** | 0/-0.030 | | | 14 | 26 | | 83 | 4 | G2CS4130 | ● |
| **13.5** | 0/-0.030 | | | 14 | 26 | | 83 | 4 | G2CS4135 | ● |
| **14** | 0/-0.030 | | | 14 | 26 | | 83 | 4 | G2CS4140 | ● |
| **14.5** | 0/-0.030 | | | 16 | 32 | | 92 | 4 | G2CS4145 | ● |
| **15** | 0/-0.030 | | | 16 | 32 | | 92 | 4 | G2CS4150 | ● |
| **15.5** | 0/-0.030 | | | 16 | 32 | | 92 | 4 | G2CS4155 | ● |
| **16** | 0/-0.030 | | | 16 | 32 | | 92 | 4 | G2CS4160 | ● |
| **17** | 0/-0.030 | | | 20 | 40 | | 100 | 4 | G2CS4170 | ● |
| **18** | 0/-0.030 | | | 20 | 40 | | 100 | 4 | G2CS4180 | ● |
| **19** | 0/-0.030 | | | 20 | 40 | | 100 | 4 | G2CS4190 | ● |
| **20** | 0/-0.030 | | | 20 | 40 | | 100 | 4 | G2CS4200 | ● |
| **22** | 0/-0.030 | | | 25 | 40 | | 100 | 4 | G2CS4220 | ● |
| **25** | 0/-0.030 | | | 25 | 40 | | 100 | 4 | G2CS4250 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# G2CS4




| Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| ap x ae | **1.5D x 0.2D** | **1.5D x 0.2D** | **1.5D x 0.2D** | **1.5D x 0.2D** |
| Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **100÷120** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **1** | 0.004 | 0.003 | 0.003 | 0.005 |
| **2** | 0.007 | 0.006 | 0.005 | 0.009 |
| **3** | 0.010 | 0.009 | 0.008 | 0.013 |
| **4** | 0.013 | 0.011 | 0.010 | 0.017 |
| **5** | 0.016 | 0.014 | 0.012 | 0.021 |
| **6** | 0.019 | 0.016 | 0.014 | 0.025 |
| **8** | 0.025 | 0.021 | 0.019 | 0.033 |
| **10** | 0.032 | 0.027 | 0.024 | 0.042 |
| **12** | 0.040 | 0.034 | 0.030 | 0.052 |
| **14** | 0.047 | 0.040 | 0.035 | 0.061 |
| **16** | 0.054 | 0.046 | 0.041 | 0.070 |
| **18** | 0.060 | 0.051 | 0.045 | 0.078 |
| **20** | 0.065 | 0.055 | 0.049 | 0.085 |
| **22** | 0.073 | 0.062 | 0.055 | 0.095 |
| **25** | 0.083 | 0.071 | 0.062 | 0.108 |

< D3 mm: ae = 0.1D

# G2WS4

weldon shank, 4 flutes

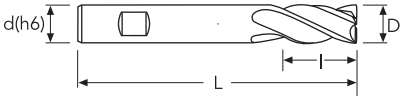
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z4



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.020 | | | 6 | 8 | | 57 | 4 | G2WS4030 | ● |
| **4** | 0/-0.020 | | | 6 | 11 | | 57 | 4 | G2WS4040 | ● |
| **5** | 0/-0.020 | | | 6 | 13 | | 57 | 4 | G2WS4050 | ● |
| **6** | 0/-0.020 | | | 6 | 13 | | 57 | 4 | G2WS4060 | ● |
| **8** | 0/-0.025 | | | 8 | 19 | | 63 | 4 | G2WS4080 | ● |
| **10** | 0/-0.025 | | | 10 | 22 | | 72 | 4 | G2WS4100 | ● |
| **12** | 0/-0.025 | | | 12 | 26 | | 83 | 4 | G2WS4120 | ● |
| **14** | 0/-0.030 | | | 14 | 26 | | 83 | 4 | G2WS4140 | ● |
| **16** | 0/-0.030 | | | 16 | 32 | | 92 | 4 | G2WS4160 | ● |
| **20** | 0/-0.030 | | | 20 | 38 | | 104 | 4 | G2WS4200 | ● |

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# G2WS4

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.2D** | **1.5D x 0.2D** | **1.5D x 0.2D** | **1.5D x 0.2D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **100÷120** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.010 | 0.009 | 0.008 | 0.013 |
| | **4** | 0.013 | 0.011 | 0.010 | 0.017 |
| | **5** | 0.016 | 0.014 | 0.012 | 0.021 |
| | **6** | 0.019 | 0.016 | 0.014 | 0.025 |
| | **8** | 0.025 | 0.021 | 0.019 | 0.033 |
| | **10** | 0.032 | 0.027 | 0.024 | 0.042 |
| | **12** | 0.040 | 0.034 | 0.030 | 0.052 |
| | **14** | 0.047 | 0.040 | 0.035 | 0.061 |
| | **16** | 0.054 | 0.046 | 0.041 | 0.070 |
| | **18** | 0.060 | 0.051 | 0.045 | 0.078 |
| | **20** | 0.065 | 0.055 | 0.049 | 0.085 |

# G2410-11-12-13

cylindrical shank, 4 flutes, long

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z4



G2410

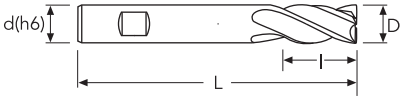


G2411-G2412-G2413

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.030 | | | 4 | 9 | | 75 | 4 | G2410020 | ● |
| **2.5** | 0/-0.030 | | | 4 | 10 | | 75 | 4 | G2410025 | ● |
| **3** | 0/-0.030 | | | 4 | 15 | | 75 | 4 | G2410030 | ● |
| **3.5** | 0/-0.030 | | | 4 | 15 | | 75 | 4 | G2410035 | ● |
| **4** | 0/-0.030 | | | 4 | 20 | | 75 | 4 | G2410040 | ● |
| **4.5** | 0/-0.030 | | | 6 | 20 | | 75 | 4 | G2410045 | ● |
| **5** | 0/-0.030 | | | 6 | 25 | | 75 | 4 | G2410050 | ● |
| **6** | 0/-0.030 | | | 6 | 25 | | 75 | 4 | G2410060 | ● |
| | | | | | | | | | | |
| **3** | 0/-0.030 | | | 6 | 15 | | 100 | 4 | G2411030 | ● |
| **4** | 0/-0.030 | | | 6 | 25 | | 100 | 4 | G2411040 | ● |
| **5** | 0/-0.030 | | | 6 | 30 | | 100 | 4 | G2411050 | ● |
| **6** | 0/-0.030 | | | 6 | 30 | | 100 | 4 | G2411060 | ● |
| **7** | 0/-0.030 | | | 8 | 35 | | 100 | 4 | G2411070 | ● |
| **8** | 0/-0.035 | | | 8 | 35 | | 100 | 4 | G2411080 | ● |
| **9** | 0/-0.035 | | | 10 | 40 | | 100 | 4 | G2411090 | ● |
| **10** | 0/-0.035 | | | 10 | 40 | | 100 | 4 | G2411100 | ● |
| **11** | 0/-0.035 | | | 12 | 45 | | 100 | 4 | G2411110 | ● |
| **12** | 0/-0.035 | | | 12 | 45 | | 100 | 4 | G2411120 | ● |
| | | | | | | | | | | |
| **8** | 0/-0.035 | | | 8 | 40 | | 150 | 4 | G2412080 | ● |
| **10** | 0/-0.035 | | | 10 | 50 | | 150 | 4 | G2412100 | ● |
| **12** | 0/-0.035 | | | 12 | 50 | | 150 | 4 | G2412120 | ● |
| **16** | 0/-0.040 | | | 16 | 70 | | 150 | 4 | G2412160 | ● |
| **18** | 0/-0.040 | | | 20 | 80 | | 150 | 4 | G2412180 | ● |
| **20** | 0/-0.040 | | | 20 | 80 | | 150 | 4 | G2412200 | ● |
| | | | | | | | | | | |
| **16** | 0/-0.040 | | | 16 | 40 | | 200 | 4 | G2413160 | ● |
| **20** | 0/-0.040 | | | 20 | 40 | | 200 | 4 | G2413200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

## G2410-G2411

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **70÷90** | **45÷65** | **30÷50** | **80÷120** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **2** | 0.006 | 0.005 | 0.005 | 0.008 |
| | **3** | 0.009 | 0.008 | 0.007 | 0.012 |
| | **4** | 0.012 | 0.010 | 0.009 | 0.015 |
| | **5** | 0.014 | 0.012 | 0.011 | 0.019 |
| | **6** | 0.017 | 0.015 | 0.013 | 0.022 |
| | **8** | 0.023 | 0.019 | 0.017 | 0.029 |
| | **10** | 0.029 | 0.024 | 0.022 | 0.037 |
| | **12** | 0.036 | 0.031 | 0.027 | 0.047 |

< D3 mm: ae = 0.1D

## G2412-G2413

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **55÷75** | **40÷60** | **20÷40** | **70÷90** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **8** | 0.020 | 0.017 | 0.015 | 0.026 |
| | **10** | 0.026 | 0.022 | 0.019 | 0.033 |
| | **12** | 0.032 | 0.027 | 0.024 | 0.042 |
| | **14** | 0.038 | 0.032 | 0.028 | 0.049 |
| | **16** | 0.043 | 0.037 | 0.032 | 0.056 |
| | **20** | 0.065 | 0.055 | 0.049 | 0.085 |

# G2CSHM

cylindrical shank, multi flute

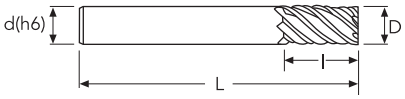
OSAWA NORM | N | MG PV200 | <45 HRC | 45° | SQUARE | Z6



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.020 | | | 6 | 15 | | 50 | 6 | G2CSHM060 | ● |
| **8** | 0/-0.025 | | | 8 | 20 | | 60 | 6 | G2CSHM080 | ● |
| **10** | 0/-0.025 | | | 10 | 30 | | 75 | 6 | G2CSHM100 | ● |
| **12** | 0/-0.025 | | | 12 | 30 | | 75 | 6 | G2CSHM120 | ● |
| **14** | 0/-0.030 | | | 14 | 30 | | 83 | 6 | G2CSHM140 | ● |
| **16** | 0/-0.030 | | | 16 | 35 | | 92 | 6 | G2CSHM160 | ● |
| **20** | 0/-0.030 | | | 20 | 40 | | 100 | 6 | G2CSHM200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# G2CSHM

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** | |
| | Vc (m/min) | **100÷120** | **70÷90** | **50÷70** | |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | |
| | **6** | 0.016 | 0.014 | 0.012 | |
| | **8** | 0.020 | 0.017 | 0.015 | |
| | **10** | 0.025 | 0.021 | 0.019 | |
| | **12** | 0.030 | 0.026 | 0.023 | |
| | **14** | 0.035 | 0.030 | 0.026 | |
| | **16** | 0.040 | 0.034 | 0.030 | |
| | **20** | 0.050 | 0.043 | 0.038 | |

# G2CSFR

cylindrical shank, roughing HR

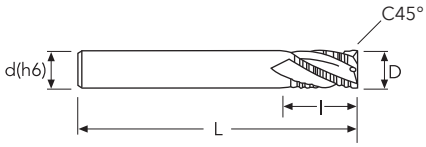
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | C45° | HR FINE | Z3~Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **4** | 0/-0.070 | 0.28 | +/-0.020 | 6 | 11 | | 50 | 3 | G2CSFR040 | ● |
| **5** | 0/-0.070 | 0.35 | +/-0.020 | 6 | 13 | | 50 | 3 | G2CSFR050 | ● |
| **6** | 0/-0.070 | 0.42 | +/-0.020 | 6 | 15 | | 50 | 3 | G2CSFR060 | ● |
| **7** | 0/-0.070 | 0.49 | +/-0.020 | 8 | 20 | | 60 | 3 | G2CSFR070 | ● |
| **8** | 0/-0.070 | 0.56 | +/-0.020 | 8 | 20 | | 60 | 3 | G2CSFR080 | ● |
| **9** | 0/-0.070 | 0.63 | +/-0.020 | 10 | 25 | | 75 | 3 | G2CSFR090 | ● |
| **10** | 0/-0.070 | 0.70 | +/-0.020 | 10 | 30 | | 75 | 4 | G2CSFR100 | ● |
| **11** | 0/-0.070 | 0.77 | +/-0.020 | 12 | 30 | | 75 | 4 | G2CSFR110 | ● |
| **12** | 0/-0.070 | 0.84 | +/-0.020 | 12 | 30 | | 75 | 4 | G2CSFR120 | ● |
| **13** | 0/-0.070 | 0.91 | +/-0.020 | 14 | 30 | | 83 | 4 | G2CSFR130 | ● |
| **14** | 0/-0.070 | 0.98 | +/-0.020 | 14 | 30 | | 83 | 4 | G2CSFR140 | ● |
| **15** | 0/-0.070 | 1.05 | +/-0.020 | 16 | 30 | | 92 | 4 | G2CSFR150 | ● |
| **16** | 0/-0.070 | 1.12 | +/-0.020 | 16 | 35 | | 92 | 4 | G2CSFR160 | ● |
| **20** | 0/-0.070 | 1.40 | +/-0.020 | 20 | 40 | | 100 | 4 | G2CSFR200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

## G2CSFR

| SIDE MILLING | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** | |
| | Vc (m/min) | **70÷90** | **50÷70** | **30÷50** | |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | |
| | **6** | 0.030 | 0.026 | 0.023 | |
| | **8** | 0.045 | 0.038 | 0.034 | |
| | **10** | 0.060 | 0.051 | 0.045 | |
| | **12** | 0.072 | 0.061 | 0.054 | |
| | **14** | 0.085 | 0.072 | 0.064 | |
| | **16** | 0.096 | 0.082 | 0.072 | |
| | **20** | 0.120 | 0.102 | 0.090 | |

D6-8: Z3
D10-20: Z4

# G2WSFR

weldon shank, roughing HR

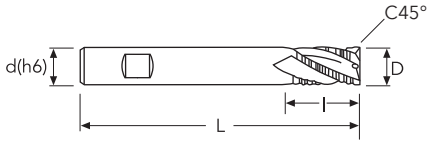
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | C45° | HR FINE | Z3~Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.070 | 0.42 | +/-0.020 | 6 | 13 | | 57 | 3 | G2WSFR060 | ● |
| **8** | 0/-0.070 | 0.56 | +/-0.020 | 8 | 19 | | 63 | 3 | G2WSFR080 | ● |
| **10** | 0/-0.070 | 0.70 | +/-0.020 | 10 | 22 | | 72 | 4 | G2WSFR100 | ● |
| **12** | 0/-0.070 | 0.84 | +/-0.020 | 12 | 26 | | 83 | 4 | G2WSFR120 | ● |
| **14** | 0/-0.070 | 0.98 | +/-0.020 | 14 | 26 | | 83 | 4 | G2WSFR140 | ● |
| **16** | 0/-0.070 | 1.12 | +/-0.020 | 16 | 32 | | 92 | 4 | G2WSFR160 | ● |
| **20** | 0/-0.070 | 1.40 | +/-0.020 | 20 | 38 | | 104 | 4 | G2WSFR200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

## G2WSFR

| SIDE MILLING | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** | |
| | Vc (m/min) | **70÷90** | **50÷70** | **30÷50** | |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | |
| | **6** | 0.030 | 0.026 | 0.023 | |
| | **8** | 0.045 | 0.038 | 0.034 | |
| | **10** | 0.060 | 0.051 | 0.045 | |
| | **12** | 0.072 | 0.061 | 0.054 | |
| | **14** | 0.085 | 0.072 | 0.064 | |
| | **16** | 0.096 | 0.082 | 0.072 | |
| | **20** | 0.120 | 0.102 | 0.090 | |

D6-8: Z3
D10-20: Z4

# G2CS2R

cylindrical shank, 2 flutes, corner radius

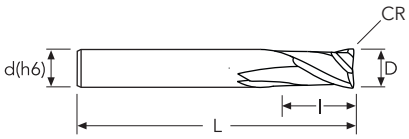



OSAWA NORM | N | MG PV200 | <45 HRC | 30° | RADIUS | Z2

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | 0.20 | +/-0.010 | 4 | 2 | | 50 | 2 | G2CS2R02010 | ● |
| **1.5** | 0/-0.020 | 0.20 | +/-0.010 | 4 | 3 | | 50 | 2 | G2CS2R02015 | ● |
| **1.5** | 0/-0.020 | 0.50 | +/-0.010 | 4 | 3 | | 50 | 2 | G2CS2R05015 | ● |
| **2** | 0/-0.020 | 0.20 | +/-0.010 | 4 | 4 | | 50 | 2 | G2CS2R02020 | ● |
| **2** | 0/-0.020 | 0.50 | +/-0.010 | 4 | 4 | | 50 | 2 | G2CS2R05020 | ● |
| **2.5** | 0/-0.020 | 0.20 | +/-0.010 | 4 | 5 | | 50 | 2 | G2CS2R02025 | ● |
| **2.5** | 0/-0.020 | 0.50 | +/-0.010 | 4 | 5 | | 50 | 2 | G2CS2R05025 | ● |
| **3** | 0/-0.020 | 0.20 | +/-0.010 | 4 | 6 | | 50 | 2 | G2CS2R02030 | ● |
| **3** | 0/-0.020 | 0.50 | +/-0.010 | 4 | 6 | | 50 | 2 | G2CS2R05030 | ● |
| **3** | 0/-0.020 | 1.00 | +/-0.010 | 4 | 6 | | 50 | 2 | G2CS2R10030 | ● |
| **4** | 0/-0.020 | 0.20 | +/-0.010 | 4 | 8 | | 50 | 2 | G2CS2R02040 | ● |
| **4** | 0/-0.020 | 0.50 | +/-0.010 | 4 | 8 | | 50 | 2 | G2CS2R05040 | ● |
| **4** | 0/-0.020 | 1.00 | +/-0.010 | 4 | 8 | | 50 | 2 | G2CS2R10040 | ● |
| **5** | 0/-0.020 | 0.50 | +/-0.010 | 6 | 10 | | 50 | 2 | G2CS2R05050 | ● |
| **5** | 0/-0.020 | 1.00 | +/-0.010 | 6 | 10 | | 50 | 2 | G2CS2R10050 | ● |
| **6** | 0/-0.020 | 0.20 | +/-0.010 | 6 | 12 | | 50 | 2 | G2CS2R02060 | ● |
| **6** | 0/-0.020 | 0.50 | +/-0.010 | 6 | 12 | | 50 | 2 | G2CS2R05060 | ● |
| **6** | 0/-0.020 | 1.00 | +/-0.010 | 6 | 12 | | 50 | 2 | G2CS2R10060 | ● |
| **6** | 0/-0.020 | 1.50 | +/-0.010 | 6 | 12 | | 50 | 2 | G2CS2R15060 | ● |
| **6** | 0/-0.020 | 2.00 | +/-0.010 | 6 | 12 | | 50 | 2 | G2CS2R20060 | ● |
| **8** | 0/-0.025 | 0.50 | +/-0.010 | 8 | 16 | | 60 | 2 | G2CS2R05080 | ● |
| **8** | 0/-0.025 | 1.00 | +/-0.010 | 8 | 16 | | 60 | 2 | G2CS2R10080 | ● |
| **8** | 0/-0.025 | 1.50 | +/-0.010 | 8 | 16 | | 60 | 2 | G2CS2R15080 | ● |
| **8** | 0/-0.025 | 2.00 | +/-0.010 | 8 | 16 | | 60 | 2 | G2CS2R20080 | ● |
| **10** | 0/-0.025 | 0.50 | +/-0.010 | 10 | 20 | | 75 | 2 | G2CS2R05100 | ● |
| **10** | 0/-0.025 | 1.00 | +/-0.010 | 10 | 20 | | 75 | 2 | G2CS2R10100 | ● |
| **10** | 0/-0.025 | 1.50 | +/-0.010 | 10 | 20 | | 75 | 2 | G2CS2R15100 | ● |
| **10** | 0/-0.025 | 2.00 | +/-0.010 | 10 | 20 | | 75 | 2 | G2CS2R20100 | ● |
| **12** | 0/-0.025 | 0.50 | +/-0.010 | 12 | 24 | | 75 | 2 | G2CS2R05120 | ● |
| **12** | 0/-0.025 | 1.00 | +/-0.010 | 12 | 24 | | 75 | 2 | G2CS2R10120 | ● |
| **12** | 0/-0.025 | 1.50 | +/-0.010 | 12 | 24 | | 75 | 2 | G2CS2R15120 | ● |
| **12** | 0/-0.025 | 2.00 | +/-0.010 | 12 | 24 | | 75 | 2 | G2CS2R20120 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# G2CS2R

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **100÷120** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.004 | 0.003 | 0.003 | 0.005 |
| | **2** | 0.008 | 0.007 | 0.006 | 0.010 |
| | **3** | 0.012 | 0.010 | 0.009 | 0.016 |
| | **4** | 0.016 | 0.014 | 0.012 | 0.021 |
| | **5** | 0.020 | 0.017 | 0.015 | 0.026 |
| | **6** | 0.025 | 0.021 | 0.019 | 0.033 |
| | **8** | 0.032 | 0.027 | 0.024 | 0.042 |
| | **10** | 0.038 | 0.032 | 0.029 | 0.049 |
| | **12** | 0.045 | 0.038 | 0.034 | 0.059 |

< D3 mm: ap = 0.2D

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.5D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **100÷120** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.005 | 0.004 | 0.004 | 0.006 |
| | **2** | 0.010 | 0.008 | 0.007 | 0.012 |
| | **3** | 0.014 | 0.012 | 0.011 | 0.019 |
| | **4** | 0.019 | 0.016 | 0.014 | 0.025 |
| | **5** | 0.024 | 0.020 | 0.018 | 0.031 |
| | **6** | 0.030 | 0.026 | 0.023 | 0.039 |
| | **8** | 0.038 | 0.033 | 0.029 | 0.050 |
| | **10** | 0.046 | 0.039 | 0.034 | 0.059 |
| | **12** | 0.054 | 0.046 | 0.041 | 0.070 |

< D3 mm: ae = 0.2D

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **D x D** | **D x D** | **D x D** | **D x D** |
| | Vc (m/min) | **70÷90** | **40÷60** | **25÷35** | **80÷100** |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.002 | 0.002 | 0.002 | 0.003 |
| | **2** | 0.005 | 0.004 | 0.004 | 0.006 |
| | **3** | 0.007 | 0.006 | 0.005 | 0.009 |
| | **4** | 0.010 | 0.008 | 0.007 | 0.012 |
| | **5** | 0.012 | 0.010 | 0.009 | 0.016 |
| | **6** | 0.015 | 0.013 | 0.011 | 0.020 |
| | **8** | 0.019 | 0.016 | 0.014 | 0.025 |
| | **10** | 0.023 | 0.019 | 0.017 | 0.030 |
| | **12** | 0.027 | 0.023 | 0.020 | 0.035 |

< D3 mm: ap = 0.5D

# G2CS4R

cylindrical shank, 4 flutes, corner radius

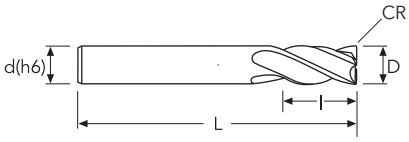
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | RADIUS | Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | 0.20 | +/-0.010 | 4 | 2 | | 50 | 4 | G2CS4R02010 | ● |
| **1.5** | 0/-0.020 | 0.20 | +/-0.010 | 4 | 3 | | 50 | 4 | G2CS4R02015 | ● |
| **1.5** | 0/-0.020 | 0.50 | +/-0.010 | 4 | 3 | | 50 | 4 | G2CS4R05015 | ● |
| **2** | 0/-0.020 | 0.20 | +/-0.010 | 4 | 4 | | 50 | 4 | G2CS4R02020 | ● |
| **2** | 0/-0.020 | 0.50 | +/-0.010 | 4 | 4 | | 50 | 4 | G2CS4R05020 | ● |
| **2.5** | 0/-0.020 | 0.20 | +/-0.010 | 4 | 5 | | 50 | 4 | G2CS4R02025 | ● |
| **2.5** | 0/-0.020 | 0.50 | +/-0.010 | 4 | 5 | | 50 | 4 | G2CS4R05025 | ● |
| **3** | 0/-0.020 | 0.20 | +/-0.010 | 4 | 6 | | 50 | 4 | G2CS4R02030 | ● |
| **3** | 0/-0.020 | 0.50 | +/-0.010 | 4 | 6 | | 50 | 4 | G2CS4R05030 | ● |
| **3** | 0/-0.020 | 1.00 | +/-0.010 | 4 | 6 | | 50 | 4 | G2CS4R10030 | ● |
| **4** | 0/-0.020 | 0.20 | +/-0.010 | 4 | 8 | | 50 | 4 | G2CS4R02040 | ● |
| **4** | 0/-0.020 | 0.50 | +/-0.010 | 4 | 8 | | 50 | 4 | G2CS4R05040 | ● |
| **4** | 0/-0.020 | 1.00 | +/-0.010 | 4 | 8 | | 50 | 4 | G2CS4R10040 | ● |
| **5** | 0/-0.020 | 0.50 | +/-0.010 | 6 | 10 | | 50 | 4 | G2CS4R05050 | ● |
| **5** | 0/-0.020 | 1.00 | +/-0.010 | 6 | 10 | | 50 | 4 | G2CS4R10050 | ● |
| **6** | 0/-0.020 | 0.20 | +/-0.010 | 6 | 12 | | 50 | 4 | G2CS4R02060 | ● |
| **6** | 0/-0.020 | 0.50 | +/-0.010 | 6 | 12 | | 50 | 4 | G2CS4R05060 | ● |
| **6** | 0/-0.020 | 1.00 | +/-0.010 | 6 | 12 | | 50 | 4 | G2CS4R10060 | ● |
| **6** | 0/-0.020 | 1.50 | +/-0.010 | 6 | 12 | | 50 | 4 | G2CS4R15060 | ● |
| **6** | 0/-0.020 | 2.00 | +/-0.010 | 6 | 12 | | 50 | 4 | G2CS4R20060 | ● |
| **8** | 0/-0.025 | 0.50 | +/-0.010 | 8 | 16 | | 60 | 4 | G2CS4R05080 | ● |
| **8** | 0/-0.025 | 1.00 | +/-0.010 | 8 | 16 | | 60 | 4 | G2CS4R10080 | ● |
| **8** | 0/-0.025 | 1.50 | +/-0.010 | 8 | 16 | | 60 | 4 | G2CS4R15080 | ● |
| **8** | 0/-0.025 | 2.00 | +/-0.010 | 8 | 16 | | 60 | 4 | G2CS4R20080 | ● |
| **10** | 0/-0.025 | 0.50 | +/-0.010 | 10 | 20 | | 75 | 4 | G2CS4R05100 | ● |
| **10** | 0/-0.025 | 1.00 | +/-0.010 | 10 | 20 | | 75 | 4 | G2CS4R10100 | ● |
| **10** | 0/-0.025 | 1.50 | +/-0.010 | 10 | 20 | | 75 | 4 | G2CS4R15100 | ● |
| **10** | 0/-0.025 | 2.00 | +/-0.010 | 10 | 20 | | 75 | 4 | G2CS4R20100 | ● |
| **10** | 0/-0.025 | 2.50 | +/-0.010 | 10 | 20 | | 75 | 4 | G2CS4R25100 | ● |
| **10** | 0/-0.025 | 3.00 | +/-0.010 | 10 | 20 | | 75 | 4 | G2CS4R30100 | ● |
| **12** | 0/-0.025 | 0.50 | +/-0.010 | 12 | 24 | | 75 | 4 | G2CS4R05120 | ● |
| **12** | 0/-0.025 | 1.00 | +/-0.010 | 12 | 24 | | 75 | 4 | G2CS4R10120 | ● |
| **12** | 0/-0.025 | 1.50 | +/-0.010 | 12 | 24 | | 75 | 4 | G2CS4R15120 | ● |
| **12** | 0/-0.025 | 2.00 | +/-0.010 | 12 | 24 | | 75 | 4 | G2CS4R20120 | ● |
| **12** | 0/-0.025 | 2.50 | +/-0.010 | 12 | 24 | | 75 | 4 | G2CS4R25120 | ● |
| **12** | 0/-0.025 | 3.00 | +/-0.010 | 12 | 24 | | 75 | 4 | G2CS4R30120 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

CUTTING PARAMETERS

## G2CS4R

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.2D** | **1.5D x 0.2D** | **1.5D x 0.2D** | **1.5D x 0.2D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **100÷120** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.004 | 0.003 | 0.003 | 0.005 |
| | **2** | 0.007 | 0.006 | 0.005 | 0.009 |
| | **3** | 0.010 | 0.009 | 0.008 | 0.013 |
| | **4** | 0.013 | 0.011 | 0.010 | 0.017 |
| | **5** | 0.016 | 0.014 | 0.012 | 0.021 |
| | **6** | 0.019 | 0.016 | 0.014 | 0.025 |
| | **8** | 0.025 | 0.021 | 0.019 | 0.033 |
| | **10** | 0.032 | 0.027 | 0.024 | 0.042 |
| | **12** | 0.040 | 0.034 | 0.030 | 0.052 |

< D3 mm: ae = 0.1D

# G2CL4R

cylindrical shank, 4 flutes, long, corner radius

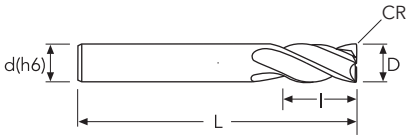
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | RADIUS | Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.030 | 0.20 | +/-0.010 | 4 | 4 | | 75 | 4 | G2CL4R02020 | ● |
| **2** | 0/-0.030 | 0.50 | +/-0.010 | 4 | 4 | | 75 | 4 | G2CL4R05020 | ● |
| **3** | 0/-0.030 | 0.20 | +/-0.010 | 4 | 6 | | 75 | 4 | G2CL4R02030 | ● |
| **3** | 0/-0.030 | 0.50 | +/-0.010 | 4 | 6 | | 75 | 4 | G2CL4R05030 | ● |
| **3** | 0/-0.030 | 1.00 | +/-0.010 | 4 | 6 | | 75 | 4 | G2CL4R10030 | ● |
| **4** | 0/-0.030 | 0.20 | +/-0.010 | 4 | 8 | | 75 | 4 | G2CL4R02040 | ● |
| **4** | 0/-0.030 | 0.50 | +/-0.010 | 4 | 8 | | 75 | 4 | G2CL4R05040 | ● |
| **4** | 0/-0.030 | 1.00 | +/-0.010 | 4 | 8 | | 75 | 4 | G2CL4R10040 | ● |
| **5** | 0/-0.030 | 0.50 | +/-0.010 | 6 | 10 | | 75 | 4 | G2CL4R05050 | ● |
| **5** | 0/-0.030 | 1.00 | +/-0.010 | 6 | 10 | | 75 | 4 | G2CL4R10050 | ● |
| **6** | 0/-0.030 | 0.50 | +/-0.010 | 6 | 12 | | 75 | 4 | G2CL4R05060 | ● |
| **6** | 0/-0.030 | 1.00 | +/-0.010 | 6 | 12 | | 75 | 4 | G2CL4R10060 | ● |
| **8** | 0/-0.035 | 0.50 | +/-0.010 | 8 | 16 | | 100 | 4 | G2CL4R05080 | ● |
| **8** | 0/-0.035 | 1.00 | +/-0.010 | 8 | 16 | | 100 | 4 | G2CL4R10080 | ● |
| **8** | 0/-0.035 | 2.00 | +/-0.010 | 8 | 16 | | 100 | 4 | G2CL4R20080 | ● |
| **10** | 0/-0.035 | 0.50 | +/-0.010 | 10 | 20 | | 100 | 4 | G2CL4R05100 | ● |
| **10** | 0/-0.035 | 1.00 | +/-0.010 | 10 | 20 | | 100 | 4 | G2CL4R10100 | ● |
| **10** | 0/-0.035 | 2.00 | +/-0.010 | 10 | 20 | | 100 | 4 | G2CL4R20100 | ● |
| **12** | 0/-0.035 | 0.50 | +/-0.010 | 12 | 24 | | 100 | 4 | G2CL4R05120 | ● |
| **12** | 0/-0.035 | 1.00 | +/-0.010 | 12 | 24 | | 100 | 4 | G2CL4R10120 | ● |
| **12** | 0/-0.035 | 2.00 | +/-0.010 | 12 | 24 | | 100 | 4 | G2CL4R20120 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

CUTTING PARAMETERS

## G2CL4R

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.2D** | **1.5D x 0.2D** | **1.5D x 0.2D** | **1.5D x 0.2D** |
| | Vc (m/min) | **55÷75** | **40÷60** | **20÷40** | **70÷90** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.004 | 0.003 | 0.003 | 0.004 |
| | **2** | 0.006 | 0.005 | 0.005 | 0.007 |
| | **3** | 0.009 | 0.008 | 0.007 | 0.010 |
| | **4** | 0.012 | 0.010 | 0.009 | 0.013 |
| | **5** | 0.015 | 0.013 | 0.011 | 0.017 |
| | **6** | 0.017 | 0.014 | 0.013 | 0.019 |
| | **8** | 0.023 | 0.020 | 0.017 | 0.030 |
| | **10** | 0.029 | 0.025 | 0.022 | 0.038 |
| | **12** | 0.036 | 0.031 | 0.027 | 0.047 |

< D3 mm: ae = 0.1D

# GB255

cylindrical shank, 2 flutes ball nose

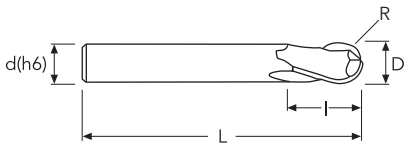
OSAWA NORM | N | MG / BR | <45 HRC | 30° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | 0.50 | +/-0.015 | 4 | 2 | | 50 | 2 | GB255010 | ● |
| **1.5** | 0/-0.020 | 0.75 | +/-0.015 | 4 | 3 | | 50 | 2 | GB255015 | ● |
| **2** | 0/-0.020 | 1.00 | +/-0.015 | 4 | 4 | | 50 | 2 | GB255020 | ● |
| **3** | 0/-0.020 | 1.50 | +/-0.015 | 4 | 6 | | 50 | 2 | GB255030 | ● |
| **4** | 0/-0.020 | 2.00 | +/-0.015 | 4 | 8 | | 50 | 2 | GB255040 | ● |
| **5** | 0/-0.020 | 2.50 | +/-0.015 | 6 | 10 | | 50 | 2 | GB255050 | ● |
| **6** | 0/-0.020 | 3.00 | +/-0.015 | 6 | 12 | | 50 | 2 | GB255060 | ● |
| **8** | 0/-0.025 | 4.00 | +/-0.015 | 8 | 16 | | 60 | 2 | GB255080 | ● |
| **10** | 0/-0.025 | 5.00 | +/-0.015 | 10 | 20 | | 75 | 2 | GB255100 | ● |
| **12** | 0/-0.025 | 6.00 | +/-0.015 | 12 | 24 | | 75 | 2 | GB255120 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

## GB255

COPYING

| Material Group ISO 513 | | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| Hardness/Rm | | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| ap x ae | | **0.1D x 0.1D** | **0.1D x 0.1D** | **0.1D x 0.1D** | **0.1D x 0.1D** |
| Vc (m/min) | | **50÷70** | **35÷55** | **20÷40** | **80÷120** |
| **D (mm)** | **D(eff.) (mm)** | **fz (mm/z)** | **fz (mm/z)** | **fz (mm/z)** | **fz (mm/z)** |
| **1** | **0.60** | 0.030 | 0.023 | 0.021 | 0.036 |
| **2** | **1.20** | 0.040 | 0.030 | 0.028 | 0.048 |
| **3** | **1.80** | 0.050 | 0.038 | 0.035 | 0.060 |
| **4** | **2.40** | 0.060 | 0.045 | 0.042 | 0.072 |
| **5** | **3.00** | 0.070 | 0.053 | 0.049 | 0.084 |
| **6** | **3.60** | 0.080 | 0.060 | 0.056 | 0.096 |
| **8** | **4.80** | 0.090 | 0.068 | 0.063 | 0.108 |
| **10** | **6.00** | 0.105 | 0.079 | 0.074 | 0.126 |
| **12** | **7.20** | 0.120 | 0.090 | 0.084 | 0.144 |

# G2CSB2

cylindrical shank, 2 flutes ball nose

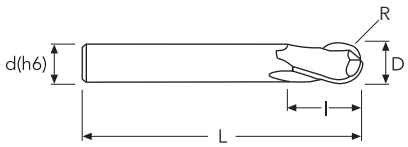
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | 0.50 | +/-0.015 | 4 | 2 | | 50 | 2 | G2CSB2010 | ● |
| **1.5** | 0/-0.020 | 0.75 | +/-0.015 | 4 | 3 | | 50 | 2 | G2CSB2015 | ● |
| **2** | 0/-0.020 | 1.00 | +/-0.015 | 4 | 4 | | 50 | 2 | G2CSB2020 | ● |
| **2.5** | 0/-0.020 | 1.25 | +/-0.015 | 4 | 5 | | 50 | 2 | G2CSB2025 | ● |
| **3** | 0/-0.020 | 1.50 | +/-0.015 | 4 | 6 | | 50 | 2 | G2CSB2030 | ● |
| **3.5** | 0/-0.020 | 1.75 | +/-0.015 | 4 | 7 | | 50 | 2 | G2CSB2035 | ● |
| **4** | 0/-0.020 | 2.00 | +/-0.015 | 4 | 8 | | 50 | 2 | G2CSB2040 | ● |
| **4.5** | 0/-0.020 | 2.25 | +/-0.015 | 6 | 9 | | 50 | 2 | G2CSB2045 | ● |
| **5** | 0/-0.020 | 2.50 | +/-0.015 | 6 | 10 | | 50 | 2 | G2CSB2050 | ● |
| **5.5** | 0/-0.020 | 2.75 | +/-0.015 | 6 | 11 | | 50 | 2 | G2CSB2055 | ● |
| **6** | 0/-0.020 | 3.00 | +/-0.015 | 6 | 12 | | 50 | 2 | G2CSB2060 | ● |
| **6.5** | 0/-0.025 | 3.25 | +/-0.015 | 8 | 13 | | 60 | 2 | G2CSB2065 | ● |
| **7** | 0/-0.025 | 3.50 | +/-0.015 | 8 | 14 | | 60 | 2 | G2CSB2070 | ● |
| **8** | 0/-0.025 | 4.00 | +/-0.015 | 8 | 16 | | 60 | 2 | G2CSB2080 | ● |
| **9** | 0/-0.025 | 4.50 | +/-0.015 | 10 | 18 | | 75 | 2 | G2CSB2090 | ● |
| **10** | 0/-0.025 | 5.00 | +/-0.015 | 10 | 20 | | 75 | 2 | G2CSB2100 | ● |
| **12** | 0/-0.025 | 6.00 | +/-0.015 | 12 | 24 | | 75 | 2 | G2CSB2120 | ● |
| **16** | 0/-0.030 | 8.00 | +/-0.015 | 16 | 30 | | 92 | 2 | G2CSB2160 | ● |
| **20** | 0/-0.030 | 10.00 | +/-0.015 | 20 | 30 | | 100 | 2 | G2CSB2200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# G2CSB2

| | Material Group ISO 513 | | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | | **0.1D x 0.1D** | **0.1D x 0.1D** | **0.1D x 0.1D** | **0.1D x 0.1D** |
| | Vc (m/min) | | **80÷100** | **60÷80** | **40÷60** | **110÷130** |
| COPYING | D (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | **0.60** | 0.030 | 0.023 | 0.021 | 0.036 |
| | **2** | **1.20** | 0.040 | 0.030 | 0.028 | 0.048 |
| | **3** | **1.80** | 0.050 | 0.038 | 0.035 | 0.060 |
| | **4** | **2.40** | 0.060 | 0.045 | 0.042 | 0.072 |
| | **5** | **3.00** | 0.070 | 0.053 | 0.049 | 0.084 |
| | **6** | **3.60** | 0.080 | 0.060 | 0.056 | 0.096 |
| | **8** | **4.80** | 0.090 | 0.068 | 0.063 | 0.108 |
| | **10** | **6.00** | 0.105 | 0.079 | 0.074 | 0.126 |
| | **12** | **7.20** | 0.120 | 0.090 | 0.084 | 0.144 |
| | **16** | **9.60** | 0.150 | 0.113 | 0.105 | 0.180 |
| | **20** | **12.00** | 0.180 | 0.135 | 0.126 | 0.216 |

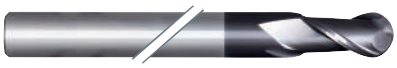
# G2250-51

cylindrical shank, 2 flutes ball nose, long

OSAWA NORM | N | MG PV200 | <45 HRC | 30° | BALL NOSE | Z2 BALL



G2250

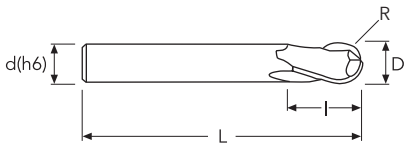


G2251

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.025 | 0.50 | +/-0.015 | 4 | 2 | | 75 | 2 | G2250010 | ● |
| **1.5** | 0/-0.025 | 0.75 | +/-0.015 | 4 | 3 | | 75 | 2 | G2250015 | ● |
| **2** | 0/-0.025 | 1.00 | +/-0.015 | 4 | 4 | | 75 | 2 | G2250020 | ● |
| **3** | 0/-0.025 | 1.50 | +/-0.015 | 4 | 6 | | 75 | 2 | G2250030 | ● |
| **4** | 0/-0.025 | 2.00 | +/-0.015 | 4 | 8 | | 75 | 2 | G2250040 | ● |
| **5** | 0/-0.025 | 2.50 | +/-0.015 | 6 | 10 | | 75 | 2 | G2250050 | ● |
| **6** | 0/-0.025 | 3.00 | +/-0.015 | 6 | 12 | | 100 | 2 | G2250060 | ● |
| **8** | 0/-0.030 | 4.00 | +/-0.015 | 8 | 16 | | 100 | 2 | G2250080 | ● |
| **10** | 0/-0.030 | 5.00 | +/-0.015 | 10 | 20 | | 100 | 2 | G2250100 | ● |
| **12** | 0/-0.030 | 6.00 | +/-0.015 | 12 | 24 | | 100 | 2 | G2250120 | ● |
| | | | | | | | | | | |
| **6** | 0/-0.025 | 3.00 | +/-0.015 | 6 | 12 | | 150 | 2 | G2251060 | ● |
| **8** | 0/-0.030 | 4.00 | +/-0.015 | 8 | 16 | | 150 | 2 | G2251080 | ● |
| **10** | 0/-0.030 | 5.00 | +/-0.015 | 10 | 20 | | 150 | 2 | G2251100 | ● |
| **12** | 0/-0.030 | 6.00 | +/-0.015 | 12 | 24 | | 150 | 2 | G2251120 | ● |
| **16** | 0/-0.035 | 8.00 | +/-0.015 | 16 | 30 | | 150 | 2 | G2251160 | ● |
| **20** | 0/-0.035 | 10.00 | +/-0.015 | 20 | 30 | | 150 | 2 | G2251200 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

CUTTING PARAMETERS

## G2250

| COPYING | Material Group ISO 513 | | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | | **0.1D x 0.1D** | **0.1D x 0.1D** | **0.1D x 0.1D** | **0.1D x 0.1D** |
| | Vc (m/min) | | **70÷90** | **50÷70** | **40÷50** | **100÷120** |
| | D (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | **0.60** | 0.027 | 0.020 | 0.019 | 0.032 |
| | **2** | **1.20** | 0.036 | 0.027 | 0.025 | 0.043 |
| | **3** | **1.80** | 0.045 | 0.034 | 0.032 | 0.054 |
| | **4** | **2.40** | 0.054 | 0.041 | 0.038 | 0.065 |
| | **5** | **3.00** | 0.063 | 0.047 | 0.044 | 0.076 |
| | **6** | **3.60** | 0.072 | 0.054 | 0.050 | 0.086 |
| | **8** | **4.80** | 0.081 | 0.061 | 0.057 | 0.097 |
| | **10** | **6.00** | 0.095 | 0.071 | 0.066 | 0.113 |
| | **12** | **7.20** | 0.108 | 0.081 | 0.076 | 0.130 |

## G2251

| COPYING | Material Group ISO 513 | | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | | **0.1D x 0.1D** | **0.1D x 0.1D** | **0.1D x 0.1D** | **0.1D x 0.1D** |
| | Vc (m/min) | | **60÷80** | **40÷60** | **35÷45** | **90÷110** |
| | D (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | **3.60** | 0.058 | 0.044 | 0.041 | 0.070 |
| | **8** | **4.80** | 0.066 | 0.049 | 0.046 | 0.079 |
| | **10** | **6.00** | 0.077 | 0.057 | 0.054 | 0.092 |
| | **12** | **7.20** | 0.087 | 0.066 | 0.061 | 0.105 |
| | **16** | **9.60** | 0.122 | 0.092 | 0.085 | 0.146 |
| | **20** | **12.00** | 0.146 | 0.110 | 0.102 | 0.175 |

# G2CSB4

cylindrical shank, 4 flutes ball nose

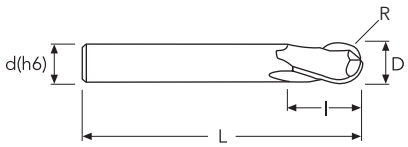
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | BALL NOSE | Z4 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | 0.50 | +/-0.015 | 4 | 2 | | 50 | 4 | G2CSB4010 | ● |
| **1.5** | 0/-0.020 | 0.75 | +/-0.015 | 4 | 3 | | 50 | 4 | G2CSB4015 | ● |
| **2** | 0/-0.020 | 1.00 | +/-0.015 | 4 | 4 | | 50 | 4 | G2CSB4020 | ● |
| **3** | 0/-0.020 | 1.50 | +/-0.015 | 4 | 6 | | 50 | 4 | G2CSB4030 | ● |
| **4** | 0/-0.020 | 2.00 | +/-0.015 | 4 | 8 | | 50 | 4 | G2CSB4040 | ● |
| **5** | 0/-0.020 | 2.50 | +/-0.015 | 6 | 10 | | 50 | 4 | G2CSB4050 | ● |
| **6** | 0/-0.020 | 3.00 | +/-0.015 | 6 | 12 | | 50 | 4 | G2CSB4060 | ● |
| **8** | 0/-0.025 | 4.00 | +/-0.015 | 8 | 16 | | 60 | 4 | G2CSB4080 | ● |
| **10** | 0/-0.025 | 5.00 | +/-0.015 | 10 | 20 | | 75 | 4 | G2CSB4100 | ● |
| **12** | 0/-0.025 | 6.00 | +/-0.015 | 12 | 24 | | 75 | 4 | G2CSB4120 | ● |
| **16** | 0/-0.030 | 8.00 | +/-0.015 | 16 | 30 | | 92 | 4 | G2CSB4160 | ● |
| **20** | 0/-0.030 | 10.00 | +/-0.015 | 20 | 30 | | 100 | 4 | G2CSB4200 | ● |

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

## G2CSB4

| | Material Group ISO 513 | | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | | **0.1D x 0.3D** | **0.1D x 0.3D** | **0.1D x 0.3D** | **0.1D x 0.3D** |
| | Vc (m/min) | | **80÷100** | **60÷80** | **40÷60** | **110÷130** |
| COPYING | D (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | **0.60** | 0.030 | 0.023 | 0.021 | 0.036 |
| | **2** | **1.20** | 0.040 | 0.030 | 0.028 | 0.048 |
| | **3** | **1.80** | 0.050 | 0.038 | 0.035 | 0.060 |
| | **4** | **2.40** | 0.060 | 0.045 | 0.042 | 0.072 |
| | **5** | **3.00** | 0.070 | 0.053 | 0.049 | 0.084 |
| | **6** | **3.60** | 0.080 | 0.060 | 0.056 | 0.096 |
| | **8** | **4.80** | 0.090 | 0.068 | 0.063 | 0.108 |
| | **10** | **6.00** | 0.105 | 0.079 | 0.074 | 0.126 |
| | **12** | **7.20** | 0.120 | 0.090 | 0.084 | 0.144 |
| | **16** | **9.60** | 0.150 | 0.113 | 0.105 | 0.180 |
| | **20** | **12.00** | 0.180 | 0.135 | 0.126 | 0.216 |





# MDTA
## GENERAL PURPOSE

MDTA is the Osawa range of micrograin carbide end mills with PV200 coating. MDTA endmills have been developed for general purpose milling up to 45 HRC. The exclusive and innovative PV200 coating (3500HV) ensures the best performance, even in applications with air blow or MQL (Minimum Quantity Lubrication).

MDTA sono le frese Osawa in metallo duro micrograna con rivestimento PV200 sviluppate per la fresatura di materiali generici sino a 45 HRC. L'esclusivo e innovativo rivestimento PV200 (3500HV) garantisce performance elevate anche in lavorazioni con impiego di refrigerazione con getto d'aria o MQL (Minimum Quantity Lubrication).

MDTA sind Fräser von Osawa aus Mikrokörnungs-Hartmetall mit Beschichtung PV200, die für das Fräsen von allgemeinen Materialien bis zu 45 HRC entwickelt wurden. Die exklusive und innovative Beschichtung PV200 (3500HV) gewährleistet auch bei Bearbeitungen mit Kühlung durch Luftstrahl oder MQL (Minimum Quantity Lubrication) hohe Leistungen.

MDTA sont les fraises Osawa en carbure micrograin avec revêtement PV200 développées pour le fraisage de matériaux génériques jusqu'à 45 HRC. Le revêtement PV200 (3500HV) exclusif et innovant garantit des performances élevées même pour les usinages employant un système de lubrification avec jet d'air ou MQL (Minimum Quantity Lubrication).

MDTA son las fresas Osawa de metal duro micrograno con revestimiento PV200 desarrolladas para el fresado de materiales genéricos hasta 45 HRC. Su exclusivo e innovador revestimiento PV200 (3500HV) garantiza rendimientos elevados incluso en elaboraciones con el uso de refrigeración con chorro de aire o MQL (Minimum Quantity Lubrication).

MDTA - это фрезы фирмы Osawa из твёрдого сплава с мелкозернистой структурой и покрытием PV200, предназначенные для стандартной обработки материалов с твёрдостью до 45 HRC. Эксклюзивное и инновационное покрытие PV200 (3500HV) гарантирует высокую производительность, даже, при обработке с обдувом воздухом или с масляным туманом.

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
**MDTA**
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# MDTACS2

cylindrical shank, 2 flutes

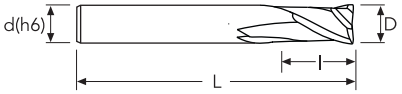
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z2



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.015 | | | 3 | 3 | | 40 | 2 | MDTACS2010403 | ● |
| **1** | 0/-0.015 | | | 4 | 3 | | 40 | 2 | MDTACS2010404 | ● |
| **1.5** | 0/-0.015 | | | 3 | 4.5 | | 40 | 2 | MDTACS2015403 | ● |
| **1.5** | 0/-0.015 | | | 4 | 4.5 | | 40 | 2 | MDTACS2015404 | ● |
| **2** | 0/-0.015 | | | 2 | 8 | | 32 | 2 | MDTACS2020 | ● |
| **2** | 0/-0.015 | | | 3 | 6.5 | | 40 | 2 | MDTACS2020403 | ● |
| **2** | 0/-0.015 | | | 4 | 6.5 | | 40 | 2 | MDTACS2020404 | ● |
| **2.5** | 0/-0.015 | | | 3 | 6.5 | | 40 | 2 | MDTACS2025403 | ● |
| **2.5** | 0/-0.015 | | | 4 | 6.5 | | 40 | 2 | MDTACS2025404 | ● |
| **3** | 0/-0.020 | | | 3 | 9 | | 40 | 2 | MDTACS2030403 | ● |
| **4** | 0/-0.020 | | | 4 | 12 | | 50 | 2 | MDTACS2040504 | ● |
| **5** | 0/-0.020 | | | 6 | 15 | | 50 | 2 | MDTACS2050506 | ● |
| **6** | 0/-0.020 | | | 6 | 16 | | 50 | 2 | MDTACS2060 | ● |
| **8** | 0/-0.020 | | | 8 | 20 | | 64 | 2 | MDTACS208064 | ● |
| **10** | 0/-0.020 | | | 10 | 22 | | 70 | 2 | MDTACS2100 | ● |
| **12** | 0/-0.020 | | | 12 | 25 | | 75 | 2 | MDTACS212075 | ● |
| **14** | 0/-0.020 | | | 14 | 25 | | 75 | 2 | MDTACS2140 | ● |
| **16** | 0/-0.020 | | | 16 | 32 | | 90 | 2 | MDTACS216090 | ● |
| **20** | 0/-0.020 | | | 20 | 38 | | 100 | 2 | MDTACS220038 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# MDTACS2

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **100÷120** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.004 | 0.003 | 0.003 | 0.005 |
| | **2** | 0.008 | 0.007 | 0.006 | 0.010 |
| | **3** | 0.012 | 0.010 | 0.009 | 0.016 |
| | **4** | 0.016 | 0.014 | 0.012 | 0.021 |
| | **5** | 0.020 | 0.017 | 0.015 | 0.026 |
| | **6** | 0.025 | 0.021 | 0.019 | 0.033 |
| | **8** | 0.032 | 0.027 | 0.024 | 0.042 |
| | **10** | 0.038 | 0.032 | 0.029 | 0.049 |
| | **12** | 0.045 | 0.038 | 0.034 | 0.059 |
| | **14** | 0.052 | 0.044 | 0.039 | 0.068 |
| | **16** | 0.060 | 0.051 | 0.045 | 0.078 |
| | **18** | 0.070 | 0.060 | 0.053 | 0.091 |
| | **20** | 0.080 | 0.068 | 0.060 | 0.104 |

< D3 mm: ap = 0.2D

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.5D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **100÷120** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.005 | 0.004 | 0.004 | 0.006 |
| | **2** | 0.010 | 0.008 | 0.007 | 0.012 |
| | **3** | 0.014 | 0.012 | 0.011 | 0.019 |
| | **4** | 0.019 | 0.016 | 0.014 | 0.025 |
| | **5** | 0.024 | 0.020 | 0.018 | 0.031 |
| | **6** | 0.030 | 0.026 | 0.023 | 0.039 |
| | **8** | 0.038 | 0.033 | 0.029 | 0.050 |
| | **10** | 0.046 | 0.039 | 0.034 | 0.059 |
| | **12** | 0.054 | 0.046 | 0.041 | 0.070 |
| | **14** | 0.062 | 0.053 | 0.047 | 0.081 |
| | **16** | 0.072 | 0.061 | 0.054 | 0.094 |
| | **18** | 0.084 | 0.071 | 0.063 | 0.109 |
| | **20** | 0.096 | 0.082 | 0.072 | 0.125 |

< D3 mm: ae = 0.2D

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **D x D** | **D x D** | **D x D** | **D x D** |
| | Vc (m/min) | **70÷90** | **40÷60** | **25÷35** | **80÷100** |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.002 | 0.002 | 0.002 | 0.003 |
| | **2** | 0.005 | 0.004 | 0.004 | 0.006 |
| | **3** | 0.007 | 0.006 | 0.005 | 0.009 |
| | **4** | 0.010 | 0.008 | 0.007 | 0.012 |
| | **5** | 0.012 | 0.010 | 0.009 | 0.016 |
| | **6** | 0.015 | 0.013 | 0.011 | 0.020 |
| | **8** | 0.019 | 0.016 | 0.014 | 0.025 |
| | **10** | 0.023 | 0.019 | 0.017 | 0.030 |
| | **12** | 0.027 | 0.023 | 0.020 | 0.035 |
| | **14** | 0.031 | 0.027 | 0.023 | 0.041 |
| | **16** | 0.036 | 0.031 | 0.027 | 0.047 |
| | **18** | 0.042 | 0.036 | 0.032 | 0.055 |
| | **20** | 0.048 | 0.041 | 0.036 | 0.062 |

< D3 mm: ap = 0.5D

INFO
CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA
HSS DRILLS
LFTA
SUTA
HSS-HSS/CO
CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH
HSS END-MILLS
CARBIDE BURRS

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
**MDTA**
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# MDTA210

cylindrical shank, 2 flutes, long

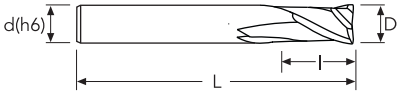
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z2



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | | | 3 | 20 | | 60 | 2 | MDTA210030 | ● |
| **4** | 0/-0.030 | | | 4 | 20 | | 60 | 2 | MDTA210040 | ● |
| **5** | 0/-0.030 | | | 5 | 25 | | 75 | 2 | MDTA210050 | ● |
| **6** | 0/-0.030 | | | 6 | 30 | | 75 | 2 | MDTA210060 | ● |
| **8** | 0/-0.030 | | | 8 | 30 | | 75 | 2 | MDTA210080 | ● |
| **10** | 0/-0.030 | | | 10 | 40 | | 100 | 2 | MDTA210100 | ● |
| **12** | 0/-0.030 | | | 12 | 45 | | 100 | 2 | MDTA210120 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# MDTA210

| SLOTTING | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **70÷90** | **45÷65** | **30÷40** | **70÷80** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.010 | 0.009 | 0.008 | 0.013 |
| | **4** | 0.014 | 0.012 | 0.011 | 0.018 |
| | **5** | 0.018 | 0.015 | 0.014 | 0.023 |
| | **6** | 0.023 | 0.019 | 0.017 | 0.029 |
| | **8** | 0.030 | 0.026 | 0.023 | 0.039 |
| | **10** | 0.035 | 0.030 | 0.026 | 0.046 |
| | **12** | 0.041 | 0.035 | 0.031 | 0.053 |

| SIDE MILLING | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.5D** |
| | Vc (m/min) | **70÷90** | **45÷65** | **30÷50** | **80÷120** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0,012 | 0,010 | 0,009 | 0,016 |
| | **4** | 0,017 | 0,014 | 0,013 | 0,022 |
| | **5** | 0,022 | 0,018 | 0,016 | 0,028 |
| | **6** | 0,027 | 0,023 | 0,020 | 0,035 |
| | **8** | 0,036 | 0,031 | 0,027 | 0,047 |
| | **10** | 0,042 | 0,036 | 0,032 | 0,055 |
| | **12** | 0,049 | 0,042 | 0,037 | 0,064 |

| DRILLING | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.5D** |
| | Vc (m/min) | **60÷80** | **40÷60** | **25÷35** | **70÷100** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.006 | 0.005 | 0.005 | 0.008 |
| | **4** | 0.008 | 0.007 | 0.006 | 0.011 |
| | **5** | 0.011 | 0.009 | 0.008 | 0.014 |
| | **6** | 0.014 | 0.011 | 0.010 | 0.018 |
| | **8** | 0.018 | 0.015 | 0.014 | 0.023 |
| | **10** | 0.021 | 0.018 | 0.016 | 0.027 |
| | **12** | 0.025 | 0.021 | 0.018 | 0.032 |

# MDCL2

cylindrical shank, 2 flutes, long

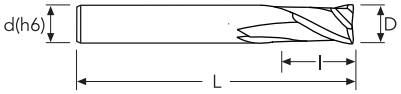
OSAWA NORM | N | MG / BR | <45 HRC | 30° | SQUARE | Z2



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.020 | | | 3 | 30 | | 75 | 2 | MDCL2030 | ● |
| **4** | 0/-0.020 | | | 4 | 30 | | 75 | 2 | MDCL2040 | ● |
| **5** | 0/-0.020 | | | 5 | 40 | | 100 | 2 | MDCL2050 | ● |
| **6** | 0/-0.020 | | | 6 | 50 | | 150 | 2 | MDCL2060 | ● |
| **8** | 0/-0.020 | | | 8 | 50 | | 150 | 2 | MDCL2080 | ● |
| **10** | 0/-0.020 | | | 10 | 60 | | 150 | 2 | MDCL2100 | ● |
| **12** | 0/-0.020 | | | 12 | 75 | | 150 | 2 | MDCL2120 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# MDCL2

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.3D x D** | **0.3D x D** | **0.3D x D** | **0.3D x D** |
| | Vc (m/min) | **40÷50** | **25÷35** | **20÷30** | **60÷80** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.010 | 0.008 | 0.007 | 0.011 |
| | **4** | 0.013 | 0.011 | 0.010 | 0.014 |
| | **5** | 0.016 | 0.014 | 0.012 | 0.018 |
| | **6** | 0.020 | 0.017 | 0.015 | 0.022 |
| | **8** | 0.026 | 0.022 | 0.019 | 0.033 |
| | **10** | 0.030 | 0.026 | 0.023 | 0.040 |
| | **12** | 0.036 | 0.031 | 0.027 | 0.047 |

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** |
| | Vc (m/min) | **45÷55** | **30÷40** | **25÷35** | **70÷90** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.012 | 0.010 | 0.009 | 0.013 |
| | **4** | 0.015 | 0.013 | 0.012 | 0.017 |
| | **5** | 0.019 | 0.016 | 0.014 | 0.021 |
| | **6** | 0.024 | 0.020 | 0.018 | 0.027 |
| | **8** | 0.031 | 0.026 | 0.023 | 0.040 |
| | **10** | 0.036 | 0.031 | 0.027 | 0.047 |
| | **12** | 0.043 | 0.037 | 0.032 | 0.056 |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
**MDTA**
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# MDTACS3

cylindrical shank, 3 flutes

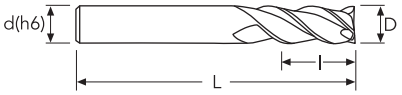
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z3



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.015 | | | 3 | 3 | | 40 | 3 | MDTACS3010403 | ● |
| **1** | 0/-0.015 | | | 4 | 3 | | 40 | 3 | MDTACS3010404 | ● |
| **1.5** | 0/-0.015 | | | 3 | 4.5 | | 40 | 3 | MDTACS3015403 | ● |
| **1.5** | 0/-0.015 | | | 4 | 4.5 | | 40 | 3 | MDTACS3015404 | ● |
| **2** | 0/-0.015 | | | 3 | 6.5 | | 40 | 3 | MDTACS3020403 | ● |
| **2** | 0/-0.015 | | | 4 | 6.5 | | 40 | 3 | MDTACS3020404 | ● |
| **2.5** | 0/-0.015 | | | 3 | 6.5 | | 40 | 3 | MDTACS3025403 | ● |
| **2.5** | 0/-0.015 | | | 4 | 6.5 | | 40 | 3 | MDTACS3025404 | ● |
| **3** | 0/-0.020 | | | 3 | 9 | | 40 | 3 | MDTACS3030403 | ● |
| **4** | 0/-0.020 | | | 4 | 12 | | 50 | 3 | MDTACS3040504 | ● |
| **5** | 0/-0.020 | | | 6 | 15 | | 50 | 3 | MDTACS3050506 | ● |
| **6** | 0/-0.020 | | | 6 | 16 | | 50 | 3 | MDTACS3060 | ● |
| **8** | 0/-0.020 | | | 8 | 20 | | 64 | 3 | MDTACS308064 | ● |
| **10** | 0/-0.020 | | | 10 | 22 | | 70 | 3 | MDTACS3100 | ● |
| **12** | 0/-0.020 | | | 12 | 25 | | 75 | 3 | MDTACS312075 | ● |
| **14** | 0/-0.020 | | | 14 | 25 | | 75 | 3 | MDTACS3140 | ● |
| **16** | 0/-0.020 | | | 16 | 32 | | 90 | 3 | MDTACS316090 | ● |
| **20** | 0/-0.020 | | | 20 | 38 | | 100 | 3 | MDTACS320038 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# MDTACS3

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **100÷120** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.004 | 0.003 | 0.003 | 0.005 |
| | **2** | 0.008 | 0.007 | 0.006 | 0.010 |
| | **3** | 0.011 | 0.009 | 0.008 | 0.014 |
| | **4** | 0.014 | 0.012 | 0.011 | 0.019 |
| | **5** | 0.018 | 0.015 | 0.013 | 0.023 |
| | **6** | 0.021 | 0.018 | 0.016 | 0.027 |
| | **8** | 0.028 | 0.023 | 0.021 | 0.036 |
| | **10** | 0.035 | 0.030 | 0.026 | 0.046 |
| | **12** | 0.044 | 0.037 | 0.033 | 0.057 |
| | **14** | 0.052 | 0.044 | 0.039 | 0.067 |
| | **16** | 0.059 | 0.050 | 0.045 | 0.077 |
| | **18** | 0.066 | 0.056 | 0.050 | 0.086 |
| | **20** | 0.072 | 0.061 | 0.054 | 0.093 |

< D3 mm: ap = 0.2D

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **100÷120** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.005 | 0.004 | 0.003 | 0.006 |
| | **2** | 0.009 | 0.008 | 0.007 | 0.012 |
| | **3** | 0.013 | 0.011 | 0.010 | 0.017 |
| | **4** | 0.017 | 0.015 | 0.013 | 0.022 |
| | **5** | 0.021 | 0.018 | 0.016 | 0.027 |
| | **6** | 0.025 | 0.021 | 0.019 | 0.033 |
| | **8** | 0.033 | 0.028 | 0.025 | 0.043 |
| | **10** | 0.042 | 0.036 | 0.032 | 0.055 |
| | **12** | 0.053 | 0.045 | 0.040 | 0.069 |
| | **14** | 0.062 | 0.053 | 0.047 | 0.081 |
| | **16** | 0.071 | 0.061 | 0.053 | 0.093 |
| | **18** | 0.079 | 0.067 | 0.059 | 0.103 |
| | **20** | 0.086 | 0.073 | 0.064 | 0.112 |

< D3 mm: ae = 0.1D

# MDTAWSH3

weldon shank, 3 flutes

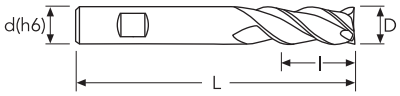
OSAWA NORM | N | MG PV200 | <45 HRC | 45° | SQUARE | Z3



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | | | 6 | 7 | | 57 | 3 | MDTAWSH3030 | ● |
| **4** | 0/-0.030 | | | 6 | 8 | | 57 | 3 | MDTAWSH3040 | ● |
| **5** | 0/-0.030 | | | 6 | 10 | | 57 | 3 | MDTAWSH3050 | ● |
| **6** | 0/-0.030 | | | 6 | 10 | | 57 | 3 | MDTAWSH3060 | ● |
| **8** | 0/-0.030 | | | 8 | 16 | | 63 | 3 | MDTAWSH3080 | ● |
| **10** | 0/-0.030 | | | 10 | 19 | | 72 | 3 | MDTAWSH3100 | ● |
| **12** | 0/-0.030 | | | 12 | 22 | | 83 | 3 | MDTAWSH3120 | ● |
| **14** | 0/-0.030 | | | 14 | 22 | | 83 | 3 | MDTAWSH3140 | ● |
| **16** | 0/-0.030 | | | 16 | 26 | | 92 | 3 | MDTAWSH3160 | ● |
| **20** | 0/-0.030 | | | 20 | 32 | | 104 | 3 | MDTAWSH3200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# MDTAWSH3

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **80÷120** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.009 | 0.008 | 0.007 | 0.012 |
| | **4** | 0.013 | 0.011 | 0.009 | 0.016 |
| | **5** | 0.016 | 0.013 | 0.012 | 0.020 |
| | **6** | 0.019 | 0.016 | 0.014 | 0.024 |
| | **8** | 0.025 | 0.021 | 0.019 | 0.033 |
| | **10** | 0.031 | 0.027 | 0.023 | 0.041 |
| | **12** | 0.040 | 0.034 | 0.030 | 0.052 |
| | **14** | 0.046 | 0.039 | 0.035 | 0.060 |
| | **16** | 0.056 | 0.048 | 0.042 | 0.073 |
| | **18** | 0.065 | 0.055 | 0.049 | 0.085 |
| | **20** | 0.075 | 0.064 | 0.056 | 0.098 |

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** |
| | Vc (m/min) | **90÷110** | **60÷80** | **40÷60** | **110÷130** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.011 | 0.010 | 0.008 | 0.015 |
| | **4** | 0.015 | 0.013 | 0.011 | 0.020 |
| | **5** | 0.019 | 0.016 | 0.014 | 0.024 |
| | **6** | 0.023 | 0.019 | 0.017 | 0.029 |
| | **8** | 0.030 | 0.026 | 0.023 | 0.039 |
| | **10** | 0.038 | 0.032 | 0.028 | 0.049 |
| | **12** | 0.048 | 0.041 | 0.036 | 0.062 |
| | **14** | 0.056 | 0.047 | 0.042 | 0.072 |
| | **16** | 0.068 | 0.057 | 0.051 | 0.088 |
| | **18** | 0.078 | 0.066 | 0.059 | 0.101 |
| | **20** | 0.090 | 0.077 | 0.068 | 0.117 |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
**MDTA**
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# MDTACS4

cylindrical shank, 4 flutes

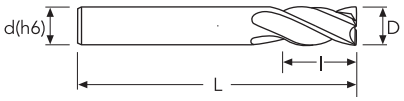
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z4



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.015 | | | 3 | 3 | | 40 | 4 | MDTACS4010403 | ● |
| **1** | 0/-0.015 | | | 4 | 3 | | 40 | 4 | MDTACS4010404 | ● |
| **1.5** | 0/-0.015 | | | 3 | 4.5 | | 40 | 4 | MDTACS4015403 | ● |
| **1.5** | 0/-0.015 | | | 4 | 4.5 | | 40 | 4 | MDTACS4015404 | ● |
| **2** | 0/-0.015 | | | 2 | 8 | | 32 | 4 | MDTACS4020 | ● |
| **2** | 0/-0.015 | | | 3 | 6.5 | | 40 | 4 | MDTACS4020403 | ● |
| **2** | 0/-0.015 | | | 4 | 6.5 | | 40 | 4 | MDTACS4020404 | ● |
| **2.5** | 0/-0.015 | | | 3 | 6.5 | | 40 | 4 | MDTACS4025403 | ● |
| **2.5** | 0/-0.015 | | | 4 | 6.5 | | 40 | 4 | MDTACS4025404 | ● |
| **3** | 0/-0.020 | | | 3 | 9 | | 40 | 4 | MDTACS4030403 | ● |
| **4** | 0/-0.020 | | | 4 | 12 | | 50 | 4 | MDTACS4040504 | ● |
| **5** | 0/-0.020 | | | 6 | 15 | | 50 | 4 | MDTACS4050506 | ● |
| **6** | 0/-0.020 | | | 6 | 16 | | 50 | 4 | MDTACS4060 | ● |
| **8** | 0/-0.020 | | | 8 | 20 | | 64 | 4 | MDTACS408064 | ● |
| **10** | 0/-0.020 | | | 10 | 22 | | 70 | 4 | MDTACS4100 | ● |
| **12** | 0/-0.020 | | | 12 | 25 | | 75 | 4 | MDTACS412075 | ● |
| **14** | 0/-0.020 | | | 14 | 25 | | 75 | 4 | MDTACS4140 | ● |
| **16** | 0/-0.020 | | | 16 | 32 | | 90 | 4 | MDTACS416090 | ● |
| **20** | 0/-0.020 | | | 20 | 38 | | 100 | 4 | MDTACS420038 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

## MDTACS4

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.2D** | **1.5D x 0.2D** | **1.5D x 0.2D** | **0.5D x D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | **100÷120** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.004 | 0.003 | 0.003 | 0.005 |
| | **2** | 0.007 | 0.006 | 0.005 | 0.009 |
| | **3** | 0.010 | 0.009 | 0.008 | 0.013 |
| | **4** | 0.013 | 0.011 | 0.010 | 0.017 |
| | **5** | 0.016 | 0.014 | 0.012 | 0.021 |
| | **6** | 0.019 | 0.016 | 0.014 | 0.025 |
| | **8** | 0.025 | 0.021 | 0.019 | 0.033 |
| | **10** | 0.032 | 0.027 | 0.024 | 0.042 |
| | **12** | 0.040 | 0.034 | 0.030 | 0.052 |
| | **14** | 0.047 | 0.040 | 0.035 | 0.061 |
| | **16** | 0.054 | 0.046 | 0.041 | 0.070 |
| | **18** | 0.060 | 0.051 | 0.045 | 0.078 |
| | **20** | 0.065 | 0.055 | 0.049 | 0.085 |
| | **22** | 0.073 | 0.062 | 0.055 | 0.095 |
| | **25** | 0.083 | 0.071 | 0.062 | 0.108 |

< D3 mm: ae = 0.1D

# MDTA410

cylindrical shank, 4 flutes, long

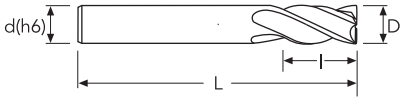
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | SQUARE | Z4



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | | | 3 | 20 | | 60 | 4 | MDTA410030 | ● |
| **4** | 0/-0.030 | | | 4 | 20 | | 60 | 4 | MDTA410040 | ● |
| **5** | 0/-0.030 | | | 5 | 25 | | 75 | 4 | MDTA410050 | ● |
| **6** | 0/-0.030 | | | 6 | 30 | | 75 | 4 | MDTA410060 | ● |
| **8** | 0/-0.030 | | | 8 | 30 | | 75 | 4 | MDTA410080 | ● |
| **10** | 0/-0.030 | | | 10 | 40 | | 100 | 4 | MDTA410100 | ● |
| **12** | 0/-0.030 | | | 12 | 45 | | 100 | 4 | MDTA410120 | ● |
| **14** | 0/-0.030 | | | 14 | 45 | | 100 | 4 | MDTA410140 | ● |
| **16** | 0/-0.030 | | | 16 | 45 | | 100 | 4 | MDTA410160 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# MDTA410

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **70÷90** | **45÷65** | **30÷50** | **80÷120** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **2** | 0.006 | 0.005 | 0.005 | 0.008 |
| | **3** | 0.009 | 0.008 | 0.007 | 0.012 |
| | **4** | 0.012 | 0.010 | 0.009 | 0.015 |
| | **5** | 0.014 | 0.012 | 0.011 | 0.019 |
| | **6** | 0.017 | 0.015 | 0.013 | 0.022 |
| | **8** | 0.023 | 0.019 | 0.017 | 0.029 |
| | **10** | 0.029 | 0.024 | 0.022 | 0.037 |
| | **12** | 0.036 | 0.031 | 0.027 | 0.047 |
| | **14** | 0.042 | 0.036 | 0.032 | 0.065 |
| | **16** | 0.048 | 0.041 | 0.036 | 0.062 |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
**MDTA**
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# MDCL4

cylindrical shank, 4 flutes, long

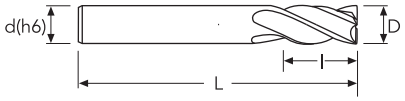
OSAWA NORM | N | MG / BR | <45 HRC | 30° | SQUARE | Z4



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.020 | | | 3 | 30 | | 75 | 4 | MDCL4030 | ● |
| **4** | 0/-0.020 | | | 4 | 30 | | 75 | 4 | MDCL4040 | ● |
| **5** | 0/-0.020 | | | 5 | 40 | | 100 | 4 | MDCL4050 | ● |
| **6** | 0/-0.020 | | | 6 | 50 | | 150 | 4 | MDCL4060 | ● |
| **8** | 0/-0.020 | | | 8 | 50 | | 150 | 4 | MDCL4080 | ● |
| **10** | 0/-0.020 | | | 10 | 60 | | 150 | 4 | MDCL4100 | ● |
| **12** | 0/-0.035 | | | 12 | 75 | | 150 | 4 | MDCL4120 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

## MDCL4

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **45÷55** | **30÷40** | **25÷35** | **70÷90** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.008 | 0.007 | 0.006 | 0.009 |
| | **4** | 0.010 | 0.009 | 0.008 | 0.011 |
| | **5** | 0.013 | 0.011 | 0.010 | 0.014 |
| | **6** | 0.015 | 0.013 | 0.011 | 0.017 |
| | **8** | 0.020 | 0.017 | 0.015 | 0.026 |
| | **10** | 0.026 | 0.022 | 0.019 | 0.033 |
| | **12** | 0.032 | 0.027 | 0.024 | 0.042 |
| | **14** | 0.038 | 0.032 | 0.028 | 0.049 |
| | **16** | 0.043 | 0.037 | 0.032 | 0.056 |
| | **20** | 0.052 | 0.044 | 0.039 | 0.068 |

# MDTAUPR

weldon shank, roughing HR, unequal pitch

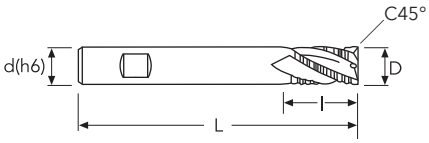
OSAWA NORM | N | MG / PV200 | <45 HRC | 40° | C45° | HR FINE | Z3 UP ≤ Ø8 | Z4 UP > Ø8




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | | | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 16 | | 57 | 3 | MDTAUPR060 | ● |
| **8** | 0/-0.030 | 0.20 | +/-0.020 | 8 | 16 | | 63 | 3 | MDTAUPR080 | ● |
| **10** | 0/-0.030 | 0.20 | +/-0.020 | 10 | 22 | | 72 | 4 | MDTAUPR100 | ● |
| **12** | 0/-0.030 | 0.20 | +/-0.020 | 12 | 26 | | 83 | 4 | MDTAUPR120 | ● |
| **14** | 0/-0.030 | 0.30 | +/-0.020 | 14 | 26 | | 83 | 4 | MDTAUPR140 | ● |
| **16** | 0/-0.030 | 0.30 | +/-0.020 | 16 | 32 | | 92 | 4 | MDTAUPR160 | ● |
| **20** | 0/-0.030 | 0.40 | +/-0.020 | 20 | 38 | | 104 | 4 | MDTAUPR200 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

CUTTING PARAMETERS

## MDTAUPR

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **0.5D x D** | **0.5D x D** | **1.5D x 0.1D** | |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | |
| | **6** | 0.030 | 0.026 | 0.023 | |
| | **8** | 0.045 | 0.038 | 0.034 | |
| | **10** | 0.055 | 0.047 | 0.041 | |
| | **12** | 0.065 | 0.055 | 0.049 | |
| | **14** | 0.075 | 0.064 | 0.056 | |
| | **16** | 0.085 | 0.072 | 0.064 | |
| | **20** | 0.100 | 0.085 | 0.075 | |

D6-8: Z3
D10-20: Z4

| | Material Group ISO 513 | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** | |
| | Vc (m/min) | **80÷100** | **50÷70** | **30÷50** | |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | |
| | **6** | 0.040 | 0.034 | 0.030 | |
| | **8** | 0.055 | 0.047 | 0.041 | |
| | **10** | 0.065 | 0.055 | 0.049 | |
| | **12** | 0.080 | 0.068 | 0.060 | |
| | **14** | 0.090 | 0.077 | 0.068 | |
| | **16** | 0.100 | 0.085 | 0.075 | |
| | **20** | 0.120 | 0.102 | 0.090 | |

D6-8: Z3
D10-20: Z4

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
**MDTA**
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# MDTACSB2

cylindrical shank, 2 flutes ball nose

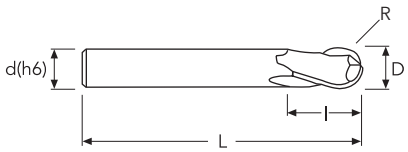
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.030 | 0.50 | 0/-0.020 | 3 | 3 | | 40 | 2 | MDTACSB2010 | ● |
| **1.5** | 0/-0.030 | 0.75 | 0/-0.020 | 3 | 5 | | 40 | 2 | MDTACSB2015 | ● |
| **2** | 0/-0.030 | 1.00 | 0/-0.020 | 3 | 7 | | 40 | 2 | MDTACSB2020 | ● |
| **2.5** | 0/-0.030 | 1.25 | 0/-0.020 | 3 | 8 | | 40 | 2 | MDTACSB2025 | ● |
| **3** | 0/-0.030 | 1.50 | 0/-0.020 | 3 | 10 | | 40 | 2 | MDTACSB2030 | ● |
| **4** | 0/-0.030 | 2.00 | 0/-0.020 | 4 | 12 | | 40 | 2 | MDTACSB2040 | ● |
| **5** | 0/-0.030 | 2.50 | 0/-0.020 | 5 | 14 | | 50 | 2 | MDTACSB2050 | ● |
| **6** | 0/-0.030 | 3.00 | 0/-0.020 | 6 | 7 | | 50 | 2 | MDTACSB2060 | ● |
| **8** | 0/-0.030 | 4.00 | 0/-0.020 | 8 | 9 | | 60 | 2 | MDTACSB2080 | ● |
| **10** | 0/-0.030 | 5.00 | 0/-0.020 | 10 | 10 | | 60 | 2 | MDTACSB2100 | ● |
| **12** | 0/-0.030 | 6.00 | 0/-0.020 | 12 | 14 | | 70 | 2 | MDTACSB2120 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

## MDTACSB2

| | Material Group ISO 513 | | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | | **0.1D x 0.1D** | **0.1D x 0.1D** | **0.1D x 0.1D** | **0.1D x 0.1D** |
| | Vc (m/min) | | **80÷100** | **60÷80** | **40÷60** | **110÷130** |
| COPYING | D (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | **0.60** | 0.030 | 0.023 | 0.021 | 0.036 |
| | **2** | **1.20** | 0.040 | 0.030 | 0.028 | 0.048 |
| | **3** | **1.80** | 0.050 | 0.038 | 0.035 | 0.060 |
| | **4** | **2.40** | 0.060 | 0.045 | 0.042 | 0.072 |
| | **5** | **3.00** | 0.070 | 0.053 | 0.049 | 0.084 |
| | **6** | **3.60** | 0.080 | 0.060 | 0.056 | 0.096 |
| | **8** | **4.80** | 0.090 | 0.068 | 0.063 | 0.108 |
| | **10** | **6.00** | 0.105 | 0.079 | 0.074 | 0.126 |
| | **12** | **7.20** | 0.120 | 0.090 | 0.084 | 0.144 |

# MDTA250

cylindrical shank, 2 flutes ball nose, long

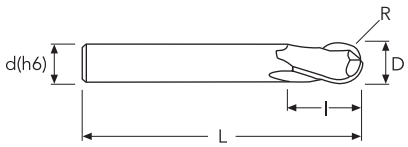
OSAWA NORM | N | MG PV200 | <45 HRC | 30° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | 1.50 | 0/-0.020 | 3 | 5 | | 75 | 2 | MDTA250030 | ● |
| **4** | 0/-0.030 | 2.00 | 0/-0.020 | 4 | 8 | | 75 | 2 | MDTA250040 | ● |
| **5** | 0/-0.030 | 2.50 | 0/-0.020 | 5 | 9 | | 75 | 2 | MDTA250050 | ● |
| **6** | 0/-0.030 | 3.00 | 0/-0.020 | 6 | 10 | | 100 | 2 | MDTA250060 | ● |
| **8** | 0/-0.030 | 4.00 | 0/-0.020 | 8 | 12 | | 100 | 2 | MDTA250080 | ● |
| **10** | 0/-0.030 | 5.00 | 0/-0.020 | 10 | 14 | | 100 | 2 | MDTA250100 | ● |
| **12** | 0/-0.030 | 6.00 | 0/-0.020 | 12 | 16 | | 100 | 2 | MDTA250120 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

# MDTA250

| | Material Group ISO 513 | | P1 P2 K1 | P3 P4 P7 M1 K2 | P5 M2 K3 | N1 N2 N3 N4 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | |
| | ap x ae | | **0.1D x 0.1D** | **0.1D x 0.1D** | **0.1D x 0.1D** | **0.1D x 0.1D** |
| | Vc (m/min) | | **70÷90** | **50÷70** | **40÷50** | **100÷120** |
| COPYING | D (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | **0.60** | 0.027 | 0.020 | 0.019 | 0.032 |
| | **2** | **1.20** | 0.036 | 0.027 | 0.025 | 0.043 |
| | **3** | **1.80** | 0.045 | 0.034 | 0.032 | 0.054 |
| | **4** | **2.40** | 0.054 | 0.041 | 0.038 | 0.065 |
| | **5** | **3.00** | 0.063 | 0.047 | 0.044 | 0.076 |
| | **6** | **3.60** | 0.072 | 0.054 | 0.050 | 0.086 |
| | **8** | **4.80** | 0.081 | 0.061 | 0.057 | 0.097 |
| | **10** | **6.00** | 0.095 | 0.071 | 0.066 | 0.113 |
| | **12** | **7.20** | 0.108 | 0.081 | 0.076 | 0.130 |



# HF VH/UP

UNIVERSAL PURPOSE

HF EVOlution is the Osawa family of micrograin carbide endmills for universal application with coatings and cutting edges specifically designed for high performance machining of all ISO materials. The HF EVOlution endmills are available in a broad range of types, lengths and radii. They are the ideal tools for both mass production and small batch manufacturing, thanks to the outstanding performance delivered and the universal applicability.

HF EVOlution è la linea Osawa di frese universali in metallo duro micrograna con spoglie e rivestimenti specifici per la lavorazione ad alto rendimento di tutti i materiali della scala ISO. Le frese HF EVOlution sono disponibili in un'ampia gamma di tipologie, lunghezze e raggi torici. Sono gli utensili ideali sia per le superproduzioni di serie che per la produzione di piccoli lotti, grazie all'eccellenza del rendimento e all'universalità d'impiego.

HF EVOlution heißt die Linie der Universalfräser aus mikrokörnigem Hartmetall von Osawa, mit Schneidekanten und spezifischen Beschichtungen zur Hochleistungsbearbeitung von allen Materialien der ISO-Skala. Die Fräser HF EVOlution sind in einer reichen Auswahl an Typologien, Längen und Torusradien erhältlich. Mit ihren ausgezeichneten Leistungen und dem universellen Einsatz sind sie die idealen Werkzeuge, sowohl für die Serienproduktion großer Mengen als auch für die Herstellung kleiner Lose.

HF EVOlution est la ligne Osawa de fraises universelles en carbure micrograin avec dépouilles et revêtements spécifiques pour l'usinage de haute performance de tous les matériaux de l'échelle ISO. Les fraises HF EVOlution sont disponibles dans une large gamme, longueurs et rayons. Ce sont des outils aussi bien pour les grandes séries que pour la production de prototypes, grâce à leur excellence de rendement et leur polyvalence.

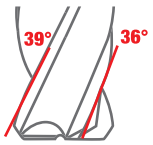
HF EVOlution es la línea de fresas universales de metal duro microgranulado con inclinación y revestimientos específicos para el mecanizado de alto rendimiento de todos los materiales de la escala ISO. Las fresas HF EVOlution están disponibles en una amplia gama de tipologías, longitudes y radios tóricos. Son las herramientas ideales tanto para las superproducciones en serie como para la producción de pequeños lotes, gracias a la excelencia del rendimiento y la universalidad de empleo.

HF EVOlution - это линейка универсальных фрез Osawa из мелкозернистого твердого сплава со специальным покрытием для высокопроизводительной обработки всех материалов по ISO. Доступна широкая гамма фрез этой серии, имеющих различную длину и радиусы на уголках. Благодаря высокой эффективности и универсальности, это идеальные инструменты как для массового, так и для мелкосерийного производства.

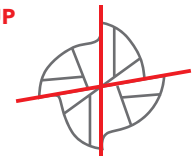
## HF VH/UP

UNIVERSAL PURPOSE

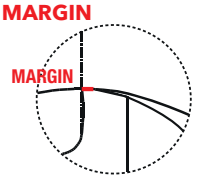
**(1) VH**



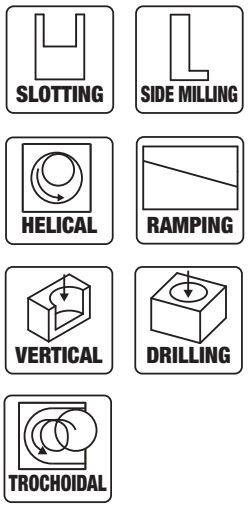

**(2) UP**



**(3) MARGIN**




ISO P
ISO M
ISO K
ISO S
ISO H




## HIGH PERFORMANCE

Thanks to the variable helix geometry VH (1) with unequal pitch UP (2) and to the highly sophisticated cutting edge preparation (3), the HF EVOlution endmills enable the highest level of performances in terms of tool life, volume of chip removed, productivity and surface finishing.

Grâce à la géométrie à hélice variable VH (1) à pas décalé UP (2) et à la préparation technique de la partie coupante (3), les fraises HF EVOlution garantissent des performances de haut niveau en termes de durée, volume de débit copeau, productivité et finition superficielle.

Grazie alla geometria ad elica variabile VH (1) con passo differenziato UP (2) e alla sofisticata preparazione del tagliente (3), le frese HF EVOlution garantiscono performance di alto livello in termini di durata, volume truciolo asportato, produttività e finitura superficiale.

Gracias a la geometría de hélice variable VH (1) con paso diferenciado UP (2) y a la sofisticada preparación del filo (3), las fresas HF EVOlution garantizan rendimientos de alto nivel en términos de duración, volumen de la viruta extraída, productividad y acabado de la superficie.

Dank der Geometrie mit variabler Helix VH (1) mit ungleicher Teilung UP (2) und der sorgfältigen Herstellung der Schneide (3) gewährleisten die Fräser HF EVOlution Höchstleistungen, was die Dauer, das Volumen des abgetragenen Spans, die Produktivität und das Oberflächenfinish betrifft.

Благодаря геометрии с переменным углом наклона спирали VH (1) с неравномерным шагом UP (2) и сложной формой зубьев (3), фрезы HF EVOlution гарантируют высокую производительность, стойкость, объем удаляемого материала и низкую шероховатость обработанной поверхности.

## UNIVERSAL

The HF EVOlution endmills are universal tools, both for the broad range of materials machineable, the type of applications and for the milling strategies applicable: slotting, side milling, helical interpolation, ramping, vertical milling, drilling and trochoidal milling. Just one single HF tool enables roughing, semi-finishing and finishing applications.

Les fraises HF EVOlution sont des outils universels aussi bien pour tous types de matériaux que pour tous types d'usinages et de stratégies de fraisages applicables : fraisage de pièces taillées dans la masse, contournage, interpolation hélicoïdale, entrée sur rampe, fraisage axial, perçage et fraisage trochoïdal. Un seul outil HF permet de réaliser des usinages d'ébauche, semi finition et finition.

Le frese HF EVOlution sono utensili universali sia per la gamma dei materiali lavorabili che per il tipo di lavorazione e strategia di fresatura applicabile: fresatura dal pieno, contornatura, interpolazione elicoidale, entrata in rampa, fresatura assiale, foratura e fresatura trocoidale. Un unico utensile HF permette lavorazioni di sgrossatura, semi-sgrossatura e finitura.

Las fresas HF EVOlution son herramientas universales tanto por su gama de materiales trabajables como por el tipo de elaboración y estrategia de fresado aplicable: fresado de una sola pieza, contorneado, interpolación helicoidal, entrada en rampa, fresado axial, perforación y fresado trocoidal. Un sola herramienta HF permite elaboraciones de desbastado, semidesbastado y acabado.

Die Fräser HF EVOlution sind universelle Werkzeuge, sowohl aufgrund der breiten Palette bearbeitbarer Materialien als auch dank der anwendbaren Bearbeitungsarten und Frässtrategien: Nutfräsen, Konturfräsen, Helixinterpolation, Rampenfräsen, Vertikalfräsen, Bohren und trochoidales Fräsen. Ein einziges HF Werkzeug kann zum Schruppen, Vorschlichten und Schlichten eingesetzt werden.

Фрезы HF EVOlution являются универсальными инструментами как для широкой гаммы обрабатываемых материалов, так и для многих стратегий фрезерования: фрезерование пазов, уступов, по спирали, под углом, вдоль оси, сверление и трохоидальное фрезерование. С помощью одной фрезы серии HF можно выполнять черновую, получистовую и чистовую обработку.










## COMPLETE RANGE

2 families of tools with application-specific geometries.
- HF UNI (VH+UP), designed for milling of materials with hardness up to 40 HRC: steel (ISO P), stainless steel (ISO M), cast iron (ISO K) and super alloys (ISO S), such as Inconel or Titanium. The HF UNI range is now extended with the new HF UNI SC "smooth cut" which reduces significantly the cutting forces thanks to the cutting edge geometry, becoming particularly suitable in case of machining with less powerful machines.
- HF HARD (UP) for steel (ISO P), stainless steel (ISO M), cast iron (ISO K), super alloys (ISO S), hardened steel (ISO H) milling, with hardness up to 55 HRC.

2 familles d'outils avec des géométries spécifiques.
- HF UNI (VH+UP), pour fraisage de matériaux dont la dureté peut atteindre 40HRC : acier (ISO P), acier inoxydable (ISO M), fonte (ISO K) et super alliages (ISO S), tels que l' inconel ou titane. La gamme HF UNI s'enrichit de la nouvelle HF UNI SC « smooth cut » qui, grâce à la géométrie de coupe, réduit considérablement les efforts de coupe, ce qui la rend particulièrement adaptée à l'utilisation sur des machines peu puissantes.
- HF HARD (UP), pour fraisage d'acier (ISO P), acier inoxydable (ISO M), fonte (ISO K) et super alliages (ISO S), acier trempé (ISO H), dont la dureté peut atteindre 55HRC.

2 famiglie di utensili con geometrie specifiche.
- HF UNI (VH+UP), per fresatura di materiali con durezza sino a 40 HRC: acciaio (ISO P), acciaio inossidabile (ISO M), ghisa (ISO K) e super leghe (ISO S), quali Inconel o titanio. La gamma HF UNI si arricchisce della nuova HF UNI SC "smooth cut" che, grazie alla geometria del tagliente, riduce notevolmente gli sforzi di taglio, risultando particolarmente adatta all'utilizzo su macchine poco potenti.
- HF HARD (UP) per fresatura di acciaio (ISO P), acciaio inossidabile (ISO M), ghisa (ISO K), super leghe (ISO S), acciaio temprato (ISO H), con durezza sino a 55 HRC.

2 familias de herramientas con geometrías específicas.
- HF UNI (VH+UP), para fresado de materiales con dureza hasta 40HRC: acero (ISO P), acero inoxidable (ISO M), fundición (ISO K) y súper aleaciones (ISO S), como Inconel o titanio. La gama HF UNI se enriquece con la nueva HF UNI SC «smooth cut», que, gracias a la geometría del filo cortante, reduce de forma importante los esfuerzos de corte, resultando especialmente adecuada para su uso en máquinas poco potentes.
- HF HARD (UP), para fresado de acero (ISO P), acero inoxidable (ISO M), fundición (ISO K) y súper aleaciones (ISO S), acero templado (ISO H), con duración de hasta 55 HRC.

2 Werkzeugfamilien mit spezifischen Geometrien.
- HF UNI (VH+UP), zum Fräsen von Materialien mit einer Härte bis zu 40HRC: Stahl (ISO P), korrosionsbeständiger Stahl (ISO M), Gusseisen (ISO K) und Superlegierungen (ISO S) wie Inconel oder Titan. Die Serie HF UNI wird durch den neuen Fräser HF UNI SC „Smooth Cut" erweitert, bei dem dank der Geometrie der Schneide die aufzubringende Schnittkraft wesentlich verringert werden konnte, so dass dieser Fräser besonders für den Einsatz auf weniger leistungsfähigen Maschinen geeignet ist.
- HF HARD (UP) für das Fräsen von Stahl (ISO P), korrosionsbeständigem Stahl (ISO M), Gusseisen (ISO K), Superlegierungen (ISO S), gehärtetem Stahl (ISO H) mit einer Härten bis zu 55HRC.

2 семейства инструментов со специальной геометрией.
- HF UNI (VH+UP), для фрезерования материалов твердостью до 40HRC: сталь (ISO P), нержавеющая сталь (ISO M), чугун (ISO K) и жаропрочные сплавы (ISO S), такие как инконель и титан. К этому семейству добавлена новая фреза HF UNI SC «smooth cut» (плавное резание), которая, благодаря форме зубьев, значительно сокращает усилия резания, что делает ее пригодной для использования на маломощных станках.
- HF HARD (UP) для фрезерования стали (ISO P), нержавеющей стали (ISO M), чугуна (ISO K), жаропрочных сплавов (ISO S), закаленной стали (ISO H) твердостью до 55 HRC.

# HF840

cylindrical shank, 45° chamfer

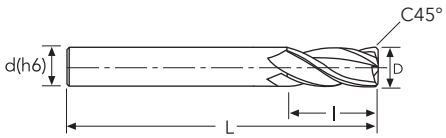
OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | C45° | Z4 UP




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.020 | 0.10 | +/-0.020 | 6 | 9 | | 57 | 4 | HF840030 | ● |
| **4** | 0/-0.020 | 0.10 | +/-0.020 | 6 | 11 | | 57 | 4 | HF840040 | ● |
| **5** | 0/-0.020 | 0.10 | +/-0.020 | 6 | 13 | | 57 | 4 | HF840050 | ● |
| **6** | 0/-0.020 | 0.10 | +/-0.020 | 6 | 13 | | 57 | 4 | HF840060 | ● |
| **8** | 0/-0.020 | 0.20 | +/-0.020 | 8 | 20 | | 64 | 4 | HF840080 | ● |
| **10** | 0/-0.020 | 0.20 | +/-0.020 | 10 | 22 | | 72 | 4 | HF840100 | ● |
| **12** | 0/-0.020 | 0.20 | +/-0.020 | 12 | 26 | | 83 | 4 | HF840120 | ● |
| **14** | 0/-0.020 | 0.30 | +/-0.020 | 14 | 26 | | 83 | 4 | HF840140 | ● |
| **16** | 0/-0.020 | 0.30 | +/-0.020 | 16 | 32 | | 92 | 4 | HF840160 | ● |
| **18** | 0/-0.020 | 0.30 | +/-0.020 | 18 | 32 | | 92 | 4 | HF840180 | ● |
| **20** | 0/-0.020 | 0.40 | +/-0.020 | 20 | 38 | | 104 | 4 | HF840200 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

# HF840

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **130÷150** | **70÷90** | **50÷70** | **30÷50** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.014 | 0.013 | 0.011 | 0.010 |
| | **4** | 0.019 | 0.017 | 0.014 | 0.013 |
| | **5** | 0.023 | 0.021 | 0.017 | 0.016 |
| | **6** | 0.027 | 0.024 | 0.020 | 0.019 |
| | **8** | 0.035 | 0.032 | 0.026 | 0.025 |
| | **10** | 0.042 | 0.038 | 0.032 | 0.029 |
| | **12** | 0.048 | 0.043 | 0.036 | 0.034 |
| | **14** | 0.054 | 0.049 | 0.041 | 0.038 |
| | **16** | 0.060 | 0.054 | 0.045 | 0.042 |
| | **18** | 0.066 | 0.059 | 0.050 | 0.046 |
| | **20** | 0.073 | 0.066 | 0.055 | 0.051 |
| **ap x ae** | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.2D x 0.3D** | **1.2D x 0.3D** |
| | Vc (m/min) | **160÷180** | **100÷120** | **70÷90** | **40÷60** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.017 | 0.015 | 0.013 | 0.018 |
| | **4** | 0.022 | 0.020 | 0.018 | 0.024 |
| | **5** | 0.028 | 0.025 | 0.022 | 0.030 |
| | **6** | 0.032 | 0.029 | 0.026 | 0.036 |
| | **8** | 0.042 | 0.038 | 0.034 | 0.046 |
| | **10** | 0.050 | 0.045 | 0.040 | 0.055 |
| | **12** | 0.058 | 0.052 | 0.046 | 0.063 |
| | **14** | 0.065 | 0.058 | 0.052 | 0.071 |
| | **16** | 0.072 | 0.065 | 0.058 | 0.079 |
| | **18** | 0.079 | 0.071 | 0.063 | 0.087 |
| | **20** | 0.088 | 0.079 | 0.070 | 0.096 |
| **ap x ae** | **≤ D5** | 1.5D x 0.25D | 1.5D x 0.25D | 1.2D x 0.1D | 1.2D x 0.1D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **5° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| HELICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.010 | 0.010 | 0.008 | 0.008 |
| | **4** | 0.013 | 0.013 | 0.011 | 0.010 |
| | **5** | 0.017 | 0.016 | 0.014 | 0.013 |
| | **6** | 0.020 | 0.018 | 0.016 | 0.015 |
| | **8** | 0.025 | 0.024 | 0.021 | 0.020 |
| | **10** | 0.031 | 0.029 | 0.025 | 0.024 |
| | **12** | 0.035 | 0.033 | 0.029 | 0.027 |
| | **14** | 0.039 | 0.037 | 0.032 | 0.030 |
| | **16** | 0.044 | 0.041 | 0.036 | 0.034 |
| | **18** | 0.048 | 0.045 | 0.040 | 0.037 |
| | **20** | 0.053 | 0.050 | 0.044 | 0.041 |
| **α° x ae** | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

# HF840

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **15° x D** | **10° x D** | **5° x D** | **5° x D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.022 | 0.020 | 0.019 | 0.026 |
| | **8** | 0.028 | 0.026 | 0.024 | 0.034 |
| | **10** | 0.034 | 0.031 | 0.029 | 0.040 |
| | **12** | 0.038 | 0.035 | 0.034 | 0.046 |
| | **14** | 0.043 | 0.040 | 0.038 | 0.052 |
| | **16** | 0.048 | 0.044 | 0.042 | 0.058 |
| | **18** | 0.053 | 0.048 | 0.046 | 0.063 |
| | **20** | 0.058 | 0.054 | 0.051 | 0.070 |

| VERTICAL | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.027 | 0.024 | 0.020 | 0.019 |
| | **8** | 0.035 | 0.032 | 0.026 | 0.025 |
| | **10** | 0.042 | 0.038 | 0.032 | 0.029 |
| | **12** | 0.048 | 0.043 | 0.036 | 0.034 |
| | **14** | 0.054 | 0.049 | 0.041 | 0.038 |
| | **16** | 0.060 | 0.054 | 0.045 | 0.042 |
| | **18** | 0.066 | 0.059 | 0.050 | 0.046 |
| | **20** | 0.073 | 0.066 | 0.055 | 0.051 |

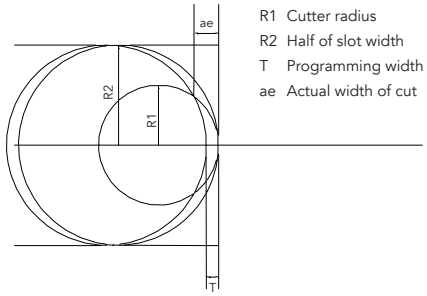
| DRILLING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **20÷40** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.007 | 0.006 | 0.006 | 0.008 |
| | **4** | 0.009 | 0.008 | 0.007 | 0.010 |
| | **5** | 0.012 | 0.010 | 0.009 | 0.013 |
| | **6** | 0.014 | 0.012 | 0.011 | 0.015 |
| | **8** | 0.018 | 0.016 | 0.014 | 0.019 |
| | **10** | 0.021 | 0.019 | 0.017 | 0.023 |
| | **12** | 0.024 | 0.022 | 0.019 | 0.026 |
| | **14** | 0.027 | 0.024 | 0.022 | 0.030 |
| | **16** | 0.030 | 0.027 | 0.024 | 0.033 |
| | **18** | 0.033 | 0.030 | 0.026 | 0.036 |
| | **20** | 0.037 | 0.033 | 0.029 | 0.040 |
| **ap x ae** | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

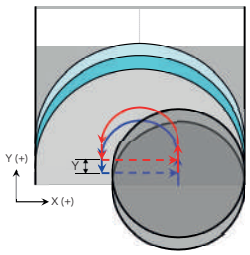
# HF840

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **2D x 0.2D** | **2D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **190÷230** | **130÷150** | **100÷120** | **50÷70** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.035 | 0.032 | 0.028 | 0.039 |
| | **4** | 0.046 | 0.042 | 0.037 | 0.051 |
| | **5** | 0.058 | 0.052 | 0.046 | 0.063 |
| | **6** | 0.068 | 0.061 | 0.054 | 0.074 |
| | **8** | 0.088 | 0.079 | 0.070 | 0.096 |
| | **10** | 0.105 | 0.095 | 0.084 | 0.116 |
| | **12** | 0.120 | 0.108 | 0.096 | 0.132 |
| | **14** | 0.135 | 0.122 | 0.108 | 0.149 |
| | **16** | 0.150 | 0.135 | 0.120 | 0.165 |
| | **18** | 0.165 | 0.149 | 0.132 | 0.182 |
| | **20** | 0.183 | 0.164 | 0.146 | 0.201 |
| **ap x ae** | **≤ D5** | 1.5D x 0.1D | 1.5D x 0.1D | | |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



# HF440

cylindrical shank and reduced neck, 45° chamfer

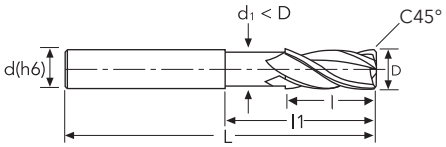
OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | C45° | Z4 UP




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SLOTTING (1.5D) | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 9 | 15 | 2.80 | 57 | 4 | HF440030 | ● |
| **4** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 11 | 18 | 3.80 | 57 | 4 | HF440040 | ● |
| **5** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 13 | 19 | 4.80 | 57 | 4 | HF440050 | ● |
| **6** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 13 | 20 | 5.80 | 57 | 4 | HF440060 | ● |
| **8** | 0/-0.030 | 0.20 | +/-0.020 | 8 | 20 | 26 | 7.80 | 64 | 4 | HF440080 | ● |
| **10** | 0/-0.030 | 0.20 | +/-0.020 | 10 | 22 | 30 | 9.80 | 72 | 4 | HF440100 | ● |
| **12** | 0/-0.030 | 0.20 | +/-0.020 | 12 | 26 | 36 | 11.80 | 83 | 4 | HF440120 | ● |
| **14** | 0/-0.030 | 0.20 | +/-0.020 | 14 | 26 | 36 | 13.70 | 83 | 4 | HF440140 | ● |
| **16** | 0/-0.030 | 0.30 | +/-0.020 | 16 | 32 | 42 | 15.70 | 92 | 4 | HF440160 | ● |
| **20** | 0/-0.030 | 0.40 | +/-0.020 | 20 | 38 | 50 | 19.70 | 104 | 4 | HF440200 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

# HF440

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.013 | 0.011 | 0.009 | 0.009 |
| | **4** | 0.017 | 0.015 | 0.012 | 0.012 |
| | **5** | 0.021 | 0.019 | 0.016 | 0.014 |
| | **6** | 0.024 | 0.022 | 0.018 | 0.017 |
| | **8** | 0.032 | 0.028 | 0.024 | 0.022 |
| | **10** | 0.038 | 0.034 | 0.028 | 0.026 |
| | **12** | 0.043 | 0.039 | 0.032 | 0.030 |
| | **14** | 0.049 | 0.044 | 0.036 | 0.034 |
| | **16** | 0.054 | 0.049 | 0.041 | 0.038 |
| | **20** | 0.066 | 0.059 | 0.049 | 0.046 |
| ap x ae | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | ap x ae | **1.5D x D** | **1.5D x D** | | |
| | Vc (m/min) | **85÷105** | **55÷75** | | |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **8** | 0.025 | 0.023 | | |
| | **10** | 0.030 | 0.027 | | |
| | **12** | 0.035 | 0.031 | | |
| | **14** | 0.039 | 0.035 | | |
| | **16** | 0.043 | 0.039 | | |
| | **20** | 0.053 | 0.047 | | |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.2D x 0.3D** | **1.2D x 0.3D** |
| | Vc (m/min) | **130÷150** | **90÷110** | **60÷80** | **40÷60** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.015 | 0.014 | 0.012 | 0.017 |
| | **4** | 0.020 | 0.018 | 0.016 | 0.022 |
| | **5** | 0.025 | 0.022 | 0.020 | 0.027 |
| | **6** | 0.029 | 0.026 | 0.023 | 0.032 |
| | **8** | 0.038 | 0.034 | 0.030 | 0.042 |
| | **10** | 0.045 | 0.041 | 0.036 | 0.050 |
| | **12** | 0.052 | 0.047 | 0.041 | 0.057 |
| | **14** | 0.058 | 0.052 | 0.047 | 0.064 |
| | **16** | 0.065 | 0.058 | 0.052 | 0.071 |
| | **20** | 0.079 | 0.071 | 0.063 | 0.087 |
| ap x ae | **≤ D5** | 1.5D x 0.25D | 1.5D x 0.25D | 1.2D x 0.1D | 1.2D x 0.1D |

INFO
CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA
HSS DRILLS
LFTA
SUTA
HSS-HSS/CO
CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH
HSS END-MILLS
CARBIDE BURRS

# HF440




| Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| α° x ae | **5° x 0.4D** | **5° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** |
| Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **3** | 0.009 | 0.009 | 0.008 | 0.007 |
| **4** | 0.012 | 0.011 | 0.010 | 0.009 |
| **5** | 0.015 | 0.014 | 0.012 | 0.012 |
| **6** | 0.018 | 0.016 | 0.015 | 0.014 |
| **8** | 0.023 | 0.021 | 0.019 | 0.018 |
| **10** | 0.028 | 0.026 | 0.023 | 0.021 |
| **12** | 0.031 | 0.029 | 0.026 | 0.024 |
| **14** | 0.035 | 0.033 | 0.029 | 0.027 |
| **16** | 0.039 | 0.037 | 0.032 | 0.030 |
| **20** | 0.048 | 0.045 | 0.039 | 0.037 |
| α° x ae | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |




| Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| α° x ae | **15° x D** | **10° x D** | **5° x D** | **5° x D** |
| Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **30÷40** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **6** | 0.019 | 0.018 | 0.017 | 0.023 |
| **8** | 0.025 | 0.023 | 0.022 | 0.030 |
| **10** | 0.030 | 0.028 | 0.026 | 0.036 |
| **12** | 0.034 | 0.032 | 0.030 | 0.042 |
| **14** | 0.039 | 0.036 | 0.034 | 0.047 |
| **16** | 0.043 | 0.040 | 0.038 | 0.052 |
| **20** | 0.052 | 0.048 | 0.046 | 0.063 |




| Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| α° x ae | **30° x D** | **15° x D** | | |
| Vc (m/min) | **80÷100** | **50÷70** | | |
| D (mm) | fz (mm/z) | fz (mm/z) | | |
| **10** | 0.025 | 0.023 | | |
| **12** | 0.028 | 0.026 | | |
| **14** | 0.032 | 0.029 | | |
| **16** | 0.035 | 0.032 | | |
| **20** | 0.043 | 0.039 | | |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF440

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **30÷40** |
| VERTICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.024 | 0.022 | 0.018 | 0.017 |
| | **8** | 0.032 | 0.028 | 0.024 | 0.022 |
| | **10** | 0.038 | 0.034 | 0.028 | 0.026 |
| | **12** | 0.043 | 0.039 | 0.032 | 0.030 |
| | **14** | 0.049 | 0.044 | 0.036 | 0.034 |
| | **16** | 0.054 | 0.049 | 0.041 | 0.038 |
| | **20** | 0.066 | 0.059 | 0.049 | 0.046 |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **85÷105** | **55÷75** | **40÷60** | **20÷40** |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.006 | 0.006 | 0.005 | 0.007 |
| | **4** | 0.008 | 0.007 | 0.007 | 0.009 |
| | **5** | 0.010 | 0.009 | 0.008 | 0.011 |
| | **6** | 0.012 | 0.011 | 0.010 | 0.013 |
| | **8** | 0.016 | 0.014 | 0.013 | 0.017 |
| | **10** | 0.019 | 0.017 | 0.015 | 0.021 |
| | **12** | 0.022 | 0.019 | 0.017 | 0.024 |
| | **14** | 0.024 | 0.022 | 0.019 | 0.027 |
| | **16** | 0.027 | 0.024 | 0.022 | 0.030 |
| | **20** | 0.033 | 0.030 | 0.026 | 0.036 |
| **ap x ae** | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

INFO
CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA
HSS DRILLS
LFTA
SUTA
HSS-HSS/CO
CARBIDE END-MILLS
G2
MDTA
**HF VH/UP**
MEF
ALU
MEX/MH
UH/MH
HSS END-MILLS
CARBIDE BURRS

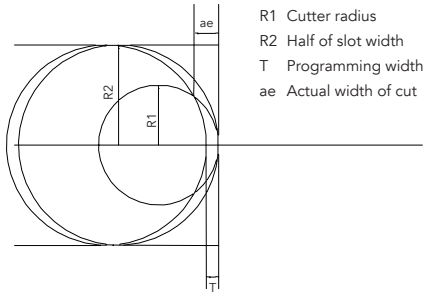
PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

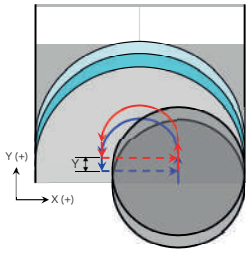
# HF440

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **2D x 0.2D** | **2D x 0.2D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **160÷200** | **110÷130** | **80÷100** | **50÷70** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.032 | 0.028 | 0.025 | 0.035 |
| | **4** | 0.042 | 0.037 | 0.033 | 0.046 |
| | **5** | 0.052 | 0.047 | 0.041 | 0.057 |
| | **6** | 0.061 | 0.055 | 0.049 | 0.067 |
| | **8** | 0.079 | 0.071 | 0.063 | 0.087 |
| | **10** | 0.095 | 0.085 | 0.076 | 0.104 |
| | **12** | 0.108 | 0.097 | 0.086 | 0.119 |
| | **14** | 0.122 | 0.109 | 0.097 | 0.134 |
| | **16** | 0.135 | 0.122 | 0.108 | 0.149 |
| | **20** | 0.164 | 0.148 | 0.131 | 0.181 |
| **ap x ae** | **≤ D5** | 1.5D x 0.1D | 1.5D x 0.1D | | |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF441

weldon shank and reduced neck, 45° chamfer

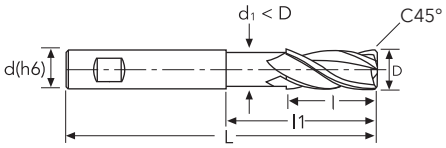
OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | C45° | Z4 UP




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 9 | 15 | 2.80 | 57 | 4 | HF441030 | ● |
| **4** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 11 | 18 | 3.80 | 57 | 4 | HF441040 | ● |
| **5** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 13 | 19 | 4.80 | 57 | 4 | HF441050 | ● |
| **6** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 13 | 20 | 5.80 | 57 | 4 | HF441060 | ● |
| **8** | 0/-0.030 | 0.20 | +/-0.020 | 8 | 20 | 26 | 7.80 | 64 | 4 | HF441080 | ● |
| **10** | 0/-0.030 | 0.20 | +/-0.020 | 10 | 22 | 30 | 9.80 | 72 | 4 | HF441100 | ● |
| **12** | 0/-0.030 | 0.20 | +/-0.020 | 12 | 26 | 36 | 11.80 | 83 | 4 | HF441120 | ● |
| **14** | 0/-0.030 | 0.20 | +/-0.020 | 14 | 26 | 36 | 13.70 | 83 | 4 | HF441140 | ● |
| **16** | 0/-0.030 | 0.30 | +/-0.020 | 16 | 32 | 42 | 15.70 | 92 | 4 | HF441160 | ● |
| **18** | 0/-0.030 | 0.30 | +/-0.020 | 18 | 32 | 42 | 17.70 | 92 | 4 | HF441180 | ● |
| **20** | 0/-0.030 | 0.40 | +/-0.020 | 20 | 38 | 50 | 19.70 | 104 | 4 | HF441200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# HF441

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.013 | 0.011 | 0.009 | 0.009 |
| | **4** | 0.017 | 0.015 | 0.012 | 0.012 |
| | **5** | 0.021 | 0.019 | 0.016 | 0.014 |
| | **6** | 0.024 | 0.022 | 0.018 | 0.017 |
| | **8** | 0.032 | 0.028 | 0.024 | 0.022 |
| | **10** | 0.038 | 0.034 | 0.028 | 0.026 |
| | **12** | 0.043 | 0.039 | 0.032 | 0.030 |
| | **14** | 0.049 | 0.044 | 0.036 | 0.034 |
| | **16** | 0.054 | 0.049 | 0.041 | 0.038 |
| | **18** | 0.059 | 0.053 | 0.045 | 0.042 |
| | **20** | 0.066 | 0.059 | 0.049 | 0.046 |
| **ap x ae** | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | ap x ae | **1.5D x D** | **1.5D x D** | | |
| | Vc (m/min) | **85÷105** | **55÷75** | | |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **8** | 0.025 | 0.023 | | |
| | **10** | 0.030 | 0.027 | | |
| | **12** | 0.035 | 0.031 | | |
| | **14** | 0.039 | 0.035 | | |
| | **16** | 0.043 | 0.039 | | |
| | **18** | 0.048 | 0.043 | | |
| | **20** | 0.053 | 0.047 | | |

| | Material Group ISO 513 | P1 P2 P7 K1 | | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | | | |
| | ap x ae | **2D x D** | | | |
| | Vc (m/min) | **60÷80** | | | |
| SLOTTING | D (mm) | fz (mm/z) | | | |
| | **10** | 0.023 | | | |
| | **12** | 0.026 | | | |
| | **14** | 0.029 | | | |
| | **16** | 0.032 | | | |
| | **18** | 0.036 | | | |
| | **20** | 0.039 | | | |

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF440 PARAMETERS.

# HF441

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.2D x 0.3D** | **1.2D x 0.3D** |
| | Vc (m/min) | **130÷150** | **90÷110** | **60÷80** | **40÷60** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.015 | 0.014 | 0.012 | 0.017 |
| | **4** | 0.020 | 0.018 | 0.016 | 0.022 |
| | **5** | 0.025 | 0.022 | 0.020 | 0.027 |
| | **6** | 0.029 | 0.026 | 0.023 | 0.032 |
| | **8** | 0.038 | 0.034 | 0.030 | 0.042 |
| | **10** | 0.045 | 0.041 | 0.036 | 0.050 |
| | **12** | 0.052 | 0.047 | 0.041 | 0.057 |
| | **14** | 0.058 | 0.052 | 0.047 | 0.064 |
| | **16** | 0.065 | 0.058 | 0.052 | 0.071 |
| | **18** | 0.071 | 0.064 | 0.057 | 0.078 |
| | **20** | 0.079 | 0.071 | 0.063 | 0.087 |
| **ap x ae** | **≤ D5** | 1.5D x 0.25D | 1.5D x 0.25D | 1.2D x 0.1D | 1.2D x 0.1D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **5° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| HELICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.009 | 0.009 | 0.008 | 0.007 |
| | **4** | 0.012 | 0.011 | 0.010 | 0.009 |
| | **5** | 0.015 | 0.014 | 0.012 | 0.012 |
| | **6** | 0.018 | 0.016 | 0.015 | 0.014 |
| | **8** | 0.023 | 0.021 | 0.019 | 0.018 |
| | **10** | 0.028 | 0.026 | 0.023 | 0.021 |
| | **12** | 0.031 | 0.029 | 0.026 | 0.024 |
| | **14** | 0.035 | 0.033 | 0.029 | 0.027 |
| | **16** | 0.039 | 0.037 | 0.032 | 0.030 |
| | **18** | 0.043 | 0.040 | 0.036 | 0.033 |
| | **20** | 0.048 | 0.045 | 0.039 | 0.037 |
| **α° x ae** | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF440 PARAMETERS.

CUTTING PARAMETERS

## HF441

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **15° x D** | **10° x D** | **5° x D** | **5° x D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **30÷40** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.019 | 0.018 | 0.017 | 0.023 |
| | **8** | 0.025 | 0.023 | 0.022 | 0.030 |
| | **10** | 0.030 | 0.028 | 0.026 | 0.036 |
| | **12** | 0.034 | 0.032 | 0.030 | 0.042 |
| | **14** | 0.039 | 0.036 | 0.034 | 0.047 |
| | **16** | 0.043 | 0.040 | 0.038 | 0.052 |
| | **18** | 0.047 | 0.044 | 0.042 | 0.057 |
| | **20** | 0.052 | 0.048 | 0.046 | 0.063 |

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | α° x ae | **30° x D** | **15° x D** | | |
| | Vc (m/min) | **80÷100** | **50÷70** | | |
| | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **10** | 0.025 | 0.023 | | |
| | **12** | 0.028 | 0.026 | | |
| | **14** | 0.032 | 0.029 | | |
| | **16** | 0.035 | 0.032 | | |
| | **18** | 0.039 | 0.036 | | |
| | **20** | 0.043 | 0.039 | | |

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | | | |
| | α° x ae | **45° x D** | | | |
| | Vc (m/min) | **60÷80** | | | |
| | D (mm) | fz (mm/z) | | | |
| | **10** | 0.024 | | | |
| | **12** | 0.028 | | | |
| | **14** | 0.031 | | | |
| | **16** | 0.035 | | | |
| | **18** | 0.038 | | | |
| | **20** | 0.042 | | | |

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF440 PARAMETERS.

CUTTING PARAMETERS

# HF441

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **30÷40** |
| VERTICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.024 | 0.022 | 0.018 | 0.017 |
| | **8** | 0.032 | 0.028 | 0.024 | 0.022 |
| | **10** | 0.038 | 0.034 | 0.028 | 0.026 |
| | **12** | 0.043 | 0.039 | 0.032 | 0.030 |
| | **14** | 0.049 | 0.044 | 0.036 | 0.034 |
| | **16** | 0.054 | 0.049 | 0.041 | 0.038 |
| | **18** | 0.059 | 0.053 | 0.045 | 0.042 |
| | **20** | 0.066 | 0.059 | 0.049 | 0.046 |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **85÷105** | **55÷75** | **40÷60** | **20÷40** |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.006 | 0.006 | 0.005 | 0.007 |
| | **4** | 0.008 | 0.007 | 0.007 | 0.009 |
| | **5** | 0.010 | 0.009 | 0.008 | 0.011 |
| | **6** | 0.012 | 0.011 | 0.010 | 0.013 |
| | **8** | 0.016 | 0.014 | 0.013 | 0.017 |
| | **10** | 0.019 | 0.017 | 0.015 | 0.021 |
| | **12** | 0.022 | 0.019 | 0.017 | 0.024 |
| | **14** | 0.024 | 0.022 | 0.019 | 0.027 |
| | **16** | 0.027 | 0.024 | 0.022 | 0.030 |
| | **18** | 0.030 | 0.027 | 0.024 | 0.033 |
| | **20** | 0.033 | 0.030 | 0.026 | 0.036 |
| **ap x ae** | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

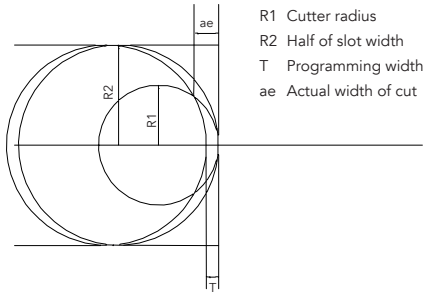
PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF440 PARAMETERS.

CUTTING PARAMETERS

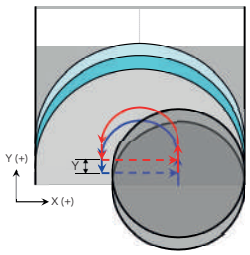
# HF441

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **2D x 0.2D** | **2D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **160÷200** | **110÷130** | **80÷100** | **50÷70** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.032 | 0.028 | 0.025 | 0.035 |
| | **4** | 0.042 | 0.037 | 0.033 | 0.046 |
| | **5** | 0.052 | 0.047 | 0.041 | 0.057 |
| | **6** | 0.061 | 0.055 | 0.049 | 0.067 |
| | **8** | 0.079 | 0.071 | 0.063 | 0.087 |
| | **10** | 0.095 | 0.085 | 0.076 | 0.104 |
| | **12** | 0.108 | 0.097 | 0.086 | 0.119 |
| | **14** | 0.122 | 0.109 | 0.097 | 0.134 |
| | **16** | 0.135 | 0.122 | 0.108 | 0.149 |
| | **18** | 0.149 | 0.134 | 0.119 | 0.163 |
| | **20** | 0.164 | 0.148 | 0.131 | 0.181 |
| **ap x ae** | **≤ D5** | 1.5D x 0.1D | 1.5D x 0.1D | | |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF440 PARAMETERS.

# HF844

cylindrical shank, 45° chamfer, roughing HR

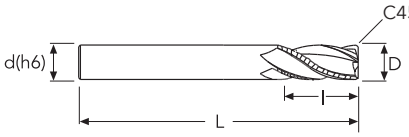
OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | C45° | HR FINE | Z4 UP




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.020 | 0.10 | +/-0.020 | 6 | 16 | | 57 | 4 | HF844060 | ● |
| **8** | 0/-0.020 | 0.20 | +/-0.020 | 8 | 20 | | 64 | 4 | HF844080 | ● |
| **10** | 0/-0.020 | 0.20 | +/-0.020 | 10 | 22 | | 72 | 4 | HF844100 | ● |
| **12** | 0/-0.020 | 0.20 | +/-0.020 | 12 | 26 | | 83 | 4 | HF844120 | ● |
| **14** | 0/-0.020 | 0.20 | +/-0.020 | 14 | 26 | | 83 | 4 | HF844140 | ● |
| **16** | 0/-0.020 | 0.30 | +/-0.020 | 16 | 32 | | 92 | 4 | HF844160 | ● |
| **18** | 0/-0.020 | 0.30 | +/-0.020 | 18 | 32 | | 92 | 4 | HF844180 | ● |
| **20** | 0/-0.020 | 0.40 | +/-0.020 | 20 | 38 | | 104 | 4 | HF844200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

## HF844

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.029 | 0.026 | 0.022 | 0.020 |
| | **8** | 0.038 | 0.034 | 0.028 | 0.026 |
| | **10** | 0.045 | 0.041 | 0.034 | 0.032 |
| | **12** | 0.052 | 0.047 | 0.039 | 0.036 |
| | **14** | 0.058 | 0.052 | 0.044 | 0.041 |
| | **16** | 0.065 | 0.058 | 0.049 | 0.045 |
| | **20** | 0.079 | 0.071 | 0.059 | 0.055 |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | ap x ae | **1.5D x D** | **1.5D x D** | | |
| | Vc (m/min) | **85÷105** | **55÷75** | | |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **8** | 0.030 | 0.027 | | |
| | **10** | 0.036 | 0.033 | | |
| | **12** | 0.041 | 0.037 | | |
| | **14** | 0.047 | 0.042 | | |
| | **16** | 0.052 | 0.047 | | |
| | **20** | 0.063 | 0.057 | | |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.2D x 0.3D** | **1.2D x 0.3D** |
| | Vc (m/min) | **130÷150** | **90÷110** | **60÷80** | **40÷60** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.035 | 0.031 | 0.028 | 0.038 |
| | **8** | 0.045 | 0.041 | 0.036 | 0.050 |
| | **10** | 0.054 | 0.049 | 0.044 | 0.060 |
| | **12** | 0.062 | 0.056 | 0.050 | 0.068 |
| | **14** | 0.070 | 0.063 | 0.056 | 0.077 |
| | **16** | 0.078 | 0.070 | 0.062 | 0.086 |
| | **20** | 0.095 | 0.085 | 0.076 | 0.104 |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF844

| HELICAL | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **8° x 0.4D** | **6° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.020 | 0.019 | 0.016 | 0.016 |
| | **8** | 0.026 | 0.024 | 0.021 | 0.021 |
| | **10** | 0.031 | 0.029 | 0.026 | 0.025 |
| | **12** | 0.036 | 0.033 | 0.029 | 0.029 |
| | **14** | 0.040 | 0.037 | 0.033 | 0.033 |
| | **16** | 0.045 | 0.041 | 0.037 | 0.036 |
| | **20** | 0.055 | 0.050 | 0.045 | 0.044 |

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **15° x D** | **10° x D** | **5° x D** | **5° x D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **30÷40** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **8** | 0.030 | 0.028 | 0.026 | 0.036 |
| | **10** | 0.036 | 0.033 | 0.032 | 0.044 |
| | **12** | 0.041 | 0.038 | 0.036 | 0.050 |
| | **14** | 0.047 | 0.043 | 0.041 | 0.056 |
| | **16** | 0.052 | 0.048 | 0.045 | 0.062 |
| | **20** | 0.063 | 0.058 | 0.055 | 0.076 |

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | α° x ae | **30° x D** | **15° x D** | | |
| | Vc (m/min) | **85÷105** | **45÷65** | | |
| | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **10** | 0.030 | 0.027 | | |
| | **12** | 0.034 | 0.031 | | |
| | **14** | 0.038 | 0.035 | | |
| | **16** | 0.042 | 0.039 | | |
| | **20** | 0.051 | 0.047 | | |



PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

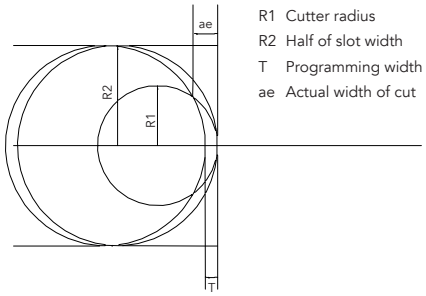
CUTTING PARAMETERS

# HF844

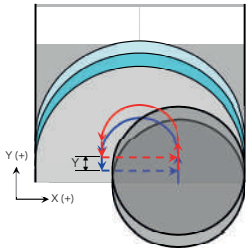
| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **30÷40** |
| VERTICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.029 | 0.026 | 0.022 | 0.020 |
| | **8** | 0.038 | 0.034 | 0.028 | 0.026 |
| | **10** | 0.045 | 0.041 | 0.034 | 0.032 |
| | **12** | 0.052 | 0.047 | 0.039 | 0.036 |
| | **14** | 0.058 | 0.052 | 0.044 | 0.041 |
| | **16** | 0.065 | 0.058 | 0.049 | 0.045 |
| | **20** | 0.079 | 0.071 | 0.059 | 0.055 |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **2D x 0.2D** | **2D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **160÷200** | **110÷130** | **80÷100** | **50÷70** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.073 | 0.066 | 0.058 | 0.080 |
| | **8** | 0.095 | 0.085 | 0.076 | 0.104 |
| | **10** | 0.113 | 0.102 | 0.091 | 0.125 |
| | **12** | 0.130 | 0.117 | 0.104 | 0.143 |
| | **14** | 0.146 | 0.131 | 0.117 | 0.160 |
| | **16** | 0.162 | 0.146 | 0.130 | 0.178 |
| | **20** | 0.197 | 0.177 | 0.158 | 0.217 |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF444

cylindrical shank and reduced neck, 45° chamfer, roughing HR

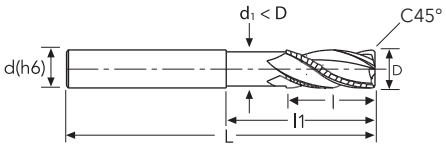



OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | C45° | HR FINE | Z4 UP

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SLOTTING (1.5D) | SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.050 | 0.10 | +/-0.020 | 6 | 13 | 20 | 5.80 | 57 | 4 | HF444060 | ● |
| **8** | 0/-0.050 | 0.20 | +/-0.020 | 8 | 20 | 26 | 7.80 | 64 | 4 | HF444080 | ● |
| **10** | 0/-0.050 | 0.20 | +/-0.020 | 10 | 22 | 30 | 9.80 | 72 | 4 | HF444100 | ● |
| **12** | 0/-0.050 | 0.20 | +/-0.020 | 12 | 26 | 36 | 11.80 | 83 | 4 | HF444120 | ● |
| **14** | 0/-0.050 | 0.20 | +/-0.020 | 14 | 26 | 36 | 13.70 | 83 | 4 | HF444140 | ● |
| **16** | 0/-0.050 | 0.30 | +/-0.020 | 16 | 32 | 42 | 15.70 | 92 | 4 | HF444160 | ● |
| **20** | 0/-0.050 | 0.40 | +/-0.020 | 20 | 38 | 50 | 19.70 | 104 | 4 | HF444200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# HF444

| SLOTTING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.026 | 0.024 | 0.020 | 0.018 |
| | **8** | 0.034 | 0.031 | 0.026 | 0.024 |
| | **10** | 0.041 | 0.037 | 0.031 | 0.029 |
| | **12** | 0.047 | 0.042 | 0.035 | 0.033 |
| | **14** | 0.052 | 0.047 | 0.039 | 0.037 |
| | **16** | 0.058 | 0.052 | 0.044 | 0.041 |
| | **20** | 0.071 | 0.064 | 0.053 | 0.050 |

| SLOTTING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | ap x ae | **1.5D x D** | **1.5D x D** | | |
| | Vc (m/min) | **85÷105** | **55÷75** | | |
| | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **8** | 0.027 | 0.024 | | |
| | **10** | 0.033 | 0.029 | | |
| | **12** | 0.037 | 0.034 | | |
| | **14** | 0.042 | 0.038 | | |
| | **16** | 0.047 | 0.042 | | |
| | **20** | 0.057 | 0.051 | | |

| SIDE MILLING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.2D x 0.3D** | **1.2D x 0.3D** |
| | Vc (m/min) | **130÷150** | **90÷110** | **60÷80** | **40÷60** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.031 | 0.028 | 0.025 | 0.035 |
| | **8** | 0.041 | 0.037 | 0.033 | 0.045 |
| | **10** | 0.049 | 0.044 | 0.039 | 0.054 |
| | **12** | 0.056 | 0.050 | 0.045 | 0.062 |
| | **14** | 0.063 | 0.057 | 0.050 | 0.069 |
| | **16** | 0.070 | 0.063 | 0.056 | 0.077 |
| | **20** | 0.085 | 0.077 | 0.068 | 0.094 |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF444

| HELICAL | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **7° x 0.4D** | **5° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.018 | 0.017 | 0.016 | 0.015 |
| | **8** | 0.024 | 0.022 | 0.020 | 0.019 |
| | **10** | 0.029 | 0.027 | 0.025 | 0.023 |
| | **12** | 0.033 | 0.031 | 0.028 | 0.026 |
| | **14** | 0.037 | 0.034 | 0.032 | 0.029 |
| | **16** | 0.041 | 0.038 | 0.035 | 0.033 |
| | **20** | 0.050 | 0.046 | 0.043 | 0.040 |

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **15° x D** | **10° x D** | **5° x D** | **5° x D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **30÷40** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **8** | 0.027 | 0.025 | 0.024 | 0.033 |
| | **10** | 0.033 | 0.030 | 0.029 | 0.039 |
| | **12** | 0.037 | 0.034 | 0.033 | 0.045 |
| | **14** | 0.042 | 0.039 | 0.037 | 0.050 |
| | **16** | 0.047 | 0.043 | 0.041 | 0.056 |
| | **20** | 0.057 | 0.052 | 0.050 | 0.068 |

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | α° x ae | **30° x D** | **15° x D** | | |
| | Vc (m/min) | **80÷100** | **50÷70** | | |
| | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **10** | 0.027 | 0.024 | | |
| | **12** | 0.030 | 0.028 | | |
| | **14** | 0.034 | 0.031 | | |
| | **16** | 0.038 | 0.035 | | |
| | **20** | 0.046 | 0.042 | | |



PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

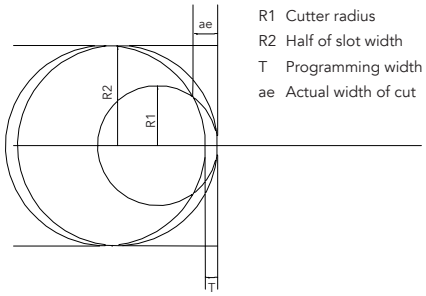
CUTTING PARAMETERS

# HF444

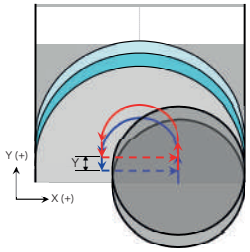
| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **30÷40** |
| VERTICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.026 | 0.024 | 0.020 | 0.018 |
| | **8** | 0.034 | 0.031 | 0.026 | 0.024 |
| | **10** | 0.041 | 0.037 | 0.031 | 0.029 |
| | **12** | 0.047 | 0.042 | 0.035 | 0.033 |
| | **14** | 0.052 | 0.047 | 0.039 | 0.037 |
| | **16** | 0.058 | 0.052 | 0.044 | 0.041 |
| | **20** | 0.071 | 0.064 | 0.053 | 0.050 |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **2D x 0.2D** | **2D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **160÷200** | **110÷130** | **80÷100** | **50÷70** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.066 | 0.059 | 0.052 | 0.072 |
| | **8** | 0.085 | 0.077 | 0.068 | 0.094 |
| | **10** | 0.102 | 0.092 | 0.082 | 0.112 |
| | **12** | 0.117 | 0.105 | 0.093 | 0.128 |
| | **14** | 0.131 | 0.118 | 0.105 | 0.144 |
| | **16** | 0.146 | 0.131 | 0.117 | 0.160 |
| | **20** | 0.177 | 0.160 | 0.142 | 0.195 |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF445

weldon shank and reduced neck, 45° chamfer, roughing HR

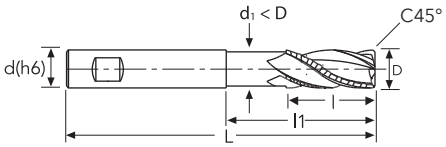



OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | C45° | HR FINE | Z4 UP

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SLOTTING (1.5D) | SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.050 | 0.10 | +/-0.020 | 6 | 13 | 20 | 5.80 | 57 | 4 | HF445060 | ● |
| **8** | 0/-0.050 | 0.20 | +/-0.020 | 8 | 20 | 26 | 7.80 | 64 | 4 | HF445080 | ● |
| **10** | 0/-0.050 | 0.20 | +/-0.020 | 10 | 22 | 30 | 9.80 | 72 | 4 | HF445100 | ● |
| **12** | 0/-0.050 | 0.20 | +/-0.020 | 12 | 26 | 36 | 11.80 | 83 | 4 | HF445120 | ● |
| **14** | 0/-0.050 | 0.20 | +/-0.020 | 14 | 26 | 36 | 13.70 | 83 | 4 | HF445140 | ● |
| **16** | 0/-0.050 | 0.30 | +/-0.020 | 16 | 32 | 42 | 15.70 | 92 | 4 | HF445160 | ● |
| **20** | 0/-0.050 | 0.40 | +/-0.020 | 20 | 38 | 50 | 19.70 | 104 | 4 | HF445200 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

CUTTING PARAMETERS

# HF445

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.026 | 0.024 | 0.020 | 0.018 |
| | **8** | 0.034 | 0.031 | 0.026 | 0.024 |
| | **10** | 0.041 | 0.037 | 0.031 | 0.029 |
| | **12** | 0.047 | 0.042 | 0.035 | 0.033 |
| | **14** | 0.052 | 0.047 | 0.039 | 0.037 |
| | **16** | 0.058 | 0.052 | 0.044 | 0.041 |
| | **20** | 0.071 | 0.064 | 0.053 | 0.050 |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | ap x ae | **1.5D x D** | **1.5D x D** | | |
| | Vc (m/min) | **85÷105** | **55÷75** | | |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **8** | 0.027 | 0.024 | | |
| | **10** | 0.033 | 0.029 | | |
| | **12** | 0.037 | 0.034 | | |
| | **14** | 0.042 | 0.038 | | |
| | **16** | 0.047 | 0.042 | | |
| | **20** | 0.057 | 0.051 | | |

| | Material Group ISO 513 | P1 P2 P7 K1 | | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | | | |
| | ap x ae | **2D x D** | | | |
| | Vc (m/min) | **60÷80** | | | |
| SLOTTING | D (mm) | fz (mm/z) | | | |
| | **10** | 0.024 | | | |
| | **12** | 0.028 | | | |
| | **14** | 0.031 | | | |
| | **16** | 0.035 | | | |
| | **20** | 0.043 | | | |

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF444 PARAMETERS.

# HF445

| SIDE MILLING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.2D x 0.3D** | **1.2D x 0.3D** |
| | Vc (m/min) | **130÷150** | **90÷110** | **60÷80** | **40÷60** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.031 | 0.028 | 0.025 | 0.035 |
| | **8** | 0.041 | 0.037 | 0.033 | 0.045 |
| | **10** | 0.049 | 0.044 | 0.039 | 0.054 |
| | **12** | 0.056 | 0.050 | 0.045 | 0.062 |
| | **14** | 0.063 | 0.057 | 0.050 | 0.069 |
| | **16** | 0.070 | 0.063 | 0.056 | 0.077 |
| | **20** | 0.085 | 0.077 | 0.068 | 0.094 |

| HELICAL | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **7° x 0.4D** | **5° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.018 | 0.017 | 0.016 | 0.015 |
| | **8** | 0.024 | 0.022 | 0.020 | 0.019 |
| | **10** | 0.029 | 0.027 | 0.025 | 0.023 |
| | **12** | 0.033 | 0.031 | 0.028 | 0.026 |
| | **14** | 0.037 | 0.034 | 0.032 | 0.029 |
| | **16** | 0.041 | 0.038 | 0.035 | 0.033 |
| | **20** | 0.050 | 0.046 | 0.043 | 0.040 |

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **15° x D** | **10° x D** | **5° x D** | **5° x D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **30÷40** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **8** | 0.027 | 0.025 | 0.024 | 0.033 |
| | **10** | 0.033 | 0.030 | 0.029 | 0.039 |
| | **12** | 0.037 | 0.034 | 0.033 | 0.045 |
| | **14** | 0.042 | 0.039 | 0.037 | 0.050 |
| | **16** | 0.047 | 0.043 | 0.041 | 0.056 |
| | **20** | 0.057 | 0.052 | 0.050 | 0.068 |

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF444 PARAMETERS.

CUTTING PARAMETERS

# HF445

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | α° x ae | **30° x D** | **15° x D** | | |
| | Vc (m/min) | **80÷100** | **50÷70** | | |
| | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **10** | 0.027 | 0.024 | | |
| | **12** | 0.030 | 0.028 | | |
| | **14** | 0.034 | 0.031 | | |
| | **16** | 0.038 | 0.035 | | |
| | **20** | 0.046 | 0.042 | | |

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | | | |
| | α° x ae | **45° x D** | | | |
| | Vc (m/min) | **60÷80** | | | |
| | D (mm) | fz (mm/z) | | | |
| | **10** | 0.026 | | | |
| | **12** | 0.030 | | | |
| | **14** | 0.034 | | | |
| | **16** | 0.038 | | | |
| | **20** | 0.046 | | | |

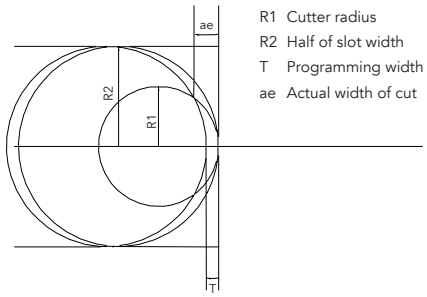
| VERTICAL | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **30÷40** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.026 | 0.024 | 0.020 | 0.018 |
| | **8** | 0.034 | 0.031 | 0.026 | 0.024 |
| | **10** | 0.041 | 0.037 | 0.031 | 0.029 |
| | **12** | 0.047 | 0.042 | 0.035 | 0.033 |
| | **14** | 0.052 | 0.047 | 0.039 | 0.037 |
| | **16** | 0.058 | 0.052 | 0.044 | 0.041 |
| | **20** | 0.071 | 0.064 | 0.053 | 0.050 |

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF444 PARAMETERS.

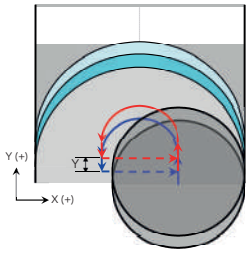
# HF445

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **2D x 0.2D** | **2D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| TROCHOIDAL | Vc (m/min) | **160÷200** | **110÷130** | **80÷100** | **50÷70** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.066 | 0.059 | 0.052 | 0.072 |
| | **8** | 0.085 | 0.077 | 0.068 | 0.094 |
| | **10** | 0.102 | 0.092 | 0.082 | 0.112 |
| | **12** | 0.117 | 0.105 | 0.093 | 0.128 |
| | **14** | 0.131 | 0.118 | 0.105 | 0.144 |
| | **16** | 0.146 | 0.131 | 0.117 | 0.160 |
| | **20** | 0.177 | 0.160 | 0.142 | 0.195 |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF444 PARAMETERS.

# HF342

cylindrical shank and reduced neck, extra short, corner radius

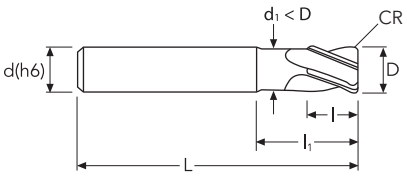



OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | RADIUS | Z4 UP

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | 0.20 | +/-0.010 | 6 | 5 | 9 | 2.80 | 50 | 4 | HF34202030 | ● |
| **4** | 0/-0.030 | 0.20 | +/-0.010 | 6 | 6 | 12 | 3.80 | 50 | 4 | HF34202040 | ● |
| **5** | 0/-0.030 | 0.20 | +/-0.010 | 6 | 8 | 14 | 4.80 | 50 | 4 | HF34202050 | ● |
| **6** | 0/-0.030 | 0.30 | +/-0.010 | 6 | 9 | 18 | 5.80 | 55 | 4 | HF34203060 | ● |
| **8** | 0/-0.030 | 0.50 | +/-0.010 | 8 | 12 | 24 | 7.80 | 60 | 4 | HF34205080 | ● |
| **10** | 0/-0.030 | 1.00 | +/-0.010 | 10 | 15 | 30 | 9.80 | 70 | 4 | HF34210100 | ● |
| **12** | 0/-0.030 | 1.00 | +/-0.010 | 12 | 18 | 35 | 11.80 | 80 | 4 | HF34210120 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

# HF342

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.014 | 0.013 | 0.011 | 0.010 |
| | **4** | 0.019 | 0.017 | 0.014 | 0.013 |
| | **5** | 0.023 | 0.021 | 0.017 | 0.016 |
| | **6** | 0.027 | 0.024 | 0.020 | 0.019 |
| | **8** | 0.035 | 0.032 | 0.026 | 0.025 |
| | **10** | 0.042 | 0.038 | 0.032 | 0.029 |
| | **12** | 0.048 | 0.043 | 0.036 | 0.034 |
| ap x ae | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **160÷180** | **100÷120** | **70÷90** | **40÷60** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.017 | 0.015 | 0.013 | 0.018 |
| | **4** | 0.022 | 0.020 | 0.018 | 0.024 |
| | **5** | 0.028 | 0.025 | 0.022 | 0.030 |
| | **6** | 0.032 | 0.029 | 0.026 | 0.036 |
| | **8** | 0.042 | 0.038 | 0.034 | 0.046 |
| | **10** | 0.050 | 0.045 | 0.040 | 0.055 |
| | **12** | 0.058 | 0.052 | 0.046 | 0.063 |
| ap x ae | **≤ D5** | 1.2D x 0.3D | 1.2D x 0.3D | D x 0.2D | D x 0.2D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **5° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| HELICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.010 | 0.010 | 0.008 | 0.008 |
| | **4** | 0.013 | 0.013 | 0.011 | 0.010 |
| | **5** | 0.017 | 0.016 | 0.014 | 0.013 |
| | **6** | 0.020 | 0.018 | 0.016 | 0.015 |
| | **8** | 0.025 | 0.024 | 0.021 | 0.020 |
| | **10** | 0.031 | 0.029 | 0.025 | 0.024 |
| | **12** | 0.035 | 0.033 | 0.029 | 0.027 |
| α° x ae | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

INFO
CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA
HSS DRILLS
LFTA
SUTA
HSS-HSS/CO
CARBIDE END-MILLS
G2
MDTA
**HF VH/UP**
MEF
ALU
MEX/MH
UH/MH
HSS END-MILLS
CARBIDE BURRS

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

# HF342

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **15° x D** | **10° x D** | **5° x D** | **5° x D** |
| | Vc (m/min) | **120÷140** | **70÷90** | **55÷75** | **25÷45** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.022 | 0.020 | 0.019 | 0.026 |
| | **8** | 0.028 | 0.026 | 0.024 | 0.034 |
| | **10** | 0.034 | 0.031 | 0.029 | 0.040 |
| | **12** | 0.038 | 0.035 | 0.034 | 0.046 |

| VERTICAL | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **120÷140** | **70÷90** | **55÷75** | **25÷45** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.027 | 0.024 | 0.020 | 0.019 |
| | **8** | 0.035 | 0.032 | 0.026 | 0.025 |
| | **10** | 0.042 | 0.038 | 0.032 | 0.029 |
| | **12** | 0.048 | 0.043 | 0.036 | 0.034 |

| DRILLING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **20÷40** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.007 | 0.006 | 0.006 | 0.008 |
| | **4** | 0.009 | 0.008 | 0.007 | 0.010 |
| | **5** | 0.012 | 0.010 | 0.009 | 0.013 |
| | **6** | 0.014 | 0.012 | 0.011 | 0.015 |
| | **8** | 0.018 | 0.016 | 0.014 | 0.019 |
| | **10** | 0.021 | 0.019 | 0.017 | 0.023 |
| | **12** | 0.024 | 0.022 | 0.019 | 0.026 |
| **ap x ae** | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF842

cylindrical shank, corner radius

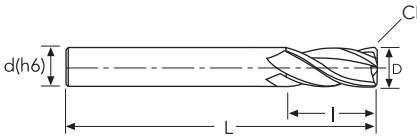



OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | RADIUS | Z4 UP

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **4** | 0/-0.025 | 0.30 | +/-0.015 | 6 | 11 | | 57 | 4 | HF84203040 | ● |
| **4** | 0/-0.025 | 0.50 | +/-0.015 | 6 | 11 | | 57 | 4 | HF84205040 | ● |
| **5** | 0/-0.025 | 0.30 | +/-0.015 | 6 | 13 | | 57 | 4 | HF84203050 | ● |
| **5** | 0/-0.025 | 0.50 | +/-0.015 | 6 | 13 | | 57 | 4 | HF84205050 | ● |
| **6** | 0/-0.025 | 0.30 | +/-0.015 | 6 | 13 | | 57 | 4 | HF84203060 | ● |
| **6** | 0/-0.025 | 0.50 | +/-0.015 | 6 | 13 | | 57 | 4 | HF84205060 | ● |
| **6** | 0/-0.025 | 1.00 | +/-0.015 | 6 | 13 | | 57 | 4 | HF84210060 | ● |
| **8** | 0/-0.030 | 0.50 | +/-0.015 | 8 | 20 | | 64 | 4 | HF84205080 | ● |
| **8** | 0/-0.030 | 1.00 | +/-0.015 | 8 | 20 | | 64 | 4 | HF84210080 | ● |
| **10** | 0/-0.030 | 0.50 | +/-0.020 | 10 | 22 | | 72 | 4 | HF84205100 | ● |
| **10** | 0/-0.030 | 1.00 | +/-0.020 | 10 | 22 | | 72 | 4 | HF84210100 | ● |
| **12** | 0/-0.030 | 0.50 | +/-0.020 | 12 | 26 | | 83 | 4 | HF84205120 | ● |
| **12** | 0/-0.030 | 1.00 | +/-0.020 | 12 | 26 | | 83 | 4 | HF84210120 | ● |
| **12** | 0/-0.030 | 2.00 | +/-0.020 | 12 | 26 | | 83 | 4 | HF84220120 | ● |
| **12** | 0/-0.030 | 3.00 | +/-0.020 | 12 | 26 | | 83 | 4 | HF84230120 | ● |
| **14** | 0/-0.030 | 1.00 | +/-0.020 | 14 | 26 | | 83 | 4 | HF84210140 | ● |
| **16** | 0/-0.030 | 1.00 | +/-0.020 | 16 | 32 | | 92 | 4 | HF84210160 | ● |
| **16** | 0/-0.030 | 2.00 | +/-0.020 | 16 | 32 | | 92 | 4 | HF84220160 | ● |
| **16** | 0/-0.030 | 3.00 | +/-0.020 | 16 | 32 | | 92 | 4 | HF84230160 | ● |
| **18** | 0/-0.030 | 1.00 | +/-0.020 | 18 | 32 | | 92 | 4 | HF84210180 | ● |
| **20** | 0/-0.030 | 1.00 | +/-0.020 | 20 | 38 | | 104 | 4 | HF84210200 | ● |
| **20** | 0/-0.030 | 2.00 | +/-0.020 | 20 | 38 | | 104 | 4 | HF84220200 | ● |
| **20** | 0/-0.030 | 3.00 | +/-0.020 | 20 | 38 | | 104 | 4 | HF84230200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# HF842

## SLOTTING

| Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| Vc (m/min) | **130÷150** | **70÷90** | **50÷70** | **30÷50** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **3** | 0.014 | 0.013 | 0.011 | 0.010 |
| **4** | 0.019 | 0.017 | 0.014 | 0.013 |
| **5** | 0.023 | 0.021 | 0.017 | 0.016 |
| **6** | 0.027 | 0.024 | 0.020 | 0.019 |
| **8** | 0.035 | 0.032 | 0.026 | 0.025 |
| **10** | 0.042 | 0.038 | 0.032 | 0.029 |
| **12** | 0.048 | 0.043 | 0.036 | 0.034 |
| **14** | 0.054 | 0.049 | 0.041 | 0.038 |
| **16** | 0.060 | 0.054 | 0.045 | 0.042 |
| **18** | 0.066 | 0.059 | 0.050 | 0.046 |
| **20** | 0.073 | 0.066 | 0.055 | 0.051 |
| **ap x ae** | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

## SIDE MILLING

| Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| Vc (m/min) | **160÷180** | **100÷120** | **70÷90** | **40÷60** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **3** | 0.017 | 0.015 | 0.013 | 0.018 |
| **4** | 0.022 | 0.020 | 0.018 | 0.024 |
| **5** | 0.028 | 0.025 | 0.022 | 0.030 |
| **6** | 0.032 | 0.029 | 0.026 | 0.036 |
| **8** | 0.042 | 0.038 | 0.034 | 0.046 |
| **10** | 0.050 | 0.045 | 0.040 | 0.055 |
| **12** | 0.058 | 0.052 | 0.046 | 0.063 |
| **14** | 0.065 | 0.058 | 0.052 | 0.071 |
| **16** | 0.072 | 0.065 | 0.058 | 0.079 |
| **18** | 0.079 | 0.071 | 0.063 | 0.087 |
| **20** | 0.088 | 0.079 | 0.070 | 0.096 |
| **ap x ae** | **≤ D5** | 1.5D x 0.25D | 1.5D x 0.25D | 1.2D x 0.1D | 1.2D x 0.1D |

## HELICAL

| Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| α° x ae | **5° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** |
| Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **3** | 0.010 | 0.010 | 0.008 | 0.008 |
| **4** | 0.013 | 0.013 | 0.011 | 0.010 |
| **5** | 0.017 | 0.016 | 0.014 | 0.013 |
| **6** | 0.020 | 0.018 | 0.016 | 0.015 |
| **8** | 0.025 | 0.024 | 0.021 | 0.020 |
| **10** | 0.031 | 0.029 | 0.025 | 0.024 |
| **12** | 0.035 | 0.033 | 0.029 | 0.027 |
| **14** | 0.039 | 0.037 | 0.032 | 0.030 |
| **16** | 0.044 | 0.041 | 0.036 | 0.034 |
| **18** | 0.048 | 0.045 | 0.040 | 0.037 |
| **20** | 0.053 | 0.050 | 0.044 | 0.041 |
| **α° x ae** | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF842

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **15° x D** | **10° x D** | **5° x D** | **5° x D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.022 | 0.020 | 0.019 | 0.026 |
| | **8** | 0.028 | 0.026 | 0.024 | 0.034 |
| | **10** | 0.034 | 0.031 | 0.029 | 0.040 |
| | **12** | 0.038 | 0.035 | 0.034 | 0.046 |
| | **14** | 0.043 | 0.040 | 0.038 | 0.052 |
| | **16** | 0.048 | 0.044 | 0.042 | 0.058 |
| | **18** | 0.053 | 0.048 | 0.046 | 0.063 |
| | **20** | 0.058 | 0.054 | 0.051 | 0.070 |

| VERTICAL | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.027 | 0.024 | 0.020 | 0.019 |
| | **8** | 0.035 | 0.032 | 0.026 | 0.025 |
| | **10** | 0.042 | 0.038 | 0.032 | 0.029 |
| | **12** | 0.048 | 0.043 | 0.036 | 0.034 |
| | **14** | 0.054 | 0.049 | 0.041 | 0.038 |
| | **16** | 0.060 | 0.054 | 0.045 | 0.042 |
| | **18** | 0.066 | 0.059 | 0.050 | 0.046 |
| | **20** | 0.073 | 0.066 | 0.055 | 0.051 |

| DRILLING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **20÷40** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.007 | 0.006 | 0.006 | 0.008 |
| | **4** | 0.009 | 0.008 | 0.007 | 0.010 |
| | **5** | 0.012 | 0.010 | 0.009 | 0.013 |
| | **6** | 0.014 | 0.012 | 0.011 | 0.015 |
| | **8** | 0.018 | 0.016 | 0.014 | 0.019 |
| | **10** | 0.021 | 0.019 | 0.017 | 0.023 |
| | **12** | 0.024 | 0.022 | 0.019 | 0.026 |
| | **14** | 0.027 | 0.024 | 0.022 | 0.030 |
| | **16** | 0.030 | 0.027 | 0.024 | 0.033 |
| | **18** | 0.033 | 0.030 | 0.026 | 0.036 |
| | **20** | 0.037 | 0.033 | 0.029 | 0.040 |
| **ap x ae** | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |
| **ap x ae** | **≤ D5** | 1.5D x 0.1D | 1.5D x 0.1D | | |

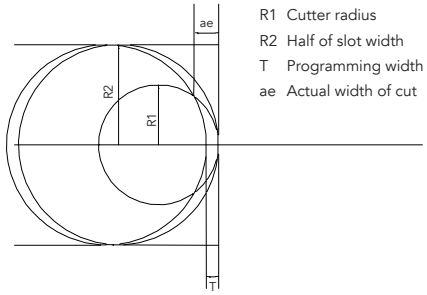
PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

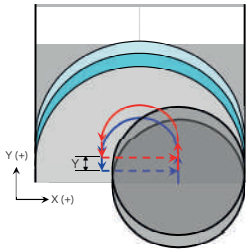
# HF842

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **2D x 0.2D** | **2D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **190÷230** | **130÷150** | **100÷120** | **50÷70** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.035 | 0.032 | 0.028 | 0.039 |
| | **4** | 0.046 | 0.042 | 0.037 | 0.051 |
| | **5** | 0.058 | 0.052 | 0.046 | 0.063 |
| | **6** | 0.068 | 0.061 | 0.054 | 0.074 |
| | **8** | 0.088 | 0.079 | 0.070 | 0.096 |
| | **10** | 0.105 | 0.095 | 0.084 | 0.116 |
| | **12** | 0.120 | 0.108 | 0.096 | 0.132 |
| | **14** | 0.135 | 0.122 | 0.108 | 0.149 |
| | **16** | 0.150 | 0.135 | 0.120 | 0.165 |
| | **18** | 0.165 | 0.149 | 0.132 | 0.182 |
| | **20** | 0.183 | 0.164 | 0.146 | 0.201 |
| **ap x ae** | **≤ D5** | 1.5D x 0.1D | 1.5D x 0.1D | | |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF442

cylindrical shank and reduced neck, corner radius

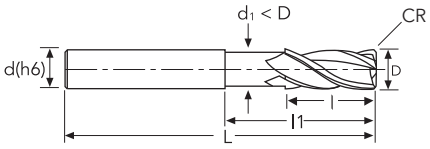
OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | RADIUS | Z4 UP




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | 0.30 | +/-0.020 | 6 | 9 | 15 | 2.80 | 57 | 4 | HF44203030 | ● |
| **3** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 9 | 15 | 2.80 | 57 | 4 | HF44205030 | ● |
| **4** | 0/-0.030 | 0.30 | +/-0.020 | 6 | 11 | 18 | 3.80 | 57 | 4 | HF44203040 | ● |
| **4** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 11 | 18 | 3.80 | 57 | 4 | HF44205040 | ● |
| **5** | 0/-0.030 | 0.30 | +/-0.020 | 6 | 13 | 19 | 4.80 | 57 | 4 | HF44203050 | ● |
| **5** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 13 | 19 | 4.80 | 57 | 4 | HF44205050 | ● |
| **6** | 0/-0.030 | 0.30 | +/-0.020 | 6 | 13 | 20 | 5.80 | 57 | 4 | HF44203060 | ● |
| **6** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 13 | 20 | 5.80 | 57 | 4 | HF44205060 | ● |
| **6** | 0/-0.030 | 1.00 | +/-0.020 | 6 | 13 | 20 | 5.80 | 57 | 4 | HF44210060 | ● |
| **8** | 0/-0.030 | 0.50 | +/-0.020 | 8 | 20 | 26 | 7.80 | 64 | 4 | HF44205080 | ● |
| **8** | 0/-0.030 | 1.00 | +/-0.020 | 8 | 20 | 26 | 7.80 | 64 | 4 | HF44210080 | ● |
| **10** | 0/-0.030 | 0.50 | +/-0.020 | 10 | 22 | 30 | 9.80 | 72 | 4 | HF44205100 | ● |
| **10** | 0/-0.030 | 1.00 | +/-0.020 | 10 | 22 | 30 | 9.80 | 72 | 4 | HF44210100 | ● |
| **12** | 0/-0.030 | 0.50 | +/-0.020 | 12 | 26 | 36 | 11.80 | 83 | 4 | HF44205120 | ● |
| **12** | 0/-0.030 | 1.00 | +/-0.020 | 12 | 26 | 36 | 11.80 | 83 | 4 | HF44210120 | ● |
| **14** | 0/-0.030 | 1.00 | +/-0.020 | 14 | 26 | 36 | 13.70 | 83 | 4 | HF44210140 | ● |
| **16** | 0/-0.030 | 1.00 | +/-0.020 | 16 | 32 | 42 | 15.70 | 92 | 4 | HF44210160 | ● |
| **16** | 0/-0.030 | 2.00 | +/-0.020 | 16 | 32 | 42 | 15.70 | 92 | 4 | HF44220160 | ● |
| **20** | 0/-0.030 | 1.00 | +/-0.020 | 20 | 38 | 50 | 19.70 | 104 | 4 | HF44210200 | ● |
| **20** | 0/-0.030 | 2.00 | +/-0.020 | 20 | 38 | 50 | 19.70 | 104 | 4 | HF44220200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# HF442

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.013 | 0.011 | 0.009 | 0.009 |
| | **4** | 0.017 | 0.015 | 0.012 | 0.012 |
| | **5** | 0.021 | 0.019 | 0.016 | 0.014 |
| | **6** | 0.024 | 0.022 | 0.018 | 0.017 |
| | **8** | 0.032 | 0.028 | 0.024 | 0.022 |
| | **10** | 0.038 | 0.034 | 0.028 | 0.026 |
| | **12** | 0.043 | 0.039 | 0.032 | 0.030 |
| | **14** | 0.049 | 0.044 | 0.036 | 0.034 |
| | **16** | 0.054 | 0.049 | 0.041 | 0.038 |
| | **20** | 0.066 | 0.059 | 0.049 | 0.046 |
| **ap x ae** | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | ap x ae | **1.5D x D** | **1.5D x D** | | |
| | Vc (m/min) | **85÷105** | **55÷75** | | |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **8** | 0.025 | 0.023 | | |
| | **10** | 0.030 | 0.027 | | |
| | **12** | 0.035 | 0.031 | | |
| | **14** | 0.039 | 0.035 | | |
| | **16** | 0.043 | 0.039 | | |
| | **20** | 0.053 | 0.047 | | |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **130÷150** | **90÷140** | **60÷80** | **40÷60** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.015 | 0.014 | 0.012 | 0.017 |
| | **4** | 0.020 | 0.018 | 0.016 | 0.022 |
| | **5** | 0.025 | 0.022 | 0.020 | 0.027 |
| | **6** | 0.029 | 0.026 | 0.023 | 0.032 |
| | **8** | 0.038 | 0.034 | 0.030 | 0.042 |
| | **10** | 0.045 | 0.041 | 0.036 | 0.050 |
| | **12** | 0.052 | 0.047 | 0.041 | 0.057 |
| | **14** | 0.058 | 0.052 | 0.047 | 0.064 |
| | **16** | 0.065 | 0.058 | 0.052 | 0.071 |
| | **20** | 0.079 | 0.071 | 0.063 | 0.087 |
| **ap x ae** | **≤ D5** | 1.5D x 0.25D | 1.5D x 0.25D | 1.2D x 0.1D | 1.2D x 0.1D |

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA
HSS DRILLS
LFTA
SUTA
HSS-HSS/CO
CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH
HSS END-MILLS
CARBIDE BURRS

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF442

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **5° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| HELICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.009 | 0.009 | 0.008 | 0.007 |
| | **4** | 0.012 | 0.011 | 0.010 | 0.009 |
| | **5** | 0.015 | 0.014 | 0.012 | 0.012 |
| | **6** | 0.018 | 0.016 | 0.015 | 0.014 |
| | **8** | 0.023 | 0.021 | 0.019 | 0.018 |
| | **10** | 0.028 | 0.026 | 0.023 | 0.021 |
| | **12** | 0.031 | 0.029 | 0.026 | 0.024 |
| | **14** | 0.035 | 0.033 | 0.029 | 0.027 |
| | **16** | 0.039 | 0.037 | 0.032 | 0.030 |
| | **20** | 0.048 | 0.045 | 0.039 | 0.037 |
| α° x ae | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **15° x D** | **10° x D** | **5° x D** | **5° x D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **30÷40** |
| RAMPING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.019 | 0.018 | 0.017 | 0.023 |
| | **8** | 0.025 | 0.023 | 0.022 | 0.030 |
| | **10** | 0.030 | 0.028 | 0.026 | 0.036 |
| | **12** | 0.034 | 0.032 | 0.030 | 0.042 |
| | **14** | 0.039 | 0.036 | 0.034 | 0.047 |
| | **16** | 0.043 | 0.040 | 0.038 | 0.052 |
| | **20** | 0.052 | 0.048 | 0.046 | 0.063 |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | α° x ae | **30° x D** | **15° x D** | | |
| | Vc (m/min) | **80÷100** | **50÷70** | | |
| RAMPING | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **10** | 0.025 | 0.023 | | |
| | **12** | 0.028 | 0.026 | | |
| | **14** | 0.032 | 0.029 | | |
| | **16** | 0.035 | 0.032 | | |
| | **20** | 0.043 | 0.039 | | |



PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

# HF442

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **30÷40** |
| VERTICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.024 | 0.022 | 0.018 | 0.017 |
| | **8** | 0.032 | 0.028 | 0.024 | 0.022 |
| | **10** | 0.038 | 0.034 | 0.028 | 0.026 |
| | **12** | 0.043 | 0.039 | 0.032 | 0.030 |
| | **14** | 0.049 | 0.044 | 0.036 | 0.034 |
| | **16** | 0.054 | 0.049 | 0.041 | 0.038 |
| | **20** | 0.066 | 0.059 | 0.049 | 0.046 |

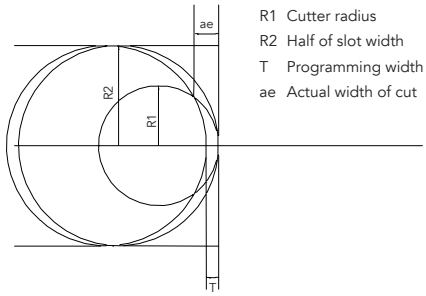
| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **85÷105** | **55÷75** | **40÷60** | **20÷40** |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.006 | 0.006 | 0.005 | 0.007 |
| | **4** | 0.008 | 0.007 | 0.007 | 0.009 |
| | **5** | 0.010 | 0.009 | 0.008 | 0.011 |
| | **6** | 0.012 | 0.011 | 0.010 | 0.013 |
| | **8** | 0.016 | 0.014 | 0.013 | 0.017 |
| | **10** | 0.019 | 0.017 | 0.015 | 0.021 |
| | **12** | 0.022 | 0.019 | 0.017 | 0.024 |
| | **14** | 0.024 | 0.022 | 0.019 | 0.027 |
| | **16** | 0.027 | 0.024 | 0.022 | 0.030 |
| | **20** | 0.033 | 0.030 | 0.026 | 0.036 |
| **ap x ae** | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

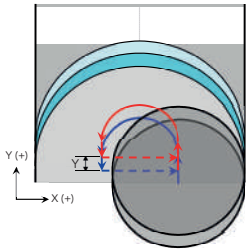
# HF442

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **2D x 0.2D** | **2D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **160÷200** | **110÷130** | **80÷100** | **50÷70** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.032 | 0.028 | 0.025 | 0.035 |
| | **4** | 0.042 | 0.037 | 0.033 | 0.046 |
| | **5** | 0.052 | 0.047 | 0.041 | 0.057 |
| | **6** | 0.061 | 0.055 | 0.049 | 0.067 |
| | **8** | 0.079 | 0.071 | 0.063 | 0.087 |
| | **10** | 0.095 | 0.085 | 0.076 | 0.104 |
| | **12** | 0.108 | 0.097 | 0.086 | 0.119 |
| | **14** | 0.122 | 0.109 | 0.097 | 0.134 |
| | **16** | 0.135 | 0.122 | 0.108 | 0.149 |
| | **20** | 0.164 | 0.148 | 0.131 | 0.181 |
| **ap x ae** | **≤ D5** | 1.5D x 0.1D | 1.5D x 0.1D | | |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



# HF443

weldon shank and reduced neck, corner radius

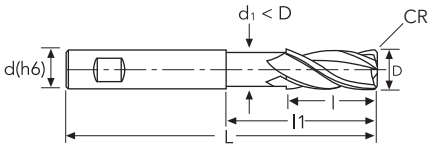
OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | RADIUS | Z4 UP




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | 0.30 | +/-0.020 | 6 | 9 | 15 | 2.80 | 57 | 4 | HF44303030 | ● |
| **3** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 9 | 15 | 2.80 | 57 | 4 | HF44305030 | ● |
| **4** | 0/-0.030 | 0.30 | +/-0.020 | 6 | 11 | 18 | 3.80 | 57 | 4 | HF44303040 | ● |
| **4** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 11 | 18 | 3.80 | 57 | 4 | HF44305040 | ● |
| **5** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 13 | 19 | 4.80 | 57 | 4 | HF44305050 | ● |
| **6** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 13 | 20 | 5.80 | 57 | 4 | HF44305060 | ● |
| **6** | 0/-0.030 | 1.00 | +/-0.020 | 6 | 13 | 20 | 5.80 | 57 | 4 | HF44310060 | ● |
| **8** | 0/-0.030 | 0.50 | +/-0.020 | 8 | 20 | 26 | 7.80 | 64 | 4 | HF44305080 | ● |
| **8** | 0/-0.030 | 1.00 | +/-0.020 | 8 | 20 | 26 | 7.80 | 64 | 4 | HF44310080 | ● |
| **10** | 0/-0.030 | 0.50 | +/-0.020 | 10 | 22 | 30 | 9.80 | 72 | 4 | HF44305100 | ● |
| **10** | 0/-0.030 | 1.00 | +/-0.020 | 10 | 22 | 30 | 9.80 | 72 | 4 | HF44310100 | ● |
| **12** | 0/-0.030 | 0.50 | +/-0.020 | 12 | 26 | 36 | 11.80 | 83 | 4 | HF44305120 | ● |
| **12** | 0/-0.030 | 1.00 | +/-0.020 | 12 | 26 | 36 | 11.80 | 83 | 4 | HF44310120 | ● |
| **14** | 0/-0.030 | 1.00 | +/-0.020 | 14 | 26 | 36 | 13.70 | 83 | 4 | HF44310140 | ● |
| **16** | 0/-0.030 | 1.00 | +/-0.020 | 16 | 32 | 42 | 15.70 | 92 | 4 | HF44310160 | ● |
| **20** | 0/-0.030 | 1.00 | +/-0.020 | 20 | 38 | 50 | 19.70 | 104 | 4 | HF44310200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# HF443

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.013 | 0.011 | 0.009 | 0.009 |
| | **4** | 0.017 | 0.015 | 0.012 | 0.012 |
| | **5** | 0.021 | 0.019 | 0.016 | 0.014 |
| | **6** | 0.024 | 0.022 | 0.018 | 0.017 |
| | **8** | 0.032 | 0.028 | 0.024 | 0.022 |
| | **10** | 0.038 | 0.034 | 0.028 | 0.026 |
| | **12** | 0.043 | 0.039 | 0.032 | 0.030 |
| | **14** | 0.049 | 0.044 | 0.036 | 0.034 |
| | **16** | 0.054 | 0.049 | 0.041 | 0.038 |
| | **18** | 0.059 | 0.053 | 0.045 | 0.042 |
| | **20** | 0.066 | 0.059 | 0.049 | 0.046 |
| ap x ae | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | ap x ae | **1.5D x D** | **1.5D x D** | | |
| | Vc (m/min) | **85÷105** | **55÷75** | | |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **8** | 0.025 | 0.023 | | |
| | **10** | 0.030 | 0.027 | | |
| | **12** | 0.035 | 0.031 | | |
| | **14** | 0.039 | 0.035 | | |
| | **16** | 0.043 | 0.039 | | |
| | **18** | 0.048 | 0.043 | | |
| | **20** | 0.053 | 0.047 | | |

| | Material Group ISO 513 | P1 P2 P7 K1 | | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | | | |
| | ap x ae | **2D x D** | | | |
| | Vc (m/min) | **60÷80** | | | |
| SLOTTING | D (mm) | fz (mm/z) | | | |
| | **10** | 0.023 | | | |
| | **12** | 0.026 | | | |
| | **14** | 0.029 | | | |
| | **16** | 0.032 | | | |
| | **18** | 0.036 | | | |
| | **20** | 0.039 | | | |

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF442 PARAMETERS.

CUTTING PARAMETERS

# HF443

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.2D x 0.3D** | **1.2D x 0.3D** |
| | Vc (m/min) | **130÷150** | **90÷110** | **60÷80** | **40÷60** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.015 | 0.014 | 0.012 | 0.017 |
| | **4** | 0.020 | 0.018 | 0.016 | 0.022 |
| | **5** | 0.025 | 0.022 | 0.020 | 0.027 |
| | **6** | 0.029 | 0.026 | 0.023 | 0.032 |
| | **8** | 0.038 | 0.034 | 0.030 | 0.042 |
| | **10** | 0.045 | 0.041 | 0.036 | 0.050 |
| | **12** | 0.052 | 0.047 | 0.041 | 0.057 |
| | **14** | 0.058 | 0.052 | 0.047 | 0.064 |
| | **16** | 0.065 | 0.058 | 0.052 | 0.071 |
| | **18** | 0.071 | 0.064 | 0.057 | 0.078 |
| | **20** | 0.079 | 0.071 | 0.063 | 0.087 |
| ap x ae | **≤ D5** | 1.5D x 0.25D | 1.5D x 0.25D | 1.2D x 0.1D | 1.2D x 0.1D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **5° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| HELICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.009 | 0.009 | 0.008 | 0.007 |
| | **4** | 0.012 | 0.011 | 0.010 | 0.009 |
| | **5** | 0.015 | 0.014 | 0.012 | 0.012 |
| | **6** | 0.018 | 0.016 | 0.015 | 0.014 |
| | **8** | 0.023 | 0.021 | 0.019 | 0.018 |
| | **10** | 0.028 | 0.026 | 0.023 | 0.021 |
| | **12** | 0.031 | 0.029 | 0.026 | 0.024 |
| | **14** | 0.035 | 0.033 | 0.029 | 0.027 |
| | **16** | 0.039 | 0.037 | 0.032 | 0.030 |
| | **18** | 0.043 | 0.040 | 0.036 | 0.033 |
| | **20** | 0.048 | 0.045 | 0.039 | 0.037 |
| α° x ae | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **15° x D** | **10° x D** | **5° x D** | **5° x D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **30÷40** |
| RAMPING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.019 | 0.018 | 0.017 | 0.023 |
| | **8** | 0.025 | 0.023 | 0.022 | 0.030 |
| | **10** | 0.030 | 0.028 | 0.026 | 0.036 |
| | **12** | 0.034 | 0.032 | 0.030 | 0.042 |
| | **14** | 0.039 | 0.036 | 0.034 | 0.047 |
| | **16** | 0.043 | 0.040 | 0.038 | 0.052 |
| | **18** | 0.047 | 0.044 | 0.042 | 0.057 |
| | **20** | 0.052 | 0.048 | 0.046 | 0.063 |

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF442 PARAMETERS.

# HF443

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | α° x ae | **30° x D** | **15° x D** | | |
| RAMPING | Vc (m/min) | **80÷100** | **50÷70** | | |
| | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **10** | 0.025 | 0.023 | | |
| | **12** | 0.028 | 0.026 | | |
| | **14** | 0.032 | 0.029 | | |
| | **16** | 0.035 | 0.032 | | |
| | **18** | 0.039 | 0.036 | | |
| | **20** | 0.043 | 0.039 | | |

| | Material Group ISO 513 | P1 P2 P7 K1 | | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | | | |
| | α° x ae | **45° x D** | | | |
| RAMPING | Vc (m/min) | **60÷80** | | | |
| | D (mm) | fz (mm/z) | | | |
| | **10** | 0.024 | | | |
| | **12** | 0.028 | | | |
| | **14** | 0.031 | | | |
| | **16** | 0.035 | | | |
| | **18** | 0.038 | | | |
| | **20** | 0.042 | | | |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| VERTICAL | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **30÷40** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.024 | 0.022 | 0.018 | 0.017 |
| | **8** | 0.032 | 0.028 | 0.024 | 0.022 |
| | **10** | 0.038 | 0.034 | 0.028 | 0.026 |
| | **12** | 0.043 | 0.039 | 0.032 | 0.030 |
| | **14** | 0.049 | 0.044 | 0.036 | 0.034 |
| | **16** | 0.054 | 0.049 | 0.041 | 0.038 |
| | **18** | 0.059 | 0.053 | 0.045 | 0.042 |
| | **20** | 0.066 | 0.059 | 0.049 | 0.046 |

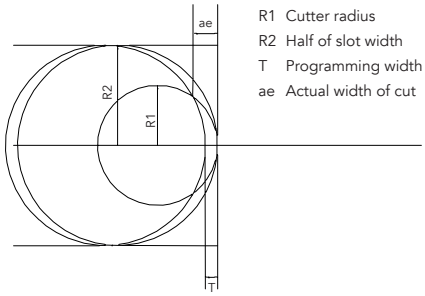
PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF442 PARAMETERS.

# HF443

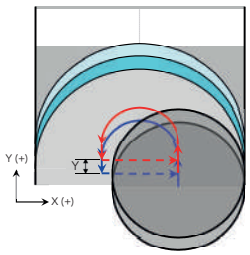
| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **85÷105** | **55÷75** | **40÷60** | **20÷40** |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.006 | 0.006 | 0.005 | 0.007 |
| | **4** | 0.008 | 0.007 | 0.007 | 0.009 |
| | **5** | 0.010 | 0.009 | 0.008 | 0.011 |
| | **6** | 0.012 | 0.011 | 0.010 | 0.013 |
| | **8** | 0.016 | 0.014 | 0.013 | 0.017 |
| | **10** | 0.019 | 0.017 | 0.015 | 0.021 |
| | **12** | 0.022 | 0.019 | 0.017 | 0.024 |
| | **14** | 0.024 | 0.022 | 0.019 | 0.027 |
| | **16** | 0.027 | 0.024 | 0.022 | 0.030 |
| | **18** | 0.030 | 0.027 | 0.024 | 0.033 |
| | **20** | 0.033 | 0.030 | 0.026 | 0.036 |
| **ap x ae** | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **2D x 0.2D** | **2D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **160÷200** | **110÷130** | **80÷100** | **50÷70** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.032 | 0.028 | 0.025 | 0.035 |
| | **4** | 0.042 | 0.037 | 0.033 | 0.046 |
| | **5** | 0.052 | 0.047 | 0.041 | 0.057 |
| | **6** | 0.061 | 0.055 | 0.049 | 0.067 |
| | **8** | 0.079 | 0.071 | 0.063 | 0.087 |
| | **10** | 0.095 | 0.085 | 0.076 | 0.104 |
| | **12** | 0.108 | 0.097 | 0.086 | 0.119 |
| | **14** | 0.122 | 0.109 | 0.097 | 0.134 |
| | **16** | 0.135 | 0.122 | 0.108 | 0.149 |
| | **18** | 0.149 | 0.134 | 0.119 | 0.163 |
| | **20** | 0.164 | 0.148 | 0.131 | 0.181 |
| **ap x ae** | **≤ D5** | 1.5D x 0.1D | 1.5D x 0.1D | | |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF442 PARAMETERS.

# HF542

cylindrical shank and reduced neck, long reach, corner radius

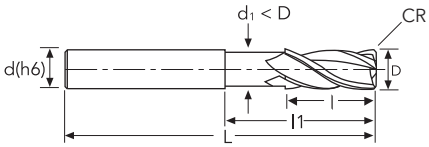



OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | RADIUS | Z4 UP

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.030 | 0.30 | +/-0.020 | 6 | 12 | 30 | 5.80 | 75 | 4 | HF5420306075 | ● |
| **6** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 12 | 30 | 5.80 | 75 | 4 | HF5420506075 | ● |
| **6** | 0/-0.030 | 1.00 | +/-0.020 | 6 | 12 | 30 | 5.80 | 75 | 4 | HF5421006075 | ● |
| **6** | 0/-0.030 | 0.30 | +/-0.020 | 6 | 12 | 30 | 5.80 | 100 | 4 | HF54203060100 | ● |
| **6** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 12 | 30 | 5.80 | 100 | 4 | HF54205060100 | ● |
| **6** | 0/-0.030 | 1.00 | +/-0.020 | 6 | 12 | 30 | 5.80 | 100 | 4 | HF54210060100 | ● |
| **8** | 0/-0.030 | 0.50 | +/-0.020 | 8 | 16 | 40 | 7.80 | 100 | 4 | HF54205080100 | ● |
| **8** | 0/-0.030 | 1.00 | +/-0.020 | 8 | 16 | 40 | 7.80 | 100 | 4 | HF54210080100 | ● |
| **8** | 0/-0.030 | 2.00 | +/-0.020 | 8 | 16 | 40 | 7.80 | 100 | 4 | HF54220080100 | ● |
| **10** | 0/-0.030 | 0.50 | +/-0.020 | 10 | 20 | 50 | 9.80 | 125 | 4 | HF54205100125 | ● |
| **10** | 0/-0.030 | 1.00 | +/-0.020 | 10 | 20 | 50 | 9.80 | 125 | 4 | HF54210100125 | ● |
| **10** | 0/-0.030 | 2.00 | +/-0.020 | 10 | 20 | 50 | 9.80 | 125 | 4 | HF54220100125 | ● |
| **12** | 0/-0.030 | 0.50 | +/-0.020 | 12 | 24 | 60 | 11.80 | 125 | 4 | HF54205120125 | ● |
| **12** | 0/-0.030 | 1.00 | +/-0.020 | 12 | 24 | 60 | 11.80 | 125 | 4 | HF54210120125 | ● |
| **12** | 0/-0.030 | 2.00 | +/-0.020 | 12 | 24 | 60 | 11.80 | 125 | 4 | HF54220120125 | ● |
| **12** | 0/-0.030 | 3.00 | +/-0.020 | 12 | 24 | 60 | 11.80 | 125 | 4 | HF54230120125 | ● |
| **12** | 0/-0.030 | 0.50 | +/-0.020 | 12 | 24 | 60 | 11.80 | 150 | 4 | HF54205120150 | ● |
| **12** | 0/-0.030 | 1.00 | +/-0.020 | 12 | 24 | 60 | 11.80 | 150 | 4 | HF54210120150 | ● |
| **12** | 0/-0.030 | 2.00 | +/-0.020 | 12 | 24 | 60 | 11.80 | 150 | 4 | HF54220120150 | ● |
| **12** | 0/-0.030 | 3.00 | +/-0.020 | 12 | 24 | 60 | 11.80 | 150 | 4 | HF54230120150 | ● |
| **16** | 0/-0.030 | 0.50 | +/-0.020 | 16 | 32 | 80 | 15.70 | 150 | 4 | HF54205160150 | ● |
| **16** | 0/-0.030 | 1.00 | +/-0.020 | 16 | 32 | 80 | 15.70 | 150 | 4 | HF54210160150 | ● |
| **16** | 0/-0.030 | 2.00 | +/-0.020 | 16 | 32 | 80 | 15.70 | 150 | 4 | HF54220160150 | ● |
| **16** | 0/-0.030 | 3.00 | +/-0.020 | 16 | 32 | 80 | 15.70 | 150 | 4 | HF54230160150 | ● |
| **16** | 0/-0.030 | 4.00 | +/-0.020 | 16 | 32 | 80 | 15.70 | 150 | 4 | HF54240160150 | ● |
| **20** | 0/-0.030 | 0.50 | +/-0.020 | 20 | 40 | 100 | 19.70 | 150 | 4 | HF54205200150 | ● |
| **20** | 0/-0.030 | 1.00 | +/-0.020 | 20 | 40 | 100 | 19.70 | 150 | 4 | HF54210200150 | ● |
| **20** | 0/-0.030 | 2.00 | +/-0.020 | 20 | 40 | 100 | 19.70 | 150 | 4 | HF54220200150 | ● |
| **20** | 0/-0.030 | 3.00 | +/-0.020 | 20 | 40 | 100 | 19.70 | 150 | 4 | HF54230200150 | ● |
| **20** | 0/-0.030 | 4.00 | +/-0.020 | 20 | 40 | 100 | 19.70 | 150 | 4 | HF54240200150 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# HF542

## SLOTTING

| Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| ap x ae | **0.5D x D** | **0.3D x D** | **0.2D x D** | **0.2D x D** |
| Vc (m/min) | **90÷110** | **60÷80** | **40÷60** | **20÷40** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **6** | 0.019 | 0.017 | 0.015 | 0.014 |
| **8** | 0.025 | 0.023 | 0.019 | 0.018 |
| **10** | 0.030 | 0.027 | 0.023 | 0.021 |
| **12** | 0.035 | 0.031 | 0.026 | 0.024 |
| **14** | 0.039 | 0.035 | 0.029 | 0.027 |
| **16** | 0.043 | 0.039 | 0.032 | 0.030 |
| **20** | 0.053 | 0.047 | 0.039 | 0.037 |

## SIDE MILLING

| Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.2D x 0.2D** | **1.2D x 0.2D** |
| Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **6** | 0.023 | 0.021 | 0.019 | 0.026 |
| **8** | 0.030 | 0.027 | 0.024 | 0.033 |
| **10** | 0.036 | 0.033 | 0.029 | 0.040 |
| **12** | 0.041 | 0.037 | 0.033 | 0.046 |
| **14** | 0.047 | 0.042 | 0.037 | 0.051 |
| **16** | 0.052 | 0.047 | 0.041 | 0.057 |
| **20** | 0.063 | 0.057 | 0.050 | 0.069 |

## HELICAL

| Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| α° x ae | **4° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** | **2° x 0.4D** |
| Vc (m/min) | **90÷110** | **60÷80** | **40÷60** | **20÷40** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **6** | 0.015 | 0.014 | 0.012 | 0.012 |
| **8** | 0.019 | 0.018 | 0.015 | 0.016 |
| **10** | 0.023 | 0.022 | 0.018 | 0.019 |
| **12** | 0.026 | 0.025 | 0.021 | 0.022 |
| **14** | 0.029 | 0.028 | 0.023 | 0.025 |
| **16** | 0.033 | 0.031 | 0.026 | 0.027 |
| **20** | 0.040 | 0.038 | 0.032 | 0.033 |

## RAMPING

| Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| α° x ae | **7° x D** | **5° x D** | **3° x D** | **3° x D** |
| Vc (m/min) | **80÷100** | **50÷70** | **35÷55** | **20÷30** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **6** | 0.016 | 0.015 | 0.015 | 0.021 |
| **8** | 0.021 | 0.020 | 0.019 | 0.027 |
| **10** | 0.025 | 0.024 | 0.023 | 0.032 |
| **12** | 0.029 | 0.027 | 0.027 | 0.037 |
| **14** | 0.033 | 0.031 | 0.030 | 0.041 |
| **16** | 0.036 | 0.034 | 0.033 | 0.046 |
| **20** | 0.044 | 0.041 | 0.040 | 0.056 |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

## HF542

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **45÷55** | **20÷30** |
| VERTICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.019 | 0.017 | 0.015 | 0.014 |
| | **8** | 0.025 | 0.023 | 0.019 | 0.018 |
| | **10** | 0.030 | 0.027 | 0.023 | 0.021 |
| | **12** | 0.035 | 0.031 | 0.026 | 0.024 |
| | **14** | 0.039 | 0.035 | 0.029 | 0.027 |
| | **16** | 0.043 | 0.039 | 0.032 | 0.030 |
| | **20** | 0.053 | 0.047 | 0.039 | 0.037 |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **70÷90** | **50÷60** | **35÷45** | **20÷30** |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.010 | 0.009 | 0.008 | 0.011 |
| | **8** | 0.013 | 0.011 | 0.010 | 0.014 |
| | **10** | 0.015 | 0.014 | 0.012 | 0.017 |
| | **12** | 0.017 | 0.016 | 0.014 | 0.019 |
| | **14** | 0.019 | 0.017 | 0.016 | 0.021 |
| | **16** | 0.022 | 0.019 | 0.017 | 0.024 |
| | **20** | 0.026 | 0.024 | 0.021 | 0.029 |



PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF942

cylindrical shank, long cutting edge ideal for trochoidal milling, corner radius

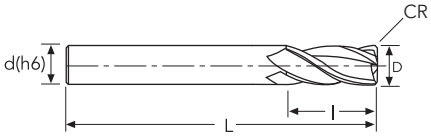



OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | RADIUS | Z4 UP

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **4** | 0/-0.030 | 0.10 | 0/-0.015 | 6 | 19 | | 75 | 4 | HF9420104075 | ● |
| **5** | 0/-0.030 | 0.10 | 0/-0.015 | 6 | 19 | | 75 | 4 | HF9420105075 | ● |
| **6** | 0/-0.030 | 0.10 | 0/-0.015 | 6 | 25 | | 75 | 4 | HF9420106075 | ● |
| **8** | 0/-0.030 | 0.20 | 0/-0.015 | 8 | 30 | | 75 | 4 | HF9420208075 | ● |
| **10** | 0/-0.035 | 0.20 | 0/-0.020 | 10 | 40 | | 100 | 4 | HF94202100100 | ● |
| **12** | 0/-0.035 | 0.30 | 0/-0.020 | 12 | 45 | | 100 | 4 | HF94203120100 | ● |
| **16** | 0/-0.035 | 0.30 | 0/-0.020 | 16 | 65 | | 125 | 4 | HF94203160125 | ● |
| **20** | 0/-0.035 | 0.30 | 0/-0.020 | 20 | 65 | | 125 | 4 | HF94203200125 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# HF942

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.2D x 0.2D** | **1.2D x 0.2D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.016 | 0.015 | 0.013 | 0.018 |
| | **5** | 0.021 | 0.019 | 0.017 | 0.023 |
| | **6** | 0.026 | 0.023 | 0.021 | 0.029 |
| | **8** | 0.031 | 0.028 | 0.025 | 0.034 |
| | **10** | 0.036 | 0.033 | 0.029 | 0.040 |
| | **12** | 0.041 | 0.037 | 0.033 | 0.045 |
| | **16** | 0.047 | 0.042 | 0.038 | 0.052 |
| | **20** | 0.063 | 0.057 | 0.051 | 0.070 |
| **ap x ae** | **≤ D5** | 1.5D x 0.1D | 1.5D x 0.1D | 1.2D x 0.1D | 1.2D x 0.1D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **4° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** | **2° x 0.4D** |
| | Vc (m/min) | **90÷110** | **60÷80** | **40÷60** | **20÷40** |
| HELICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.010 | 0.010 | 0.008 | 0.009 |
| | **5** | 0.013 | 0.013 | 0.011 | 0.011 |
| | **6** | 0.016 | 0.016 | 0.013 | 0.014 |
| | **8** | 0.019 | 0.018 | 0.015 | 0.016 |
| | **10** | 0.023 | 0.022 | 0.018 | 0.019 |
| | **12** | 0.026 | 0.025 | 0.021 | 0.022 |
| | **16** | 0.030 | 0.028 | 0.024 | 0.025 |
| | **20** | 0.040 | 0.038 | 0.032 | 0.033 |
| **α° x ae** | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

# HF942

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **5° x D** | **5° x D** | **3° x D** | **3° x D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **35÷55** | **20÷30** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.012 | 0.011 | 0.010 | 0.014 |
| | **5** | 0.015 | 0.014 | 0.014 | 0.019 |
| | **6** | 0.019 | 0.017 | 0.017 | 0.023 |
| | **8** | 0.022 | 0.020 | 0.020 | 0.027 |
| | **10** | 0.027 | 0.024 | 0.023 | 0.032 |
| | **12** | 0.030 | 0.027 | 0.026 | 0.036 |
| | **16** | 0.034 | 0.031 | 0.030 | 0.041 |
| | **20** | 0.046 | 0.042 | 0.041 | 0.056 |

| VERTICAL | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **35÷55** | **20÷30** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.014 | 0.012 | 0.010 | 0.010 |
| | **5** | 0.018 | 0.016 | 0.013 | 0.012 |
| | **6** | 0.022 | 0.019 | 0.016 | 0.015 |
| | **8** | 0.026 | 0.023 | 0.019 | 0.018 |
| | **10** | 0.030 | 0.027 | 0.023 | 0.021 |
| | **12** | 0.034 | 0.031 | 0.026 | 0.024 |
| | **16** | 0.039 | 0.035 | 0.029 | 0.027 |
| | **20** | 0.053 | 0.048 | 0.040 | 0.037 |

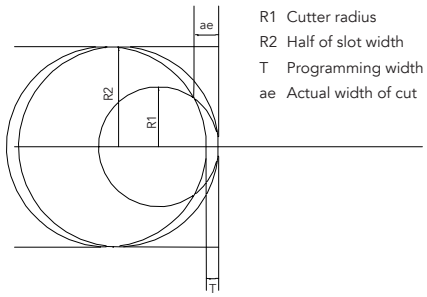
| DRILLING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **D x 0.5D** | **D x 0.5D** |
| | Vc (m/min) | **70÷90** | **50÷60** | **35÷45** | **20÷30** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.007 | 0.006 | 0.005 | 0.007 |
| | **5** | 0.009 | 0.008 | 0.007 | 0.010 |
| | **6** | 0.011 | 0.010 | 0.009 | 0.012 |
| | **8** | 0.013 | 0.012 | 0.010 | 0.014 |
| | **10** | 0.015 | 0.014 | 0.012 | 0.017 |
| | **12** | 0.017 | 0.015 | 0.014 | 0.019 |
| | **16** | 0.020 | 0.018 | 0.016 | 0.022 |
| | **20** | 0.026 | 0.024 | 0.021 | 0.029 |
| **ap x ae** | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

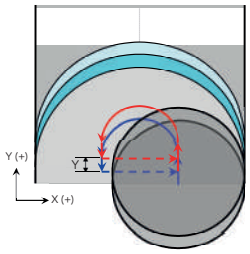
# HF942

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **2D x 0.1D** | **2D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **140÷160** | **100÷120** | **70÷90** | **40÷60** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.034 | 0.031 | 0.027 | 0.037 |
| | **5** | 0.044 | 0.040 | 0.035 | 0.048 |
| | **6** | 0.054 | 0.049 | 0.043 | 0.059 |
| | **8** | 0.064 | 0.058 | 0.051 | 0.070 |
| | **10** | 0.076 | 0.068 | 0.061 | 0.084 |
| | **12** | 0.086 | 0.077 | 0.069 | 0.095 |
| | **16** | 0.098 | 0.088 | 0.078 | 0.108 |
| | **20** | 0.132 | 0.119 | 0.106 | 0.145 |
| **ap x ae** | **≤ D5** | 1.5D x 0.1D | 1.5D x 0.1D | 1.2D x 0.05D | 1.2D x 0.05D |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut



# HF943

weldon shank, long cutting edge ideal for trochoidal milling, corner radius

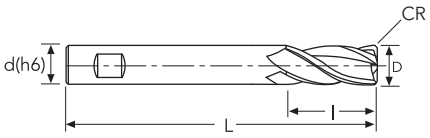



OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | RADIUS | Z4 UP

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING | TROCHOIDAL




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **4** | 0/-0.030 | 0.10 | 0/-0.015 | 6 | 19 | | 75 | 4 | HF9430104075 | ● |
| **5** | 0/-0.030 | 0.10 | 0/-0.015 | 6 | 19 | | 75 | 4 | HF9430105075 | ● |
| **6** | 0/-0.030 | 0.10 | 0/-0.015 | 6 | 25 | | 75 | 4 | HF9430106075 | ● |
| **8** | 0/-0.030 | 0.20 | 0/-0.015 | 8 | 30 | | 75 | 4 | HF9430208075 | ● |
| **10** | 0/-0.035 | 0.20 | 0/-0.020 | 10 | 40 | | 100 | 4 | HF94302100100 | ● |
| **12** | 0/-0.035 | 0.30 | 0/-0.020 | 12 | 45 | | 100 | 4 | HF94303120100 | ● |
| **16** | 0/-0.035 | 0.30 | 0/-0.020 | 16 | 65 | | 125 | 4 | HF94303160125 | ● |
| **20** | 0/-0.035 | 0.30 | 0/-0.020 | 20 | 65 | | 125 | 4 | HF94303200125 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

# HF943

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.2D x 0.2D** | **1.2D x 0.2D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.016 | 0.015 | 0.013 | 0.018 |
| | **5** | 0.021 | 0.019 | 0.017 | 0.023 |
| | **6** | 0.026 | 0.023 | 0.021 | 0.029 |
| | **8** | 0.031 | 0.028 | 0.025 | 0.034 |
| | **10** | 0.036 | 0.033 | 0.029 | 0.040 |
| | **12** | 0.041 | 0.037 | 0.033 | 0.045 |
| | **16** | 0.047 | 0.042 | 0.038 | 0.052 |
| | **20** | 0.063 | 0.057 | 0.051 | 0.070 |
| **ap x ae** | **≤ D5** | 1.5D x 0.1D | 1.5D x 0.1D | 1.2D x 0.1D | 1.2D x 0.1D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **4° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** | **2° x 0.4D** |
| | Vc (m/min) | **90÷110** | **60÷80** | **40÷60** | **20÷40** |
| HELICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.010 | 0.010 | 0.008 | 0.009 |
| | **5** | 0.013 | 0.013 | 0.011 | 0.011 |
| | **6** | 0.016 | 0.016 | 0.013 | 0.014 |
| | **8** | 0.019 | 0.018 | 0.015 | 0.016 |
| | **10** | 0.023 | 0.022 | 0.018 | 0.019 |
| | **12** | 0.026 | 0.025 | 0.021 | 0.022 |
| | **16** | 0.030 | 0.028 | 0.024 | 0.025 |
| | **20** | 0.040 | 0.038 | 0.032 | 0.033 |
| **α° x ae** | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF942 PARAMETERS.

CUTTING PARAMETERS

# HF943

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **5° x D** | **5° x D** | **3° x D** | **3° x D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **35÷55** | **20÷30** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.012 | 0.011 | 0.010 | 0.014 |
| | **5** | 0.015 | 0.014 | 0.014 | 0.019 |
| | **6** | 0.019 | 0.017 | 0.017 | 0.023 |
| | **8** | 0.022 | 0.020 | 0.020 | 0.027 |
| | **10** | 0.027 | 0.024 | 0.023 | 0.032 |
| | **12** | 0.030 | 0.027 | 0.026 | 0.036 |
| | **16** | 0.034 | 0.031 | 0.030 | 0.041 |
| | **20** | 0.046 | 0.042 | 0.041 | 0.056 |

| VERTICAL | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **35÷55** | **20÷30** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.014 | 0.012 | 0.010 | 0.010 |
| | **5** | 0.018 | 0.016 | 0.013 | 0.012 |
| | **6** | 0.022 | 0.019 | 0.016 | 0.015 |
| | **8** | 0.026 | 0.023 | 0.019 | 0.018 |
| | **10** | 0.030 | 0.027 | 0.023 | 0.021 |
| | **12** | 0.034 | 0.031 | 0.026 | 0.024 |
| | **16** | 0.039 | 0.035 | 0.029 | 0.027 |
| | **20** | 0.053 | 0.048 | 0.040 | 0.037 |

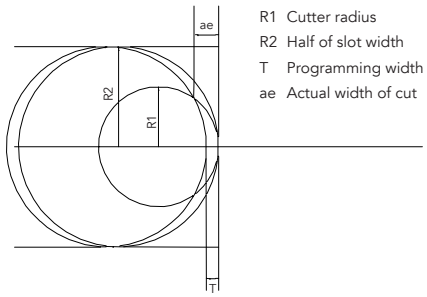
| DRILLING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **D x 0.5D** | **D x 0.5D** |
| | Vc (m/min) | **70÷90** | **50÷60** | **35÷45** | **20÷30** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.007 | 0.006 | 0.005 | 0.007 |
| | **5** | 0.009 | 0.008 | 0.007 | 0.010 |
| | **6** | 0.011 | 0.010 | 0.009 | 0.012 |
| | **8** | 0.013 | 0.012 | 0.010 | 0.014 |
| | **10** | 0.015 | 0.014 | 0.012 | 0.017 |
| | **12** | 0.017 | 0.015 | 0.014 | 0.019 |
| | **16** | 0.020 | 0.018 | 0.016 | 0.022 |
| | **20** | 0.026 | 0.024 | 0.021 | 0.029 |
| **ap x ae** | **≤ D5** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF942 PARAMETERS.

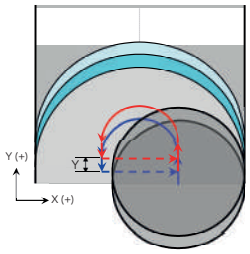
# HF943

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **2D x 0.1D** | **2D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **140÷160** | **100÷120** | **70÷90** | **40÷60** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.034 | 0.031 | 0.027 | 0.037 |
| | **5** | 0.044 | 0.040 | 0.035 | 0.048 |
| | **6** | 0.054 | 0.049 | 0.043 | 0.059 |
| | **8** | 0.064 | 0.058 | 0.051 | 0.070 |
| | **10** | 0.076 | 0.068 | 0.061 | 0.084 |
| | **12** | 0.086 | 0.077 | 0.069 | 0.095 |
| | **16** | 0.098 | 0.088 | 0.078 | 0.108 |
| | **20** | 0.132 | 0.119 | 0.106 | 0.145 |
| **ap x ae** | **≤ D5** | 1.5D x 0.1D | 1.5D x 0.1D | 1.2D x 0.05D | 1.2D x 0.05D |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF942 PARAMETERS.

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
**HF VH/UP**
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# HF642

cylindrical shank, 5F ideal for trochoidal milling, corner radius

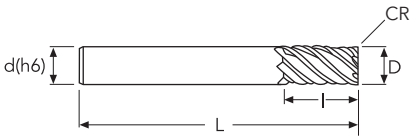
OSAWA NORM | MG PV300 | <40 HRC | 36°/37°/38° | RADIUS | Z5




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **4** | 0/-0.020 | 0.10 | 0/-0.015 | 6 | 12 | | 57 | 5 | HF64201040 | ● |
| **5** | 0/-0.020 | 0.10 | 0/-0.015 | 6 | 13 | | 57 | 5 | HF64201050 | ● |
| **6** | 0/-0.020 | 0.10 | 0/-0.015 | 6 | 13 | | 57 | 5 | HF64201060 | ● |
| **8** | 0/-0.020 | 0.20 | 0/-0.015 | 8 | 20 | | 64 | 5 | HF64202080 | ● |
| **10** | 0/-0.020 | 0.20 | 0/-0.020 | 10 | 22 | | 72 | 5 | HF64202100 | ● |
| **12** | 0/-0.020 | 0.30 | 0/-0.020 | 12 | 26 | | 83 | 5 | HF64203120 | ● |
| **16** | 0/-0.020 | 0.30 | 0/-0.020 | 16 | 32 | | 92 | 5 | HF64203160 | ● |
| **20** | 0/-0.020 | 0.30 | 0/-0.020 | 20 | 38 | | 104 | 5 | HF64203200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# HF642

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.2D x 0.3D** | **1.2D x 0.3D** |
| | Vc (m/min) | **160÷180** | **100÷120** | **70÷90** | **40÷60** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.019 | 0.017 | 0.015 | 0.021 |
| | **5** | 0.023 | 0.021 | 0.019 | 0.026 |
| | **6** | 0.028 | 0.025 | 0.022 | 0.030 |
| | **8** | 0.036 | 0.032 | 0.029 | 0.039 |
| | **10** | 0.043 | 0.039 | 0.034 | 0.047 |
| | **12** | 0.049 | 0.044 | 0.039 | 0.054 |
| | **14** | 0.055 | 0.050 | 0.044 | 0.061 |
| | **16** | 0.061 | 0.055 | 0.049 | 0.067 |
| | **20** | 0.074 | 0.067 | 0.060 | 0.082 |
| ap x ae | **≤ D5** | 1.5D x 0.3D | 1.5D x 0.3D | 1.2D x 0.2D | 1.2D x 0.2D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **5° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** | **2° x 0.4D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| HELICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.011 | 0.011 | 0.009 | 0.009 |
| | **5** | 0.014 | 0.013 | 0.012 | 0.011 |
| | **6** | 0.017 | 0.016 | 0.014 | 0.013 |
| | **8** | 0.022 | 0.020 | 0.018 | 0.017 |
| | **10** | 0.026 | 0.024 | 0.021 | 0.020 |
| | **12** | 0.030 | 0.028 | 0.024 | 0.023 |
| | **14** | 0.033 | 0.031 | 0.028 | 0.026 |
| | **16** | 0.037 | 0.035 | 0.031 | 0.029 |
| | **20** | 0.045 | 0.042 | 0.037 | 0.035 |
| α° x ae | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **15° x D** | **10° x D** | **5° x D** | **5° x D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| RAMPING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.018 | 0.017 | 0.016 | 0.022 |
| | **8** | 0.024 | 0.022 | 0.021 | 0.029 |
| | **10** | 0.028 | 0.026 | 0.025 | 0.034 |
| | **12** | 0.033 | 0.030 | 0.029 | 0.039 |
| | **14** | 0.037 | 0.034 | 0.032 | 0.044 |
| | **16** | 0.041 | 0.037 | 0.036 | 0.049 |
| | **20** | 0.050 | 0.046 | 0.043 | 0.060 |



PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

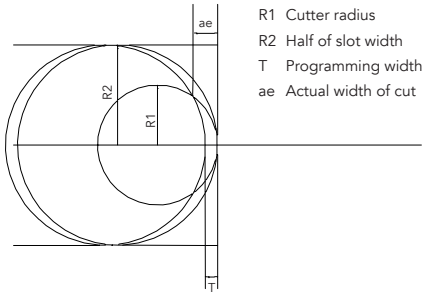
CUTTING PARAMETERS

# HF642

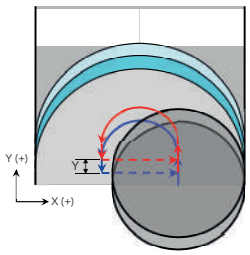
| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| VERTICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.023 | 0.021 | 0.017 | 0.016 |
| | **8** | 0.030 | 0.027 | 0.022 | 0.021 |
| | **10** | 0.036 | 0.032 | 0.027 | 0.025 |
| | **12** | 0.041 | 0.037 | 0.031 | 0.029 |
| | **14** | 0.046 | 0.041 | 0.034 | 0.032 |
| | **16** | 0.051 | 0.046 | 0.038 | 0.036 |
| | **20** | 0.062 | 0.056 | 0.047 | 0.043 |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **2D x 0.2D** | **2D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **190÷230** | **130÷150** | **100÷120** | **50÷70** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.039 | 0.035 | 0.031 | 0.043 |
| | **5** | 0.049 | 0.044 | 0.039 | 0.054 |
| | **6** | 0.057 | 0.052 | 0.046 | 0.063 |
| | **8** | 0.074 | 0.067 | 0.060 | 0.082 |
| | **10** | 0.089 | 0.080 | 0.071 | 0.098 |
| | **12** | 0.102 | 0.092 | 0.082 | 0.112 |
| | **14** | 0.115 | 0.103 | 0.092 | 0.126 |
| | **16** | 0.128 | 0.115 | 0.102 | 0.140 |
| | **20** | 0.155 | 0.140 | 0.124 | 0.171 |
| **ap x ae** | **≤ D5** | 1.5D x 0.1D | 1.5D x 0.1D | D x 0.1D | D x 0.1D |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF643

weldon shank, 5 flutes ideal for trochoidal milling, corner radius

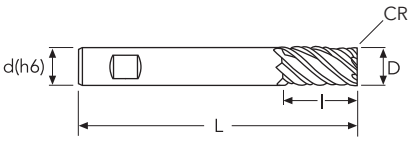
OSAWA NORM | MG PV300 | <40 HRC | 36°/37°/38° | RADIUS | Z5




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **4** | 0/-0.020 | 0.10 | 0/-0.015 | 6 | 12 | | 57 | 5 | HF64301040 | ● |
| **5** | 0/-0.020 | 0.10 | 0/-0.015 | 6 | 13 | | 57 | 5 | HF64301050 | ● |
| **6** | 0/-0.020 | 0.10 | 0/-0.015 | 6 | 13 | | 57 | 5 | HF64301060 | ● |
| **8** | 0/-0.020 | 0.20 | 0/-0.015 | 8 | 20 | | 64 | 5 | HF64302080 | ● |
| **10** | 0/-0.020 | 0.20 | 0/-0.020 | 10 | 22 | | 72 | 5 | HF64302100 | ● |
| **12** | 0/-0.020 | 0.30 | 0/-0.020 | 12 | 26 | | 83 | 5 | HF64303120 | ● |
| **16** | 0/-0.020 | 0.30 | 0/-0.020 | 16 | 32 | | 92 | 5 | HF64303160 | ● |
| **20** | 0/-0.020 | 0.30 | 0/-0.020 | 20 | 38 | | 104 | 5 | HF64303200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# HF643

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.2D x 0.3D** | **1.2D x 0.3D** |
| | Vc (m/min) | **160÷180** | **100÷120** | **70÷90** | **40÷60** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.019 | 0.017 | 0.015 | 0.021 |
| | **5** | 0.023 | 0.021 | 0.019 | 0.026 |
| | **6** | 0.028 | 0.025 | 0.022 | 0.030 |
| | **8** | 0.036 | 0.032 | 0.029 | 0.039 |
| | **10** | 0.043 | 0.039 | 0.034 | 0.047 |
| | **12** | 0.049 | 0.044 | 0.039 | 0.054 |
| | **14** | 0.055 | 0.050 | 0.044 | 0.061 |
| | **16** | 0.061 | 0.055 | 0.049 | 0.067 |
| | **20** | 0.074 | 0.067 | 0.060 | 0.082 |
| **ap x ae** | **≤ D5** | 1.5D x 0.3D | 1.5D x 0.3D | 1.2D x 0.2D | 1.2D x 0.2D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **5° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| HELICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.011 | 0.011 | 0.009 | 0.009 |
| | **5** | 0.014 | 0.013 | 0.012 | 0.011 |
| | **6** | 0.017 | 0.016 | 0.014 | 0.013 |
| | **8** | 0.022 | 0.020 | 0.018 | 0.017 |
| | **10** | 0.026 | 0.024 | 0.021 | 0.020 |
| | **12** | 0.030 | 0.028 | 0.024 | 0.023 |
| | **14** | 0.033 | 0.031 | 0.028 | 0.026 |
| | **16** | 0.037 | 0.035 | 0.031 | 0.029 |
| | **20** | 0.045 | 0.042 | 0.037 | 0.035 |
| **α° x ae** | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **15° x D** | **10° x D** | **5° x D** | **5° x D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| RAMPING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.018 | 0.017 | 0.016 | 0.022 |
| | **8** | 0.024 | 0.022 | 0.021 | 0.029 |
| | **10** | 0.028 | 0.026 | 0.025 | 0.034 |
| | **12** | 0.033 | 0.030 | 0.029 | 0.039 |
| | **14** | 0.037 | 0.034 | 0.032 | 0.044 |
| | **16** | 0.041 | 0.037 | 0.036 | 0.049 |
| | **20** | 0.050 | 0.046 | 0.043 | 0.060 |

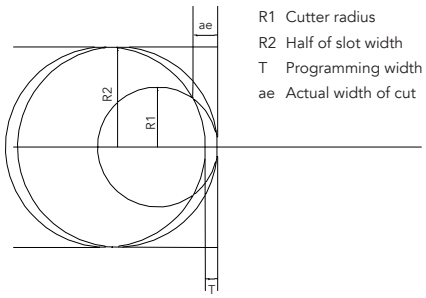
PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF642 PARAMETERS.

# HF643

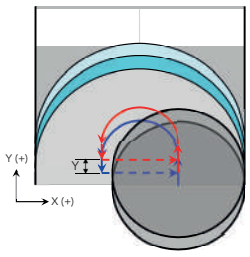
| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| VERTICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.023 | 0.021 | 0.017 | 0.016 |
| | **8** | 0.030 | 0.027 | 0.022 | 0.021 |
| | **10** | 0.036 | 0.032 | 0.027 | 0.025 |
| | **12** | 0.041 | 0.037 | 0.031 | 0.029 |
| | **14** | 0.046 | 0.041 | 0.034 | 0.032 |
| | **16** | 0.051 | 0.046 | 0.038 | 0.036 |
| | **20** | 0.062 | 0.056 | 0.047 | 0.043 |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **2D x 0.2D** | **2D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **190÷230** | **130÷150** | **100÷120** | **50÷70** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.039 | 0.035 | 0.031 | 0.043 |
| | **5** | 0.049 | 0.044 | 0.039 | 0.054 |
| | **6** | 0.057 | 0.052 | 0.046 | 0.063 |
| | **8** | 0.074 | 0.067 | 0.060 | 0.082 |
| | **10** | 0.089 | 0.080 | 0.071 | 0.098 |
| | **12** | 0.102 | 0.092 | 0.082 | 0.112 |
| | **14** | 0.115 | 0.103 | 0.092 | 0.126 |
| | **16** | 0.128 | 0.115 | 0.102 | 0.140 |
| | **20** | 0.155 | 0.140 | 0.124 | 0.171 |
| **ap x ae** | **≤ D5** | 1.5D x 0.1D | 1.5D x 0.1D | D x 0.1D | D x 0.1D |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF642 PARAMETERS.

# HF742

cylindrical shank, long 5 flutes ideal for trochoidal milling, corner radius

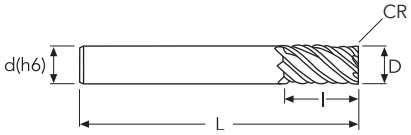
OSAWA NORM | MG PV300 | <40 HRC | 36°/37°/38° | RADIUS | Z5




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.030 | 0.10 | 0/-0.015 | 6 | 25 | | 75 | 5 | HF7420106075 | ● |
| **8** | 0/-0.030 | 0.20 | 0/-0.015 | 8 | 25 | | 75 | 5 | HF7420208075 | ● |
| **10** | 0/-0.035 | 0.20 | 0/-0.020 | 10 | 38 | | 100 | 5 | HF74202100100 | ● |
| **12** | 0/-0.035 | 0.30 | 0/-0.020 | 12 | 45 | | 100 | 5 | HF74203120100 | ● |
| **16** | 0/-0.035 | 0.30 | 0/-0.020 | 16 | 55 | | 125 | 5 | HF74203160125 | ● |
| **20** | 0/-0.035 | 0.30 | 0/-0.020 | 20 | 65 | | 125 | 5 | HF74203200125 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

# HF742

| SIDE MILLING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.2D x 0.2D** | **1.2D x 0.2D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.023 | 0.021 | 0.019 | 0.026 |
| | **8** | 0.028 | 0.025 | 0.022 | 0.030 |
| | **10** | 0.033 | 0.030 | 0.026 | 0.036 |
| | **12** | 0.037 | 0.033 | 0.030 | 0.041 |
| | **16** | 0.042 | 0.038 | 0.034 | 0.047 |
| | **20** | 0.057 | 0.051 | 0.046 | 0.063 |

| HELICAL | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **4° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** | **2° x 0.4D** |
| | Vc (m/min) | **90÷110** | **60÷80** | **40÷60** | **20÷40** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.016 | 0.016 | 0.013 | 0.014 |
| | **8** | 0.019 | 0.018 | 0.015 | 0.016 |
| | **10** | 0.023 | 0.022 | 0.018 | 0.019 |
| | **12** | 0.026 | 0.025 | 0.021 | 0.022 |
| | **16** | 0.030 | 0.028 | 0.024 | 0.025 |
| | **20** | 0.040 | 0.038 | 0.032 | 0.033 |

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **5° x D** | **4° x D** | **3° x D** | **3° x D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **35÷55** | **20÷30** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.017 | 0.016 | 0.015 | 0.021 |
| | **8** | 0.020 | 0.019 | 0.018 | 0.024 |
| | **10** | 0.024 | 0.022 | 0.021 | 0.029 |
| | **12** | 0.027 | 0.025 | 0.024 | 0.033 |
| | **16** | 0.031 | 0.029 | 0.027 | 0.037 |
| | **20** | 0.042 | 0.039 | 0.037 | 0.050 |



PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

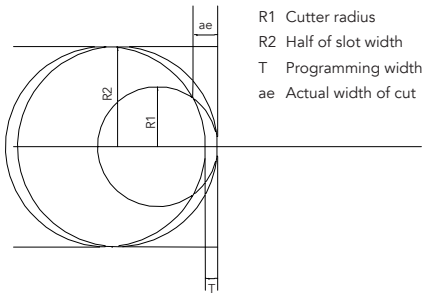
CUTTING PARAMETERS

# HF742

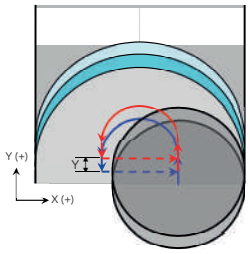
| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| VERTICAL | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **35÷55** | **20÷30** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.022 | 0.019 | 0.016 | 0.015 |
| | **8** | 0.026 | 0.023 | 0.019 | 0.018 |
| | **10** | 0.030 | 0.027 | 0.023 | 0.021 |
| | **12** | 0.034 | 0.031 | 0.026 | 0.024 |
| | **16** | 0.039 | 0.035 | 0.029 | 0.027 |
| | **20** | 0.053 | 0.048 | 0.040 | 0.037 |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| TROCHOIDAL | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **3D x 0.1D** | **3D x 0.1D** | **2D x 0.1D** | **2D x 0.1D** |
| | Vc (m/min) | **130÷170** | **100÷120** | **70÷90** | **40÷60** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.054 | 0.049 | 0.043 | 0.059 |
| | **8** | 0.064 | 0.058 | 0.051 | 0.070 |
| | **10** | 0.076 | 0.068 | 0.061 | 0.084 |
| | **12** | 0.086 | 0.077 | 0.069 | 0.095 |
| | **16** | 0.098 | 0.088 | 0.078 | 0.108 |
| | **20** | 0.132 | 0.119 | 0.106 | 0.145 |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF743

weldon shank, long 5 flutes ideal for trochoidal milling, corner radius

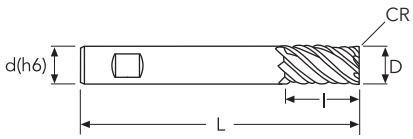
OSAWA NORM | MG PV300 | <40 HRC | 36°/37°/38° | RADIUS | Z5




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable

SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.030 | 0.10 | 0/-0.015 | 6 | 25 | | 75 | 5 | HF7430106075 | ● |
| **8** | 0/-0.030 | 0.20 | 0/-0.015 | 8 | 25 | | 75 | 5 | HF7430208075 | ● |
| **10** | 0/-0.035 | 0.20 | 0/-0.020 | 10 | 38 | | 100 | 5 | HF74302100100 | ● |
| **12** | 0/-0.035 | 0.30 | 0/-0.020 | 12 | 45 | | 100 | 5 | HF74303120100 | ● |
| **16** | 0/-0.035 | 0.30 | 0/-0.020 | 16 | 55 | | 125 | 5 | HF74303160125 | ● |
| **20** | 0/-0.035 | 0.30 | 0/-0.020 | 20 | 65 | | 125 | 5 | HF74303200125 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# HF743

| SIDE MILLING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.2D x 0.2D** | **1.2D x 0.2D** |
| | Vc (m/min) | **110÷130** | **70÷90** | **50÷70** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.023 | 0.021 | 0.019 | 0.026 |
| | **8** | 0.028 | 0.025 | 0.022 | 0.030 |
| | **10** | 0.033 | 0.030 | 0.026 | 0.036 |
| | **12** | 0.037 | 0.033 | 0.030 | 0.041 |
| | **16** | 0.042 | 0.038 | 0.034 | 0.047 |
| | **20** | 0.057 | 0.051 | 0.046 | 0.063 |

| HELICAL | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **4° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** | **2° x 0.4D** |
| | Vc (m/min) | **90÷110** | **60÷80** | **40÷60** | **20÷40** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.016 | 0.016 | 0.013 | 0.014 |
| | **8** | 0.019 | 0.018 | 0.015 | 0.016 |
| | **10** | 0.023 | 0.022 | 0.018 | 0.019 |
| | **12** | 0.026 | 0.025 | 0.021 | 0.022 |
| | **16** | 0.030 | 0.028 | 0.024 | 0.025 |
| | **20** | 0.040 | 0.038 | 0.032 | 0.033 |

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **5° x D** | **4° x D** | **3° x D** | **3° x D** |
| | Vc (m/min) | **80÷100** | **50÷70** | **35÷55** | **20÷30** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.017 | 0.016 | 0.015 | 0.021 |
| | **8** | 0.020 | 0.019 | 0.018 | 0.024 |
| | **10** | 0.024 | 0.022 | 0.021 | 0.029 |
| | **12** | 0.027 | 0.025 | 0.024 | 0.033 |
| | **16** | 0.031 | 0.029 | 0.027 | 0.037 |
| | **20** | 0.042 | 0.039 | 0.037 | 0.050 |

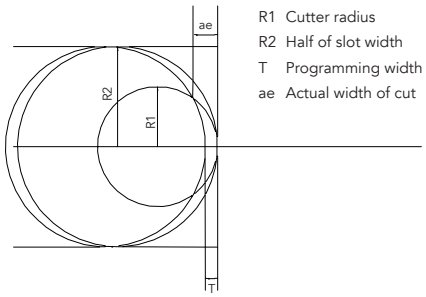
PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF742 PARAMETERS.

# HF743

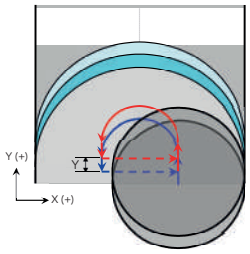
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| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| VERTICAL | Vc (m/min) | **80÷100** | **50÷70** | **35÷55** | **20÷30** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.022 | 0.019 | 0.016 | 0.015 |
| | **8** | 0.026 | 0.023 | 0.019 | 0.018 |
| | **10** | 0.030 | 0.027 | 0.023 | 0.021 |
| | **12** | 0.034 | 0.031 | 0.026 | 0.024 |
| | **16** | 0.039 | 0.035 | 0.029 | 0.027 |
| | **20** | 0.053 | 0.048 | 0.040 | 0.037 |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **3D x 0.1D** | **3D x 0.1D** | **2D x 0.1D** | **2D x 0.1D** |
| TROCHOIDAL | Vc (m/min) | **130÷170** | **100÷120** | **70÷90** | **40÷60** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.054 | 0.049 | 0.043 | 0.059 |
| | **8** | 0.064 | 0.058 | 0.051 | 0.070 |
| | **10** | 0.076 | 0.068 | 0.061 | 0.084 |
| | **12** | 0.086 | 0.077 | 0.069 | 0.095 |
| | **16** | 0.098 | 0.088 | 0.078 | 0.108 |
| | **20** | 0.132 | 0.119 | 0.106 | 0.145 |

*NOTES:*
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*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF742 PARAMETERS.

# HF871

weldon shank, SC smooth cut for low cutting force, chamfer + radius

OSAWA NORM | MG PV300 | <40 HRC | VH 36°/39° | C+R | Z4 UP



from D1 to D2.5: cylindrical shank



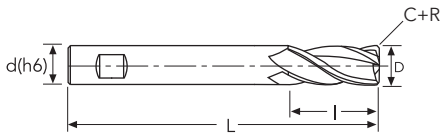

from D3: weldon shank

Replaces HF861 with new general dimensions

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | |

★ 1st choice ☆ suitable




| D | D Tol. | C+R | C+R Tol | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | 0.1 | | 4 | 3 | | | 50 | 4 | HF871010 | ● |
| **1.5** | 0/-0.020 | 0.1 | | 4 | 4.5 | | | 50 | 4 | HF871015 | ● |
| **2** | 0/-0.020 | 0.1 | | 4 | 6.5 | | | 50 | 4 | HF871020 | ● |
| **2.5** | 0/-0.020 | 0.1 | | 4 | 6.5 | | | 50 | 4 | HF871025 | ● |
| **3** | 0/-0.020 | 0.1 | | 6 | 9 | | | 50 | 4 | HF871030 | ● |
| **3.5** | 0/-0.020 | 0.1 | | 6 | 11 | | | 57 | 4 | HF871035 | ● |
| **4** | 0/-0.020 | 0.1 | | 6 | 11 | | | 57 | 4 | HF871040 | ● |
| **4.5** | 0/-0.020 | 0.1 | | 6 | 13 | | | 57 | 4 | HF871045 | ● |
| **5** | 0/-0.020 | 0.1 | | 6 | 13 | | | 57 | 4 | HF871050 | ● |
| **5.5** | 0/-0.020 | 0.1 | | 6 | 13 | | | 57 | 4 | HF871055 | ● |
| **6** | 0/-0.020 | 0.1 | | 6 | 13 | | | 57 | 4 | HF871060 | ● |
| **7** | 0/-0.020 | 0.2 | | 8 | 20 | | | 64 | 4 | HF871070 | ● |
| **8** | 0/-0.020 | 0.2 | | 8 | 20 | | | 64 | 4 | HF871080 | ● |
| **9** | 0/-0.020 | 0.2 | | 10 | 22 | | | 72 | 4 | HF871090 | ● |
| **10** | 0/-0.020 | 0.2 | | 10 | 22 | | | 72 | 4 | HF871100 | ● |
| **11** | 0/-0.020 | 0.2 | | 12 | 26 | | | 83 | 4 | HF871110 | ● |
| **12** | 0/-0.020 | 0.2 | | 12 | 26 | | | 83 | 4 | HF871120 | ● |
| **13** | 0/-0.020 | 0.2 | | 14 | 26 | | | 83 | 4 | HF871130 | ● |
| **14** | 0/-0.020 | 0.2 | | 14 | 26 | | | 83 | 4 | HF871140 | ● |
| **15** | 0/-0.020 | 0.2 | | 16 | 32 | | | 92 | 4 | HF871150 | ● |
| **16** | 0/-0.020 | 0.2 | | 16 | 32 | | | 92 | 4 | HF871160 | ● |
| **18** | 0/-0.020 | 0.2 | | 18 | 32 | | | 92 | 4 | HF871180 | ● |
| **20** | 0/-0.020 | 0.2 | | 20 | 38 | | | 104 | 4 | HF871200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# HF871

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.005 | 0.005 | 0.004 | 0.004 |
| | **2** | 0.010 | 0.009 | 0.008 | 0.007 |
| | **3** | 0.014 | 0.013 | 0.011 | 0.010 |
| | **4** | 0.019 | 0.017 | 0.014 | 0.013 |
| | **5** | 0.023 | 0.021 | 0.017 | 0.016 |
| | **6** | 0.027 | 0.024 | 0.020 | 0.019 |
| | **8** | 0.035 | 0.032 | 0.026 | 0.025 |
| | **10** | 0.042 | 0.038 | 0.032 | 0.029 |
| | **12** | 0.048 | 0.043 | 0.036 | 0.034 |
| | **14** | 0.054 | 0.049 | 0.041 | 0.038 |
| | **16** | 0.060 | 0.054 | 0.045 | 0.042 |
| | **18** | 0.066 | 0.059 | 0.050 | 0.046 |
| | **20** | 0.073 | 0.066 | 0.055 | 0.051 |
| ap x ae | **D1** | 0.25D x D | 0.25D x D | 0.2D x D | 0.2D x D |
| ap x ae | **≤ D3** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | ap x ae | **1.5D x D** | **1.5D x D** | | |
| | Vc (m/min) | **100÷120** | **60÷80** | | |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **8** | 0.028 | 0.025 | | |
| | **10** | 0.034 | 0.030 | | |
| | **12** | 0.038 | 0.035 | | |
| | **14** | 0.043 | 0.039 | | |
| | **16** | 0.048 | 0.043 | | |
| | **18** | 0.053 | 0.048 | | |
| | **20** | 0.058 | 0.053 | | |

| | Material Group ISO 513 | P1 P2 P7 K1 | | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | | | |
| | ap x ae | **2D x D** | | | |
| | Vc (m/min) | **75÷95** | | | |
| SLOTTING | D (mm) | fz (mm/z) | | | |
| | **10** | 0.025 | | | |
| | **12** | 0.029 | | | |
| | **14** | 0.032 | | | |
| | **16** | 0.036 | | | |
| | **18** | 0.040 | | | |
| | **20** | 0.044 | | | |

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF840 PARAMETERS.

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
**HF VH/UP**
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# HF871

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.2D x 0.3D** | **1.2D x 0.3D** |
| | Vc (m/min) | **160÷180** | **100÷120** | **70÷90** | **40÷60** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.006 | 0.005 | 0.005 | 0.007 |
| | **2** | 0.012 | 0.011 | 0.010 | 0.013 |
| | **3** | 0.017 | 0.015 | 0.013 | 0.018 |
| | **4** | 0.022 | 0.020 | 0.018 | 0.024 |
| | **5** | 0.028 | 0.025 | 0.022 | 0.030 |
| | **6** | 0.032 | 0.029 | 0.026 | 0.036 |
| | **8** | 0.042 | 0.038 | 0.034 | 0.046 |
| | **10** | 0.050 | 0.045 | 0.040 | 0.055 |
| | **12** | 0.058 | 0.052 | 0.046 | 0.063 |
| | **14** | 0.065 | 0.058 | 0.052 | 0.071 |
| | **16** | 0.072 | 0.065 | 0.058 | 0.079 |
| | **18** | 0.079 | 0.071 | 0.063 | 0.087 |
| | **20** | 0.088 | 0.079 | 0.070 | 0.096 |
| **ap x ae** | **≤ D3** | 1.5D x 0.1D | 1.5D x 0.1D | 1.2D x 0.1D | 1.2D x 0.1D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **5° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** | **3° x 0.4D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| HELICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.004 | 0.003 | 0.003 | 0.003 |
| | **2** | 0.007 | 0.007 | 0.006 | 0.006 |
| | **3** | 0.010 | 0.010 | 0.008 | 0.008 |
| | **4** | 0.013 | 0.013 | 0.011 | 0.010 |
| | **5** | 0.017 | 0.016 | 0.014 | 0.013 |
| | **6** | 0.020 | 0.018 | 0.016 | 0.015 |
| | **8** | 0.025 | 0.024 | 0.021 | 0.020 |
| | **10** | 0.031 | 0.029 | 0.025 | 0.024 |
| | **12** | 0.035 | 0.033 | 0.029 | 0.027 |
| | **14** | 0.039 | 0.037 | 0.032 | 0.030 |
| | **16** | 0.044 | 0.041 | 0.036 | 0.034 |
| | **18** | 0.048 | 0.045 | 0.040 | 0.037 |
| | **20** | 0.053 | 0.050 | 0.044 | 0.041 |
| **α° x ae** | **≤ D3** | 1° x 0.4D | 1° x 0.4D | 1° x 0.4D | 1° x 0.4D |

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF840 PARAMETERS.

# HF871

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | α° x ae | **15° x D** | **10° x D** | **5° x D** | **5° x D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.022 | 0.020 | 0.019 | 0.026 |
| | **8** | 0.028 | 0.026 | 0.024 | 0.034 |
| | **10** | 0.034 | 0.031 | 0.029 | 0.040 |
| | **12** | 0.038 | 0.035 | 0.034 | 0.046 |
| | **14** | 0.043 | 0.040 | 0.038 | 0.052 |
| | **16** | 0.048 | 0.044 | 0.042 | 0.058 |
| | **18** | 0.053 | 0.048 | 0.046 | 0.063 |
| | **20** | 0.058 | 0.054 | 0.051 | 0.070 |

| RAMPING | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | | |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | | |
| | α° x ae | **30° x D** | **15° x D** | | |
| | Vc (m/min) | **80÷100** | **60÷80** | | |
| | D (mm) | fz (mm/z) | fz (mm/z) | | |
| | **10** | 0.025 | 0.023 | | |
| | **12** | 0.028 | 0.026 | | |
| | **14** | 0.032 | 0.029 | | |
| | **16** | 0.035 | 0.032 | | |
| | **18** | 0.039 | 0.036 | | |
| | **20** | 0.043 | 0.039 | | |

| VERTICAL | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **130÷150** | **80÷100** | **60÷80** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.027 | 0.024 | 0.020 | 0.019 |
| | **8** | 0.035 | 0.032 | 0.026 | 0.025 |
| | **10** | 0.042 | 0.038 | 0.032 | 0.029 |
| | **12** | 0.048 | 0.043 | 0.036 | 0.034 |
| | **14** | 0.054 | 0.049 | 0.041 | 0.038 |
| | **16** | 0.060 | 0.054 | 0.045 | 0.042 |
| | **18** | 0.066 | 0.059 | 0.050 | 0.046 |
| | **20** | 0.073 | 0.066 | 0.055 | 0.051 |

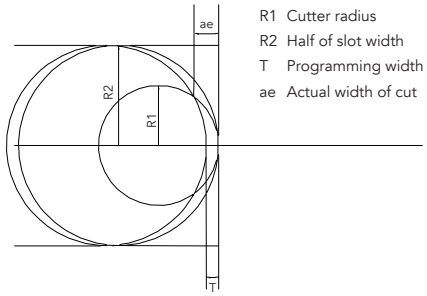
PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF840 PARAMETERS.

# HF871

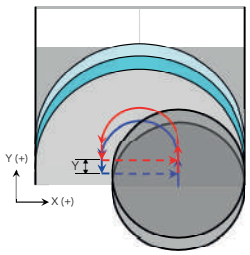
| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **20÷40** |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.003 | 0.002 | 0.002 | 0.003 |
| | **2** | 0.005 | 0.005 | 0.004 | 0.006 |
| | **3** | 0.007 | 0.006 | 0.006 | 0.008 |
| | **4** | 0.009 | 0.008 | 0.007 | 0.010 |
| | **5** | 0.012 | 0.010 | 0.009 | 0.013 |
| | **6** | 0.014 | 0.012 | 0.011 | 0.015 |
| | **8** | 0.018 | 0.016 | 0.014 | 0.019 |
| | **10** | 0.021 | 0.019 | 0.017 | 0.023 |
| | **12** | 0.024 | 0.022 | 0.019 | 0.026 |
| | **14** | 0.027 | 0.024 | 0.022 | 0.030 |
| | **16** | 0.030 | 0.027 | 0.024 | 0.033 |
| | **18** | 0.033 | 0.030 | 0.026 | 0.036 |
| | **20** | 0.037 | 0.033 | 0.029 | 0.040 |
| **ap x ae** | **≤ D3** | 0.5D x D | 0.5D x D | 0.25D x D | 0.25D x D |

| | Material Group ISO 513 | P1 P2 P7 K1 | P3 P4 M1 K2 K3 | P5 M2 M3 K4 S1 S4 | S2 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷1000 N/mm² | ≤35 HRC | ≤40 HRC |
| | ap x ae | **2D x 0.2D** | **2D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **190÷230** | **130÷150** | **100÷120** | **50÷70** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.013 | 0.011 | 0.010 | 0.014 |
| | **2** | 0.025 | 0.023 | 0.020 | 0.028 |
| | **3** | 0.035 | 0.032 | 0.028 | 0.039 |
| | **4** | 0.046 | 0.042 | 0.037 | 0.051 |
| | **5** | 0.058 | 0.052 | 0.046 | 0.063 |
| | **6** | 0.068 | 0.061 | 0.054 | 0.074 |
| | **8** | 0.088 | 0.079 | 0.070 | 0.096 |
| | **10** | 0.105 | 0.095 | 0.084 | 0.116 |
| | **12** | 0.120 | 0.108 | 0.096 | 0.132 |
| | **14** | 0.135 | 0.122 | 0.108 | 0.149 |
| | **16** | 0.150 | 0.135 | 0.120 | 0.165 |
| | **18** | 0.165 | 0.149 | 0.132 | 0.182 |
| | **20** | 0.183 | 0.164 | 0.146 | 0.201 |
| **ap x ae** | **D1** | 1.5D x 0.1D | 1.5D x 0.1D | 1.5D x 0.1D | 1.5D x 0.1D |
| **ap x ae** | **≤ D3** | 1.5D x 0.1D | 1.5D x 0.1D | 1.5D x 0.1D | 1.5D x 0.1D |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF840 PARAMETERS.

# HF850

cylindrical shank, 45° chamfer

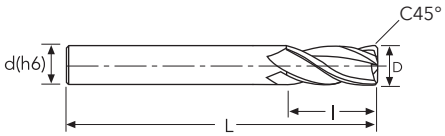
OSAWA NORM | MG PV300 | 30÷55 HRC | 40° | C45° | Z4 UP




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | ★ |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 9 | | 57 | 4 | HF850030 | ● |
| **4** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 11 | | 57 | 4 | HF850040 | ● |
| **5** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 13 | | 57 | 4 | HF850050 | ● |
| **6** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 13 | | 57 | 4 | HF850060 | ● |
| **8** | 0/-0.030 | 0.20 | +/-0.020 | 8 | 20 | | 64 | 4 | HF850080 | ● |
| **10** | 0/-0.030 | 0.20 | +/-0.020 | 10 | 22 | | 72 | 4 | HF850100 | ● |
| **12** | 0/-0.030 | 0.20 | +/-0.020 | 12 | 26 | | 83 | 4 | HF850120 | ● |
| **14** | 0/-0.030 | 0.30 | +/-0.020 | 14 | 26 | | 90 | 4 | HF850140 | ● |
| **16** | 0/-0.030 | 0.30 | +/-0.020 | 16 | 32 | | 92 | 4 | HF850160 | ● |
| **20** | 0/-0.030 | 0.40 | +/-0.020 | 20 | 38 | | 104 | 4 | HF850200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# HF850

## SLOTTING

| Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|
| Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| ap x ae | **0.5D x D** | **0.5D x D** | **0.3D x D** | **0.2D x D** |
| Vc (m/min) | **80÷100** | **60÷80** | **40÷60** | **30÷50** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **3** | 0.012 | 0.011 | 0.009 | 0.008 |
| **4** | 0.016 | 0.014 | 0.012 | 0.011 |
| **5** | 0.020 | 0.018 | 0.015 | 0.014 |
| **6** | 0.023 | 0.021 | 0.017 | 0.016 |
| **8** | 0.030 | 0.027 | 0.022 | 0.021 |
| **10** | 0.036 | 0.032 | 0.027 | 0.025 |
| **12** | 0.041 | 0.037 | 0.031 | 0.029 |
| **14** | 0.046 | 0.041 | 0.034 | 0.032 |
| **16** | 0.051 | 0.046 | 0.038 | 0.036 |
| **20** | 0.062 | 0.056 | 0.047 | 0.043 |
| **ap x ae** | **≤ D5** | 0.3D x D | 0.3D x D | 0.2D x D | 0.1D x D |

## SIDE MILLING

| Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|
| Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| ap x ae | **1.5D x 0.3D** | **1.5D x 0.2D** | **1.2D x 0.2D** | **D x 0.1D** |
| Vc (m/min) | **100÷120** | **70÷90** | **50÷70** | **40÷60** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **3** | 0.014 | 0.013 | 0.011 | 0.016 |
| **4** | 0.019 | 0.017 | 0.015 | 0.021 |
| **5** | 0.023 | 0.021 | 0.019 | 0.026 |
| **6** | 0.028 | 0.025 | 0.022 | 0.030 |
| **8** | 0.036 | 0.032 | 0.029 | 0.039 |
| **10** | 0.043 | 0.039 | 0.034 | 0.047 |
| **12** | 0.049 | 0.044 | 0.039 | 0.054 |
| **14** | 0.055 | 0.050 | 0.044 | 0.061 |
| **16** | 0.061 | 0.055 | 0.049 | 0.067 |
| **20** | 0.074 | 0.067 | 0.060 | 0.082 |
| **ap x ae** | **≤ D5** | 1.2D x 0.2D | 1.2D x 0.1D | D x 0.1D | D x 0.05D |

## HELICAL

| Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|
| Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| α° x ae | **5° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** | **2° x 0.4D** |
| Vc (m/min) | **80÷100** | **60÷80** | **40÷60** | **30÷50** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **3** | 0.009 | 0.008 | 0.007 | 0.008 |
| **4** | 0.011 | 0.011 | 0.009 | 0.010 |
| **5** | 0.014 | 0.013 | 0.012 | 0.012 |
| **6** | 0.017 | 0.016 | 0.014 | 0.015 |
| **8** | 0.022 | 0.020 | 0.018 | 0.019 |
| **10** | 0.026 | 0.024 | 0.021 | 0.023 |
| **12** | 0.030 | 0.028 | 0.024 | 0.026 |
| **14** | 0.033 | 0.031 | 0.028 | 0.029 |
| **16** | 0.037 | 0.035 | 0.031 | 0.032 |
| **20** | 0.045 | 0.042 | 0.037 | 0.039 |
| **α° x ae** | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF850

| RAMPING | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | α° x ae | **5° x D** | **4° x D** | **3° x D** | **2° x D** |
| | Vc (m/min) | **80÷100** | **60÷80** | **40÷60** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.020 | 0.019 | 0.018 | 0.027 |
| | **8** | 0.026 | 0.024 | 0.023 | 0.035 |
| | **10** | 0.031 | 0.029 | 0.027 | 0.043 |
| | **12** | 0.036 | 0.033 | 0.031 | 0.049 |
| | **14** | 0.040 | 0.037 | 0.035 | 0.055 |
| | **16** | 0.045 | 0.042 | 0.039 | 0.061 |
| | **20** | 0.054 | 0.051 | 0.048 | 0.074 |

| VERTICAL | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **80÷100** | **60÷80** | **40÷60** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.023 | 0.021 | 0.017 | 0.016 |
| | **8** | 0.030 | 0.027 | 0.022 | 0.021 |
| | **10** | 0.036 | 0.032 | 0.027 | 0.025 |
| | **12** | 0.041 | 0.037 | 0.031 | 0.029 |
| | **14** | 0.046 | 0.041 | 0.034 | 0.032 |
| | **16** | 0.051 | 0.046 | 0.038 | 0.036 |
| | **20** | 0.062 | 0.056 | 0.047 | 0.043 |



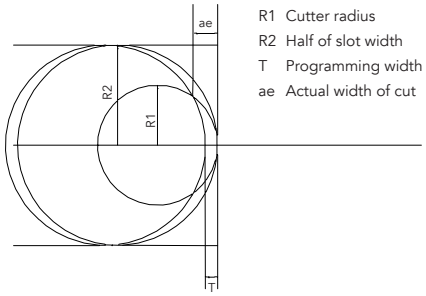
PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

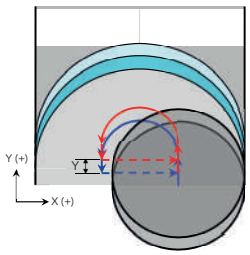
# HF850

| TROCHOIDAL | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **1-5D x 0.1D** | **1-5D x 0.1D** | **D x 0.1D** | **D x 0.1D** |
| | Vc (m/min) | **130÷150** | **100÷120** | **60÷80** | **50÷70** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.027 | 0.024 | 0.021 | 0.029 |
| | **4** | 0.035 | 0.032 | 0.028 | 0.039 |
| | **5** | 0.044 | 0.040 | 0.035 | 0.048 |
| | **6** | 0.052 | 0.046 | 0.041 | 0.057 |
| | **8** | 0.067 | 0.060 | 0.054 | 0.074 |
| | **10** | 0.080 | 0.072 | 0.064 | 0.088 |
| | **12** | 0.092 | 0.083 | 0.073 | 0.101 |
| | **14** | 0.103 | 0.093 | 0.083 | 0.114 |
| | **16** | 0.115 | 0.103 | 0.092 | 0.126 |
| | **20** | 0.140 | 0.126 | 0.112 | 0.154 |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF450

cylindrical shank and reduced neck, 45° chamfer

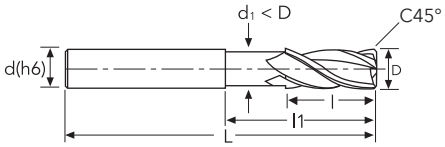
OSAWA NORM | MG PV300 | 30÷55 HRC | 40° | C45° | Z4 UP




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | ★ |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 9 | 15 | 2.80 | 57 | 4 | HF450030 | ● |
| **4** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 11 | 18 | 3.80 | 57 | 4 | HF450040 | ● |
| **5** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 13 | 19 | 4.80 | 57 | 4 | HF450050 | ● |
| **6** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 13 | 20 | 5.80 | 57 | 4 | HF450060 | ● |
| **8** | 0/-0.030 | 0.20 | +/-0.020 | 8 | 20 | 26 | 7.80 | 64 | 4 | HF450080 | ● |
| **10** | 0/-0.030 | 0.20 | +/-0.020 | 10 | 22 | 30 | 9.80 | 72 | 4 | HF450100 | ● |
| **12** | 0/-0.030 | 0.20 | +/-0.020 | 12 | 26 | 36 | 11.80 | 83 | 4 | HF450120 | ● |
| **14** | 0/-0.030 | 0.20 | +/-0.020 | 14 | 26 | 36 | 13.70 | 83 | 4 | HF450140 | ● |
| **16** | 0/-0.030 | 0.30 | +/-0.020 | 16 | 32 | 42 | 15.70 | 92 | 4 | HF450160 | ● |
| **20** | 0/-0.030 | 0.40 | +/-0.020 | 20 | 38 | 50 | 19.70 | 104 | 4 | HF450200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# HF450

## SLOTTING

| Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|
| Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| ap x ae | **0.5D x D** | **0.5D x D** | **0.3D x D** | **0.2D x D** |
| Vc (m/min) | **70÷90** | **50÷70** | **30÷50** | **20÷40** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **3** | 0.011 | 0.010 | 0.008 | 0.007 |
| **4** | 0.014 | 0.013 | 0.011 | 0.010 |
| **5** | 0.018 | 0.016 | 0.013 | 0.012 |
| **6** | 0.021 | 0.019 | 0.015 | 0.014 |
| **8** | 0.027 | 0.024 | 0.020 | 0.019 |
| **10** | 0.032 | 0.029 | 0.024 | 0.022 |
| **12** | 0.037 | 0.033 | 0.028 | 0.026 |
| **14** | 0.041 | 0.037 | 0.031 | 0.029 |
| **16** | 0.046 | 0.041 | 0.034 | 0.032 |
| **20** | 0.056 | 0.050 | 0.042 | 0.039 |
| **ap x ae** **≤ D5** | 0.3D x D | 0.3D x D | 0.2D x D | 0.1D x D |

## SIDE MILLING

| Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|
| Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| ap x ae | **1.5D x 0.3D** | **1.5D x 0.2D** | **1.2D x 0.2D** | **D x 0.1D** |
| Vc (m/min) | **90÷110** | **60÷80** | **40÷60** | **30÷50** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **3** | 0.013 | 0.012 | 0.010 | 0.014 |
| **4** | 0.017 | 0.015 | 0.014 | 0.019 |
| **5** | 0.021 | 0.019 | 0.017 | 0.023 |
| **6** | 0.025 | 0.022 | 0.020 | 0.027 |
| **8** | 0.032 | 0.029 | 0.026 | 0.035 |
| **10** | 0.039 | 0.035 | 0.031 | 0.042 |
| **12** | 0.044 | 0.040 | 0.035 | 0.048 |
| **14** | 0.050 | 0.045 | 0.040 | 0.055 |
| **16** | 0.055 | 0.050 | 0.044 | 0.061 |
| **20** | 0.067 | 0.060 | 0.054 | 0.074 |
| **ap x ae** **≤ D5** | 1.2D x 0.2D | 1.2D x 0.2D | D x 0.1D | D x 0.05D |

## HELICAL

| Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|
| Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| α° x ae | **5° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** | **2° x 0.4D** |
| Vc (m/min) | **70÷90** | **50÷70** | **30÷50** | **20÷40** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **3** | 0.008 | 0.007 | 0.006 | 0.007 |
| **4** | 0.010 | 0.010 | 0.008 | 0.009 |
| **5** | 0.013 | 0.012 | 0.011 | 0.011 |
| **6** | 0.015 | 0.014 | 0.012 | 0.013 |
| **8** | 0.019 | 0.018 | 0.016 | 0.017 |
| **10** | 0.023 | 0.022 | 0.019 | 0.020 |
| **12** | 0.027 | 0.025 | 0.022 | 0.023 |
| **14** | 0.030 | 0.028 | 0.025 | 0.026 |
| **16** | 0.033 | 0.031 | 0.028 | 0.029 |
| **20** | 0.041 | 0.038 | 0.034 | 0.035 |
| **α° x ae** **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF450

| RAMPING | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | α° x ae | **5° x D** | **4° x D** | **3° x D** | **2° x D** |
| | Vc (m/min) | **60÷80** | **50÷60** | **30÷40** | **20÷30** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.018 | 0.017 | 0.016 | 0.025 |
| | **8** | 0.023 | 0.022 | 0.021 | 0.032 |
| | **10** | 0.028 | 0.026 | 0.025 | 0.038 |
| | **12** | 0.032 | 0.030 | 0.028 | 0.044 |
| | **14** | 0.036 | 0.034 | 0.032 | 0.049 |
| | **16** | 0.040 | 0.037 | 0.035 | 0.055 |
| | **20** | 0.049 | 0.045 | 0.043 | 0.067 |

| VERTICAL | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **60÷80** | **50÷60** | **30÷40** | **20÷30** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.021 | 0.019 | 0.015 | 0.014 |
| | **8** | 0.027 | 0.024 | 0.020 | 0.019 |
| | **10** | 0.032 | 0.029 | 0.024 | 0.022 |
| | **12** | 0.037 | 0.033 | 0.028 | 0.026 |
| | **14** | 0.041 | 0.037 | 0.031 | 0.029 |
| | **16** | 0.046 | 0.041 | 0.034 | 0.032 |
| | **20** | 0.056 | 0.050 | 0.042 | 0.039 |

INFO
CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA
HSS DRILLS
LFTA
SUTA
HSS-HSS/CO
CARBIDE END-MILLS
G2
MDTA
**HF VH/UP**
MEF
ALU
MEX/MH
UH/MH
HSS END-MILLS
CARBIDE BURRS

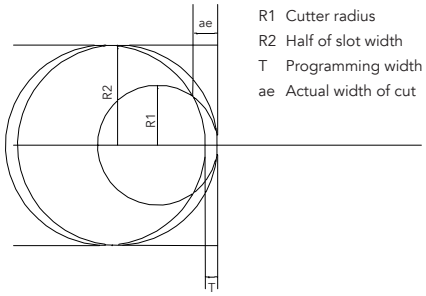
PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

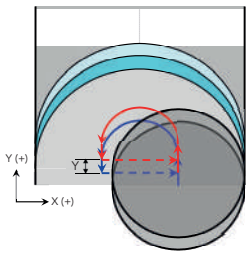
# HF450

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **1.5D x 0.1D** | **1.5D x 0.1D** | **D x 0.1D** | **D x 0.1D** |
| | Vc (m/min) | **110÷130** | **80÷100** | **50÷70** | **40÷60** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.027 | 0.024 | 0.021 | 0.029 |
| | **4** | 0.035 | 0.032 | 0.028 | 0.039 |
| | **5** | 0.044 | 0.040 | 0.035 | 0.048 |
| | **6** | 0.052 | 0.046 | 0.041 | 0.057 |
| | **8** | 0.067 | 0.060 | 0.054 | 0.074 |
| | **10** | 0.080 | 0.072 | 0.064 | 0.088 |
| | **12** | 0.092 | 0.083 | 0.073 | 0.101 |
| | **14** | 0.103 | 0.093 | 0.083 | 0.114 |
| | **16** | 0.115 | 0.103 | 0.092 | 0.126 |
| | **20** | 0.140 | 0.126 | 0.112 | 0.154 |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF451

weldon shank and reduced neck, 45° chamfer

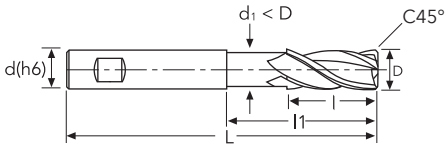
OSAWA NORM | MG PV300 | 30÷55 HRC | 40° | C45° | Z4 UP




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | ★ |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 9 | 15 | 2.80 | 57 | 4 | HF451030 | ● |
| **4** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 11 | 18 | 3.80 | 57 | 4 | HF451040 | ● |
| **5** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 13 | 19 | 4.80 | 57 | 4 | HF451050 | ● |
| **6** | 0/-0.030 | 0.10 | +/-0.020 | 6 | 13 | 20 | 5.80 | 57 | 4 | HF451060 | ● |
| **8** | 0/-0.030 | 0.20 | +/-0.020 | 8 | 20 | 26 | 7.80 | 64 | 4 | HF451080 | ● |
| **10** | 0/-0.030 | 0.20 | +/-0.020 | 10 | 22 | 30 | 9.80 | 72 | 4 | HF451100 | ● |
| **12** | 0/-0.030 | 0.20 | +/-0.020 | 12 | 26 | 36 | 11.80 | 83 | 4 | HF451120 | ● |
| **14** | 0/-0.030 | 0.20 | +/-0.020 | 14 | 26 | 36 | 13.70 | 83 | 4 | HF451140 | ● |
| **16** | 0/-0.030 | 0.30 | +/-0.020 | 16 | 32 | 42 | 15.70 | 92 | 4 | HF451160 | ● |
| **20** | 0/-0.030 | 0.40 | +/-0.020 | 20 | 38 | 50 | 19.70 | 104 | 4 | HF451200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# HF451

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.3D x D** | **0.2D x D** |
| | Vc (m/min) | **70÷90** | **50÷70** | **30÷50** | **20÷40** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.011 | 0.010 | 0.008 | 0.007 |
| | **4** | 0.014 | 0.013 | 0.011 | 0.010 |
| | **5** | 0.018 | 0.016 | 0.013 | 0.012 |
| | **6** | 0.021 | 0.019 | 0.015 | 0.014 |
| | **8** | 0.027 | 0.024 | 0.020 | 0.019 |
| | **10** | 0.032 | 0.029 | 0.024 | 0.022 |
| | **12** | 0.037 | 0.033 | 0.028 | 0.026 |
| | **14** | 0.041 | 0.037 | 0.031 | 0.029 |
| | **16** | 0.046 | 0.041 | 0.034 | 0.032 |
| | **20** | 0.056 | 0.050 | 0.042 | 0.039 |
| **ap x ae** | **≤ D5** | 0.3D x D | 0.3D x D | 0.2D x D | 0.1D x D |

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.2D** | **1.2D x 0.2D** | **D x 0.1D** |
| | Vc (m/min) | **90÷110** | **60÷80** | **40÷60** | **30÷50** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.013 | 0.012 | 0.010 | 0.014 |
| | **4** | 0.017 | 0.015 | 0.014 | 0.019 |
| | **5** | 0.021 | 0.019 | 0.017 | 0.023 |
| | **6** | 0.025 | 0.022 | 0.020 | 0.027 |
| | **8** | 0.032 | 0.029 | 0.026 | 0.035 |
| | **10** | 0.039 | 0.035 | 0.031 | 0.042 |
| | **12** | 0.044 | 0.040 | 0.035 | 0.048 |
| | **14** | 0.050 | 0.045 | 0.040 | 0.055 |
| | **16** | 0.055 | 0.050 | 0.044 | 0.061 |
| | **20** | 0.067 | 0.060 | 0.054 | 0.074 |
| **ap x ae** | **≤ D5** | 1.2D x 0.2D | 1.2D x 0.1D | D x 0.1D | D x 0.05D |

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | α° x ae | **5° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** | **2° x 0.4D** |
| | Vc (m/min) | **70÷90** | **50÷70** | **30÷50** | **20÷40** |
| HELICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.008 | 0.007 | 0.006 | 0.007 |
| | **4** | 0.010 | 0.010 | 0.008 | 0.009 |
| | **5** | 0.013 | 0.012 | 0.011 | 0.011 |
| | **6** | 0.015 | 0.014 | 0.012 | 0.013 |
| | **8** | 0.019 | 0.018 | 0.016 | 0.017 |
| | **10** | 0.023 | 0.022 | 0.019 | 0.020 |
| | **12** | 0.027 | 0.025 | 0.022 | 0.023 |
| | **14** | 0.030 | 0.028 | 0.025 | 0.026 |
| | **16** | 0.033 | 0.031 | 0.028 | 0.029 |
| | **20** | 0.041 | 0.038 | 0.034 | 0.035 |
| **α° x ae** | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF450 PARAMETERS.

# HF451

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | α° x ae | **5° x D** | **4° x D** | **3° x D** | **2° x D** |
| | Vc (m/min) | **60÷80** | **50÷60** | **30÷40** | **20÷30** |
| RAMPING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.018 | 0.017 | 0.016 | 0.025 |
| | **8** | 0.023 | 0.022 | 0.021 | 0.032 |
| | **10** | 0.028 | 0.026 | 0.025 | 0.038 |
| | **12** | 0.032 | 0.030 | 0.028 | 0.044 |
| | **14** | 0.036 | 0.034 | 0.032 | 0.049 |
| | **16** | 0.040 | 0.037 | 0.035 | 0.055 |
| | **20** | 0.049 | 0.045 | 0.043 | 0.067 |

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **60÷80** | **50÷60** | **30÷40** | **20÷30** |
| VERTICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.021 | 0.019 | 0.015 | 0.014 |
| | **8** | 0.027 | 0.024 | 0.020 | 0.019 |
| | **10** | 0.032 | 0.029 | 0.024 | 0.022 |
| | **12** | 0.037 | 0.033 | 0.028 | 0.026 |
| | **14** | 0.041 | 0.037 | 0.031 | 0.029 |
| | **16** | 0.046 | 0.041 | 0.034 | 0.032 |
| | **20** | 0.056 | 0.050 | 0.042 | 0.039 |

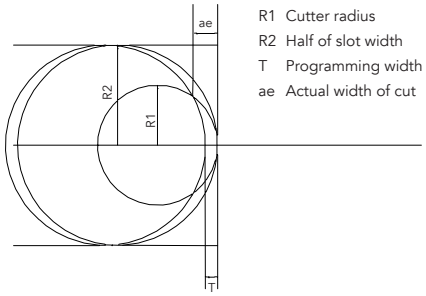
PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF450 PARAMETERS.

CUTTING PARAMETERS

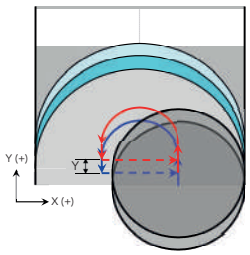
# HF451

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **1.5D x 0.1D** | **1.5D x 0.1D** | **D x 0.1D** | **D x 0.1D** |
| | Vc (m/min) | **110÷130** | **80÷100** | **50÷70** | **40÷60** |
| TROCHOIDAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.027 | 0.024 | 0.021 | 0.029 |
| | **4** | 0.035 | 0.032 | 0.028 | 0.039 |
| | **5** | 0.044 | 0.040 | 0.035 | 0.048 |
| | **6** | 0.052 | 0.046 | 0.041 | 0.057 |
| | **8** | 0.067 | 0.060 | 0.054 | 0.074 |
| | **10** | 0.080 | 0.072 | 0.064 | 0.088 |
| | **12** | 0.092 | 0.083 | 0.073 | 0.101 |
| | **14** | 0.103 | 0.093 | 0.083 | 0.114 |
| | **16** | 0.115 | 0.103 | 0.092 | 0.126 |
| | **20** | 0.140 | 0.126 | 0.112 | 0.154 |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH PRECISION WELDON CHUCK AND STABLE MACHINING CONDITION.
FOR APPLICATION ON HIGH POWER MILLING CHUCK, PLEASE REFER TO HF450 PARAMETERS.

# HF852

cylindrical shank, corner radius

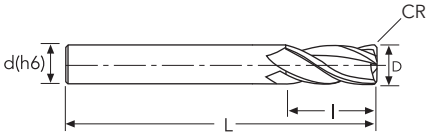
OSAWA NORM | MG PV300 | 30÷55 HRC | 40° | RADIUS | Z4 UP




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | ★ |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **4** | 0/-0.020 | 0.30 | +/-0.015 | 6 | 12 | | 57 | 4 | HF85203040 | ● |
| **4** | 0/-0.020 | 0.50 | +/-0.015 | 6 | 12 | | 57 | 4 | HF85205040 | ● |
| **5** | 0/-0.020 | 0.30 | +/-0.015 | 6 | 15 | | 57 | 4 | HF85203050 | ● |
| **5** | 0/-0.020 | 0.50 | +/-0.015 | 6 | 15 | | 57 | 4 | HF85205050 | ● |
| **6** | 0/-0.020 | 0.30 | +/-0.015 | 6 | 16 | | 57 | 4 | HF85203060 | ● |
| **6** | 0/-0.020 | 0.50 | +/-0.015 | 6 | 16 | | 57 | 4 | HF85205060 | ● |
| **6** | 0/-0.020 | 1.00 | +/-0.015 | 6 | 16 | | 57 | 4 | HF85210060 | ● |
| **8** | 0/-0.020 | 0.50 | +/-0.015 | 8 | 20 | | 64 | 4 | HF85205080 | ● |
| **8** | 0/-0.020 | 1.00 | +/-0.015 | 8 | 20 | | 64 | 4 | HF85210080 | ● |
| **10** | 0/-0.020 | 0.50 | +/-0.020 | 10 | 22 | | 72 | 4 | HF85205100 | ● |
| **10** | 0/-0.020 | 1.00 | +/-0.020 | 10 | 22 | | 72 | 4 | HF85210100 | ● |
| **12** | 0/-0.020 | 0.50 | +/-0.020 | 12 | 26 | | 83 | 4 | HF85205120 | ● |
| **12** | 0/-0.020 | 1.00 | +/-0.020 | 12 | 26 | | 83 | 4 | HF85210120 | ● |
| **12** | 0/-0.020 | 2.00 | +/-0.020 | 12 | 26 | | 83 | 4 | HF85220120 | ● |
| **12** | 0/-0.020 | 3.00 | +/-0.020 | 12 | 26 | | 83 | 4 | HF85230120 | ● |
| **14** | 0/-0.020 | 1.00 | +/-0.020 | 14 | 32 | | 83 | 4 | HF85210140 | ● |
| **16** | 0/-0.020 | 1.00 | +/-0.020 | 16 | 32 | | 92 | 4 | HF85210160 | ● |
| **16** | 0/-0.020 | 2.00 | +/-0.020 | 16 | 32 | | 92 | 4 | HF85220160 | ● |
| **20** | 0/-0.020 | 1.00 | +/-0.020 | 20 | 38 | | 104 | 4 | HF85210200 | ● |
| **20** | 0/-0.020 | 2.00 | +/-0.020 | 20 | 38 | | 104 | 4 | HF85220200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# HF852

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.3D x D** | **0.2D x D** |
| | Vc (m/min) | **80÷100** | **60÷80** | **40÷60** | **30÷50** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.012 | 0.011 | 0.009 | 0.008 |
| | **4** | 0.016 | 0.014 | 0.012 | 0.011 |
| | **5** | 0.020 | 0.018 | 0.015 | 0.014 |
| | **6** | 0.023 | 0.021 | 0.017 | 0.016 |
| | **8** | 0.030 | 0.027 | 0.022 | 0.021 |
| | **10** | 0.036 | 0.032 | 0.027 | 0.025 |
| | **12** | 0.041 | 0.037 | 0.031 | 0.029 |
| | **14** | 0.046 | 0.041 | 0.034 | 0.032 |
| | **16** | 0.051 | 0.046 | 0.038 | 0.036 |
| | **20** | 0.062 | 0.056 | 0.047 | 0.043 |
| **ap x ae** | **≤ D5** | 0.3D x D | 0.3D x D | 0.2D x D | 0.1D x D |

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.2D** | **1.2D x 0.2D** | **D x 0.1D** |
| | Vc (m/min) | **100÷120** | **70÷90** | **50÷70** | **40÷60** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.014 | 0.013 | 0.011 | 0.016 |
| | **4** | 0.019 | 0.017 | 0.015 | 0.021 |
| | **5** | 0.023 | 0.021 | 0.019 | 0.026 |
| | **6** | 0.028 | 0.025 | 0.022 | 0.030 |
| | **8** | 0.036 | 0.032 | 0.029 | 0.039 |
| | **10** | 0.043 | 0.039 | 0.034 | 0.047 |
| | **12** | 0.049 | 0.044 | 0.039 | 0.054 |
| | **14** | 0.055 | 0.050 | 0.044 | 0.061 |
| | **16** | 0.061 | 0.055 | 0.049 | 0.067 |
| | **20** | 0.074 | 0.067 | 0.060 | 0.082 |
| **ap x ae** | **≤ D5** | 1.2D x 0.2D | 1.2D x 0.2D | D x 0.1D | D x 0.05D |

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | α° x ae | **5° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** | **2° x 0.4D** |
| | Vc (m/min) | **80÷100** | **60÷80** | **40÷60** | **30÷50** |
| HELICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.009 | 0.008 | 0.007 | 0.008 |
| | **4** | 0.011 | 0.011 | 0.009 | 0.010 |
| | **5** | 0.014 | 0.013 | 0.012 | 0.012 |
| | **6** | 0.017 | 0.016 | 0.014 | 0.015 |
| | **8** | 0.022 | 0.020 | 0.018 | 0.019 |
| | **10** | 0.026 | 0.024 | 0.021 | 0.023 |
| | **12** | 0.030 | 0.028 | 0.024 | 0.026 |
| | **14** | 0.033 | 0.031 | 0.028 | 0.029 |
| | **16** | 0.037 | 0.035 | 0.031 | 0.032 |
| | **20** | 0.045 | 0.042 | 0.037 | 0.039 |
| **α° x ae** | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF852

| RAMPING | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | α° x ae | **5° x D** | **4° x D** | **3° x D** | **2° x D** |
| | Vc (m/min) | **80÷100** | **60÷80** | **40÷60** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.020 | 0.019 | 0.018 | 0.027 |
| | **8** | 0.026 | 0.024 | 0.023 | 0.035 |
| | **10** | 0.031 | 0.029 | 0.027 | 0.043 |
| | **12** | 0.036 | 0.033 | 0.031 | 0.049 |
| | **14** | 0.040 | 0.037 | 0.035 | 0.055 |
| | **16** | 0.045 | 0.042 | 0.039 | 0.061 |
| | **20** | 0.054 | 0.051 | 0.048 | 0.074 |

| VERTICAL | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **80÷100** | **60÷80** | **40÷60** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.023 | 0.021 | 0.017 | 0.016 |
| | **8** | 0.030 | 0.027 | 0.022 | 0.021 |
| | **10** | 0.036 | 0.032 | 0.027 | 0.025 |
| | **12** | 0.041 | 0.037 | 0.031 | 0.029 |
| | **14** | 0.046 | 0.041 | 0.034 | 0.032 |
| | **16** | 0.051 | 0.046 | 0.038 | 0.036 |
| | **20** | 0.062 | 0.056 | 0.047 | 0.043 |



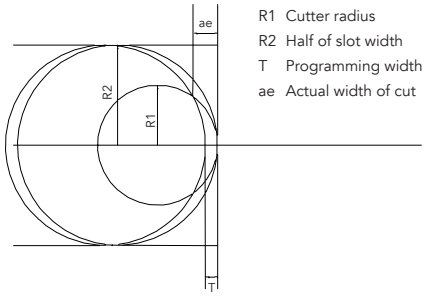
PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

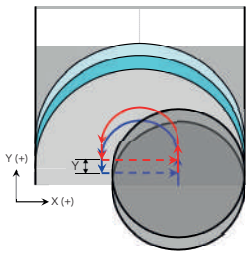
# HF852

| TROCHOIDAL | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **1.5D x 0.1D** | **1.5D x 0.1D** | **D x 0.1D** | **D x 0.1D** |
| | Vc (m/min) | **130÷150** | **100÷120** | **60÷80** | **50÷70** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.027 | 0.024 | 0.021 | 0.029 |
| | **4** | 0.035 | 0.032 | 0.028 | 0.039 |
| | **5** | 0.044 | 0.040 | 0.035 | 0.048 |
| | **6** | 0.052 | 0.046 | 0.041 | 0.057 |
| | **8** | 0.067 | 0.060 | 0.054 | 0.074 |
| | **10** | 0.080 | 0.072 | 0.064 | 0.088 |
| | **12** | 0.092 | 0.083 | 0.073 | 0.101 |
| | **14** | 0.103 | 0.093 | 0.083 | 0.114 |
| | **16** | 0.115 | 0.103 | 0.092 | 0.126 |
| | **20** | 0.140 | 0.126 | 0.112 | 0.154 |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF452

cylindrical shank and reduced neck, corner radius

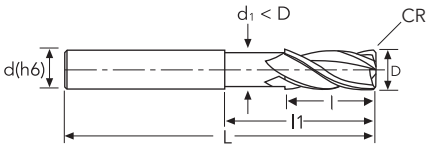
OSAWA NORM | MG PV300 | 30÷55 HRC | 40° | RADIUS | Z4 UP




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | ★ | | ★ | ★ |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | TROCHOIDAL




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | 0.30 | +/-0.020 | 6 | 9 | 15 | 2.80 | 57 | 4 | HF45203030 | ● |
| **3** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 9 | 15 | 2.80 | 57 | 4 | HF45205030 | ● |
| **4** | 0/-0.030 | 0.30 | +/-0.020 | 6 | 11 | 18 | 3.80 | 57 | 4 | HF45203040 | ● |
| **4** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 11 | 18 | 3.80 | 57 | 4 | HF45205040 | ● |
| **5** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 13 | 19 | 4.80 | 57 | 4 | HF45205050 | ● |
| **6** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 13 | 20 | 5.80 | 57 | 4 | HF45205060 | ● |
| **6** | 0/-0.030 | 1.00 | +/-0.020 | 6 | 13 | 20 | 5.80 | 57 | 4 | HF45210060 | ● |
| **8** | 0/-0.030 | 0.50 | +/-0.020 | 8 | 20 | 26 | 7.80 | 64 | 4 | HF45205080 | ● |
| **8** | 0/-0.030 | 1.00 | +/-0.020 | 8 | 20 | 26 | 7.80 | 64 | 4 | HF45210080 | ● |
| **10** | 0/-0.030 | 0.50 | +/-0.020 | 10 | 22 | 30 | 9.80 | 72 | 4 | HF45205100 | ● |
| **10** | 0/-0.030 | 1.00 | +/-0.020 | 10 | 22 | 30 | 9.80 | 72 | 4 | HF45210100 | ● |
| **12** | 0/-0.030 | 0.50 | +/-0.020 | 12 | 26 | 36 | 11.80 | 83 | 4 | HF45205120 | ● |
| **12** | 0/-0.030 | 1.00 | +/-0.020 | 12 | 26 | 36 | 11.80 | 83 | 4 | HF45210120 | ● |
| **16** | 0/-0.030 | 1.00 | +/-0.020 | 16 | 32 | 42 | 15.70 | 92 | 4 | HF45210160 | ● |
| **16** | 0/-0.030 | 2.00 | +/-0.020 | 16 | 32 | 42 | 15.70 | 92 | 4 | HF45220160 | ● |
| **20** | 0/-0.030 | 1.00 | +/-0.020 | 20 | 38 | 50 | 19.70 | 104 | 4 | HF45210200 | ● |
| **20** | 0/-0.030 | 2.00 | +/-0.020 | 20 | 38 | 50 | 19.70 | 104 | 4 | HF45220200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# HF452

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.3D x D** | **0.2D x D** |
| | Vc (m/min) | **70÷90** | **50÷70** | **30÷50** | **20÷40** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.011 | 0.010 | 0.008 | 0.007 |
| | **4** | 0.014 | 0.013 | 0.011 | 0.010 |
| | **5** | 0.018 | 0.016 | 0.013 | 0.012 |
| | **6** | 0.021 | 0.019 | 0.015 | 0.014 |
| | **8** | 0.027 | 0.024 | 0.020 | 0.019 |
| | **10** | 0.032 | 0.029 | 0.024 | 0.022 |
| | **12** | 0.037 | 0.033 | 0.028 | 0.026 |
| | **14** | 0.041 | 0.037 | 0.031 | 0.029 |
| | **16** | 0.046 | 0.041 | 0.034 | 0.032 |
| | **20** | 0.056 | 0.050 | 0.042 | 0.039 |
| **ap x ae** | **≤ D5** | 0.3D x D | 0.3D x D | 0.2D x D | 0.1D x D |

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.2D** | **1.2D x 0.2D** | **D x 0.1D** |
| | Vc (m/min) | **90÷110** | **60÷80** | **40÷60** | **30÷50** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.013 | 0.012 | 0.010 | 0.014 |
| | **4** | 0.017 | 0.015 | 0.014 | 0.019 |
| | **5** | 0.021 | 0.019 | 0.017 | 0.023 |
| | **6** | 0.025 | 0.022 | 0.020 | 0.027 |
| | **8** | 0.032 | 0.029 | 0.026 | 0.035 |
| | **10** | 0.039 | 0.035 | 0.031 | 0.042 |
| | **12** | 0.044 | 0.040 | 0.035 | 0.048 |
| | **14** | 0.050 | 0.045 | 0.040 | 0.055 |
| | **16** | 0.055 | 0.050 | 0.044 | 0.061 |
| | **20** | 0.067 | 0.060 | 0.054 | 0.074 |
| **ap x ae** | **≤ D5** | 1.2D x 0.2D | 1.2D x 0.1D | D x 0.1D | D x 0.05D |

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | α° x ae | **5° x 0.4D** | **4° x 0.4D** | **3° x 0.4D** | **2° x 0.4D** |
| | Vc (m/min) | **70÷90** | **50÷70** | **30÷50** | **20÷40** |
| HELICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.008 | 0.007 | 0.006 | 0.007 |
| | **4** | 0.010 | 0.010 | 0.008 | 0.009 |
| | **5** | 0.013 | 0.012 | 0.011 | 0.011 |
| | **6** | 0.015 | 0.014 | 0.012 | 0.013 |
| | **8** | 0.019 | 0.018 | 0.016 | 0.017 |
| | **10** | 0.023 | 0.022 | 0.019 | 0.020 |
| | **12** | 0.027 | 0.025 | 0.022 | 0.023 |
| | **14** | 0.030 | 0.028 | 0.025 | 0.026 |
| | **16** | 0.033 | 0.031 | 0.028 | 0.029 |
| | **20** | 0.041 | 0.038 | 0.034 | 0.035 |
| **α° x ae** | **≤ D5** | 2° x 0.4D | 2° x 0.4D | 1° x 0.4D | 1° x 0.4D |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HF452

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | α° x ae | **5° x D** | **4° x D** | **3° x D** | **2° x D** |
| | Vc (m/min) | **60÷80** | **50÷60** | **30÷40** | **20÷30** |
| RAMPING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.018 | 0.017 | 0.016 | 0.025 |
| | **8** | 0.023 | 0.022 | 0.021 | 0.032 |
| | **10** | 0.028 | 0.026 | 0.025 | 0.038 |
| | **12** | 0.032 | 0.030 | 0.028 | 0.044 |
| | **14** | 0.036 | 0.034 | 0.032 | 0.049 |
| | **16** | 0.040 | 0.037 | 0.035 | 0.055 |
| | **20** | 0.049 | 0.045 | 0.043 | 0.067 |

| | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **D x 0.4D** | **D x 0.4D** | **D x 0.25D** | **D x 0.25D** |
| | Vc (m/min) | **60÷80** | **50÷60** | **30÷40** | **20÷30** |
| VERTICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.021 | 0.019 | 0.015 | 0.014 |
| | **8** | 0.027 | 0.024 | 0.020 | 0.019 |
| | **10** | 0.032 | 0.029 | 0.024 | 0.022 |
| | **12** | 0.037 | 0.033 | 0.028 | 0.026 |
| | **14** | 0.041 | 0.037 | 0.031 | 0.029 |
| | **16** | 0.046 | 0.041 | 0.034 | 0.032 |
| | **20** | 0.056 | 0.050 | 0.042 | 0.039 |



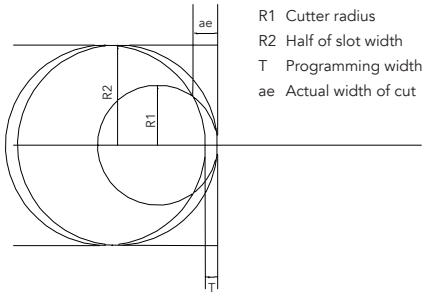
PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

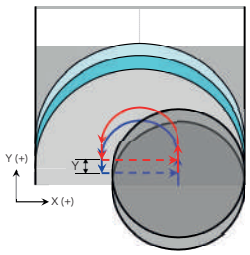
# HF452

| TROCHOIDAL | Material Group ISO 513 | P4 M3 K4 | P4 P5 P8 M3 K4 S1 | P5 P8 P8 K4 S2 S3 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | 800÷1000 N/mm² | 900÷1200 N/mm² | 35÷45 HRC | ≤55 HRC |
| | ap x ae | **1.5D x 0.1D** | **1.5D x 0.1D** | **D x 0.1D** | **D x 0.1D** |
| | Vc (m/min) | **110÷130** | **80÷100** | **50÷70** | **40÷60** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.027 | 0.024 | 0.021 | 0.029 |
| | **4** | 0.035 | 0.032 | 0.028 | 0.039 |
| | **5** | 0.044 | 0.040 | 0.035 | 0.048 |
| | **6** | 0.052 | 0.046 | 0.041 | 0.057 |
| | **8** | 0.067 | 0.060 | 0.054 | 0.074 |
| | **10** | 0.080 | 0.072 | 0.064 | 0.088 |
| | **12** | 0.092 | 0.083 | 0.073 | 0.101 |
| | **14** | 0.103 | 0.093 | 0.083 | 0.114 |
| | **16** | 0.115 | 0.103 | 0.092 | 0.126 |
| | **20** | 0.140 | 0.126 | 0.112 | 0.154 |

*NOTES:*
*Down milling CNC programming is required.*
*"ae" value max 0.2xD - "T" value max 0.1xD.*
*The use of end mill with diameter 30-40% smaller than the width of the slot is recommended.*
*The cutting conditions are based on CNC programming with medium dynamic speed.*
*With lower CNC dynamic speed, use the same cutting conditions or reduce the cutting speed Vc.*
*With higher CNC dynamic speed, reduce the "T" value by approximately -30 -50% and apply the maximum available cutting speed Vc.*




R1 Cutter radius
R2 Half of slot width
T Programming width of cut
ae Actual width of cut




PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION





# MEF

## STAINLESS STEEL AND SUPER ALLOYS

Ultra-fine micrograin and Endless Black coating for high performance machining on stainless steel, HRSA and titanium alloy, carbon and low alloy steel. The unique design of the cutting geometry and the Endless Black coating are specifically developed to control the cutting friction delivering longer tool life through the reduction of the heat generation.

Micrograna ultrafine e rivestimento Endless Black per la lavorazione ad alto rendimento di acciai al carbonio, acciai inossidabili, HRSA e leghe di titanio. La geometria e il rivestimento specifici consentono di generare bassi sforzi di taglio e l'abbassamento del coefficiente di attrito, garantendo una riduzione dello sviluppo del calore con conseguente rallentamento del processo di usura del tagliente.

Besonders feine Mikrokörnung und Beschichtung Endless Black für Hochleistungsbearbeitungen von Kohlenstoffstahl, Edelstahl, HRSA und Titanlegierungen. Dank der speziellen Geometrie und der spezifischen Beschichtung wird ein niedriger Schneiddruck erzeugt und der Reibungsfaktor gesenkt, wodurch die Hitzeentwicklung reduziert und in Folge die Abnutzung der Schneidkante verzögert werden.

Ultra Micrograin et revêtement Endless Black pour l'usinage à haute performance pour les aciers au carbone, aciers inoxydables, HRSA et alliages de titane. La géométrie et le revêtement spécifiques permettent de générer peu d'efforts de coupe et de réduire le coefficient de frottement, en garantissant une diminution du développement de la chaleur et le ralentissement consécutif du processus d'usure de l'arête.

Micrograno ultrafino y revestimiento Endless Black para el mecanizado a alto rendimiento de aceros al carbono, aceros inoxidables, HRSA y aleaciones de titanio. La geometría y revestimiento específicos permiten generar bajos esfuerzos de corte y reducción del coeficiente de rozamiento, garantizando una reducción del desarrollo de calor con la consiguiente ralentización del proceso de desgaste del filo.

Микрозернистая супермелкая структура твердого сплава и покрытие Endless Black служат для высокоэффективной обработки нержавеющей стали, жаропрочных и титановых сплавов, низко- и высокоуглеродистых сталей. Специальные геометрия и покрытие позволяют снизить трение и тепловыделение при резании и, тем самым, увеличить стойкость инструмента.

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# MEFCS2

cylindrical shank, 2 flutes

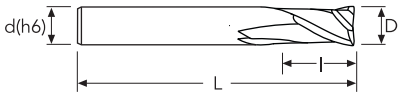
OSAWA NORM | VA | UMG ENDLESS | <45 HRC | 35° | SQUARE | Z2



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | | | ★ | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.030 | | | 4 | 2.5 | | 40 | 2 | MEFCS2010 | ● |
| **1.5** | 0/-0.030 | | | 4 | 4 | | 40 | 2 | MEFCS2015 | ● |
| **2** | 0/-0.030 | | | 4 | 6 | | 40 | 2 | MEFCS2020 | ● |
| **2.5** | 0/-0.030 | | | 4 | 8 | | 40 | 2 | MEFCS2025 | ● |
| **3** | 0/-0.030 | | | 6 | 8 | | 45 | 2 | MEFCS2030 | ● |
| **4** | 0/-0.030 | | | 6 | 11 | | 45 | 2 | MEFCS2040 | ● |
| **5** | 0/-0.030 | | | 6 | 13 | | 50 | 2 | MEFCS2050 | ● |
| **6** | 0/-0.030 | | | 6 | 13 | | 50 | 2 | MEFCS2060 | ● |
| **8** | 0/-0.030 | | | 8 | 19 | | 60 | 2 | MEFCS2080 | ● |
| **10** | 0/-0.030 | | | 10 | 22 | | 70 | 2 | MEFCS2100 | ● |
| **12** | 0/-0.030 | | | 12 | 26 | | 75 | 2 | MEFCS2120 | ● |
| **14** | 0/-0.030 | | | 14 | 26 | | 85 | 2 | MEFCS2140 | ● |
| **16** | 0/-0.030 | | | 16 | 32 | | 100 | 2 | MEFCS2160 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

# MEFCS2

| | Material Group ISO 513 | P1 P2 P3 | P4 P7 M1 | P5 M2 M3 S1 S2 S4 | P8 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 700÷1000 N/mm² | ≤35 HRC | ≤45 HRC |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.3D x D** | **0.2D x D** |
| | Vc (m/min) | **90÷110** | **50÷70** | **30÷50** | **20÷40** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.005 | 0.004 | 0.004 | 0.004 |
| | **2** | 0.009 | 0.008 | 0.007 | 0.007 |
| | **3** | 0.012 | 0.010 | 0.009 | 0.009 |
| | **4** | 0.017 | 0.015 | 0.014 | 0.014 |
| | **5** | 0.023 | 0.020 | 0.018 | 0.018 |
| | **6** | 0.029 | 0.024 | 0.023 | 0.023 |
| | **8** | 0.035 | 0.029 | 0.028 | 0.028 |
| | **10** | 0.040 | 0.034 | 0.032 | 0.032 |
| | **12** | 0.046 | 0.039 | 0.037 | 0.037 |
| | **14** | 0.052 | 0.044 | 0.041 | 0.041 |
| | **16** | 0.058 | 0.049 | 0.046 | 0.046 |

< D3 mm: ap = 0.1D ÷ 0.2D

| | Material Group ISO 513 | P1 P2 P3 | P4 P7 M1 | P5 M2 M3 S1 S2 S4 | P8 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 700÷1000 N/mm² | ≤35 HRC | ≤45 HRC |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **D x 0.3D** | **D x 0.1D** |
| | Vc (m/min) | **90÷110** | **60÷80** | **40÷60** | **30÷50** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.006 | 0.005 | 0.004 | 0.004 |
| | **2** | 0.011 | 0.009 | 0.009 | 0.009 |
| | **3** | 0.014 | 0.012 | 0.011 | 0.011 |
| | **4** | 0.021 | 0.018 | 0.017 | 0.017 |
| | **5** | 0.028 | 0.023 | 0.022 | 0.022 |
| | **6** | 0.035 | 0.029 | 0.028 | 0.028 |
| | **8** | 0.041 | 0.035 | 0.033 | 0.033 |
| | **10** | 0.048 | 0.041 | 0.039 | 0.039 |
| | **12** | 0.055 | 0.047 | 0.044 | 0.044 |
| | **14** | 0.062 | 0.053 | 0.050 | 0.050 |
| | **16** | 0.069 | 0.059 | 0.055 | 0.055 |

< D3 mm: ap = 0.1D ÷ 0.2D

| | Material Group ISO 513 | P1 P2 P3 | P4 P7 M1 | P5 M2 M3 S1 S2 S4 | P8 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 700÷1000 N/mm² | ≤35 HRC | ≤45 HRC |
| | ap x ae | **D x D** | **D x D** | **0.5D x D** | **0.2D x D** |
| | Vc (m/min) | **90÷110** | **50÷70** | **30÷50** | **20÷40** |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.003 | 0.002 | 0.002 | 0.002 |
| | **2** | 0.006 | 0.005 | 0.004 | 0.004 |
| | **3** | 0.007 | 0.006 | 0.006 | 0.006 |
| | **4** | 0.010 | 0.009 | 0.008 | 0.008 |
| | **5** | 0.014 | 0.012 | 0.011 | 0.011 |
| | **6** | 0.017 | 0.015 | 0.014 | 0.014 |
| | **8** | 0.021 | 0.018 | 0.017 | 0.017 |
| | **10** | 0.024 | 0.021 | 0.019 | 0.019 |
| | **12** | 0.028 | 0.023 | 0.022 | 0.022 |
| | **14** | 0.031 | 0.026 | 0.025 | 0.025 |
| | **16** | 0.035 | 0.029 | 0.028 | 0.028 |

< D3 mm: ap = 0.1D ÷ 0.2D

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
**MEF**
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# MEFCSH3

cylindrical shank, 3 flutes

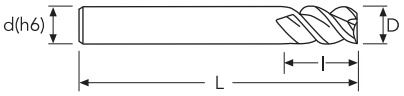
OSAWA NORM | VA | UMG ENDLESS | <45 HRC | 50° | SQUARE | Z3 ≤ Ø18 | Z4 > Ø18



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | | | ★ | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.030 | | | 6 | 13 | | 50 | 3 | MEFCSH3060 | ● |
| **8** | 0/-0.030 | | | 8 | 19 | | 60 | 3 | MEFCSH3080 | ● |
| **10** | 0/-0.030 | | | 10 | 22 | | 70 | 3 | MEFCSH3100 | ● |
| **12** | 0/-0.030 | | | 12 | 26 | | 75 | 3 | MEFCSH3120 | ● |
| **16** | 0/-0.030 | | | 16 | 32 | | 100 | 3 | MEFCSH3160 | ● |
| **18** | 0/-0.030 | | | 18 | 32 | | 90 | 3 | MEFCSH3180 | ● |
| **20** | 0/-0.030 | | | 20 | 38 | | 105 | 4 | MEFCSH4200 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

# MEFCSH3

| SLOTTING | Material Group ISO 513 | P1 P2 P3 | P4 P7 M1 | P5 M2 M3 S1 S2 S4 | P8 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 700÷1000 N/mm² | ≤35 HRC | ≤45 HRC |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.3D x D** | **0.2D x D** |
| | Vc (m/min) | **80÷100** | **60÷80** | **40÷60** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.022 | 0.013 | 0.012 | 0.012 |
| | **8** | 0.029 | 0.017 | 0.015 | 0.016 |
| | **10** | 0.036 | 0.021 | 0.019 | 0.020 |
| | **12** | 0.046 | 0.027 | 0.024 | 0.026 |
| | **14** | 0.053 | 0.031 | 0.028 | 0.030 |
| | **16** | 0.065 | 0.038 | 0.034 | 0.036 |
| | **18** | 0.075 | 0.044 | 0.039 | 0.042 |
| | **20** | 0.086 | 0.051 | 0.045 | 0.048 |

| SIDE MILLING | Material Group ISO 513 | P1 P2 P3 | P4 P7 M1 | P5 M2 M3 S1 S2 S4 | P8 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 700÷1000 N/mm² | ≤35 HRC | ≤45 HRC |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.3D x D** | **0.2D x D** |
| | Vc (m/min) | **80÷100** | **60÷80** | **40÷60** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.026 | 0.015 | 0.014 | 0.014 |
| | **8** | 0.035 | 0.020 | 0.019 | 0.019 |
| | **10** | 0.043 | 0.026 | 0.024 | 0.024 |
| | **12** | 0.055 | 0.033 | 0.031 | 0.031 |
| | **14** | 0.064 | 0.038 | 0.036 | 0.036 |
| | **16** | 0.078 | 0.046 | 0.043 | 0.043 |
| | **18** | 0.090 | 0.053 | 0.050 | 0.050 |
| | **20** | 0.104 | 0.061 | 0.058 | 0.058 |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
**MEF**
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# MEFCS4

cylindrical shank, 4 flutes

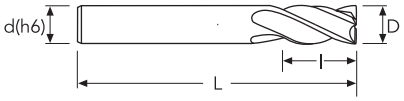
OSAWA NORM | VA | UMG ENDLESS | <45 HRC | 35° | SQUARE | Z4



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | | | ★ | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.030 | | | 4 | 6 | | 40 | 4 | MEFCS4020 | ● |
| **2.5** | 0/-0.030 | | | 4 | 8 | | 40 | 4 | MEFCS4025 | ● |
| **3** | 0/-0.030 | | | 6 | 8 | | 45 | 4 | MEFCS4030 | ● |
| **4** | 0/-0.030 | | | 6 | 11 | | 45 | 4 | MEFCS4040 | ● |
| **5** | 0/-0.030 | | | 6 | 13 | | 50 | 4 | MEFCS4050 | ● |
| **6** | 0/-0.030 | | | 6 | 13 | | 50 | 4 | MEFCS4060 | ● |
| **8** | 0/-0.030 | | | 8 | 19 | | 60 | 4 | MEFCS4080 | ● |
| **10** | 0/-0.030 | | | 10 | 22 | | 70 | 4 | MEFCS4100 | ● |
| **12** | 0/-0.030 | | | 12 | 26 | | 75 | 4 | MEFCS4120 | ● |
| **14** | 0/-0.030 | | | 14 | 26 | | 85 | 4 | MEFCS4140 | ● |
| **16** | 0/-0.030 | | | 16 | 32 | | 100 | 4 | MEFCS4160 | ● |
| **20** | 0/-0.030 | | | 20 | 38 | | 105 | 4 | MEFCS4200 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

## MEFCS4

| | Material Group ISO 513 | P1 P2 P3 | P4 P7 M1 | P5 M2 M3 S1 S2 S4 | P8 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 700÷1000 N/mm² | ≤35 HRC | ≤45 HRC |
| | ap x ae | **1.5D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.1D** |
| | Vc (m/min) | **90÷110** | **60÷80** | **40÷60** | **30÷50** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.012 | 0.010 | 0.010 | 0.010 |
| | **4** | 0.015 | 0.013 | 0.012 | 0.012 |
| | **5** | 0.018 | 0.015 | 0.014 | 0.014 |
| | **6** | 0.023 | 0.020 | 0.018 | 0.018 |
| | **8** | 0.030 | 0.026 | 0.024 | 0.024 |
| | **10** | 0.038 | 0.032 | 0.030 | 0.030 |
| | **12** | 0.045 | 0.038 | 0.036 | 0.036 |
| | **14** | 0.052 | 0.044 | 0.042 | 0.042 |
| | **16** | 0.058 | 0.049 | 0.046 | 0.046 |
| | **18** | 0.066 | 0.056 | 0.053 | 0.053 |
| | **20** | 0.075 | 0.064 | 0.060 | 0.060 |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
**MEF**
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# MEF600

cylindrical shank, multi flute

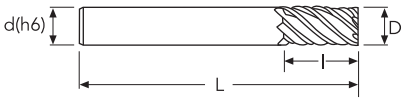
OSAWA NORM | VA | UMG ENDLESS | <45 HRC | 50° | SQUARE | Z6~Z8



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | | | ★ | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.030 | | | 6 | 13 | | 57 | 6 | MEF600060 | ● |
| **8** | 0/-0.030 | | | 8 | 19 | | 63 | 6 | MEF600080 | ● |
| **10** | 0/-0.030 | | | 10 | 22 | | 72 | 6 | MEF600100 | ● |
| **12** | 0/-0.030 | | | 12 | 26 | | 83 | 6 | MEF600120 | ● |
| **16** | 0/-0.030 | | | 16 | 32 | | 92 | 6 | MEF600160 | ● |
| **20** | 0/-0.030 | | | 20 | 38 | | 104 | 8 | MEF600200 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

# MEF600

| | Material Group ISO 513 | P1 P2 P3 | P4 P7 M1 | P5 M2 M3 S1 S2 S4 | P8 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 700÷1000 N/mm² | ≤35 HRC | ≤45 HRC |
| | ap x ae | **1.5D x 0.1D** | **1.5D x 0.1D** | **D x 0.1D** | **D x 0.05D** |
| | Vc (m/min) | **100÷140** | **70÷110** | **50÷80** | **40÷60** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.015 | 0.013 | 0.012 | 0.012 |
| | **8** | 0.020 | 0.017 | 0.016 | 0.016 |
| | **10** | 0.025 | 0.021 | 0.020 | 0.020 |
| | **12** | 0.030 | 0.026 | 0.024 | 0.024 |
| | **14** | 0.035 | 0.030 | 0.028 | 0.028 |
| | **16** | 0.040 | 0.034 | 0.032 | 0.032 |
| | **20** | 0.050 | 0.043 | 0.040 | 0.040 |

# MEF901

cylindrical shank, roughing

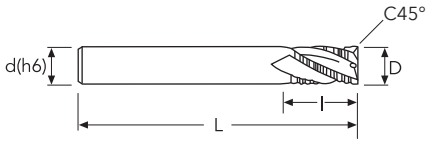
OSAWA NORM | VA | UMG ENDLESS | <45 HRC | 45° | C45° | HR FINE | Z3~Z6




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | | | ★ | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **4** | 0/-0.048 | 0.10 | +/-0.020 | 6 | 11 | | 57 | 3 | MEF901040 | ● |
| **5** | 0/-0.048 | 0.10 | +/-0.020 | 6 | 13 | | 57 | 4 | MEF901050 | ● |
| **6** | 0/-0.048 | 0.15 | +/-0.020 | 6 | 16 | | 57 | 4 | MEF901060 | ● |
| **8** | 0/-0.058 | 0.20 | +/-0.020 | 8 | 16 | | 63 | 4 | MEF901080 | ● |
| **10** | 0/-0.058 | 0.20 | +/-0.020 | 10 | 22 | | 72 | 4 | MEF901100 | ● |
| **12** | 0/-0.070 | 0.20 | +/-0.020 | 12 | 26 | | 83 | 4 | MEF901120 | ● |
| **14** | 0/-0.070 | 0.20 | +/-0.020 | 14 | 26 | | 83 | 5 | MEF901140 | ● |
| **16** | 0/-0.070 | 0.20 | +/-0.020 | 16 | 32 | | 92 | 5 | MEF901160 | ● |
| **20** | 0/-0.084 | 0.20 | +/-0.020 | 20 | 38 | | 104 | 6 | MEF901200 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

CUTTING PARAMETERS

## MEF901

| | Material Group ISO 513 | P1 P2 P3 | P4 P7 M1 | P5 M2 M3 S1 S2 S4 | P8 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 700÷1000 N/mm² | ≤35 HRC | ≤45 HRC |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.2D** | **D x 0.1D** |
| | Vc (m/min) | **100÷140** | **70÷90** | **50÷70** | **40÷60** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | 0.018 | 0.015 | 0.014 | 0.014 |
| | **5** | 0.022 | 0.019 | 0.018 | 0.018 |
| | **6** | 0.028 | 0.024 | 0.022 | 0.022 |
| | **8** | 0.035 | 0.030 | 0.028 | 0.028 |
| | **10** | 0.040 | 0.034 | 0.032 | 0.032 |
| | **12** | 0.045 | 0.038 | 0.036 | 0.036 |
| | **14** | 0.050 | 0.043 | 0.040 | 0.040 |
| | **16** | 0.057 | 0.048 | 0.046 | 0.046 |
| | **20** | 0.073 | 0.062 | 0.058 | 0.058 |

# MEF902

cylindrical shank, reduced neck, roughing

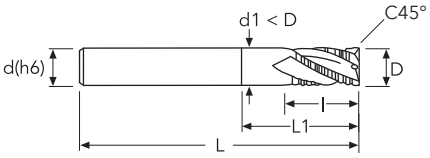
OSAWA NORM | VA | UMG ENDLESS | <45 HRC | 45° | C45° | HR FINE | Z4~Z6




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ★ | | | ★ | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.048 | 0.15 | +/-0.020 | 6 | 16 | 20 | 5.50 | 57 | 4 | MEF902060 | ● |
| **8** | 0/-0.058 | 0.20 | +/-0.020 | 8 | 16 | 26 | 7.50 | 63 | 4 | MEF902080 | ● |
| **10** | 0/-0.058 | 0.20 | +/-0.020 | 10 | 22 | 31 | 9.50 | 72 | 4 | MEF902100 | ● |
| **12** | 0/-0.070 | 0.20 | +/-0.020 | 12 | 26 | 37 | 11.50 | 83 | 4 | MEF902120 | ● |
| **16** | 0/-0.070 | 0.20 | +/-0.020 | 16 | 32 | 51 | 15.50 | 92 | 5 | MEF902160 | ● |
| **20** | 0/-0.084 | 0.20 | +/-0.020 | 20 | 38 | 59 | 19.20 | 104 | 6 | MEF902200 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

CUTTING PARAMETERS

## MEF902

| SIDE MILLING | Material Group ISO 513 | P1 P2 P3 | P4 P7 M1 | P5 M2 M3 S1 S2 S4 | P8 S3 S5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 700÷1000 N/mm² | ≤35 HRC | ≤45 HRC |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.2D** | **D x 0.1D** |
| | Vc (m/min) | **100÷120** | **60÷80** | **45÷65** | **35÷45** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.027 | 0.023 | 0.021 | 0.021 |
| | **8** | 0.033 | 0.028 | 0.027 | 0.027 |
| | **10** | 0.038 | 0.032 | 0.030 | 0.030 |
| | **12** | 0.043 | 0.036 | 0.034 | 0.034 |
| | **14** | 0.048 | 0.040 | 0.038 | 0.038 |
| | **16** | 0.054 | 0.046 | 0.043 | 0.043 |
| | **20** | 0.069 | 0.059 | 0.055 | 0.055 |





# ALU

## NON-FERROUS MATERIALS

Uncoated micrograin carbide and cutting geometry specifically developed for non-ferrous machining. Lapped cutting edges and ad-hoc profile of the chip pocket for low cutting forces and outstanding finishing quality. Also available in the HF ALU version with unequal pitch (UP) with a specific design allowing mirror finishing and DxD machining, even in the 4-flutes version.

Micrograna non rivestita e geometria di taglio sviluppata specificamente per la lavorazione di materiali non-ferrosi. Taglienti lappati e particolare profilo del vano truciolo per bassi sforzi di taglio e un'eccellente finitura superficiale. Disponibile anche la versione HF Alu con passo differenziato (UP) con un particolare design che permette finiture a specchio e lavorazioni DxD, anche nella versione a 4 taglienti.

Unbeschichtete Mikrokörnung und eigens für die Bearbeitung von NE-Metallen entwickelte Schnittgeometrie. Dank der geläppten Schneiden und der besonderen Form der Nuten ist die aufzubringende Schnittkraft gering, bei gleichzeitig ausgezeichnetem Oberflächenfinish. Auch in der Version HF Alu mit ungleicher Teilung (UP) und besonderer Form erhältlich, die auch in der Version mit 4 Schneiden ein spiegelblankes Oberflächenfinish und DxD-Bearbeitungen ermöglicht.

Micrograin non revêtu et géométrie de coupe développée spécifiquement pour l'usinage de matériaux non ferreux. Arêtes de coupe polies et profil particulier de la goujure pour de faibles efforts de coupe et une excellente finition superficielle. Également disponible la version HF Alu à pas décalé(UP), avec un design particulier qui permet des finitions glacées et des usinages DxD,aussi dans la version à 4 arêtes de coupe.

Micrograna no revestida y geometría de corte desarrollada específicamente para la elaboración de materiales no ferrosos. Filos de corte lapeados y perfil especial del compartimento de virutas, para bajos esfuerzos de corte y un excelente acabado de la superfície. También está disponible la versión HF Alu con paso diferenciado (UP) con un diseño especial que permite acabados a espejo y elaboraciones D x D, incluso en la versión de 4 filos.

Мелкозернистый твердый сплав без покрытия со специально разработанной геометрией для обработки цветных металлов. Доведенные режущие кромки и специальный профиль стружечных канавок снижают силы резания и улучшают качество обработанной поверхности. Также доступна версия HF Alu с неравномерным шагом (UP) и специальной геометрией, позволяющая получать зеркальную поверхность и работать в режиме DxD, в том числе для версии с 4-мя зубьями.

# HFAL4

cylindrical shank, 4 flutes

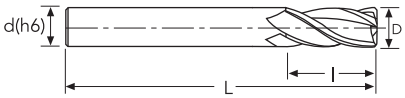
OSAWA NORM | ALU | MG / BR | 40° | SQUARE | Z4 UP



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.025 | | | 6 | 9 | | 57 | 4 | HFAL4030 | ● |
| **4** | 0/-0.025 | | | 6 | 12 | | 57 | 4 | HFAL4040 | ● |
| **5** | 0/-0.025 | | | 6 | 13 | | 57 | 4 | HFAL4050 | ● |
| **6** | 0/-0.025 | | | 6 | 13 | | 57 | 4 | HFAL4060 | ● |
| **8** | 0/-0.030 | | | 8 | 20 | | 64 | 4 | HFAL4080 | ● |
| **10** | 0/-0.030 | | | 10 | 22 | | 72 | 4 | HFAL4100 | ● |
| **12** | 0/-0.030 | | | 12 | 26 | | 83 | 4 | HFAL4120 | ● |
| **14** | 0/-0.030 | | | 14 | 32 | | 90 | 4 | HFAL4140 | ● |
| **16** | 0/-0.030 | | | 16 | 32 | | 92 | 4 | HFAL4160 | ● |
| **20** | 0/-0.030 | | | 20 | 38 | | 104 | 4 | HFAL4200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# HFAL4

| SLOTTING | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | D x D | D x D | D x D | D x D |
| | Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷1000 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.030 | 0.025 | 0.021 | 0.033 |
| | 4 | 0.040 | 0.034 | 0.028 | 0.044 |
| | 5 | 0.050 | 0.042 | 0.035 | 0.054 |
| | 6 | 0.059 | 0.050 | 0.041 | 0.064 |
| | 8 | 0.077 | 0.066 | 0.054 | 0.085 |
| | 10 | 0.095 | 0.080 | 0.066 | 0.104 |
| | 12 | 0.108 | 0.092 | 0.076 | 0.119 |
| | 14 | 0.126 | 0.107 | 0.088 | 0.139 |
| | 16 | 0.144 | 0.122 | 0.101 | 0.158 |
| | 18 | 0.158 | 0.135 | 0.111 | 0.174 |
| | 20 | 0.176 | 0.149 | 0.123 | 0.193 |

| SIDE MILLING | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 1.5D x 0.5D | 1.5D x 0.5D | 1.5D x 0.5D | 1.5D x 0.5D |
| | Vc (m/min) | 300÷600 | 200÷500 | 200÷400 | 600÷1000 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.036 | 0.032 | 0.029 | 0.039 |
| | 4 | 0.048 | 0.043 | 0.038 | 0.052 |
| | 5 | 0.059 | 0.053 | 0.048 | 0.065 |
| | 6 | 0.070 | 0.063 | 0.056 | 0.077 |
| | 8 | 0.093 | 0.084 | 0.074 | 0.102 |
| | 10 | 0.113 | 0.102 | 0.091 | 0.125 |
| | 12 | 0.130 | 0.117 | 0.104 | 0.143 |
| | 14 | 0.151 | 0.136 | 0.121 | 0.166 |
| | 16 | 0.173 | 0.156 | 0.138 | 0.190 |
| | 18 | 0.190 | 0.171 | 0.152 | 0.209 |
| | 20 | 0.211 | 0.190 | 0.168 | 0.232 |

| HELICAL | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 8° x 0.5D | 5° x 0.5D | 5° x 0.5D | 8° x 0.5D |
| | Vc (m/min) | 300÷600 | 200÷500 | 200÷400 | 600÷1000 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.021 | 0.018 | 0.015 | 0.023 |
| | 4 | 0.027 | 0.025 | 0.020 | 0.030 |
| | 5 | 0.034 | 0.031 | 0.025 | 0.038 |
| | 6 | 0.040 | 0.036 | 0.030 | 0.044 |
| | 8 | 0.054 | 0.048 | 0.039 | 0.059 |
| | 10 | 0.065 | 0.058 | 0.048 | 0.072 |
| | 12 | 0.075 | 0.067 | 0.055 | 0.082 |
| | 14 | 0.087 | 0.078 | 0.064 | 0.096 |
| | 16 | 0.100 | 0.089 | 0.073 | 0.110 |
| | 18 | 0.110 | 0.098 | 0.081 | 0.120 |
| | 20 | 0.121 | 0.109 | 0.089 | 0.133 |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
**ALU**
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

CUTTING PARAMETERS

# HFAL4




| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|
| Hardness/Rm | | | | |
| ap x ae | 15° x D | 10° x D | 7° x D | 15° x D |
| Vc (m/min) | 300÷500 | 200÷400 | 200÷300 | 600÷1000 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.020 | 0.017 | 0.015 | 0.022 |
| 4 | 0.026 | 0.023 | 0.019 | 0.029 |
| 5 | 0.033 | 0.029 | 0.024 | 0.036 |
| 6 | 0.039 | 0.034 | 0.029 | 0.043 |
| 8 | 0.051 | 0.045 | 0.038 | 0.057 |
| 10 | 0.063 | 0.055 | 0.046 | 0.069 |
| 12 | 0.072 | 0.062 | 0.053 | 0.079 |
| 14 | 0.084 | 0.073 | 0.062 | 0.092 |
| 16 | 0.096 | 0.083 | 0.071 | 0.105 |
| 18 | 0.105 | 0.092 | 0.078 | 0.116 |
| 20 | 0.117 | 0.101 | 0.086 | 0.128 |




| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|
| Hardness/Rm | | | | |
| ap x ae | D x 0.4D | D x 0.4D | D x 0.4D | D x 0.4D |
| Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷1000 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.030 | 0.027 | 0.024 | 0.033 |
| 4 | 0.040 | 0.036 | 0.032 | 0.044 |
| 5 | 0.050 | 0.045 | 0.040 | 0.054 |
| 6 | 0.059 | 0.053 | 0.047 | 0.064 |
| 8 | 0.077 | 0.070 | 0.062 | 0.085 |
| 10 | 0.095 | 0.085 | 0.076 | 0.104 |
| 12 | 0.108 | 0.097 | 0.086 | 0.119 |
| 14 | 0.126 | 0.113 | 0.101 | 0.139 |
| 16 | 0.144 | 0.130 | 0.115 | 0.158 |
| 18 | 0.158 | 0.143 | 0.127 | 0.174 |
| 20 | 0.176 | 0.158 | 0.140 | 0.193 |




| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|
| Hardness/Rm | | | | |
| ap x ae | D x D | D x D | 0.5D x D | 0.5D x D |
| Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷1000 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.015 | 0.013 | 0.012 | 0.016 |
| 4 | 0.020 | 0.018 | 0.016 | 0.022 |
| 5 | 0.025 | 0.022 | 0.020 | 0.027 |
| 6 | 0.029 | 0.026 | 0.023 | 0.032 |
| 8 | 0.039 | 0.035 | 0.031 | 0.043 |
| 10 | 0.047 | 0.043 | 0.038 | 0.052 |
| 12 | 0.054 | 0.049 | 0.043 | 0.059 |
| 14 | 0.063 | 0.057 | 0.050 | 0.069 |
| 16 | 0.072 | 0.065 | 0.058 | 0.079 |
| 18 | 0.079 | 0.071 | 0.063 | 0.087 |
| 20 | 0.088 | 0.079 | 0.070 | 0.097 |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HFAL3

cylindrical shank, 3 flutes, corner radius

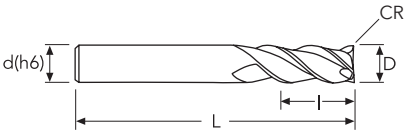
OSAWA NORM | ALU | MG POLISHED | 30° | RADIUS | Z3 UP




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.020 | 0.10 | ±0.020 | 6 | 6.5 | | 50 | 3 | HFAL301020 | ● |
| **3** | 0/-0.020 | 0.10 | ±0.020 | 6 | 9 | | 50 | 3 | HFAL301030 | ● |
| **4** | 0/-0.020 | 0.10 | ±0.020 | 6 | 12 | | 50 | 3 | HFAL301040 | ● |
| **5** | 0/-0.020 | 0.10 | ±0.020 | 6 | 15 | | 50 | 3 | HFAL301050 | ● |
| **6** | 0/-0.020 | 0.10 | ±0.020 | 6 | 20 | | 60 | 3 | HFAL301060 | ● |
| **8** | 0/-0.020 | 0.10 | ±0.020 | 8 | 20 | | 64 | 3 | HFAL301080 | ● |
| **10** | 0/-0.020 | 0.10 | ±0.020 | 10 | 22 | | 75 | 3 | HFAL301100 | ● |
| **12** | 0/-0.020 | 0.10 | ±0.020 | 12 | 25 | | 75 | 3 | HFAL301120 | ● |
| **14** | 0/-0.020 | 0.10 | ±0.020 | 14 | 32 | | 90 | 3 | HFAL301140 | ● |
| **16** | 0/-0.020 | 0.10 | ±0.020 | 16 | 32 | | 90 | 3 | HFAL301160 | ● |
| **20** | 0/-0.020 | 0.10 | ±0.020 | 20 | 38 | | 100 | 3 | HFAL301200 | ● |

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
**ALU**
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# HFAL3

SLOTTING

| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|
| Hardness/Rm | | | | |
| ap x ae | D x D | D x D | D x D | D x D |
| Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷900 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 2 | 0.022 | 0.019 | 0.015 | 0.024 |
| 3 | 0.033 | 0.028 | 0.023 | 0.036 |
| 4 | 0.044 | 0.037 | 0.031 | 0.048 |
| 5 | 0.055 | 0.047 | 0.039 | 0.061 |
| 6 | 0.065 | 0.055 | 0.046 | 0.072 |
| 8 | 0.086 | 0.073 | 0.060 | 0.095 |
| 10 | 0.105 | 0.089 | 0.074 | 0.116 |
| 12 | 0.120 | 0.102 | 0.084 | 0.132 |
| 14 | 0.140 | 0.119 | 0.098 | 0.154 |
| 16 | 0.160 | 0.136 | 0.112 | 0.176 |
| 18 | 0.176 | 0.150 | 0.123 | 0.194 |
| 20 | 0.195 | 0.166 | 0.137 | 0.215 |

SIDE MILLING

| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|
| Hardness/Rm | | | | |
| ap x ae | 1.5D x 0.5D | 1.5D x 0.5D | 1.5D x 0.5D | 1.5D x 0.5D |
| Vc (m/min) | 300÷600 | 200÷500 | 200÷400 | 600÷1000 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 2 | 0.026 | 0.024 | 0.021 | 0.029 |
| 3 | 0.040 | 0.036 | 0.032 | 0.044 |
| 4 | 0.053 | 0.048 | 0.042 | 0.058 |
| 5 | 0.066 | 0.059 | 0.053 | 0.073 |
| 6 | 0.078 | 0.070 | 0.062 | 0.086 |
| 8 | 0.103 | 0.093 | 0.083 | 0.114 |
| 10 | 0.126 | 0.113 | 0.101 | 0.139 |
| 12 | 0.144 | 0.130 | 0.115 | 0.158 |
| 14 | 0.168 | 0.151 | 0.134 | 0.185 |
| 16 | 0.192 | 0.173 | 0.154 | 0.211 |
| 18 | 0.211 | 0.190 | 0.169 | 0.232 |
| 20 | 0.234 | 0.211 | 0.187 | 0.257 |

HELICAL

| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|
| Hardness/Rm | | | | |
| ap x ae | 8° x 0.5D | 5° x 0.5D | 5° x 0.5D | 8° x 0.5D |
| Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷900 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 2 | 0.015 | 0.014 | 0.011 | 0.017 |
| 3 | 0.023 | 0.020 | 0.017 | 0.025 |
| 4 | 0.030 | 0.027 | 0.022 | 0.033 |
| 5 | 0.038 | 0.034 | 0.028 | 0.042 |
| 6 | 0.045 | 0.040 | 0.033 | 0.049 |
| 8 | 0.059 | 0.053 | 0.044 | 0.065 |
| 10 | 0.073 | 0.065 | 0.054 | 0.080 |
| 12 | 0.083 | 0.074 | 0.061 | 0.091 |
| 14 | 0.097 | 0.087 | 0.071 | 0.106 |
| 16 | 0.111 | 0.099 | 0.082 | 0.122 |
| 18 | 0.122 | 0.109 | 0.090 | 0.134 |
| 20 | 0.135 | 0.121 | 0.099 | 0.148 |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HFAL3

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 15° x D | 10° x D | 7° x D | 15° x D |
| | Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷900 |
| RAMPING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 2 | 0.015 | 0.013 | 0.011 | 0.016 |
| | 3 | 0.022 | 0.019 | 0.016 | 0.024 |
| | 4 | 0.029 | 0.025 | 0.022 | 0.032 |
| | 5 | 0.037 | 0.032 | 0.027 | 0.040 |
| | 6 | 0.043 | 0.038 | 0.032 | 0.048 |
| | 8 | 0.057 | 0.050 | 0.042 | 0.063 |
| | 10 | 0.070 | 0.061 | 0.051 | 0.077 |
| | 12 | 0.080 | 0.069 | 0.059 | 0.088 |
| | 14 | 0.093 | 0.081 | 0.069 | 0.102 |
| | 16 | 0.106 | 0.092 | 0.078 | 0.117 |
| | 18 | 0.117 | 0.102 | 0.086 | 0.129 |
| | 20 | 0.130 | 0.113 | 0.096 | 0.143 |

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | D x 0.4D | D x 0.4D | D x 0.4D | D x 0.4D |
| | Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷900 |
| VERTICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 2 | 0.022 | 0.020 | 0.018 | 0.024 |
| | 3 | 0.033 | 0.030 | 0.026 | 0.036 |
| | 4 | 0.044 | 0.040 | 0.035 | 0.048 |
| | 5 | 0.055 | 0.050 | 0.044 | 0.061 |
| | 6 | 0.065 | 0.059 | 0.052 | 0.072 |
| | 8 | 0.086 | 0.077 | 0.069 | 0.095 |
| | 10 | 0.105 | 0.095 | 0.084 | 0.116 |
| | 12 | 0.120 | 0.108 | 0.096 | 0.132 |
| | 14 | 0.140 | 0.126 | 0.112 | 0.154 |
| | 16 | 0.160 | 0.144 | 0.128 | 0.176 |
| | 18 | 0.176 | 0.158 | 0.141 | 0.194 |
| | 20 | 0.195 | 0.176 | 0.156 | 0.215 |

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | D x D | D x D | 0.5D x D | 0.5D x D |
| | Vc (m/min) | 270÷370 | 190÷290 | 150÷250 | 500÷700 |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 2 | 0.011 | 0.010 | 0.009 | 0.012 |
| | 3 | 0.017 | 0.015 | 0.013 | 0.018 |
| | 4 | 0.022 | 0.020 | 0.018 | 0.024 |
| | 5 | 0.028 | 0.025 | 0.022 | 0.030 |
| | 6 | 0.033 | 0.029 | 0.026 | 0.036 |
| | 8 | 0.043 | 0.039 | 0.034 | 0.047 |
| | 10 | 0.053 | 0.047 | 0.042 | 0.058 |
| | 12 | 0.060 | 0.054 | 0.048 | 0.066 |
| | 14 | 0.070 | 0.063 | 0.056 | 0.077 |
| | 16 | 0.080 | 0.072 | 0.064 | 0.088 |
| | 18 | 0.088 | 0.079 | 0.070 | 0.097 |
| | 20 | 0.098 | 0.088 | 0.078 | 0.107 |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# HFA53

cylincrical shank, reduced neck, 3 flutes, long reach, corner radius

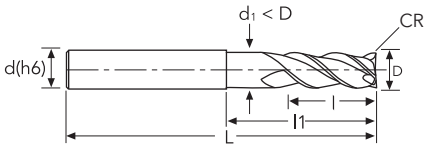
OSAWA NORM | ALU | MG / BR | 30° | RADIUS | Z3 UP




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | 0.2 | +/-0.010 | 6 | 5 | 18 | 2.80 | 60 | 3 | HFA5302030 | ● |
| **3** | 0/-0.030 | 0.5 | +/-0.010 | 6 | 5 | 18 | 2.80 | 60 | 3 | HFA5305030 | ● |
| **4** | 0/-0.030 | 0.5 | +/-0.010 | 6 | 6 | 22 | 3.80 | 60 | 3 | HFA5305040 | ● |
| **4** | 0/-0.030 | 1.0 | +/-0.010 | 6 | 6 | 22 | 3.80 | 60 | 3 | HFA5310040 | ● |
| **5** | 0/-0.030 | 0.5 | +/-0.010 | 6 | 8 | 24 | 4.80 | 60 | 3 | HFA5305050 | ● |
| **5** | 0/-0.030 | 1.0 | +/-0.010 | 6 | 8 | 24 | 4.80 | 60 | 3 | HFA5310050 | ● |
| **6** | 0/-0.030 | 0.5 | +/-0.010 | 6 | 9 | 29 | 5.80 | 65 | 3 | HFA5305060 | ● |
| **6** | 0/-0.030 | 1.0 | +/-0.010 | 6 | 9 | 29 | 5.80 | 65 | 3 | HFA5310060 | ● |
| **6** | 0/-0.030 | 2.0 | +/-0.010 | 6 | 9 | 29 | 5.80 | 65 | 3 | HFA5320060 | ● |
| **8** | 0/-0.030 | 0.5 | +/-0.010 | 8 | 12 | 39 | 7.80 | 75 | 3 | HFA5305080 | ● |
| **8** | 0/-0.030 | 1.0 | +/-0.010 | 8 | 12 | 39 | 7.80 | 75 | 3 | HFA5310080 | ● |
| **8** | 0/-0.030 | 2.0 | +/-0.010 | 8 | 12 | 39 | 7.80 | 75 | 3 | HFA5320080 | ● |
| **8** | 0/-0.030 | 3.0 | +/-0.010 | 8 | 12 | 39 | 7.80 | 75 | 3 | HFA5330080 | ● |
| **10** | 0/-0.030 | 0.5 | +/-0.010 | 10 | 15 | 52 | 9.80 | 100 | 3 | HFA5305100 | ● |
| **10** | 0/-0.030 | 1.0 | +/-0.010 | 10 | 15 | 52 | 9.80 | 100 | 3 | HFA5310100 | ● |
| **10** | 0/-0.030 | 2.0 | +/-0.010 | 10 | 15 | 52 | 9.80 | 100 | 3 | HFA5320100 | ● |
| **10** | 0/-0.030 | 3.0 | +/-0.010 | 10 | 15 | 52 | 9.80 | 100 | 3 | HFA5330100 | ● |
| **10** | 0/-0.030 | 4.0 | +/-0.010 | 10 | 15 | 52 | 9.80 | 100 | 3 | HFA5340100 | ● |
| **12** | 0/-0.030 | 0.5 | +/-0.010 | 12 | 18 | 62 | 11.80 | 120 | 3 | HFA5305120 | ● |
| **12** | 0/-0.030 | 1.0 | +/-0.010 | 12 | 18 | 62 | 11.80 | 120 | 3 | HFA5310120 | ● |
| **12** | 0/-0.030 | 2.0 | +/-0.010 | 12 | 18 | 62 | 11.80 | 120 | 3 | HFA5320120 | ● |
| **12** | 0/-0.030 | 3.0 | +/-0.010 | 12 | 18 | 62 | 11.80 | 120 | 3 | HFA5330120 | ● |
| **12** | 0/-0.030 | 4.0 | +/-0.010 | 12 | 18 | 62 | 11.80 | 120 | 3 | HFA5340120 | ● |
| **16** | 0/-0.030 | 0.5 | +/-0.010 | 16 | 24 | 82 | 15.70 | 130 | 3 | HFA5305160 | ● |
| **16** | 0/-0.030 | 1.0 | +/-0.010 | 16 | 24 | 82 | 15.70 | 130 | 3 | HFA5310160 | ● |
| **16** | 0/-0.030 | 2.0 | +/-0.010 | 16 | 24 | 82 | 15.70 | 130 | 3 | HFA5320160 | ● |
| **16** | 0/-0.030 | 3.0 | +/-0.010 | 16 | 24 | 82 | 15.70 | 130 | 3 | HFA5330160 | ● |
| **16** | 0/-0.030 | 4.0 | +/-0.010 | 16 | 24 | 82 | 15.70 | 130 | 3 | HFA5340160 | ● |
| **20** | 0/-0.030 | 0.5 | +/-0.010 | 20 | 30 | 100 | 19.70 | 150 | 3 | HFA5305200 | ● |
| **20** | 0/-0.030 | 1.0 | +/-0.010 | 20 | 30 | 100 | 19.70 | 150 | 3 | HFA5310200 | ● |
| **20** | 0/-0.030 | 2.0 | +/-0.010 | 20 | 30 | 100 | 19.70 | 150 | 3 | HFA5320200 | ● |
| **20** | 0/-0.030 | 3.0 | +/-0.010 | 20 | 30 | 100 | 19.70 | 150 | 3 | HFA5330200 | ● |
| **20** | 0/-0.030 | 4.0 | +/-0.010 | 20 | 30 | 100 | 19.70 | 150 | 3 | HFA5340200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# HFA53

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| | Vc (m/min) | 200÷500 | 150÷350 | 150÷250 | 500÷900 |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.026 | 0.022 | 0.018 | 0.029 |
| | 4 | 0.035 | 0.030 | 0.025 | 0.039 |
| | 5 | 0.044 | 0.037 | 0.031 | 0.048 |
| | 6 | 0.052 | 0.044 | 0.036 | 0.057 |
| | 8 | 0.069 | 0.058 | 0.048 | 0.076 |
| | 10 | 0.084 | 0.071 | 0.059 | 0.092 |
| | 12 | 0.096 | 0.082 | 0.067 | 0.106 |
| | 14 | 0.112 | 0.095 | 0.078 | 0.123 |
| | 16 | 0.128 | 0.109 | 0.090 | 0.141 |
| | 18 | 0.141 | 0.120 | 0.099 | 0.155 |
| | 20 | 0.156 | 0.133 | 0.109 | 0.172 |

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 1.5D x 0.5D | 1.5D x 0.5D | 1.5D x 0.5D | 1.5D x 0.5D |
| | Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷900 |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.032 | 0.029 | 0.025 | 0.035 |
| | 4 | 0.042 | 0.038 | 0.034 | 0.046 |
| | 5 | 0.053 | 0.048 | 0.042 | 0.058 |
| | 6 | 0.062 | 0.056 | 0.050 | 0.069 |
| | 8 | 0.083 | 0.074 | 0.066 | 0.091 |
| | 10 | 0.101 | 0.091 | 0.081 | 0.111 |
| | 12 | 0.115 | 0.104 | 0.092 | 0.127 |
| | 14 | 0.134 | 0.121 | 0.108 | 0.148 |
| | 16 | 0.154 | 0.138 | 0.123 | 0.169 |
| | 18 | 0.169 | 0.152 | 0.135 | 0.186 |
| | 20 | 0.187 | 0.168 | 0.150 | 0.206 |

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 8° x 0.5D | 5° x 0.5D | 5° x 0.5D | 8° x 0.5D |
| | Vc (m/min) | 200÷500 | 150÷350 | 200÷400 | 500÷900 |
| HELICAL | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.018 | 0.016 | 0.013 | 0.020 |
| | 4 | 0.024 | 0.022 | 0.018 | 0.027 |
| | 5 | 0.030 | 0.027 | 0.022 | 0.033 |
| | 6 | 0.036 | 0.032 | 0.027 | 0.040 |
| | 8 | 0.048 | 0.043 | 0.035 | 0.052 |
| | 10 | 0.058 | 0.052 | 0.043 | 0.064 |
| | 12 | 0.066 | 0.059 | 0.049 | 0.073 |
| | 14 | 0.077 | 0.069 | 0.057 | 0.085 |
| | 16 | 0.088 | 0.079 | 0.065 | 0.097 |
| | 18 | 0.097 | 0.087 | 0.072 | 0.107 |
| | 20 | 0.108 | 0.097 | 0.080 | 0.119 |

INFO
CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA
HSS DRILLS
LFTA
SUTA
HSS-HSS/CO
CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH
HSS END-MILLS
CARBIDE BURRS

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

# HFA53




| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|
| Hardness/Rm | | | | |
| ap x ae | 15° x D | 10° x D | 7° x D | 15° x D |
| Vc (m/min) | 200÷500 | 150÷350 | 200÷400 | 500÷900 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.018 | 0.014 | 0.013 | 0.019 |
| 4 | 0.023 | 0.018 | 0.017 | 0.026 |
| 5 | 0.029 | 0.023 | 0.022 | 0.032 |
| 6 | 0.035 | 0.027 | 0.025 | 0.038 |
| 8 | 0.046 | 0.036 | 0.034 | 0.050 |
| 10 | 0.056 | 0.044 | 0.041 | 0.061 |
| 12 | 0.064 | 0.050 | 0.047 | 0.070 |
| 14 | 0.074 | 0.058 | 0.055 | 0.082 |
| 16 | 0.085 | 0.067 | 0.063 | 0.094 |
| 18 | 0.094 | 0.073 | 0.069 | 0.103 |
| 20 | 0.104 | 0.081 | 0.076 | 0.114 |




| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|
| Hardness/Rm | | | | |
| ap x ae | D x 0.4D | D x 0.4D | D x 0.4D | D x 0.4D |
| Vc (m/min) | 200÷500 | 150÷350 | 150÷250 | 500÷900 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.026 | 0.024 | 0.021 | 0.029 |
| 4 | 0.035 | 0.032 | 0.028 | 0.039 |
| 5 | 0.044 | 0.040 | 0.035 | 0.048 |
| 6 | 0.052 | 0.047 | 0.042 | 0.057 |
| 8 | 0.069 | 0.062 | 0.055 | 0.076 |
| 10 | 0.084 | 0.076 | 0.067 | 0.092 |
| 12 | 0.096 | 0.086 | 0.077 | 0.106 |
| 14 | 0.112 | 0.101 | 0.090 | 0.123 |
| 16 | 0.128 | 0.115 | 0.102 | 0.141 |
| 18 | 0.141 | 0.127 | 0.113 | 0.155 |
| 20 | 0.156 | 0.140 | 0.125 | 0.172 |




| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|
| Hardness/Rm | | | | |
| ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| Vc (m/min) | 230÷330 | 150÷250 | 110÷210 | 510÷610 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.013 | 0.012 | 0.011 | 0.015 |
| 4 | 0.018 | 0.016 | 0.014 | 0.019 |
| 5 | 0.022 | 0.020 | 0.018 | 0.024 |
| 6 | 0.026 | 0.023 | 0.021 | 0.029 |
| 8 | 0.034 | 0.031 | 0.028 | 0.038 |
| 10 | 0.042 | 0.038 | 0.034 | 0.046 |
| 12 | 0.048 | 0.043 | 0.038 | 0.053 |
| 14 | 0.056 | 0.050 | 0.045 | 0.062 |
| 16 | 0.064 | 0.058 | 0.051 | 0.070 |
| 18 | 0.070 | 0.063 | 0.056 | 0.077 |
| 20 | 0.078 | 0.070 | 0.062 | 0.086 |

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

# MDCSA1

cylindrical shank, 1 flute, polished

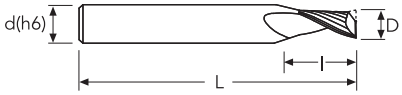
OSAWA NORM | ALU | MG POLISHED | 25° | SQUARE | Z1



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.015 | | | 2 | 10 | | 40 | 1 | MDCSA1020 | ● |
| **3** | 0/-0.020 | | | 3 | 12 | | 40 | 1 | MDCSA1030 | ● |
| **4** | 0/-0.020 | | | 4 | 15 | | 50 | 1 | MDCSA1040 | ● |
| **5** | 0/-0.020 | | | 5 | 16 | | 50 | 1 | MDCSA1050 | ● |
| **6** | 0/-0.020 | | | 6 | 20 | | 60 | 1 | MDCSA1060 | ● |
| **8** | 0/-0.020 | | | 8 | 22 | | 63 | 1 | MDCSA1080 | ● |
| **10** | 0/-0.020 | | | 10 | 25 | | 72 | 1 | MDCSA1100 | ● |
| **12** | 0/-0.020 | | | 12 | 30 | | 83 | 1 | MDCSA1120 | ● |

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
**ALU**
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

CUTTING PARAMETERS

# MDCSA1

SLOTTING

| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|
| Hardness/Rm | | | | |
| ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 400÷600 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 2 | 0.023 | 0.019 | 0.016 | 0.023 |
| 3 | 0.030 | 0.026 | 0.021 | 0.030 |
| 4 | 0.039 | 0.033 | 0.027 | 0.039 |
| 5 | 0.049 | 0.041 | 0.034 | 0.049 |
| 6 | 0.058 | 0.049 | 0.040 | 0.058 |
| 8 | 0.079 | 0.067 | 0.055 | 0.079 |
| 10 | 0.098 | 0.083 | 0.068 | 0.098 |
| 12 | 0.116 | 0.099 | 0.081 | 0.116 |

< D3 ap x ae D x 0.25D

SIDE MILLING

| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|
| Hardness/Rm | | | | |
| ap x ae | D x 0.5D | D x 0.5D | D x 0.5D | D x 0.5D |
| Vc (m/min) | 300÷600 | 200÷500 | 200÷400 | 400÷800 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 2 | 0.030 | 0.026 | 0.021 | 0.030 |
| 3 | 0.040 | 0.034 | 0.028 | 0.040 |
| 4 | 0.052 | 0.044 | 0.036 | 0.052 |
| 5 | 0.065 | 0.055 | 0.046 | 0.065 |
| 6 | 0.077 | 0.065 | 0.054 | 0.077 |
| 8 | 0.105 | 0.089 | 0.074 | 0.105 |
| 10 | 0.130 | 0.111 | 0.091 | 0.130 |
| 12 | 0.155 | 0.132 | 0.109 | 0.155 |

< D3 ap x ae D x 0.25D

DRILLING

| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|
| Hardness/Rm | | | | |
| ap x ae | D x D | D x D | D x D | 0.5D x D |
| Vc (m/min) | 300÷400 | 150÷350 | 100÷300 | 300÷500 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 2 | 0.011 | 0.010 | 0.008 | 0.011 |
| 3 | 0.015 | 0.013 | 0.011 | 0.015 |
| 4 | 0.020 | 0.017 | 0.014 | 0.020 |
| 5 | 0.024 | 0.021 | 0.017 | 0.024 |
| 6 | 0.029 | 0.025 | 0.020 | 0.029 |
| 8 | 0.039 | 0.033 | 0.028 | 0.039 |
| 10 | 0.049 | 0.041 | 0.034 | 0.049 |
| 12 | 0.058 | 0.049 | 0.041 | 0.058 |

< D3 ap x ae 0.5D x D

# MDCSA2

cylindrical shank, 2 flutes, polished

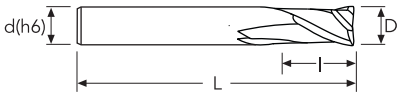
OSAWA NORM | ALU | MG POLISHED | 45° | SQUARE | Z2



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.015 | | | 4 | 3 | | 40 | 2 | MDCSA2010 | ● |
| **1.5** | 0/-0.015 | | | 4 | 4.5 | | 40 | 2 | MDCSA2015 | ● |
| **2** | 0/-0.015 | | | 4 | 6.5 | | 40 | 2 | MDCSA2020 | ● |
| **2.5** | 0/-0.020 | | | 4 | 6.5 | | 40 | 2 | MDCSA2025 | ● |
| **3** | 0/-0.030 | | | 6 | 8 | | 57 | 2 | MDCSA2030 | ● |
| **4** | 0/-0.030 | | | 6 | 11 | | 57 | 2 | MDCSA2040 | ● |
| **5** | 0/-0.030 | | | 6 | 13 | | 57 | 2 | MDCSA2050 | ● |
| **6** | 0/-0.030 | | | 6 | 13 | | 57 | 2 | MDCSA2060 | ● |
| **8** | 0/-0.030 | | | 8 | 19 | | 63 | 2 | MDCSA2080 | ● |
| **10** | 0/-0.030 | | | 10 | 22 | | 72 | 2 | MDCSA2100 | ● |
| **12** | 0/-0.030 | | | 12 | 26 | | 83 | 2 | MDCSA2120 | ● |
| **14** | 0/-0.030 | | | 14 | 26 | | 83 | 2 | MDCSA2140 | ● |
| **16** | 0/-0.030 | | | 16 | 32 | | 92 | 2 | MDCSA2160 | ● |
| **18** | 0/-0.030 | | | 18 | 32 | | 92 | 2 | MDCSA2180 | ● |
| **20** | 0/-0.030 | | | 20 | 38 | | 104 | 2 | MDCSA2200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

CUTTING PARAMETERS

# MDCSA2

| SLOTTING | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| | Vc (m/min) | 300÷600 | 150÷350 | 150÷250 | 500÷900 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 1 | 0.011 | 0.010 | 0.008 | 0.011 |
| | 1.5 | 0.017 | 0.014 | 0.012 | 0.017 |
| | 2 | 0.022 | 0.019 | 0.016 | 0.022 |
| | 3 | 0.028 | 0.024 | 0.020 | 0.028 |
| | 4 | 0.038 | 0.032 | 0.026 | 0.038 |
| | 5 | 0.047 | 0.040 | 0.033 | 0.047 |
| | 6 | 0.056 | 0.048 | 0.039 | 0.056 |
| | 8 | 0.075 | 0.064 | 0.052 | 0.075 |
| | 10 | 0.094 | 0.080 | 0.066 | 0.094 |
| | 12 | 0.112 | 0.095 | 0.078 | 0.112 |
| | 14 | 0.130 | 0.111 | 0.091 | 0.130 |
| | 16 | 0.148 | 0.126 | 0.103 | 0.148 |
| | 18 | 0.166 | 0.141 | 0.116 | 0.166 |
| | 20 | 0.185 | 0.157 | 0.129 | 0.185 |

< D3 ap x ae 0.25D x D

| SIDE MILLING | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | D x 0.5D | D x 0.5D | D x 0.5D | D x 0.5D |
| | Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷1000 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 1 | 0.013 | 0.011 | 0.009 | 0.013 |
| | 1.5 | 0.020 | 0.017 | 0.014 | 0.020 |
| | 2 | 0.027 | 0.023 | 0.019 | 0.027 |
| | 3 | 0.034 | 0.029 | 0.024 | 0.034 |
| | 4 | 0.045 | 0.038 | 0.032 | 0.045 |
| | 5 | 0.056 | 0.048 | 0.040 | 0.056 |
| | 6 | 0.068 | 0.057 | 0.047 | 0.068 |
| | 8 | 0.090 | 0.076 | 0.063 | 0.090 |
| | 10 | 0.112 | 0.096 | 0.079 | 0.112 |
| | 12 | 0.134 | 0.114 | 0.094 | 0.134 |
| | 14 | 0.157 | 0.133 | 0.110 | 0.157 |
| | 16 | 0.177 | 0.151 | 0.124 | 0.177 |
| | 18 | 0.200 | 0.170 | 0.140 | 0.200 |
| | 20 | 0.222 | 0.188 | 0.155 | 0.222 |

< D3 ap x ae D x 0.5D

# MDCSA2

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| | Vc (m/min) | 200÷400 | 150÷350 | 150÷350 | 500÷900 |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 1 | 0.006 | 0.005 | 0.004 | 0.006 |
| | 1.5 | 0.008 | 0.007 | 0.006 | 0.008 |
| | 2 | 0.011 | 0.010 | 0.008 | 0.011 |
| | 3 | 0.014 | 0.012 | 0.010 | 0.014 |
| | 4 | 0.019 | 0.016 | 0.013 | 0.019 |
| | 5 | 0.024 | 0.020 | 0.016 | 0.024 |
| | 6 | 0.028 | 0.024 | 0.020 | 0.028 |
| | 8 | 0.037 | 0.032 | 0.026 | 0.037 |
| | 10 | 0.047 | 0.040 | 0.033 | 0.047 |
| | 12 | 0.056 | 0.048 | 0.039 | 0.056 |
| | 14 | 0.065 | 0.055 | 0.046 | 0.065 |
| | 16 | 0.074 | 0.063 | 0.052 | 0.074 |
| | 18 | 0.083 | 0.071 | 0.058 | 0.083 |
| | 20 | 0.092 | 0.079 | 0.065 | 0.092 |

< D3 ap x ae 0.25D x D

# MDCSA3

cylindrical shank, 3 flutes, polished

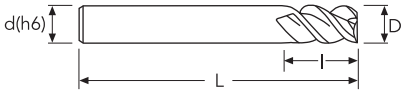
OSAWA NORM | ALU | MG POLISHED | 55° | SQUARE | Z3



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | | | 4 | 3 | | 50 | 3 | MDCSA3010 | ● |
| **1.5** | 0/-0.020 | | | 4 | 4.5 | | 50 | 3 | MDCSA3015 | ● |
| **2** | 0/-0.020 | | | 4 | 6 | | 50 | 3 | MDCSA3020 | ● |
| **3** | 0/-0.020 | | | 4 | 8 | | 50 | 3 | MDCSA3030 | ● |
| **4** | 0/-0.020 | | | 4 | 11 | | 50 | 3 | MDCSA3040 | ● |
| **5** | 0/-0.020 | | | 6 | 13 | | 50 | 3 | MDCSA3050 | ● |
| **6** | 0/-0.020 | | | 6 | 15 | | 50 | 3 | MDCSA3060 | ● |
| **8** | 0/-0.025 | | | 8 | 20 | | 60 | 3 | MDCSA3080 | ● |
| **10** | 0/-0.025 | | | 10 | 25 | | 75 | 3 | MDCSA3100 | ● |
| **12** | 0/-0.025 | | | 12 | 30 | | 75 | 3 | MDCSA3120 | ● |
| **16** | 0/-0.030 | | | 16 | 40 | | 100 | 3 | MDCSA3160 | ● |
| **20** | 0/-0.030 | | | 20 | 40 | | 100 | 3 | MDCSA3200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# MDCSA3

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| | Vc (m/min) | 200÷600 | 150÷350 | 150÷250 | 500÷900 |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 1 | 0.010 | 0.009 | 0.007 | 0.010 |
| | 1.5 | 0.015 | 0.013 | 0.011 | 0.015 |
| | 2 | 0.020 | 0.017 | 0.014 | 0.020 |
| | 3 | 0.025 | 0.022 | 0.018 | 0.025 |
| | 4 | 0.034 | 0.029 | 0.024 | 0.034 |
| | 5 | 0.042 | 0.036 | 0.030 | 0.042 |
| | 6 | 0.051 | 0.043 | 0.035 | 0.051 |
| | 8 | 0.067 | 0.057 | 0.047 | 0.067 |
| | 10 | 0.084 | 0.072 | 0.059 | 0.084 |
| | 12 | 0.101 | 0.086 | 0.071 | 0.101 |
| | 14 | 0.117 | 0.100 | 0.082 | 0.117 |
| | 16 | 0.133 | 0.113 | 0.093 | 0.133 |
| | 18 | 0.150 | 0.127 | 0.105 | 0.150 |
| | 20 | 0.166 | 0.141 | 0.116 | 0.166 |

< D3 ap x ae 0.25D x D

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 1.5D x 0.3D | 1.5D x 0.3D | 1.5D x 0.3D | 1.5D x 0.3D |
| | Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷1000 |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 1 | 0.012 | 0.010 | 0.008 | 0.012 |
| | 1.5 | 0.018 | 0.015 | 0.013 | 0.018 |
| | 2 | 0.024 | 0.021 | 0.017 | 0.024 |
| | 3 | 0.030 | 0.026 | 0.021 | 0.030 |
| | 4 | 0.041 | 0.034 | 0.028 | 0.041 |
| | 5 | 0.051 | 0.043 | 0.036 | 0.051 |
| | 6 | 0.061 | 0.052 | 0.043 | 0.061 |
| | 8 | 0.081 | 0.069 | 0.057 | 0.081 |
| | 10 | 0.101 | 0.086 | 0.071 | 0.101 |
| | 12 | 0.121 | 0.103 | 0.085 | 0.121 |
| | 14 | 0.141 | 0.120 | 0.099 | 0.141 |
| | 16 | 0.160 | 0.136 | 0.112 | 0.160 |
| | 18 | 0.180 | 0.153 | 0.126 | 0.180 |
| | 20 | 0.200 | 0.170 | 0.140 | 0.200 |

< D3 ap x ae D x 0.1D

# MDA310-11-12

cylindrical shank, 3 flutes polished, long

OSAWA NORM | ALU | MG POLISHED | 55° | SQUARE | Z3



MDA310

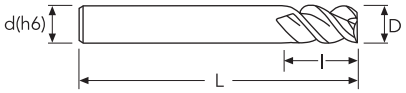


MDA311 - MDA312

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | | | 6 | 12 | | 75 | 3 | MDA310030 | ● |
| **4** | 0/-0.030 | | | 6 | 16 | | 75 | 3 | MDA310040 | ● |
| **5** | 0/-0.030 | | | 6 | 20 | | 75 | 3 | MDA310050 | ● |
| **6** | 0/-0.030 | | | 6 | 25 | | 75 | 3 | MDA310060 | ● |
| | | | | | | | | | | |
| **3** | 0/-0.030 | | | 6 | 15 | | 100 | 3 | MDA311030 | ● |
| **4** | 0/-0.030 | | | 6 | 20 | | 100 | 3 | MDA311040 | ● |
| **5** | 0/-0.030 | | | 6 | 25 | | 100 | 3 | MDA311050 | ● |
| **6** | 0/-0.030 | | | 6 | 30 | | 100 | 3 | MDA311060 | ● |
| **8** | 0/-0.035 | | | 8 | 35 | | 100 | 3 | MDA311080 | ● |
| **10** | 0/-0.035 | | | 10 | 40 | | 100 | 3 | MDA311100 | ● |
| **12** | 0/-0.035 | | | 12 | 45 | | 100 | 3 | MDA311120 | ● |
| | | | | | | | | | | |
| **8** | 0/-0.035 | | | 8 | 40 | | 150 | 3 | MDA312080 | ● |
| **10** | 0/-0.035 | | | 10 | 50 | | 150 | 3 | MDA312100 | ● |
| **12** | 0/-0.035 | | | 12 | 50 | | 150 | 3 | MDA312120 | ● |
| **16** | 0/-0.040 | | | 16 | 70 | | 150 | 3 | MDA312160 | ● |
| **20** | 0/-0.040 | | | 20 | 80 | | 150 | 3 | MDA312200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

## MDA310

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 0.3D x D | 0.3D x D | 0.3D x D | 0.3D x D |
| SLOTTING | Vc (m/min) | 220÷340 | 150÷250 | 100÷200 | 400÷700 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.023 | 0.019 | 0.016 | 0.023 |
| | 4 | 0.030 | 0.026 | 0.021 | 0.030 |
| | 5 | 0.038 | 0.032 | 0.027 | 0.038 |
| | 6 | 0.046 | 0.039 | 0.032 | 0.046 |

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 1.5D x 0.1D | 1.5D x 0.1D | 1.5D x 0.1D | 1.5D x 0.1D |
| SIDE MILLING | Vc (m/min) | 270÷370 | 200÷300 | 150÷250 | 500÷800 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.027 | 0.023 | 0.019 | 0.027 |
| | 4 | 0.036 | 0.031 | 0.026 | 0.036 |
| | 5 | 0.046 | 0.039 | 0.032 | 0.046 |
| | 6 | 0.055 | 0.047 | 0.038 | 0.055 |

## MDA311

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 0.3D x D | 0.3D x D | 0.3D x D | 0.3D x D |
| SLOTTING | Vc (m/min) | 180÷280 | 110÷210 | 100÷160 | 350÷550 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.019 | 0.016 | 0.013 | 0.019 |
| | 4 | 0.025 | 0.022 | 0.018 | 0.025 |
| | 5 | 0.032 | 0.027 | 0.022 | 0.032 |
| | 6 | 0.038 | 0.032 | 0.027 | 0.038 |
| | 8 | 0.051 | 0.043 | 0.035 | 0.051 |
| | 10 | 0.063 | 0.054 | 0.044 | 0.063 |
| | 12 | 0.076 | 0.064 | 0.053 | 0.076 |

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 2D x0.05D | 2D x0.05D | 2D x0.05D | 2D x0.05D |
| SIDE MILLING | Vc (m/min) | 210÷310 | 150÷250 | 110÷210 | 420÷620 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.023 | 0.019 | 0.016 | 0.023 |
| | 4 | 0.030 | 0.026 | 0.021 | 0.030 |
| | 5 | 0.038 | 0.032 | 0.027 | 0.038 |
| | 6 | 0.046 | 0.039 | 0.032 | 0.046 |
| | 8 | 0.061 | 0.052 | 0.042 | 0.061 |
| | 10 | 0.076 | 0.064 | 0.053 | 0.076 |
| | 12 | 0.091 | 0.077 | 0.064 | 0.091 |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
**ALU**
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

CUTTING PARAMETERS

# MDA312

| SLOTTING | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 0.1D x D | 0.1D x D | 0.1D x D | 0.1D x D |
| | Vc (m/min) | 130÷230 | 100÷160 | 80÷120 | 250÷450 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 8 | 0.040 | 0.034 | 0.028 | 0.040 |
| | 10 | 0.051 | 0.043 | 0.035 | 0.051 |
| | 12 | 0.060 | 0.051 | 0.042 | 0.060 |
| | 16 | 0.080 | 0.068 | 0.056 | 0.080 |
| | 20 | 0.100 | 0.085 | 0.070 | 0.100 |

| SIDE MILLING | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 2.5D x 0.05D | 2.5D x 0.05D | 2.5D x 0.05D | 2.5D x 0.05D |
| | Vc (m/min) | 150÷250 | 100÷200 | 100÷160 | 300÷500 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 8 | 0.048 | 0.041 | 0.034 | 0.048 |
| | 10 | 0.061 | 0.052 | 0.042 | 0.061 |
| | 12 | 0.073 | 0.062 | 0.051 | 0.073 |
| | 16 | 0.096 | 0.081 | 0.067 | 0.096 |
| | 20 | 0.120 | 0.102 | 0.084 | 0.120 |

OSAWA

# MDCSAM

cylindrical shank, 6F, polished

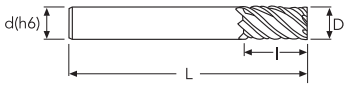
OSAWA NORM | ALU | MG POLISHED | 50° | SQUARE | Z6



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.020 | | | 6 | 15 | | 57 | 6 | MDCSAM060 | ● |
| **8** | 0/-0.020 | | | 8 | 20 | | 64 | 6 | MDCSAM080 | ● |
| **10** | 0/-0.020 | | | 10 | 22 | | 75 | 6 | MDCSAM100 | ● |
| **12** | 0/-0.020 | | | 12 | 25 | | 75 | 6 | MDCSAM120 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO
CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA
HSS DRILLS
LFTA
SUTA
HSS-HSS/CO
CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH
HSS END-MILLS
CARBIDE BURRS

CUTTING PARAMETERS

# MDCSAM

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 1.5D x 0.05D | 1.5D x 0.05D | 1.5D x 0.05D | 1.5D x 0.05D |
| SIDE MILLING | Vc (m/min) | 600÷1000 | 400÷800 | 300÷700 | 900÷1300 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.050 | 0.043 | 0.035 | 0.050 |
| | **8** | 0.067 | 0.057 | 0.047 | 0.067 |
| | **10** | 0.084 | 0.071 | 0.059 | 0.084 |
| | **12** | 0.100 | 0.085 | 0.070 | 0.100 |
| | **20** | 0.120 | 0.102 | 0.084 | 0.120 |

# MCA212R

cylindrical shank, 2 flutes, corner radius

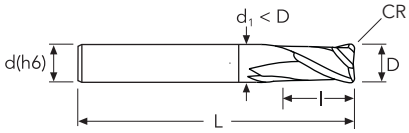
OSAWA NORM | ALU | MG PV200 | 25° | RADIUS | Z2




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.030 | 0.20 | +/-0.020 | 3 | 3 | 6 | 1.90 | 40 | 2 | MCA212R02020 | ● |
| **3** | 0/-0.030 | 0.20 | +/-0.020 | 3 | 4 | 8 | 2.80 | 40 | 2 | MCA212R02030 | ● |
| **4** | 0/-0.030 | 0.20 | +/-0.020 | 4 | 5 | 12 | 3.70 | 50 | 2 | MCA212R02040 | ● |
| **5** | 0/-0.030 | 0.20 | +/-0.020 | 5 | 8 | 14 | 4.80 | 50 | 2 | MCA212R02050 | ● |
| **6** | 0/-0.030 | 0.20 | +/-0.020 | 6 | 8 | 18 | 5.50 | 65 | 2 | MCA212R02060 | ● |
| **8** | 0/-0.030 | 0.20 | +/-0.020 | 8 | 10 | 22 | 7.40 | 70 | 2 | MCA212R02080 | ● |
| **10** | 0/-0.030 | 0.20 | +/-0.020 | 10 | 14 | 28 | 9.70 | 80 | 2 | MCA212R02100 | ● |
| **12** | 0/-0.030 | 0.20 | +/-0.020 | 12 | 16 | 35 | 11.00 | 90 | 2 | MCA212R02120 | ● |

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
**ALU**
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# MCA212R

| SLOTTING | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| | Vc (m/min) | 200÷600 | 200÷400 | 150÷350 | 600÷1000 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 2 | 0.030 | 0.025 | 0.021 | 0.033 |
| | 3 | 0.040 | 0.034 | 0.028 | 0.044 |
| | 4 | 0.050 | 0.042 | 0.035 | 0.054 |
| | 5 | 0.059 | 0.050 | 0.041 | 0.064 |
| | 6 | 0.077 | 0.066 | 0.054 | 0.085 |
| | 8 | 0.095 | 0.080 | 0.066 | 0.104 |
| | 10 | 0.108 | 0.092 | 0.076 | 0.119 |
| | 12 | 0.126 | 0.107 | 0.088 | 0.139 |

< D3 ap x ae 0.25D x D

| SIDE MILLING | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | D x 0.5D | D x 0.5D | D x 0.5D | D x 0.5D |
| | Vc (m/min) | 300÷600 | 250÷450 | 200÷400 | 600÷1000 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 2 | 0.027 | 0.023 | 0.019 | 0.027 |
| | 3 | 0.034 | 0.029 | 0.024 | 0.034 |
| | 4 | 0.045 | 0.038 | 0.032 | 0.045 |
| | 5 | 0.056 | 0.048 | 0.040 | 0.056 |
| | 6 | 0.068 | 0.057 | 0.047 | 0.068 |
| | 8 | 0.090 | 0.076 | 0.063 | 0.090 |
| | 10 | 0.112 | 0.096 | 0.079 | 0.112 |
| | 12 | 0.134 | 0.114 | 0.094 | 0.134 |

< D3 ap x ae D x 0.5D

# MDCAB2

cylindrical shank, 2 flutes ball nose, polished

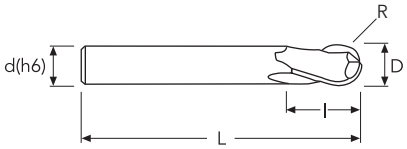
OSAWA NORM | ALU | MG POLISHED | 40° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | 0.50 | +/-0.010 | 4 | 2 | | 50 | 2 | MDCAB2010 | ● |
| **1.5** | 0/-0.020 | 0.75 | +/-0.010 | 4 | 3 | | 50 | 2 | MDCAB2015 | ● |
| **2** | 0/-0.020 | 1.00 | +/-0.010 | 4 | 4 | | 50 | 2 | MDCAB2020 | ● |
| **3** | 0/-0.020 | 1.50 | +/-0.010 | 4 | 6 | | 50 | 2 | MDCAB2030 | ● |
| **4** | 0/-0.020 | 2.00 | +/-0.010 | 4 | 8 | | 50 | 2 | MDCAB2040 | ● |
| **5** | 0/-0.020 | 2.50 | +/-0.010 | 6 | 10 | | 50 | 2 | MDCAB2050 | ● |
| **6** | 0/-0.020 | 3.00 | +/-0.010 | 6 | 12 | | 50 | 2 | MDCAB2060 | ● |
| **8** | 0/-0.025 | 4.00 | +/-0.010 | 8 | 16 | | 60 | 2 | MDCAB2080 | ● |
| **10** | 0/-0.025 | 5.00 | +/-0.010 | 10 | 20 | | 75 | 2 | MDCAB2100 | ● |
| **12** | 0/-0.025 | 6.00 | +/-0.010 | 12 | 24 | | 75 | 2 | MDCAB2120 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# MDCAB2

| | Material Group ISO 513 | | N1 | N2 N3 | N4 | N5 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | | |
| | ap x ae | | 0.2D x 0.4D | 0.2D x 0.4D | 0.2D x 0.4D | 0.2D x 0.4D |
| | Vc (m/min) | | 200÷600 | 250÷450 | 200÷400 | 600÷1000 |
| COPYING | D (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 1 | 0.80 | 0.013 | 0.011 | 0.010 | 0.013 |
| | 1.5 | 1.20 | 0.017 | 0.015 | 0.013 | 0.017 |
| | 2 | 1.60 | 0.017 | 0.015 | 0.013 | 0.017 |
| | 2.5 | 2.00 | 0.021 | 0.019 | 0.017 | 0.021 |
| | 3 | 2.40 | 0.025 | 0.023 | 0.020 | 0.025 |
| | 4 | 3.20 | 0.035 | 0.032 | 0.028 | 0.035 |
| | 5 | 4.00 | 0.045 | 0.040 | 0.036 | 0.045 |
| | 6 | 4.80 | 0.053 | 0.048 | 0.043 | 0.053 |
| | 8 | 6.40 | 0.067 | 0.060 | 0.054 | 0.067 |
| | 10 | 8.00 | 0.080 | 0.072 | 0.064 | 0.080 |
| | 12 | 9.60 | 0.094 | 0.084 | 0.075 | 0.094 |



# MEX AND MH

STEEL AND HARDENED STEEL
30÷55 HRC (MEX) AND 30÷70 HRC (MH)

MEX: Ultra-fine micrograin and Endless Orange coating for high perfromance machining on 30÷55 HRC materials.
MH: Wide range of tools available for general milling, copying and super finishing (30÷70 HRC).

MEX: Micrograna ultrafine e rivestimento Endless Orange per lavorazione ad alto rendimento di materiali con durezza compresa tra 30÷55 HRC.
MH: Ampia gamma per soddisfare applicazioni di copiatura e super finitura (30÷70 HRC).

MEX: Besonders feine Mikrokörnung und Beschichtung Endless Orange für Hochleistungsbearbeitungen von Materialien mit einer Härte zwischen 30 und 55 HRC.
MH: Große Produktpalette für Anwendungen zum Fräsen im Allgemeinen, Kopierfräsen und Schlichtbearbeitung (30÷70 HRC).

MEX: Ultra Micrograin et revêtement Endless Orange pour un usinage à rendement élevé de matériaux ayant une dureté comprise entre 30÷55 HRC.
MH: Une large gamme pour satisfaire les applications de fraisage général, copiage et super finition (30÷70 HRC).

MEX: Micrograno ultrafino y revestimiento Endless Orange para el mecanizado a alto rendimiento de materiales con una dureza comprendida entre 30 y 55 HRC.
MH: Amplia gama para satisfacer aplicaciones de fresado general, copiado y súper acabado (30÷70 HRC).

MEX: Микрозернистая структура твердого сплава и покрытие Endless Orange служат для высокоэффективной обработки материалов с твёрдостью 30÷55 HRC.
MH: Широкий ассортимент для профилированной и суперфинишной обработки (30 ÷ 70 HRC).

# MEXM2

cylindrical shank, 2 flutes, miniature

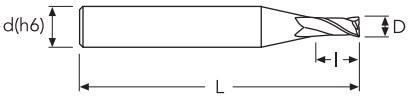
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | SQUARE | Z2



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SLOTTING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **0.3** | 0/-0.010 | | | 4 | 0.6 | | 40 | 2 | MEXM20030 | ● |
| **0.4** | 0/-0.010 | | | 4 | 0.8 | | 40 | 2 | MEXM20040 | ● |
| **0.5** | 0/-0.010 | | | 4 | 1 | | 40 | 2 | MEXM20050 | ● |
| **0.6** | 0/-0.010 | | | 4 | 1.2 | | 40 | 2 | MEXM20060 | ● |
| **0.7** | 0/-0.010 | | | 4 | 1.4 | | 40 | 2 | MEXM20070 | ● |
| **0.8** | 0/-0.010 | | | 4 | 1.6 | | 40 | 2 | MEXM20080 | ● |
| **0.9** | 0/-0.010 | | | 4 | 1.8 | | 40 | 2 | MEXM20090 | ● |
| **1** | 0/-0.015 | | | 3 | 2 | | 40 | 2 | MEXM20100 | ● |
| **1.1** | 0/-0.015 | | | 3 | 2.2 | | 40 | 2 | MEXM20110 | ● |
| **1.2** | 0/-0.015 | | | 3 | 2.4 | | 40 | 2 | MEXM20120 | ● |
| **1.3** | 0/-0.015 | | | 3 | 2.6 | | 40 | 2 | MEXM20130 | ● |
| **1.4** | 0/-0.015 | | | 3 | 2.8 | | 40 | 2 | MEXM20140 | ● |
| **1.5** | 0/-0.015 | | | 3 | 3 | | 40 | 2 | MEXM20150 | ● |
| **1.6** | 0/-0.015 | | | 3 | 3.2 | | 40 | 2 | MEXM20160 | ● |
| **1.7** | 0/-0.015 | | | 3 | 3.4 | | 40 | 2 | MEXM20170 | ● |
| **1.8** | 0/-0.015 | | | 3 | 3.6 | | 40 | 2 | MEXM20180 | ● |
| **1.9** | 0/-0.015 | | | 3 | 3.8 | | 40 | 2 | MEXM20190 | ● |
| **2** | 0/-0.015 | | | 3 | 4 | | 40 | 2 | MEXM20200 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

# MEXM2

| | Material Group ISO 513 | | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | | **ap x D** | **ap x D** | **ap x D** | **ap x D** |
| | Vc (m/min) | | **70÷90** | **50÷70** | **30÷50** | **20÷40** |
| | D (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| SLOTTING | **0.3** | 0.02 | 0.004 | 0.004 | 0.003 | 0.003 |
| | **0.4** | 0.02 | 0.006 | 0.005 | 0.005 | 0.004 |
| | **0.5** | 0.03 | 0.007 | 0.006 | 0.006 | 0.005 |
| | **0.6** | 0.03 | 0.008 | 0.007 | 0.006 | 0.006 |
| | **0.8** | 0.04 | 0.010 | 0.009 | 0.008 | 0.007 |
| | **1** | 0.05 | 0.012 | 0.011 | 0.010 | 0.008 |
| | **1.2** | 0.06 | 0.022 | 0.020 | 0.018 | 0.015 |
| | **1.4** | 0.07 | 0.024 | 0.022 | 0.019 | 0.017 |
| | **1.5** | 0.08 | 0.025 | 0.023 | 0.020 | 0.018 |
| | **1.6** | 0.08 | 0.026 | 0.023 | 0.021 | 0.018 |
| | **1.8** | 0.09 | 0.028 | 0.025 | 0.022 | 0.020 |
| | **2** | 0.10 | 0.030 | 0.027 | 0.024 | 0.021 |

# MEXM2SC

cylindrical shank, 2 flutes, short cutting length, miniature

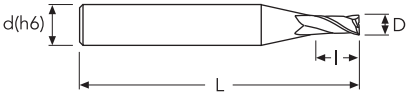
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | SQUARE | Z2



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SLOTTING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **0.2** | 0/-0.010 | | | 4 | 0.3 | | 50 | 2 | MEXM2SC0020 | ● |
| **0.3** | 0/-0.010 | | | 4 | 0.4 | | 50 | 2 | MEXM2SC0030 | ● |
| **0.4** | 0/-0.010 | | | 4 | 0.6 | | 50 | 2 | MEXM2SC0040 | ● |
| **0.5** | 0/-0.010 | | | 4 | 0.7 | | 50 | 2 | MEXM2SC0050 | ● |
| **0.6** | 0/-0.010 | | | 4 | 0.9 | | 50 | 2 | MEXM2SC0060 | ● |
| **0.7** | 0/-0.010 | | | 4 | 1 | | 50 | 2 | MEXM2SC0070 | ● |
| **0.8** | 0/-0.010 | | | 4 | 1.2 | | 50 | 2 | MEXM2SC0080 | ● |
| **0.9** | 0/-0.010 | | | 4 | 1.4 | | 50 | 2 | MEXM2SC0090 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

# MEXM2SC

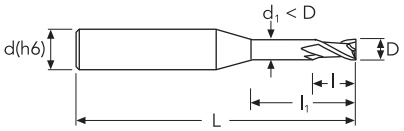
| | Material Group ISO 513 | | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | | **ap x D** | **ap x D** | **ap x D** | **ap x D** |
| | Vc (m/min) | | **70÷110** | **50÷90** | **40÷60** | **20÷40** |
| SLOTTING | D (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **0.2** | 0.01 | 0.003 | 0.003 | 0.002 | 0.002 |
| | **0.3** | 0.02 | 0.004 | 0.004 | 0.003 | 0.003 |
| | **0.4** | 0.02 | 0.006 | 0.005 | 0.005 | 0.004 |
| | **0.5** | 0.03 | 0.007 | 0.006 | 0.006 | 0.005 |
| | **0.6** | 0.03 | 0.008 | 0.007 | 0.006 | 0.006 |
| | **0.8** | 0.04 | 0.010 | 0.009 | 0.008 | 0.007 |
| | **0.9** | 0.05 | 0.012 | 0.011 | 0.010 | 0.008 |

# MEXLN2

cylindrical shank, 2 flutes, extended and reduced neck

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | SQUARE | Z2

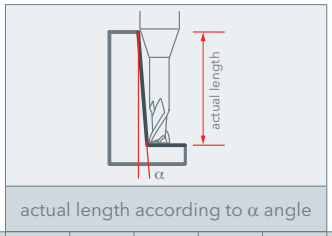





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | C | C Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.2** | 0/-0.010 | | | 4 | 0.3 | 0.5 | 0.16 | 50 | 2 | 0.57 | 0.59 | 0.61 | 0.63 | 0.68 | MEXLN2002005 | ● |
| **0.2** | 0/-0.010 | | | 4 | 0.3 | 1 | 0.16 | 50 | 2 | 1.09 | 1.12 | 1.16 | 1.21 | 1.30 | MEXLN200201 | ● |
| **0.2** | 0/-0.010 | | | 4 | 0.3 | 1.5 | 0.16 | 50 | 2 | 1.60 | 1.66 | 1.72 | 1.78 | 1.91 | MEXLN2002015 | ● |
| **0.3** | 0/-0.010 | | | 4 | 0.4 | 1 | 0.26 | 50 | 2 | 1.09 | 1.12 | 1.16 | 1.21 | 1.30 | MEXLN200301 | ● |
| **0.3** | 0/-0.010 | | | 4 | 0.4 | 2 | 0.26 | 50 | 2 | 2.12 | 2.19 | 2.27 | 2.35 | 2.53 | MEXLN200302 | ● |
| **0.3** | 0/-0.010 | | | 4 | 0.4 | 3 | 0.26 | 50 | 2 | 3.15 | 3.26 | 3.38 | 3.50 | 3.76 | MEXLN200303 | ● |
| **0.4** | 0/-0.010 | | | 4 | 0.6 | 2 | 0.37 | 50 | 2 | 2.12 | 2.19 | 2.27 | 2.35 | 2.53 | MEXLN200402 | ● |
| **0.4** | 0/-0.010 | | | 4 | 0.6 | 3 | 0.37 | 50 | 2 | 3.15 | 3.26 | 3.38 | 3.50 | 3.76 | MEXLN200403 | ● |
| **0.4** | 0/-0.010 | | | 4 | 0.6 | 4 | 0.37 | 50 | 2 | 4.19 | 4.33 | 4.49 | 4.65 | 5.00 | MEXLN200404 | ● |
| **0.4** | 0/-0.010 | | | 4 | 0.6 | 5 | 0.37 | 50 | 2 | 5.22 | 5.40 | 5.59 | 5.79 | 6.23 | MEXLN200405 | ● |
| **0.5** | 0/-0.010 | | | 4 | 0.7 | 2 | 0.45 | 50 | 2 | 2.16 | 2.23 | 2.31 | 2.40 | 2.57 | MEXLN200502 | ● |
| **0.5** | 0/-0.010 | | | 4 | 0.7 | 4 | 0.45 | 50 | 2 | 4.23 | 4.37 | 4.53 | 4.69 | 5.04 | MEXLN200504 | ● |
| **0.5** | 0/-0.010 | | | 4 | 0.7 | 6 | 0.45 | 50 | 2 | 6.29 | 6.51 | 6.74 | 6.98 | 7.51 | MEXLN200506 | ● |
| **0.5** | 0/-0.010 | | | 4 | 0.7 | 8 | 0.45 | 50 | 2 | 8.36 | 8.65 | 8.96 | 9.28 | 9.98 | MEXLN200508 | ● |
| **0.6** | 0/-0.010 | | | 4 | 0.9 | 2 | 0.55 | 50 | 2 | 2.16 | 2.23 | 2.31 | 2.40 | 2.57 | MEXLN200602 | ● |
| **0.6** | 0/-0.010 | | | 4 | 0.9 | 4 | 0.55 | 50 | 2 | 4.23 | 4.37 | 4.53 | 4.69 | 5.04 | MEXLN200604 | ● |
| **0.6** | 0/-0.010 | | | 4 | 0.9 | 6 | 0.55 | 50 | 2 | 6.29 | 6.51 | 6.74 | 6.98 | 7.51 | MEXLN200606 | ● |
| **0.6** | 0/-0.010 | | | 4 | 0.9 | 8 | 0.55 | 50 | 2 | 8.36 | 8.65 | 8.96 | 9.28 | 9.98 | MEXLN200608 | ● |
| **0.6** | 0/-0.010 | | | 4 | 0.9 | 10 | 0.55 | 50 | 2 | 10.43 | 10.79 | 11.17 | 11.57 | 12.44 | MEXLN200610 | ● |
| **0.7** | 0/-0.010 | | | 4 | 1.0 | 2 | 0.65 | 50 | 2 | 2.16 | 2.23 | 2.31 | 2.40 | 2.57 | MEXLN200702 | ● |
| **0.7** | 0/-0.010 | | | 4 | 1.0 | 4 | 0.65 | 50 | 2 | 4.23 | 4.37 | 4.53 | 4.69 | 5.04 | MEXLN200704 | ● |
| **0.7** | 0/-0.010 | | | 4 | 1.0 | 6 | 0.65 | 50 | 2 | 6.29 | 6.51 | 6.74 | 6.98 | 7.51 | MEXLN200706 | ● |
| **0.7** | 0/-0.010 | | | 4 | 1.0 | 8 | 0.65 | 50 | 2 | 8.36 | 8.65 | 8.96 | 9.28 | 9.98 | MEXLN200708 | ● |
| **0.7** | 0/-0.010 | | | 4 | 1.0 | 10 | 0.65 | 50 | 2 | 10.43 | 10.79 | 11.17 | 11.57 | 12.44 | MEXLN200710 | ● |
| **0.8** | 0/-0.010 | | | 4 | 1.2 | 4 | 0.75 | 50 | 2 | 4.23 | 4.37 | 4.53 | 4.69 | 5.04 | MEXLN200804 | ● |
| **0.8** | 0/-0.010 | | | 4 | 1.2 | 6 | 0.75 | 50 | 2 | 6.29 | 6.51 | 6.74 | 6.98 | 7.51 | MEXLN200806 | ● |
| **0.8** | 0/-0.010 | | | 4 | 1.2 | 8 | 0.75 | 50 | 2 | 8.36 | 8.65 | 8.96 | 9.28 | 9.98 | MEXLN200808 | ● |
| **0.8** | 0/-0.010 | | | 4 | 1.2 | 10 | 0.75 | 50 | 2 | 10.43 | 10.79 | 11.17 | 11.57 | 12.44 | MEXLN200810 | ● |
| **0.8** | 0/-0.010 | | | 4 | 1.2 | 12 | 0.75 | 50 | 2 | 12.49 | 12.93 | 13.38 | 13.87 | 14.91 | MEXLN200812 | ● |
| **0.9** | 0/-0.010 | | | 4 | 1.4 | 6 | 0.85 | 50 | 2 | 6.29 | 6.51 | 6.74 | 6.98 | 7.51 | MEXLN200906 | ● |
| **0.9** | 0/-0.010 | | | 4 | 1.4 | 8 | 0.85 | 50 | 2 | 8.36 | 8.65 | 8.96 | 9.28 | 9.98 | MEXLN200908 | ● |
| **0.9** | 0/-0.010 | | | 4 | 1.4 | 10 | 0.85 | 50 | 2 | 10.43 | 10.79 | 11.17 | 11.57 | 12.44 | MEXLN200910 | ● |
| **0.9** | 0/-0.010 | | | 4 | 1.4 | 15 | 0.85 | 50 | 2 | 15.6 | 16.14 | 16.71 | 17.31 | 18.61 | MEXLN200915 | ● |
| **1.0** | 0/-0.015 | | | 4 | 1.5 | 6 | 0.95 | 50 | 2 | 6.39 | 6.61 | 6.84 | 7.09 | 7.62 | MEXLN201006 | ● |
| **1.0** | 0/-0.015 | | | 4 | 1.5 | 8 | 0.95 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | MEXLN201008 | ● |
| **1.0** | 0/-0.015 | | | 4 | 1.5 | 10 | 0.95 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | MEXLN201010 | ● |
| **1.0** | 0/-0.015 | | | 4 | 1.5 | 12 | 0.95 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | 15.02 | MEXLN201012 | ● |
| **1.0** | 0/-0.015 | | | 4 | 1.5 | 14 | 0.95 | 50 | 2 | 14.66 | 15.17 | 15.70 | 16.27 | 17.49 | MEXLN201014 | ● |
| **1.0** | 0/-0.015 | | | 4 | 1.5 | 16 | 0.95 | 50 | 2 | 16.73 | 17.3 | 17.92 | 18.56 | 19.96 | MEXLN201016 | ● |

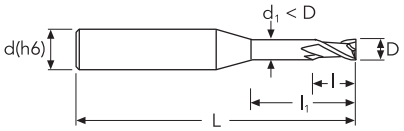
● stock standard ○ non-stock standard ▽ stock exhaustion

# MEXLN2

cylindrical shank, 2 flutes, extended and reduced neck

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | SQUARE | Z2

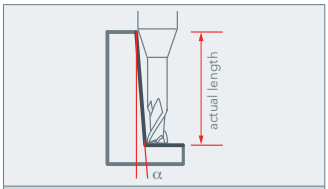





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | C | C Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.2** | 0/-0.015 | | | 4 | 1.8 | 6 | 1.15 | 50 | 2 | 6.39 | 6.61 | 6.84 | 7.09 | 7.62 | MEXLN201206 | ● |
| **1.2** | 0/-0.015 | | | 4 | 1.8 | 8 | 1.15 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | MEXLN201208 | ● |
| **1.2** | 0/-0.015 | | | 4 | 1.8 | 10 | 1.15 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | MEXLN201210 | ● |
| **1.2** | 0/-0.015 | | | 4 | 1.8 | 12 | 1.15 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | 15.02 | MEXLN201212 | ● |
| **1.4** | 0/-0.015 | | | 4 | 2.1 | 6 | 1.35 | 50 | 2 | 6.39 | 6.61 | 6.84 | 7.09 | 7.62 | MEXLN201406 | ● |
| **1.4** | 0/-0.015 | | | 4 | 2.1 | 8 | 1.35 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | MEXLN201408 | ● |
| **1.4** | 0/-0.015 | | | 4 | 2.1 | 10 | 1.35 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | MEXLN201410 | ● |
| **1.4** | 0/-0.015 | | | 4 | 2.1 | 12 | 1.35 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | 15.02 | MEXLN201412 | ● |
| **1.4** | 0/-0.015 | | | 4 | 2.1 | 16 | 1.35 | 50 | 2 | 16.73 | 17.3 | 17.92 | 18.56 | 19.96 | MEXLN201416 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 6 | 1.45 | 50 | 2 | 6.39 | 6.61 | 6.84 | 7.09 | 7.62 | MEXLN201506 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 8 | 1.45 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | MEXLN201508 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 10 | 1.45 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | MEXLN201510 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 12 | 1.45 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | 15.02 | MEXLN201512 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 14 | 1.45 | 50 | 2 | 14.66 | 15.17 | 15.70 | 16.27 | 17.49 | MEXLN201514 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 16 | 1.45 | 50 | 2 | 16.73 | 17.30 | 17.92 | 18.56 | 19.96 | MEXLN201516 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 18 | 1.45 | 60 | 2 | 18.79 | 19.44 | 20.13 | 20.86 | 22.43 | MEXLN201518 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 20 | 1.45 | 60 | 2 | 20.86 | 21.58 | 22.35 | 23.15 | - | MEXLN201520 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 6 | 1.55 | 50 | 2 | 6.39 | 6.61 | 6.84 | 7.09 | 7.62 | MEXLN201606 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 8 | 1.55 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | MEXLN201608 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 10 | 1.55 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | MEXLN201610 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 12 | 1.55 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | 15.02 | MEXLN201612 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 14 | 1.55 | 50 | 2 | 14.66 | 15.17 | 15.70 | 16.27 | 17.49 | MEXLN201614 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 16 | 1.55 | 50 | 2 | 16.73 | 17.30 | 17.92 | 18.56 | 19.96 | MEXLN201616 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 18 | 1.55 | 60 | 2 | 18.79 | 19.44 | 20.13 | 20.86 | 22.43 | MEXLN201618 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 20 | 1.55 | 60 | 2 | 20.86 | 21.58 | 22.35 | 23.15 | - | MEXLN201620 | ● |
| **1.8** | 0/-0.015 | | | 4 | 2.7 | 6 | 1.75 | 50 | 2 | 6.39 | 6.61 | 6.84 | 7.09 | 7.62 | MEXLN201806 | ● |
| **1.8** | 0/-0.015 | | | 4 | 2.7 | 8 | 1.75 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | MEXLN201808 | ● |
| **1.8** | 0/-0.015 | | | 4 | 2.7 | 10 | 1.75 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | MEXLN201810 | ● |
| **1.8** | 0/-0.015 | | | 4 | 2.7 | 12 | 1.75 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | 15.02 | MEXLN201812 | ● |
| **1.8** | 0/-0.015 | | | 4 | 2.7 | 16 | 1.75 | 50 | 2 | 16.73 | 17.30 | 17.92 | 18.56 | 19.96 | MEXLN201816 | ● |
| **1.8** | 0/-0.015 | | | 4 | 2.7 | 20 | 1.75 | 60 | 2 | 20.86 | 21.58 | 22.35 | 23.15 | - | MEXLN201820 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 6 | 1.95 | 50 | 2 | 6.39 | 6.61 | 6.84 | 7.09 | 7.62 | MEXLN202006 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 8 | 1.95 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | MEXLN202008 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 10 | 1.95 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | MEXLN202010 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 12 | 1.95 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | 15.02 | MEXLN202012 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 14 | 1.95 | 50 | 2 | 14.66 | 15.17 | 15.70 | 16.27 | 17.49 | MEXLN202014 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 16 | 1.95 | 50 | 2 | 16.73 | 17.30 | 17.92 | 18.56 | - | MEXLN202016 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 18 | 1.95 | 60 | 2 | 18.79 | 19.44 | 20.13 | 20.86 | - | MEXLN202018 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 20 | 1.95 | 60 | 2 | 20.86 | 21.58 | 22.35 | 23.15 | - | MEXLN202020 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

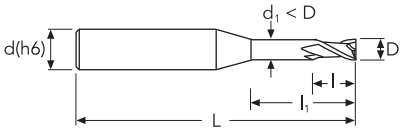
# MEXLN2

cylindrical shank, 2 flutes, extended and reduced neck

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | SQUARE | Z2



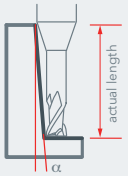





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | C | C Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.015 | | | 4 | 3 | 25 | 1.95 | 75 | 2 | 26.03 | 26.93 | 27.88 | - | - | MEXLN202025 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 30 | 1.95 | 75 | 2 | 31.20 | 32.28 | 33.42 | - | - | MEXLN202030 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 8 | 2.40 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | MEXLN202508 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 10 | 2.40 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | MEXLN202510 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 12 | 2.40 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | - | MEXLN202512 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 16 | 2.40 | 50 | 2 | 16.73 | 17.3 | 17.92 | 18.56 | - | MEXLN202516 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 20 | 2.40 | 60 | 2 | 20.86 | 21.58 | 22.35 | - | - | MEXLN202520 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 25 | 2.40 | 60 | 2 | 26.03 | 26.93 | 27.88 | - | - | MEXLN202525 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 30 | 2.40 | 75 | 2 | 31.20 | 32.28 | - | - | - | MEXLN202530 | ● |
| **3** | 0/-0.025 | | | 6 | 4.5 | 8 | 2.85 | 50 | 2 | 8.65 | 8.95 | 9.26 | 9.60 | 10.31 | MEXLN203008 | ● |
| **3** | 0/-0.025 | | | 6 | 4.5 | 10 | 2.85 | 50 | 2 | 10.72 | 11.09 | 11.48 | 11.89 | 12.78 | MEXLN203010 | ● |
| **3** | 0/-0.025 | | | 6 | 4.5 | 12 | 2.85 | 50 | 2 | 12.78 | 13.23 | 13.69 | 14.18 | 15.25 | MEXLN203012 | ● |
| **3** | 0/-0.025 | | | 6 | 4.5 | 14 | 2.85 | 50 | 2 | 14.85 | 15.36 | 15.91 | 16.48 | 17.72 | MEXLN203014 | ● |
| **3** | 0/-0.025 | | | 6 | 4.5 | 16 | 2.85 | 60 | 2 | 16.92 | 17.50 | 18.12 | 18.77 | 20.18 | MEXLN203016 | ● |
| **3** | 0/-0.025 | | | 6 | 4.5 | 18 | 2.85 | 60 | 2 | 18.99 | 19.64 | 20.34 | 21.07 | 22.65 | MEXLN203018 | ● |
| **3** | 0/-0.025 | | | 6 | 4.5 | 20 | 2.85 | 60 | 2 | 21.05 | 21.78 | 22.55 | 23.36 | 25.12 | MEXLN203020 | ● |
| **3** | 0/-0.025 | | | 6 | 4.5 | 25 | 2.85 | 75 | 2 | 26.22 | 27.13 | 28.09 | 29.10 | - | MEXLN203025 | ● |
| **4** | 0/-0.025 | | | 6 | 4.5 | 10 | 3.85 | 60 | 2 | 10.91 | 11.29 | 11.68 | 12.10 | 13.00 | MEXLN204010 | ● |
| **4** | 0/-0.025 | | | 6 | 4.5 | 15 | 3.85 | 60 | 2 | 16.08 | 16.63 | 17.22 | 17.84 | 19.17 | MEXLN204015 | ● |
| **4** | 0/-0.025 | | | 6 | 4.5 | 20 | 3.85 | 60 | 2 | 21.25 | 21.98 | 22.76 | 23.57 | - | MEXLN204020 | ● |
| **4** | 0/-0.025 | | | 6 | 4.5 | 25 | 3.85 | 75 | 2 | 26.41 | 27.33 | 28.29 | - | - | MEXLN204025 | ● |
| **4** | 0/-0.025 | | | 6 | 4.5 | 30 | 3.85 | 75 | 2 | 31.58 | 32.67 | 33.83 | - | - | MEXLN204030 | ● |
| **4** | 0/-0.025 | | | 6 | 4.5 | 40 | 3.85 | 75 | 2 | 41.92 | 43.37 | - | - | - | MEXLN204040 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

# MEXLN2

| | Material Group ISO 513 | | | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | | | **ap x D** | **ap x D** | **ap x D** | **ap x D** |
| | Vc (m/min) | | | **70÷110** | **50÷90** | **40÷60** | **20÷40** |
| | D (mm) | l1 (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| SQUARE RIB | 0.2 | ≤ 6D | 0.01 | 0.003 | 0.003 | 0.002 | 0.002 |
| | | ≤ 8D | 0.01 | 0.003 | 0.002 | 0.002 | 0.002 |
| | | ≤ 10D | 0.01 | 0.002 | 0.002 | 0.002 | 0.001 |
| | | ≤ 12D | 0.01 | 0.002 | 0.001 | 0.001 | 0.001 |
| | 0.3 | ≤ 6D | 0.02 | 0.004 | 0.004 | 0.003 | 0.003 |
| | | ≤ 8D | 0.01 | 0.004 | 0.003 | 0.003 | 0.003 |
| | | ≤ 10D | 0.01 | 0.003 | 0.003 | 0.003 | 0.002 |
| | | ≤ 12D | 0.01 | 0.003 | 0.003 | 0.002 | 0.002 |
| | 0.4 | ≤ 6D | 0.02 | 0.006 | 0.005 | 0.005 | 0.004 |
| | | ≤ 8D | 0.02 | 0.005 | 0.005 | 0.004 | 0.004 |
| | | ≤ 10D | 0.01 | 0.005 | 0.004 | 0.004 | 0.003 |
| | | ≤ 12D | 0.01 | 0.004 | 0.004 | 0.003 | 0.003 |
| | 0.5 | ≤ 6D | 0.03 | 0.007 | 0.006 | 0.006 | 0.005 |
| | | ≤ 8D | 0.02 | 0.006 | 0.006 | 0.005 | 0.004 |
| | | ≤ 10D | 0.02 | 0.006 | 0.005 | 0.004 | 0.004 |
| | | ≤ 12D | 0.01 | 0.005 | 0.004 | 0.004 | 0.003 |
| | 0.6 | ≤ 6D | 0.03 | 0.008 | 0.007 | 0.006 | 0.006 |
| | | ≤ 8D | 0.03 | 0.007 | 0.006 | 0.006 | 0.005 |
| | | ≤ 10D | 0.02 | 0.006 | 0.006 | 0.005 | 0.004 |
| | | ≤ 12D | 0.02 | 0.006 | 0.005 | 0.004 | 0.004 |
| | 0.8 | ≤ 6D | 0.04 | 0.010 | 0.009 | 0.008 | 0.007 |
| | | ≤ 8D | 0.03 | 0.009 | 0.008 | 0.007 | 0.006 |
| | | ≤ 10D | 0.03 | 0.008 | 0.007 | 0.006 | 0.006 |
| | | ≤ 12D | 0.02 | 0.007 | 0.006 | 0.006 | 0.005 |
| | 1 | ≤ 6D | 0.05 | 0.012 | 0.011 | 0.010 | 0.008 |
| | | ≤ 8D | 0.04 | 0.011 | 0.010 | 0.009 | 0.008 |
| | | ≤ 10D | 0.04 | 0.010 | 0.009 | 0.008 | 0.007 |
| | | ≤ 12D | 0.03 | 0.008 | 0.008 | 0.007 | 0.006 |
| | 1.2 | ≤ 6D | 0.06 | 0.022 | 0.020 | 0.018 | 0.015 |
| | | ≤ 8D | 0.05 | 0.020 | 0.018 | 0.016 | 0.014 |
| | | ≤ 10D | 0.04 | 0.018 | 0.016 | 0.014 | 0.012 |
| | | ≤ 12D | 0.03 | 0.015 | 0.014 | 0.012 | 0.011 |
| | 1.4 | ≤ 6D | 0.07 | 0.024 | 0.022 | 0.019 | 0.017 |
| | | ≤ 8D | 0.06 | 0.022 | 0.019 | 0.017 | 0.015 |
| | | ≤ 10D | 0.05 | 0.019 | 0.017 | 0.015 | 0.013 |
| | | ≤ 12D | 0.04 | 0.017 | 0.015 | 0.013 | 0.012 |
| | | ≤ 15D | 0.03 | 0.014 | 0.013 | 0.012 | 0.010 |
| | | ≥ 15D | 0.02 | 0.012 | 0.011 | 0.010 | 0.008 |
| | 1.5 | ≤ 6D | 0.08 | 0.025 | 0.023 | 0.020 | 0.018 |
| | | ≤ 8D | 0.06 | 0.023 | 0.020 | 0.018 | 0.016 |
| | | ≤ 10D | 0.05 | 0.020 | 0.018 | 0.016 | 0.014 |
| | | ≤ 12D | 0.04 | 0.018 | 0.016 | 0.014 | 0.012 |
| | | ≤ 15D | 0.03 | 0.015 | 0.014 | 0.012 | 0.011 |
| | | ≥ 15D | 0.02 | 0.013 | 0.011 | 0.010 | 0.009 |
| | 1.6 | ≤ 6D | 0.08 | 0.026 | 0.023 | 0.021 | 0.018 |
| | | ≤ 8D | 0.07 | 0.023 | 0.021 | 0.019 | 0.016 |
| | | ≤ 10D | 0.06 | 0.021 | 0.019 | 0.017 | 0.015 |
| | | ≤ 12D | 0.04 | 0.018 | 0.016 | 0.015 | 0.013 |
| | | ≤ 15D | 0.04 | 0.016 | 0.014 | 0.012 | 0.011 |
| | | ≥ 15D | 0.02 | 0.013 | 0.012 | 0.010 | 0.009 |

CUTTING PARAMETERS

# MEXLN2

SQUARE RIB

| Material Group ISO 513 | | | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| ap x ae | | | **ap x D** | **ap x D** | **ap x D** | **ap x D** |
| Vc (m/min) | | | **70÷110** | **50÷90** | **40÷60** | **20÷40** |
| **D (mm)** | **l1 (mm)** | **ap (mm)** | **fz (mm/z)** | **fz (mm/z)** | **fz (mm/z)** | **fz (mm/z)** |
| **1.8** | ≤ 6D | 0.09 | 0.028 | 0.025 | 0.022 | 0.020 |
| | ≤ 8D | 0.08 | 0.025 | 0.023 | 0.020 | 0.018 |
| | ≤ 10D | 0.06 | 0.022 | 0.020 | 0.018 | 0.016 |
| | ≤ 12D | 0.05 | 0.020 | 0.018 | 0.016 | 0.014 |
| | ≤ 15D | 0.04 | 0.017 | 0.015 | 0.013 | 0.012 |
| | ≥ 15D | 0.03 | 0.014 | 0.013 | 0.011 | 0.010 |
| **2** | ≤ 6D | 0.10 | 0.030 | 0.027 | 0.024 | 0.021 |
| | ≤ 8D | 0.09 | 0.027 | 0.024 | 0.022 | 0.019 |
| | ≤ 10D | 0.07 | 0.024 | 0.022 | 0.019 | 0.017 |
| | ≤ 12D | 0.06 | 0.021 | 0.019 | 0.017 | 0.015 |
| | ≤ 15D | 0.05 | 0.018 | 0.016 | 0.014 | 0.013 |
| | ≥ 15D | 0.03 | 0.018 | 0.016 | 0.014 | 0.013 |
| **2.5** | ≤ 6D | 0.13 | 0.035 | 0.032 | 0.028 | 0.025 |
| | ≤ 8D | 0.11 | 0.032 | 0.028 | 0.025 | 0.022 |
| | ≤ 10D | 0.09 | 0.028 | 0.025 | 0.022 | 0.020 |
| | ≤ 12D | 0.07 | 0.025 | 0.022 | 0.020 | 0.017 |
| | ≤ 15D | 0.06 | 0.021 | 0.019 | 0.017 | 0.015 |
| | ≥ 15D | 0.04 | 0.021 | 0.019 | 0.017 | 0.015 |
| **3** | ≤ 6D | 0.15 | 0.040 | 0.036 | 0.032 | 0.028 |
| | ≤ 8D | 0.13 | 0.036 | 0.032 | 0.029 | 0.025 |
| | ≤ 10D | 0.11 | 0.032 | 0.029 | 0.026 | 0.022 |
| | ≤ 12D | 0.08 | 0.028 | 0.025 | 0.022 | 0.020 |
| | ≤ 15D | 0.07 | 0.024 | 0.022 | 0.019 | 0.017 |
| | ≥ 15D | 0.05 | 0.024 | 0.022 | 0.019 | 0.017 |
| **4** | ≤ 6D | 0.20 | 0.050 | 0.045 | 0.040 | 0.035 |
| | ≤ 8D | 0.17 | 0.045 | 0.041 | 0.036 | 0.032 |
| | ≤ 10D | 0.14 | 0.040 | 0.036 | 0.032 | 0.028 |
| | ≤ 12D | 0.11 | 0.035 | 0.032 | 0.028 | 0.025 |
| | ≤ 15D | 0.09 | 0.030 | 0.027 | 0.024 | 0.021 |
| | ≥ 15D | 0.06 | 0.030 | 0.027 | 0.024 | 0.021 |

# MEXCS2

cylindrical shank, 2 flutes

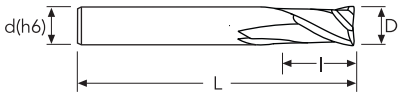
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | SQUARE | Z2



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SLOTTING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.012 | | | 4 | 2.5 | | 40 | 2 | MEXCS2010 | ● |
| **1.5** | 0/-0.012 | | | 4 | 4 | | 40 | 2 | MEXCS2015 | ● |
| **2** | 0/-0.012 | | | 4 | 6 | | 40 | 2 | MEXCS2020 | ● |
| **2.5** | 0/-0.012 | | | 4 | 8 | | 40 | 2 | MEXCS2025 | ● |
| **3** | 0/-0.012 | | | 6 | 8 | | 55 | 2 | MEXCS2030 | ● |
| **3.5** | 0/-0.012 | | | 6 | 10 | | 55 | 2 | MEXCS2035 | ● |
| **4** | 0/-0.012 | | | 6 | 10 | | 55 | 2 | MEXCS2040 | ● |
| **4.5** | 0/-0.012 | | | 6 | 12 | | 55 | 2 | MEXCS2045 | ● |
| **5** | 0/-0.012 | | | 6 | 13 | | 55 | 2 | MEXCS2050 | ● |
| **5.5** | 0/-0.012 | | | 6 | 14 | | 55 | 2 | MEXCS2055 | ● |
| **6** | 0/-0.015 | | | 6 | 15 | | 60 | 2 | MEXCS2060 | ● |
| **6.5** | 0/-0.015 | | | 8 | 17 | | 65 | 2 | MEXCS2065 | ● |
| **7** | 0/-0.015 | | | 8 | 18 | | 65 | 2 | MEXCS2070 | ● |
| **8** | 0/-0.015 | | | 8 | 20 | | 70 | 2 | MEXCS2080 | ● |
| **8.5** | 0/-0.015 | | | 10 | 21 | | 70 | 2 | MEXCS2085 | ● |
| **9** | 0/-0.015 | | | 10 | 23 | | 70 | 2 | MEXCS2090 | ● |
| **10** | 0/-0.015 | | | 10 | 22 | | 75 | 2 | MEXCS2100 | ● |
| **11** | 0/-0.015 | | | 12 | 28 | | 75 | 2 | MEXCS2110 | ● |
| **12** | 0/-0.015 | | | 12 | 26 | | 80 | 2 | MEXCS2120 | ● |
| **14** | 0/-0.020 | | | 14 | 32 | | 90 | 2 | MEXCS2140 | ● |
| **16** | 0/-0.020 | | | 16 | 32 | | 90 | 2 | MEXCS2160 | ● |
| **18** | 0/-0.020 | | | 18 | 38 | | 100 | 2 | MEXCS2180 | ● |
| **20** | 0/-0.020 | | | 20 | 38 | | 100 | 2 | MEXCS2200 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

CUTTING PARAMETERS

# MEXCS2

| | Material Group ISO 513 | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | **0.5D x D** | **0.3D x D** | **0.2D x D** | **0.1D x D** |
| | Vc (m/min) | **70÷110** | **50÷90** | **40÷60** | **20÷40** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.006 | 0.005 | 0.005 | 0.004 |
| | **2** | 0.010 | 0.009 | 0.008 | 0.007 |
| | **3** | 0.014 | 0.013 | 0.012 | 0.010 |
| | **4** | 0.020 | 0.018 | 0.016 | 0.014 |
| | **5** | 0.026 | 0.023 | 0.020 | 0.018 |
| | **6** | 0.032 | 0.029 | 0.026 | 0.023 |
| | **8** | 0.038 | 0.034 | 0.031 | 0.027 |
| | **10** | 0.046 | 0.041 | 0.037 | 0.032 |
| | **12** | 0.055 | 0.050 | 0.044 | 0.039 |
| | **14** | 0.064 | 0.057 | 0.051 | 0.045 |
| | **16** | 0.072 | 0.065 | 0.058 | 0.051 |
| | **18** | 0.082 | 0.074 | 0.066 | 0.058 |
| | **20** | 0.094 | 0.084 | 0.075 | 0.065 |

< D3 mm: ap = 0.1D ÷ 0.2D

# MEXCL2

cylindrical shank, 2 flutes, long

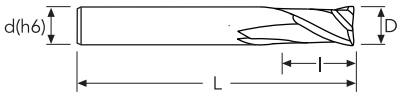
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | SQUARE | Z2



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SLOTTING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.030 | | | 6 | 8 | | 60 | 2 | MEXCL2010 | ● |
| **1.5** | 0/-0.030 | | | 6 | 12 | | 60 | 2 | MEXCL2015 | ● |
| **2** | 0/-0.030 | | | 6 | 12 | | 60 | 2 | MEXCL2020 | ● |
| **3** | 0/-0.030 | | | 6 | 15 | | 60 | 2 | MEXCL2030 | ● |
| **4** | 0/-0.030 | | | 6 | 20 | | 60 | 2 | MEXCL2040 | ● |
| **5** | 0/-0.030 | | | 6 | 25 | | 70 | 2 | MEXCL2050 | ● |
| **6** | 0/-0.030 | | | 6 | 25 | | 70 | 2 | MEXCL2060 | ● |
| **8** | 0/-0.030 | | | 8 | 30 | | 80 | 2 | MEXCL2080 | ● |
| **10** | 0/-0.030 | | | 10 | 35 | | 90 | 2 | MEXCL2100 | ● |
| **12** | 0/-0.030 | | | 12 | 40 | | 90 | 2 | MEXCL2120 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

CUTTING PARAMETERS

# MEXCL2

| | Material Group ISO 513 | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | **0.5D x D** | **0.3D x D** | **0.2D x D** | **0.1D x D** |
| | Vc (m/min) | **70÷110** | **50÷90** | **40÷60** | **20÷40** |
| L SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.005 | 0.005 | 0.004 | 0.004 |
| | **1.5** | 0.006 | 0.005 | 0.005 | 0.004 |
| | **2** | 0.009 | 0.008 | 0.007 | 0.006 |
| | **3** | 0.012 | 0.011 | 0.010 | 0.008 |
| | **4** | 0.018 | 0.016 | 0.014 | 0.013 |
| | **5** | 0.024 | 0.022 | 0.019 | 0.017 |
| | **6** | 0.029 | 0.026 | 0.023 | 0.020 |
| | **8** | 0.035 | 0.032 | 0.028 | 0.025 |
| | **10** | 0.041 | 0.037 | 0.033 | 0.029 |
| | **12** | 0.050 | 0.045 | 0.040 | 0.035 |

≤ D3 mm: ap = 0.4 mm

# MEX400

cylindrical shank, 4 flutes unequal pitch

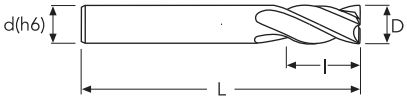
OSAWA NORM | MEX | NMG ENDLESS ORANGE | <55 HRC | 40° | SQUARE | Z4 UP



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ★ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.010 | | | 4 | 3 | | 50 | 4 | MEX400010 | ● |
| **1.5** | 0/-0.010 | | | 4 | 4.5 | | 50 | 4 | MEX400015 | ● |
| **2** | 0/-0.015 | | | 4 | 6 | | 40 | 4 | MEX400020 | ● |
| **2.5** | 0/-0.015 | | | 4 | 8 | | 40 | 4 | MEX400025 | ● |
| **3** | 0/-0.015 | | | 6 | 8 | | 55 | 4 | MEX400030 | ● |
| **3.5** | 0/-0.020 | | | 6 | 10 | | 55 | 4 | MEX400035 | ● |
| **4** | 0/-0.020 | | | 6 | 11 | | 55 | 4 | MEX400040 | ● |
| **4.5** | 0/-0.020 | | | 6 | 11 | | 45 | 4 | MEX400045 | ● |
| **5** | 0/-0.020 | | | 6 | 13 | | 55 | 4 | MEX400050 | ● |
| **5.5** | 0/-0.020 | | | 6 | 13 | | 55 | 4 | MEX400055 | ● |
| **6** | 0/-0.020 | | | 6 | 15 | | 60 | 4 | MEX400060 | ● |
| **6.5** | 0/-0.020 | | | 8 | 17 | | 65 | 4 | MEX400065 | ● |
| **7** | 0/-0.020 | | | 8 | 18 | | 65 | 4 | MEX400070 | ● |
| **8** | 0/-0.020 | | | 8 | 20 | | 70 | 4 | MEX400080 | ● |
| **9** | 0/-0.020 | | | 10 | 23 | | 70 | 4 | MEX400090 | ● |
| **10** | 0/-0.020 | | | 10 | 22 | | 75 | 4 | MEX400100 | ● |
| **11** | 0/-0.020 | | | 12 | 28 | | 75 | 4 | MEX400110 | ● |
| **12** | -0.005/-0.025 | | | 12 | 26 | | 80 | 4 | MEX400120 | ● |
| **14** | -0.010/-0.025 | | | 14 | 35 | | 90 | 4 | MEX400140 | ● |
| **16** | -0.010/-0.025 | | | 16 | 32 | | 100 | 4 | MEX400160 | ● |
| **20** | -0.010/-0.025 | | | 20 | 40 | | 100 | 4 | MEX400200 | ● |
| **25** | -0.010/-0.025 | | | 25 | 40 | | 100 | 4 | MEX400250 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

CUTTING PARAMETERS

# MEX400




| Material Group ISO 513 | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|
| Hardness/Rm | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| ap x ae | **D x 0.05D** | **D x 0.05D** | **D x 0.05D** | **D x 0.05D** |
| Vc (m/min) | **120÷160** | **100÷140** | **90÷120** | **80÷100** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **1** | 0.007 | 0.006 | | 0.006 |
| **2** | 0.010 | 0.010 | 0.010 | 0.010 |
| **3** | 0.016 | 0.016 | 0.016 | 0.016 |
| **4** | 0.027 | 0.027 | 0.027 | 0.027 |
| **5** | 0.036 | 0.036 | 0.036 | 0.036 |
| **6** | 0.043 | 0.043 | 0.043 | 0.043 |
| **8** | 0.060 | 0.060 | 0.060 | 0.060 |
| **10** | 0.085 | 0.085 | 0.085 | 0.085 |
| **12** | 0.100 | 0.100 | 0.100 | 0.100 |
| **14** | 0.120 | 0.120 | 0.120 | 0.120 |
| **16** | 0.150 | 0.150 | 0.150 | 0.150 |
| **18** | 0.175 | 0.175 | 0.175 | 0.175 |
| **20** | 0.200 | 0.200 | 0.200 | 0.200 |
| **22** | 0.215 | 0.215 | 0.215 | 0.215 |
| **25** | 0.225 | 0.225 | 0.225 | 0.225 |

# MEXCL4

cylindrical shank, 4 flutes, long

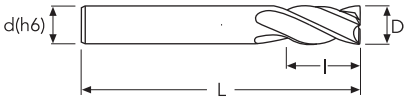
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | SQUARE | Z4



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.020 | | | 6 | 8 | | 60 | 4 | MEXCL4020 | ● |
| **3** | 0/-0.020 | | | 6 | 15 | | 60 | 4 | MEXCL4030 | ● |
| **4** | 0/-0.020 | | | 6 | 20 | | 60 | 4 | MEXCL4040 | ● |
| **5** | 0/-0.020 | | | 6 | 25 | | 70 | 4 | MEXCL4050 | ● |
| **6** | 0/-0.020 | | | 6 | 25 | | 70 | 4 | MEXCL4060 | ● |
| **8** | 0/-0.020 | | | 8 | 30 | | 80 | 4 | MEXCL4080 | ● |
| **10** | 0/-0.020 | | | 10 | 35 | | 90 | 4 | MEXCL4100 | ● |
| **12** | 0/-0.020 | | | 12 | 40 | | 90 | 4 | MEXCL4120 | ● |
| **14** | 0/-0.020 | | | 16 | 50 | | 110 | 4 | MEXCL4140 | ● |
| **16** | 0/-0.020 | | | 16 | 50 | | 110 | 4 | MEXCL4160 | ● |
| **20** | 0/-0.020 | | | 20 | 50 | | 110 | 4 | MEXCL4200 | ● |
| **25** | 0/-0.050 | | | 25 | 70 | | 130 | 4 | MEXCL4250 | ● |
| | | | | | | | | | | |
| **3** | 0/-0.030 | | | 6 | 25 | | 100 | 4 | MEXCL4030100 | ● |
| **4** | 0/-0.030 | | | 6 | 31 | | 100 | 4 | MEXCL4040100 | ● |
| **5** | 0/-0.030 | | | 6 | 31 | | 100 | 4 | MEXCL4050100 | ● |
| **6** | 0/-0.030 | | | 6 | 38 | | 100 | 4 | MEXCL4060100 | ● |
| **8** | 0/-0.030 | | | 8 | 41 | | 100 | 4 | MEXCL4080100 | ● |
| **10** | 0/-0.035 | | | 10 | 57 | | 125 | 4 | MEXCL4100125 | ● |
| **12** | 0/-0.035 | | | 12 | 75 | | 150 | 4 | MEXCL4120150 | ● |
| **14** | 0/-0.035 | | | 14 | 75 | | 150 | 4 | MEXCL4140150 | ● |
| **16** | 0/-0.035 | | | 16 | 75 | | 150 | 4 | MEXCL4160150 | ● |
| **20** | 0/-0.035 | | | 20 | 75 | | 150 | 4 | MEXCL4200150 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

CUTTING PARAMETERS

# MEXCL4

| | Material Group ISO 513 | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | **1.5D x 0.1D** | **1.5D x 0.05D** | **1.5D x 0.05D** | **1.5D x 0.05D** |
| | Vc (m/min) | **60÷100** | **50÷70** | **30÷50** | **20÷40** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **2** | 0.014 | 0.013 | 0.012 | 0.010 |
| | **3** | 0.022 | 0.020 | 0.017 | 0.015 |
| | **4** | 0.029 | 0.026 | 0.023 | 0.020 |
| | **5** | 0.033 | 0.029 | 0.026 | 0.023 |
| | **6** | 0.036 | 0.033 | 0.029 | 0.025 |
| | **8** | 0.047 | 0.042 | 0.038 | 0.033 |
| | **10** | 0.060 | 0.054 | 0.048 | 0.042 |
| | **12** | 0.072 | 0.065 | 0.058 | 0.051 |
| | **14** | 0.083 | 0.075 | 0.066 | 0.058 |
| | **16** | 0.094 | 0.084 | 0.075 | 0.065 |
| | **20** | 0.119 | 0.107 | 0.095 | 0.083 |
| | **25** | 0.150 | 0.135 | 0.120 | 0.105 |

# MEXCSHM

cylindrical shank, multi flute

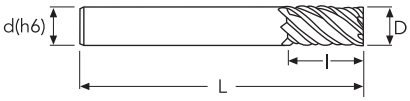
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 50° | SQUARE | Z6~Z8



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.020 | | | 6 | 8 | | 50 | 6 | MEXCSHM030 | ● |
| **4** | 0/-0.020 | | | 6 | 11 | | 50 | 6 | MEXCSHM040 | ● |
| **5** | 0/-0.020 | | | 6 | 13 | | 50 | 6 | MEXCSHM050 | ● |
| **6** | 0/-0.020 | | | 6 | 15 | | 60 | 6 | MEXCSHM060 | ● |
| **8** | 0/-0.020 | | | 8 | 20 | | 70 | 6 | MEXCSHM080 | ● |
| **10** | 0/-0.020 | | | 10 | 25 | | 80 | 6 | MEXCSHM100 | ● |
| **12** | 0/-0.020 | | | 12 | 30 | | 80 | 6 | MEXCSHM120 | ● |
| **14** | 0/-0.020 | | | 14 | 30 | | 90 | 6 | MEXCSHM140 | ● |
| **16** | 0/-0.020 | | | 16 | 40 | | 100 | 6 | MEXCSHM160 | ● |
| **18** | 0/-0.020 | | | 18 | 35 | | 100 | 8 | MEXCSHM180 | ● |
| **20** | 0/-0.020 | | | 20 | 50 | | 100 | 8 | MEXCSHM200 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

CUTTING PARAMETERS

# MEXCSHM

SIDE MILLING

| Material Group ISO 513 | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|
| Hardness/Rm | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| ap x ae | **1.5D x 0.1D** | **1.5D x 0.1D** | **1.5D x 0.05D** | **1.5D x 0.05D** |
| Vc (m/min) | **120÷160** | **90÷130** | **60÷100** | **50÷70** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **3** | 0.008 | 0.008 | 0.007 | 0.006 |
| **4** | 0.012 | 0.011 | 0.010 | 0.008 |
| **5** | 0.014 | 0.013 | 0.012 | 0.010 |
| **6** | 0.018 | 0.016 | 0.014 | 0.013 |
| **8** | 0.028 | 0.025 | 0.022 | 0.019 |
| **10** | 0.034 | 0.030 | 0.027 | 0.024 |
| **12** | 0.041 | 0.037 | 0.033 | 0.029 |
| **14** | 0.048 | 0.043 | 0.038 | 0.034 |
| **16** | 0.056 | 0.051 | 0.045 | 0.039 |
| **18** | 0.065 | 0.059 | 0.052 | 0.046 |
| **20** | 0.073 | 0.066 | 0.058 | 0.051 |

# MEXCLHM

cylindrical shank, multi flute, long

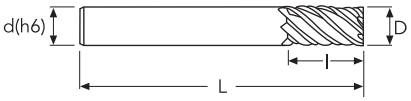
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 50° | SQUARE | Z6~Z8



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.030 | | | 6 | 19 | | 75 | 6 | MEXCLHM030 | ● |
| **4** | 0/-0.030 | | | 6 | 19 | | 75 | 6 | MEXCLHM040 | ● |
| **5** | 0/-0.030 | | | 6 | 19 | | 75 | 6 | MEXCLHM050 | ● |
| **6** | 0/-0.030 | | | 6 | 25 | | 80 | 6 | MEXCLHM060 | ● |
| **8** | 0/-0.030 | | | 8 | 40 | | 100 | 6 | MEXCLHM080 | ● |
| **10** | 0/-0.030 | | | 10 | 45 | | 120 | 6 | MEXCLHM100 | ● |
| **12** | 0/-0.030 | | | 12 | 60 | | 120 | 6 | MEXCLHM120 | ● |
| **16** | 0/-0.030 | | | 16 | 80 | | 150 | 6 | MEXCLHM160 | ● |
| **20** | 0/-0.030 | | | 20 | 80 | | 150 | 8 | MEXCLHM200 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

CUTTING PARAMETERS

# MEXCLHM

| | Material Group ISO 513 | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | **1.5D x 0.05D** | **1.5D x 0.05D** | **1.5D x 0.05D** | **1.5D x 0.05D** |
| | Vc (m/min) | **80÷120** | **50÷90** | **40÷60** | **20÷40** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.007 | 0.006 | 0.006 | 0.005 |
| | **4** | 0.010 | 0.009 | 0.008 | 0.007 |
| | **5** | 0.012 | 0.011 | 0.010 | 0.009 |
| | **6** | 0.015 | 0.014 | 0.012 | 0.011 |
| | **8** | 0.023 | 0.021 | 0.019 | 0.016 |
| | **10** | 0.029 | 0.026 | 0.023 | 0.020 |
| | **12** | 0.035 | 0.031 | 0.028 | 0.024 |
| | **14** | 0.041 | 0.037 | 0.033 | 0.029 |
| | **16** | 0.048 | 0.043 | 0.038 | 0.034 |
| | **18** | 0.055 | 0.050 | 0.044 | 0.039 |
| | **20** | 0.063 | 0.057 | 0.050 | 0.044 |

# MEXCSFR

cylindrical shank, roughing

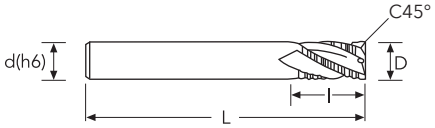
OSAWA NORM | MEX | UMG ENDLESS | <55 HRC | 20° | C45° | HR FINE | Z3~Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| D | D Tol. | C45° | C45° Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.048 | 0.40 | +/-0.020 | 6 | 15 | | 60 | 3 | MEXCSFR060 | ● |
| **8** | 0/-0.058 | 0.40 | +/-0.020 | 8 | 20 | | 65 | 3 | MEXCSFR080 | ● |
| **10** | 0/-0.058 | 0.50 | +/-0.020 | 10 | 25 | | 70 | 4 | MEXCSFR100 | ● |
| **12** | 0/-0.070 | 0.50 | +/-0.020 | 12 | 30 | | 80 | 4 | MEXCSFR120 | ● |
| **14** | 0/-0.070 | 0.50 | +/-0.020 | 14 | 25 | | 100 | 4 | MEXCSFR140 | ● |
| **16** | 0/-0.070 | 0.50 | +/-0.020 | 16 | 40 | | 100 | 4 | MEXCSFR160 | ● |
| **20** | 0/-0.084 | 0.50 | +/-0.020 | 20 | 50 | | 100 | 4 | MEXCSFR200 | ● |

CUTTING PARAMETERS

## MEXCSFR

| SLOTTING | Material Group ISO 513 | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.3D x D** | **0.1D x D** |
| | Vc (m/min) | **70÷90** | **50÷70** | **40÷60** | **20÷40** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.043 | 0.038 | 0.034 | 0.030 |
| | **8** | 0.055 | 0.050 | 0.044 | 0.039 |
| | **10** | 0.071 | 0.064 | 0.057 | 0.050 |
| | **12** | 0.085 | 0.077 | 0.068 | 0.060 |
| | **14** | 0.098 | 0.088 | 0.078 | 0.068 |
| | **16** | 0.110 | 0.099 | 0.088 | 0.077 |
| | **20** | 0.140 | 0.126 | 0.112 | 0.098 |

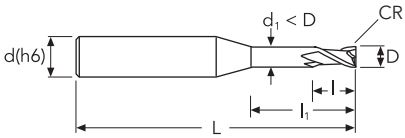
| SIDE MILLING | Material Group ISO 513 | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | **1.5D x 0.3D** | **1.5D x 0.3D** | **D x 0.1D** | **D x 0.05D** |
| | Vc (m/min) | **80÷100** | **60÷80** | **50÷70** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.047 | 0.042 | 0.037 | 0.033 |
| | **8** | 0.061 | 0.055 | 0.049 | 0.043 |
| | **10** | 0.078 | 0.070 | 0.062 | 0.055 |
| | **12** | 0.094 | 0.084 | 0.075 | 0.065 |
| | **14** | 0.108 | 0.097 | 0.086 | 0.075 |
| | **16** | 0.121 | 0.109 | 0.097 | 0.085 |
| | **20** | 0.154 | 0.139 | 0.123 | 0.108 |

# MEXLN2R

cylindrical shank, 2 flutes, extended and reduced neck, corner radius

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z2

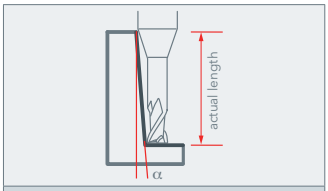



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.3** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.4 | 1 | 0.26 | 50 | 2 | 1,08 | 1,12 | 1,15 | 1,19 | 1,25 | MEXLN20030001 | ● |
| **0.3** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.4 | 1.5 | 0.26 | 50 | 2 | 1,60 | 1,65 | 1,70 | 1,75 | 1,85 | MEXLN20030065 | ● |
| **0.3** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.4 | 2 | 0.26 | 50 | 2 | 2,12 | 2,19 | 2,25 | 2,32 | 2,46 | MEXLN20030002 | ● |
| **0.3** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.4 | 3 | 0.26 | 50 | 2 | 3,15 | 3,25 | 3,35 | 3,46 | 3,66 | MEXLN20030003 | ● |
| **0.3** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 0.4 | 1 | 0.26 | 50 | 2 | 1,08 | 1,12 | 1,15 | 1,18 | 1,24 | MEXLN20030101 | ● |
| **0.3** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 0.4 | 1.5 | 0.26 | 50 | 2 | 1,60 | 1,65 | 1,70 | 1,75 | 1,84 | MEXLN20030165 | ● |
| **0.3** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 0.4 | 2 | 0.26 | 50 | 2 | 2,12 | 2,18 | 2,25 | 2,31 | 2,45 | MEXLN20030102 | ● |
| **0.3** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 0.4 | 3 | 0.26 | 50 | 2 | 3,15 | 3,25 | 3,35 | 3,45 | 3,65 | MEXLN20030103 | ● |
| **0.4** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.6 | 1 | 0.37 | 50 | 2 | 1,08 | 1,12 | 1,15 | 1,19 | 1,25 | MEXLN20040001 | ● |
| **0.4** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.6 | 2 | 0.37 | 50 | 2 | 2,12 | 2,19 | 2,25 | 2,32 | 2,46 | MEXLN20040002 | ● |
| **0.4** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.6 | 3 | 0.37 | 50 | 2 | 3,15 | 3,25 | 3,35 | 3,46 | 3,66 | MEXLN20040003 | ● |
| **0.4** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.6 | 4 | 0.37 | 50 | 2 | 4,19 | 4,32 | 4,46 | 4,59 | 4,86 | MEXLN20040004 | ● |
| **0.4** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 0.6 | 1 | 0.37 | 50 | 2 | 1,08 | 1,12 | 1,15 | 1,18 | 1,24 | MEXLN20040101 | ● |
| **0.4** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 0.6 | 2 | 0.37 | 50 | 2 | 2,12 | 2,18 | 2,25 | 2,31 | 2,45 | MEXLN20040102 | ● |
| **0.4** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 0.6 | 3 | 0.37 | 50 | 2 | 3,15 | 3,25 | 3,35 | 3,45 | 3,65 | MEXLN20040103 | ● |
| **0.4** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 0.6 | 4 | 0.37 | 50 | 2 | 4,18 | 4,32 | 4,45 | 4,58 | 4,85 | MEXLN20040104 | ● |
| **0.5** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.7 | 2 | 0.45 | 50 | 2 | 2,16 | 2,23 | 2,29 | 2,36 | 2,50 | MEXLN20050002 | ● |
| **0.5** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.7 | 4 | 0.45 | 50 | 2 | 4,22 | 4,36 | 4,50 | 4,63 | 4,90 | MEXLN20050004 | ● |
| **0.5** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.7 | 6 | 0.45 | 50 | 2 | 6,29 | 6,49 | 6,70 | 6,90 | 7,31 | MEXLN20050006 | ● |
| **0.5** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 0.7 | 2 | 0.45 | 50 | 2 | 2,16 | 2,22 | 2,29 | 2,36 | 2,49 | MEXLN20050102 | ● |
| **0.5** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 0.7 | 4 | 0.45 | 50 | 2 | 4,22 | 4,36 | 4,49 | 4,63 | 4,89 | MEXLN20050104 | ● |
| **0.5** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 0.7 | 6 | 0.45 | 50 | 2 | 6,29 | 6,49 | 6,69 | 6,89 | 7,30 | MEXLN20050106 | ● |
| **0.6** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 0.9 | 2 | 0.55 | 50 | 2 | 2,16 | 2,22 | 2,29 | 2,36 | 2,49 | MEXLN20060102 | ● |
| **0.6** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 0.9 | 4 | 0.55 | 50 | 2 | 4,22 | 4,36 | 4,49 | 4,63 | 4,89 | MEXLN20060104 | ● |
| **0.6** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 0.9 | 6 | 0.55 | 50 | 2 | 6,29 | 6,49 | 6,69 | 6,89 | 7,30 | MEXLN20060106 | ● |
| **0.7** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 1.0 | 4 | 0.65 | 50 | 2 | 4,22 | 4,36 | 4,49 | 4,63 | 4,89 | MEXLN20070104 | ● |
| **0.7** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 1.0 | 6 | 0.65 | 50 | 2 | 6,29 | 6,49 | 6,69 | 6,89 | 7,30 | MEXLN20070106 | ● |
| **0.8** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 1.2 | 4 | 0.75 | 50 | 2 | 4,22 | 4,36 | 4,50 | 4,63 | 4,90 | MEXLN20080004 | ● |
| **0.8** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 1.2 | 6 | 0.75 | 50 | 2 | 6,29 | 6,49 | 6,70 | 6,90 | 7,31 | MEXLN20080006 | ● |
| **0.8** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 1.2 | 8 | 0.75 | 50 | 2 | 8,36 | 8,63 | 8,90 | 9,17 | 9,71 | MEXLN20080008 | ● |
| **0.8** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 1.2 | 4 | 0.75 | 50 | 2 | 4,22 | 4,36 | 4,49 | 4,63 | 4,89 | MEXLN20080104 | ● |
| **0.8** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 1.2 | 6 | 0.75 | 50 | 2 | 6,29 | 6,49 | 6,69 | 6,89 | 7,30 | MEXLN20080106 | ● |
| **0.8** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 1.2 | 8 | 0.75 | 50 | 2 | 8,36 | 8,63 | 8,89 | 9,16 | 9,70 | MEXLN20080108 | ● |
| **0.9** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 1.4 | 8 | 0.85 | 50 | 2 | 8,36 | 8,63 | 8,89 | 9,16 | 9,70 | MEXLN20090108 | ● |
| **0.9** | 0/-0.010 | 0.10 | 0/-0.010 | 4 | 1.4 | 15 | 0.85 | 50 | 2 | 15,59 | 16,10 | 16,60 | 17,11 | 18,12 | MEXLN20090115 | ● |
| **1** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.5 | 4 | 0.95 | 50 | 2 | 4,32 | 4,46 | 4,59 | 4,73 | 5,01 | MEXLN20100104 | ● |
| **1** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.5 | 6 | 0.95 | 50 | 2 | 6,39 | 6,59 | 6,80 | 7,00 | 7,41 | MEXLN20100106 | ● |
| **1** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.5 | 8 | 0.95 | 50 | 2 | 8,45 | 8,73 | 9,00 | 9,27 | 9,81 | MEXLN20100108 | ● |
| **1** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.5 | 10 | 0.95 | 50 | 2 | 10,52 | 10,86 | 11,20 | 11,54 | 12,22 | MEXLN20100110 | ● |

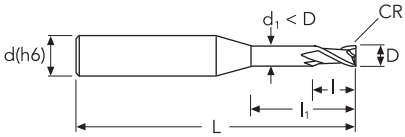
● stock standard ○ non-stock standard ▽ stock exhaustion

# MEXLN2R

cylindrical shank, 2 flutes, extended and reduced neck, corner radius

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z2

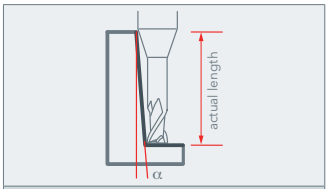



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.5 | 12 | 0.95 | 50 | 2 | 12,59 | 12,99 | 13,40 | 13,81 | 14,62 | MEXLN20100112 | ● |
| **1** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.5 | 16 | 0.95 | 50 | 2 | 16,72 | 17,26 | 17,80 | 18,35 | 19,43 | MEXLN20100116 | ● |
| **1** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.5 | 20 | 0.95 | 50 | 2 | 20,86 | 21,53 | 22,21 | 22,88 | 24,24 | MEXLN20100120 | ● |
| **1** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 1.5 | 4 | 0.95 | 50 | 2 | 4,32 | 4,45 | 4,58 | 4,72 | 4,99 | MEXLN20100204 | ● |
| **1** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 1.5 | 6 | 0.95 | 50 | 2 | 6,38 | 6,58 | 6,79 | 6,99 | 7,39 | MEXLN20100206 | ● |
| **1** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 1.5 | 8 | 0.95 | 50 | 2 | 8,45 | 8,72 | 8,99 | 9,26 | 9,79 | MEXLN20100208 | ● |
| **1** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 1.5 | 10 | 0.95 | 50 | 2 | 10,52 | 10,85 | 11,19 | 11,52 | 12,20 | MEXLN20100210 | ● |
| **1** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 1.5 | 12 | 0.95 | 50 | 2 | 12,58 | 12,99 | 13,39 | 13,79 | 14,60 | MEXLN20100212 | ● |
| **1** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 1.5 | 16 | 0.95 | 50 | 2 | 16,72 | 17,26 | 17,79 | 18,33 | 19,41 | MEXLN20100216 | ● |
| **1** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 1.5 | 20 | 0.95 | 50 | 2 | 20,85 | 21,53 | 22,20 | 22,87 | 24,22 | MEXLN20100220 | ● |
| **1** | 0/-0.015 | 0.30 | 0/-0.010 | 4 | 1.5 | 6 | 0.95 | 50 | 2 | 6,38 | 6,58 | 6,78 | 6,97 | 7,37 | MEXLN20100306 | ● |
| **1** | 0/-0.015 | 0.30 | 0/-0.010 | 4 | 1.5 | 10 | 0.95 | 50 | 2 | 10,51 | 10,85 | 11,18 | 11,51 | 12,18 | MEXLN20100310 | ● |
| **1** | 0/-0.015 | 0.30 | 0/-0.010 | 4 | 1.5 | 16 | 0.95 | 50 | 2 | 16,72 | 17,25 | 17,78 | 18,32 | 19,39 | MEXLN20100316 | ● |
| **1** | 0/-0.015 | 0.30 | 0/-0.010 | 4 | 1.5 | 20 | 0.95 | 50 | 2 | 20,85 | 21,52 | 22,19 | 22,86 | 24,20 | MEXLN20100320 | ● |
| **1.2** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.8 | 6 | 1.15 | 50 | 2 | 6,39 | 6,59 | 6,80 | 7,00 | 7,41 | MEXLN20120106 | ● |
| **1.2** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.8 | 8 | 1.15 | 50 | 2 | 8,45 | 8,73 | 9,00 | 9,27 | 9,81 | MEXLN20120108 | ● |
| **1.2** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.8 | 10 | 1.15 | 50 | 2 | 10,52 | 10,86 | 11,20 | 11,54 | 12,22 | MEXLN20120110 | ● |
| **1.2** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.8 | 12 | 1.15 | 50 | 2 | 12,59 | 12,99 | 13,40 | 13,81 | 14,62 | MEXLN20120112 | ● |
| **1.4** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 2.1 | 6 | 1.35 | 50 | 2 | 6,39 | 6,59 | 6,80 | 7,00 | 7,41 | MEXLN20140106 | ● |
| **1.4** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 2.1 | 8 | 1.35 | 50 | 2 | 8,45 | 8,73 | 9,00 | 9,27 | 9,81 | MEXLN20140108 | ● |
| **1.4** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 2.1 | 10 | 1.35 | 50 | 2 | 10,52 | 10,86 | 11,20 | 11,54 | 12,22 | MEXLN20140110 | ● |
| **1.4** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 2.1 | 12 | 1.35 | 50 | 2 | 12,59 | 12,99 | 13,40 | 13,81 | 14,62 | MEXLN20140112 | ● |
| **1.4** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 2.1 | 16 | 1.35 | 50 | 2 | 16,72 | 17,26 | 17,80 | 18,35 | 19,43 | MEXLN20140116 | ● |
| **1.5** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 2.3 | 4 | 1.45 | 50 | 2 | 4,32 | 4,46 | 4,59 | 4,73 | 5,01 | MEXLN20150104 | ● |
| **1.5** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 2.3 | 8 | 1.45 | 50 | 2 | 8,45 | 8,73 | 9,00 | 9,27 | 9,81 | MEXLN20150108 | ● |
| **1.5** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 2.3 | 12 | 1.45 | 50 | 2 | 12,59 | 12,99 | 13,40 | 13,81 | 14,62 | MEXLN20150112 | ● |
| **1.5** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 2.3 | 16 | 1.45 | 50 | 2 | 16,72 | 17,26 | 17,80 | 18,35 | 19,43 | MEXLN20150116 | ● |
| **1.5** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 2.3 | 20 | 1.45 | 60 | 2 | 20,86 | 21,53 | 22,21 | 22,88 | 24,24 | MEXLN20150120 | ● |
| **1.5** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.3 | 8 | 1.45 | 50 | 2 | 8,45 | 8,72 | 8,99 | 9,26 | 9,79 | MEXLN20150208 | ● |
| **1.5** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.3 | 10 | 1.45 | 50 | 2 | 10,52 | 10,85 | 11,19 | 11,52 | 12,20 | MEXLN20150210 | ● |
| **1.5** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.3 | 12 | 1.45 | 50 | 2 | 12,58 | 12,99 | 13,39 | 13,79 | 14,60 | MEXLN20150212 | ● |
| **1.5** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.3 | 16 | 1.45 | 50 | 2 | 16,72 | 17,26 | 17,79 | 18,33 | 19,41 | MEXLN20150216 | ● |
| **1.5** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.3 | 20 | 1.45 | 60 | 2 | 20,85 | 21,53 | 22,20 | 22,87 | 24,22 | MEXLN20150220 | ● |
| **1.5** | 0/-0.015 | 0.30 | 0/-0.010 | 4 | 2.3 | 8 | 1.45 | 50 | 2 | 8,45 | 8,71 | 8,98 | 9,24 | 9,77 | MEXLN20150308 | ● |
| **1.5** | 0/-0.015 | 0.30 | 0/-0.010 | 4 | 2.3 | 16 | 1.45 | 50 | 2 | 16,72 | 17,25 | 17,78 | 18,32 | 19,39 | MEXLN20150316 | ● |
| **1.5** | 0/-0.015 | 0.30 | 0/-0.010 | 4 | 2.3 | 20 | 1.45 | 60 | 2 | 20,85 | 21,52 | 22,19 | 22,86 | 24,20 | MEXLN20150320 | ● |
| **1.6** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 2.4 | 8 | 1.55 | 50 | 2 | 8,45 | 8,73 | 9,00 | 9,27 | 9,81 | MEXLN20160108 | ● |
| **1.6** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 2.4 | 12 | 1.55 | 50 | 2 | 12,59 | 12,99 | 13,40 | 13,81 | 14,62 | MEXLN20160112 | ● |
| **1.6** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 2.4 | 16 | 1.55 | 50 | 2 | 16,72 | 17,26 | 17,80 | 18,35 | 19,43 | MEXLN20160116 | ● |

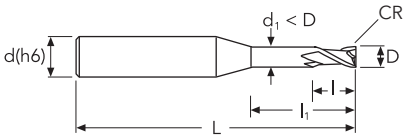
● stock standard ○ non-stock standard ▽ stock exhaustion

# MEXLN2R

cylindrical shank, 2 flutes, extended and reduced neck, corner radius

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z2

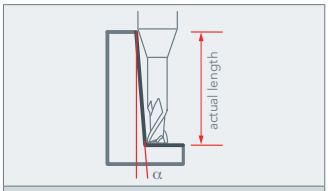



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.8** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.7 | 8 | 1.75 | 50 | 2 | 8,45 | 8,72 | 8,99 | 9,26 | 9,79 | MEXLN20180208 | ● |
| **1.8** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.7 | 12 | 1.75 | 50 | 2 | 12,58 | 12,99 | 13,39 | 13,79 | 14,60 | MEXLN20180212 | ● |
| **1.8** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.7 | 16 | 1.75 | 50 | 2 | 16,72 | 17,26 | 17,79 | 18,33 | 19,41 | MEXLN20180216 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 6 | 1.95 | 50 | 2 | 6,38 | 6,58 | 6,79 | 6,99 | 7,39 | MEXLN20200206 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 8 | 1.95 | 50 | 2 | 8,45 | 8,72 | 8,99 | 9,26 | 9,79 | MEXLN20200208 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 10 | 1.95 | 50 | 2 | 10,52 | 10,85 | 11,19 | 11,52 | 12,20 | MEXLN20200210 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 12 | 1.95 | 50 | 2 | 12,58 | 12,99 | 13,39 | 13,79 | 14,60 | MEXLN20200212 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 14 | 1.95 | 50 | 2 | 14,65 | 15,12 | 15,59 | 16,06 | 17,01 | MEXLN20200214 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 16 | 1.95 | 50 | 2 | 16,72 | 17,26 | 17,79 | 18,33 | 19,41 | MEXLN20200216 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 20 | 1.95 | 60 | 2 | 20,85 | 21,53 | 22,20 | 22,87 | - | MEXLN20200220 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 25 | 1.95 | 75 | 2 | 26,02 | 26,86 | 27,70 | 28,54 | - | MEXLN20200225 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 30 | 1.95 | 75 | 2 | 31,19 | 32,20 | 33,21 | - | - | MEXLN20200230 | ● |
| **2** | 0/-0.015 | 0.50 | 0/-0.010 | 4 | 3 | 6 | 1.95 | 50 | 2 | 6,37 | 6,56 | 6,75 | 6,95 | 7,33 | MEXLN20200506 | ● |
| **2** | 0/-0.015 | 0.50 | 0/-0.010 | 4 | 3 | 8 | 1.95 | 50 | 2 | 8,44 | 8,70 | 8,96 | 9,22 | 9,73 | MEXLN20200508 | ● |
| **2** | 0/-0.015 | 0.50 | 0/-0.010 | 4 | 3 | 12 | 1.95 | 50 | 2 | 12,57 | 12,97 | 13,36 | 13,75 | 14,54 | MEXLN20200512 | ● |
| **2** | 0/-0.015 | 0.50 | 0/-0.010 | 4 | 3 | 16 | 1.95 | 50 | 2 | 16,71 | 17,24 | 17,76 | 18,29 | 19,35 | MEXLN20200516 | ● |
| **2** | 0/-0.015 | 0.50 | 0/-0.010 | 4 | 3 | 20 | 1.95 | 60 | 2 | 20,84 | 21,51 | 22,17 | 22,83 | - | MEXLN20200520 | ● |
| **2** | 0/-0.015 | 0.50 | 0/-0.010 | 4 | 3 | 25 | 1.95 | 75 | 2 | 26,01 | 26,84 | 27,67 | 28,50 | - | MEXLN20200525 | ● |
| **2** | 0/-0.015 | 0.50 | 0/-0.010 | 4 | 3 | 30 | 1.95 | 75 | 2 | 31,18 | 32,18 | 33,18 | - | - | MEXLN20200530 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 8 | 2.40 | 50 | 2 | 8,45 | 8,71 | 8,98 | 9,24 | 9,77 | MEXLN20250308 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 12 | 2.40 | 50 | 2 | 12,58 | 12,98 | 13,38 | 13,78 | 14,58 | MEXLN20250312 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 16 | 2.40 | 50 | 2 | 16,72 | 17,25 | 17,78 | 18,32 | - | MEXLN20250316 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 20 | 2.40 | 60 | 2 | 20,85 | 21,52 | 22,19 | - | - | MEXLN20250320 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 25 | 2.40 | 60 | 2 | 26,02 | 26,86 | 27,69 | - | - | MEXLN20250325 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 30 | 2.40 | 75 | 2 | 31,19 | 32,19 | - | - | - | MEXLN20250330 | ● |
| **2.5** | 0/-0.020 | 0.50 | 0/-0.015 | 4 | 3.7 | 8 | 2.40 | 50 | 2 | 8,44 | 8,70 | 8,96 | 9,22 | 9,73 | MEXLN20250508 | ● |
| **2.5** | 0/-0.020 | 0.50 | 0/-0.015 | 4 | 3.7 | 12 | 2.40 | 50 | 2 | 12,57 | 12,97 | 13,36 | 13,75 | 14,54 | MEXLN20250512 | ● |
| **2.5** | 0/-0.020 | 0.50 | 0/-0.015 | 4 | 3.7 | 16 | 2.40 | 50 | 2 | 16,71 | 17,24 | 17,76 | 18,29 | - | MEXLN20250516 | ● |
| **2.5** | 0/-0.020 | 0.50 | 0/-0.015 | 4 | 3.7 | 20 | 2.40 | 60 | 2 | 20,84 | 21,51 | 22,17 | - | - | MEXLN20250520 | ● |
| **2.5** | 0/-0.020 | 0.50 | 0/-0.015 | 4 | 3.7 | 25 | 2.40 | 60 | 2 | 26,01 | 26,84 | 27,67 | - | - | MEXLN20250525 | ● |
| **2.5** | 0/-0.020 | 0.50 | 0/-0.015 | 4 | 3.7 | 30 | 2.40 | 75 | 2 | 31,18 | 32,18 | - | - | - | MEXLN20250530 | ● |
| **3** | 0/-0.025 | 0.20 | 0/-0.015 | 6 | 4.5 | 10 | 2.85 | 50 | 2 | 10,71 | 11,05 | 11,39 | 11,74 | 12,42 | MEXLN20300210 | ● |
| **3** | 0/-0.025 | 0.20 | 0/-0.015 | 6 | 4.5 | 12 | 2.85 | 50 | 2 | 12,78 | 13,19 | 13,60 | 14,00 | 14,82 | MEXLN20300212 | ● |
| **3** | 0/-0.025 | 0.20 | 0/-0.015 | 6 | 4.5 | 16 | 2.85 | 60 | 2 | 16,91 | 17,46 | 18,00 | 18,54 | 19,63 | MEXLN20300216 | ● |
| **3** | 0/-0.025 | 0.20 | 0/-0.015 | 6 | 4.5 | 20 | 2.85 | 60 | 2 | 21,05 | 21,72 | 22,40 | 23,08 | 24,44 | MEXLN20300220 | ● |
| **3** | 0/-0.025 | 0.20 | 0/-0.015 | 6 | 4.5 | 25 | 2.85 | 75 | 2 | 26,21 | 27,06 | 27,91 | 28,75 | 30,45 | MEXLN20300225 | ● |
| **3** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 10 | 2.85 | 50 | 2 | 10,71 | 11,04 | 11,38 | 11,72 | 12,40 | MEXLN20300310 | ● |
| **3** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 12 | 2.85 | 50 | 2 | 12,77 | 13,18 | 13,59 | 13,99 | 14,80 | MEXLN20300312 | ● |
| **3** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 16 | 2.85 | 60 | 2 | 16,91 | 17,45 | 17,99 | 18,53 | 19,61 | MEXLN20300316 | ● |

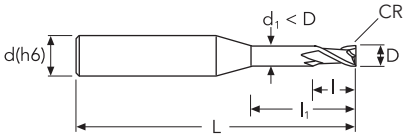
● stock standard ○ non-stock standard ▽ stock exhaustion

# MEXLN2R

cylindrical shank, 2 flutes, extended and reduced neck, corner radius

OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z2

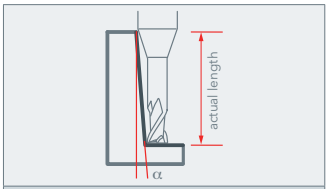



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 20 | 2.85 | 60 | 2 | 21,04 | 21,72 | 22,39 | 23,07 | 24,42 | MEXLN20300320 | ● |
| **3** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 25 | 2.85 | 75 | 2 | 26,21 | 27,05 | 27,90 | 28,74 | 30,43 | MEXLN20300325 | ● |
| **3** | 0/-0.025 | 0.50 | 0/-0.015 | 6 | 4.5 | 10 | 2.85 | 50 | 2 | 10,70 | 11,03 | 11,36 | 11,70 | 12,36 | MEXLN20300510 | ● |
| **3** | 0/-0.025 | 0.50 | 0/-0.015 | 6 | 4.5 | 12 | 2.85 | 50 | 2 | 12,77 | 13,17 | 13,57 | 13,96 | 14,76 | MEXLN20300512 | ● |
| **3** | 0/-0.025 | 0.50 | 0/-0.015 | 6 | 4.5 | 16 | 2.85 | 60 | 2 | 16,90 | 17,44 | 17,97 | 18,50 | 19,57 | MEXLN20300516 | ● |
| **3** | 0/-0.025 | 0.50 | 0/-0.015 | 6 | 4.5 | 20 | 2.85 | 60 | 2 | 21,04 | 21,70 | 22,37 | 23,04 | 24,38 | MEXLN20300520 | ● |
| **3** | 0/-0.025 | 0.50 | 0/-0.015 | 6 | 4.5 | 25 | 2.85 | 75 | 2 | 26,20 | 27,04 | 27,88 | 28,71 | 30,39 | MEXLN20300525 | ● |
| **4** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 10 | 3.85 | 60 | 2 | 10,90 | 11,24 | 11,59 | 11,93 | 12,62 | MEXLN20400310 | ● |
| **4** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 15 | 3.85 | 60 | 2 | 16,07 | 16,58 | 17,09 | 17,61 | 18,63 | MEXLN20400315 | ● |
| **4** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 20 | 3.85 | 60 | 2 | 21,24 | 21,92 | 22,60 | 23,28 | - | MEXLN20400320 | ● |
| **4** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 25 | 3.85 | 75 | 2 | 26,40 | 27,25 | 28,10 | 28,95 | - | MEXLN20400325 | ● |
| **4** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 30 | 3.85 | 75 | 2 | 31,57 | 32,59 | 33,61 | - | - | MEXLN20400330 | ● |
| **4** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 40 | 3.85 | 75 | 2 | 41,91 | 43,26 | - | - | - | MEXLN20400340 | ● |
| **4** | 0/-0.025 | 0.50 | 0/-0.015 | 6 | 4.5 | 10 | 3.85 | 60 | 2 | 10,89 | 11,23 | 11,57 | 11,91 | 12,58 | MEXLN20400510 | ● |
| **4** | 0/-0.025 | 0.50 | 0/-0.015 | 6 | 4.5 | 15 | 3.85 | 60 | 2 | 16,06 | 16,57 | 17,07 | 17,58 | 18,59 | MEXLN20400515 | ● |
| **4** | 0/-0.025 | 0.50 | 0/-0.015 | 6 | 4.5 | 20 | 3.85 | 60 | 2 | 21,23 | 21,90 | 22,58 | 23,25 | - | MEXLN20400520 | ● |
| **4** | 0/-0.025 | 0.50 | 0/-0.015 | 6 | 4.5 | 25 | 3.85 | 75 | 2 | 26,40 | 27,24 | 28,08 | 28,92 | - | MEXLN20400525 | ● |
| **4** | 0/-0.025 | 0.50 | 0/-0.015 | 6 | 4.5 | 30 | 3.85 | 75 | 2 | 31,57 | 32,58 | 33,59 | - | - | MEXLN20400530 | ● |
| **4** | 0/-0.025 | 0.50 | 0/-0.015 | 6 | 4.5 | 40 | 3.85 | 75 | 2 | 41,90 | 43,25 | - | - | - | MEXLN20400540 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

# MEXLN2R

| | Material Group ISO 513 | | | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | | | **ap x D** | **ap x D** | **ap x D** | **ap x D** |
| | Vc (m/min) | | | **70÷110** | **50÷90** | **40÷60** | **20÷40** |
| | D (mm) | l1 (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| SQUARE RIB | **0.3** | ≤ 6D | 0.02 | 0.004 | 0.004 | 0.003 | 0.003 |
| | | ≤ 8D | 0.01 | 0.004 | 0.003 | 0.003 | 0.003 |
| | | ≤ 10D | 0.01 | 0.003 | 0.003 | 0.003 | 0.002 |
| | | ≤ 12D | 0.01 | 0.003 | 0.003 | 0.002 | 0.002 |
| | **0.4** | ≤ 6D | 0.02 | 0.006 | 0.005 | 0.005 | 0.004 |
| | | ≤ 8D | 0.02 | 0.005 | 0.005 | 0.004 | 0.004 |
| | | ≤ 10D | 0.01 | 0.005 | 0.004 | 0.004 | 0.003 |
| | | ≤ 12D | 0.01 | 0.004 | 0.004 | 0.003 | 0.003 |
| | **0.5** | ≤ 6D | 0.03 | 0.007 | 0.006 | 0.006 | 0.005 |
| | | ≤ 8D | 0.02 | 0.006 | 0.006 | 0.005 | 0.004 |
| | | ≤ 10D | 0.02 | 0.006 | 0.005 | 0.004 | 0.004 |
| | | ≤ 12D | 0.01 | 0.005 | 0.004 | 0.004 | 0.003 |
| | **0.6** | ≤ 6D | 0.03 | 0.008 | 0.007 | 0.006 | 0.006 |
| | | ≤ 8D | 0.03 | 0.007 | 0.006 | 0.006 | 0.005 |
| | | ≤ 10D | 0.02 | 0.006 | 0.006 | 0.005 | 0.004 |
| | | ≤ 12D | 0.02 | 0.006 | 0.005 | 0.004 | 0.004 |
| | **0.8** | ≤ 6D | 0.04 | 0.010 | 0.009 | 0.008 | 0.007 |
| | | ≤ 8D | 0.03 | 0.009 | 0.008 | 0.007 | 0.006 |
| | | ≤ 10D | 0.03 | 0.008 | 0.007 | 0.006 | 0.006 |
| | | ≤ 12D | 0.02 | 0.007 | 0.006 | 0.006 | 0.005 |
| | **1** | ≤ 6D | 0.05 | 0.012 | 0.011 | 0.010 | 0.008 |
| | | ≤ 8D | 0.04 | 0.011 | 0.010 | 0.009 | 0.008 |
| | | ≤ 10D | 0.04 | 0.010 | 0.009 | 0.008 | 0.007 |
| | | ≤ 12D | 0.03 | 0.008 | 0.008 | 0.007 | 0.006 |
| | **1.2** | ≤ 6D | 0.06 | 0.022 | 0.020 | 0.018 | 0.015 |
| | | ≤ 8D | 0.05 | 0.020 | 0.018 | 0.016 | 0.014 |
| | | ≤ 10D | 0.04 | 0.018 | 0.016 | 0.014 | 0.012 |
| | | ≤ 12D | 0.03 | 0.015 | 0.014 | 0.012 | 0.011 |
| | **1.4** | ≤ 6D | 0.07 | 0.024 | 0.022 | 0.019 | 0.017 |
| | | ≤ 8D | 0.06 | 0.022 | 0.019 | 0.017 | 0.015 |
| | | ≤ 10D | 0.05 | 0.019 | 0.017 | 0.015 | 0.013 |
| | | ≤ 12D | 0.04 | 0.017 | 0.015 | 0.013 | 0.012 |
| | | ≤ 15D | 0.03 | 0.014 | 0.013 | 0.012 | 0.010 |
| | | ≥ 15D | 0.02 | 0.012 | 0.011 | 0.010 | 0.008 |
| | **1.5** | ≤ 6D | 0.08 | 0.025 | 0.023 | 0.020 | 0.018 |
| | | ≤ 8D | 0.06 | 0.023 | 0.020 | 0.018 | 0.016 |
| | | ≤ 10D | 0.05 | 0.020 | 0.018 | 0.016 | 0.014 |
| | | ≤ 12D | 0.04 | 0.018 | 0.016 | 0.014 | 0.012 |
| | | ≤ 15D | 0.03 | 0.015 | 0.014 | 0.012 | 0.011 |
| | | ≥ 15D | 0.02 | 0.013 | 0.011 | 0.010 | 0.009 |
| | **1.6** | ≤ 6D | 0.08 | 0.026 | 0.023 | 0.021 | 0.018 |
| | | ≤ 8D | 0.07 | 0.023 | 0.021 | 0.019 | 0.016 |
| | | ≤ 10D | 0.06 | 0.021 | 0.019 | 0.017 | 0.015 |
| | | ≤ 12D | 0.04 | 0.018 | 0.016 | 0.015 | 0.013 |
| | | ≤ 15D | 0.04 | 0.016 | 0.014 | 0.012 | 0.011 |
| | | ≥ 15D | 0.02 | 0.013 | 0.012 | 0.010 | 0.009 |

# MEXLN2R

SQUARE RIB

| Material Group ISO 513 | | | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| ap x ae | | | **ap x D** | **ap x D** | **ap x D** | **ap x D** |
| Vc (m/min) | | | **70÷110** | **50÷90** | **40÷60** | **20÷40** |
| D (mm) | l1 (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 1.8 | ≤ 6D | 0.09 | 0.028 | 0.025 | 0.022 | 0.020 |
| | ≤ 8D | 0.08 | 0.025 | 0.023 | 0.020 | 0.018 |
| | ≤ 10D | 0.06 | 0.022 | 0.020 | 0.018 | 0.016 |
| | ≤ 12D | 0.05 | 0.020 | 0.018 | 0.016 | 0.014 |
| | ≤ 15D | 0.04 | 0.017 | 0.015 | 0.013 | 0.012 |
| | ≥ 15D | 0.03 | 0.014 | 0.013 | 0.011 | 0.010 |
| 2 | ≤ 6D | 0.10 | 0.030 | 0.027 | 0.024 | 0.021 |
| | ≤ 8D | 0.09 | 0.027 | 0.024 | 0.022 | 0.019 |
| | ≤ 10D | 0.07 | 0.024 | 0.022 | 0.019 | 0.017 |
| | ≤ 12D | 0.06 | 0.021 | 0.019 | 0.017 | 0.015 |
| | ≤ 15D | 0.05 | 0.018 | 0.016 | 0.014 | 0.013 |
| | ≥ 15D | 0.03 | 0.018 | 0.016 | 0.014 | 0.013 |
| 2.5 | ≤ 6D | 0.13 | 0.035 | 0.032 | 0.028 | 0.025 |
| | ≤ 8D | 0.11 | 0.032 | 0.028 | 0.025 | 0.022 |
| | ≤ 10D | 0.09 | 0.028 | 0.025 | 0.022 | 0.020 |
| | ≤ 12D | 0.07 | 0.025 | 0.022 | 0.020 | 0.017 |
| | ≤ 15D | 0.06 | 0.021 | 0.019 | 0.017 | 0.015 |
| | ≥ 15D | 0.04 | 0.021 | 0.019 | 0.017 | 0.015 |
| 3 | ≤ 6D | 0.15 | 0.040 | 0.036 | 0.032 | 0.028 |
| | ≤ 8D | 0.13 | 0.036 | 0.032 | 0.029 | 0.025 |
| | ≤ 10D | 0.11 | 0.032 | 0.029 | 0.026 | 0.022 |
| | ≤ 12D | 0.08 | 0.028 | 0.025 | 0.022 | 0.020 |
| | ≤ 15D | 0.07 | 0.024 | 0.022 | 0.019 | 0.017 |
| | ≥ 15D | 0.05 | 0.024 | 0.022 | 0.019 | 0.017 |
| 4 | ≤ 6D | 0.20 | 0.050 | 0.045 | 0.040 | 0.035 |
| | ≤ 8D | 0.17 | 0.045 | 0.041 | 0.036 | 0.032 |
| | ≤ 10D | 0.14 | 0.040 | 0.036 | 0.032 | 0.028 |
| | ≤ 12D | 0.11 | 0.035 | 0.032 | 0.028 | 0.025 |
| | ≤ 15D | 0.09 | 0.030 | 0.027 | 0.024 | 0.021 |
| | ≥ 15D | 0.06 | 0.030 | 0.027 | 0.024 | 0.021 |

# MEXLS2R

cylindrical shank, 2 flutes, long, corner radius

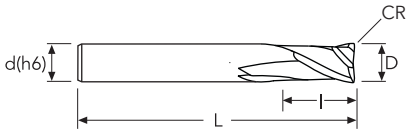
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z2




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SLOTTING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.015 | 0.30 | 0/-0.010 | 6 | 4 | | 75 | 2 | MEXLS2R03020 | ● |
| **3** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 5 | | 75 | 2 | MEXLS2R03030 | ● |
| **3** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 5 | | 75 | 2 | MEXLS2R05030 | ● |
| **4** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 8 | | 75 | 2 | MEXLS2R03040 | ● |
| **4** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 8 | | 75 | 2 | MEXLS2R05040 | ● |
| **5** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 9 | | 75 | 2 | MEXLS2R03050 | ● |
| **5** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 9 | | 75 | 2 | MEXLS2R05050 | ● |
| **6** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 10 | | 75 | 2 | MEXLS2R03060 | ● |
| **6** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 10 | | 75 | 2 | MEXLS2R05060 | ● |
| **6** | 0/-0.020 | 1.00 | 0/-0.015 | 6 | 10 | | 75 | 2 | MEXLS2R10060 | ● |
| **8** | 0/-0.020 | 0.30 | 0/-0.015 | 8 | 12 | | 75 | 2 | MEXLS2R03080 | ● |
| **8** | 0/-0.020 | 0.50 | 0/-0.015 | 8 | 12 | | 75 | 2 | MEXLS2R05080 | ● |
| **8** | 0/-0.020 | 1.00 | 0/-0.015 | 8 | 12 | | 75 | 2 | MEXLS2R10080 | ● |
| **10** | 0/-0.020 | 0.50 | 0/-0.020 | 10 | 14 | | 100 | 2 | MEXLS2R05100 | ● |
| **10** | 0/-0.020 | 1.00 | 0/-0.020 | 10 | 14 | | 100 | 2 | MEXLS2R10100 | ● |
| **12** | 0/-0.020 | 0.50 | 0/-0.020 | 12 | 16 | | 100 | 2 | MEXLS2R05120 | ● |
| **12** | 0/-0.020 | 1.00 | 0/-0.020 | 12 | 16 | | 100 | 2 | MEXLS2R10120 | ● |
| **16** | 0/-0.020 | 0.50 | 0/-0.020 | 16 | 22 | | 125 | 2 | MEXLS2R05160 | ● |
| **16** | 0/-0.020 | 1.00 | 0/-0.020 | 16 | 22 | | 125 | 2 | MEXLS2R10160 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

CUTTING PARAMETERS

# MEXLS2R

| SLOTTING | Material Group ISO 513 | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | **0.3D x D** | **0.3D x D** | **0.2D x D** | **0.05D x D** |
| | Vc (m/min) | **70÷110** | **50÷90** | **40÷60** | **20÷40** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **2** | 0.005 | 0.005 | 0.004 | 0.004 |
| | **3** | 0.006 | 0.005 | 0.005 | 0.004 |
| | **4** | 0.009 | 0.008 | 0.007 | 0.006 |
| | **5** | 0.012 | 0.011 | 0.010 | 0.008 |
| | **6** | 0.018 | 0.016 | 0.014 | 0.013 |
| | **8** | 0.024 | 0.022 | 0.019 | 0.017 |
| | **10** | 0.029 | 0.026 | 0.023 | 0.020 |
| | **12** | 0.035 | 0.032 | 0.028 | 0.025 |
| | **16** | 0.041 | 0.037 | 0.033 | 0.029 |

≤ D3 mm: ap = 0.4 mm

# MEXCS4R

cylindrical shank, 4 flutes, corner radius

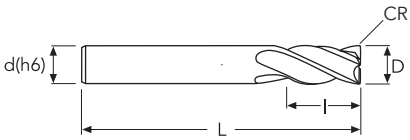
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | | 50 | 4 | MEXCS4R01002 | ● |
| **1.5** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 4.5 | | 50 | 4 | MEXCS4R01502 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 6.5 | | 50 | 4 | MEXCS4R02002 | ● |
| **2** | 0/-0.015 | 0.30 | 0/-0.010 | 4 | 6.5 | | 50 | 4 | MEXCS4R02003 | ● |
| **2.5** | 0/-0.020 | 0.20 | 0/-0.015 | 4 | 6.5 | | 50 | 4 | MEXCS4R02502 | ● |
| **2.5** | 0/-0.020 | 0.50 | 0/-0.015 | 4 | 6.5 | | 50 | 4 | MEXCS4R02505 | ● |
| **3** | 0/-0.020 | 0.20 | 0/-0.015 | 4 | 9 | | 50 | 4 | MEXCS4R03002 | ● |
| **3** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 9 | | 50 | 4 | MEXCS4R03003 | ● |
| **3** | 0/-0.020 | 0.50 | 0/-0.015 | 4 | 9 | | 50 | 4 | MEXCS4R03005 | ● |
| **4** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 12 | | 50 | 4 | MEXCS4R04003 | ● |
| **4** | 0/-0.020 | 0.50 | 0/-0.015 | 4 | 12 | | 50 | 4 | MEXCS4R04005 | ● |
| **4** | 0/-0.020 | 1.00 | 0/-0.015 | 4 | 12 | | 50 | 4 | MEXCS4R04010 | ● |
| **5** | 0/-0.020 | 0.30 | 0/-0.015 | 5 | 15 | | 50 | 4 | MEXCS4R05003 | ● |
| **5** | 0/-0.020 | 0.50 | 0/-0.015 | 5 | 15 | | 50 | 4 | MEXCS4R05005 | ● |
| **5** | 0/-0.020 | 1.00 | 0/-0.015 | 5 | 15 | | 50 | 4 | MEXCS4R05010 | ● |
| **6** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 16 | | 50 | 4 | MEXCS4R06003 | ● |
| **6** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 16 | | 50 | 4 | MEXCS4R06005 | ● |
| **6** | 0/-0.020 | 1.00 | 0/-0.015 | 6 | 16 | | 50 | 4 | MEXCS4R06010 | ● |
| **8** | 0/-0.020 | 0.30 | 0/-0.015 | 8 | 20 | | 64 | 4 | MEXCS4R08003 | ● |
| **8** | 0/-0.020 | 0.50 | 0/-0.015 | 8 | 20 | | 64 | 4 | MEXCS4R08005 | ● |
| **8** | 0/-0.020 | 1.00 | 0/-0.015 | 8 | 20 | | 64 | 4 | MEXCS4R08010 | ● |
| **8** | 0/-0.020 | 1.50 | 0/-0.015 | 8 | 20 | | 64 | 4 | MEXCS4R08015 | ● |
| **8** | 0/-0.020 | 2.00 | 0/-0.015 | 8 | 20 | | 64 | 4 | MEXCS4R08020 | ● |
| **10** | 0/-0.020 | 0.30 | 0/-0.020 | 10 | 22 | | 75 | 4 | MEXCS4R10003 | ● |
| **10** | 0/-0.020 | 0.50 | 0/-0.020 | 10 | 22 | | 75 | 4 | MEXCS4R10005 | ● |
| **10** | 0/-0.020 | 1.00 | 0/-0.020 | 10 | 22 | | 75 | 4 | MEXCS4R10010 | ● |
| **10** | 0/-0.020 | 1.50 | 0/-0.020 | 10 | 22 | | 75 | 4 | MEXCS4R10015 | ● |
| **10** | 0/-0.020 | 2.00 | 0/-0.020 | 10 | 22 | | 75 | 4 | MEXCS4R10020 | ● |
| **12** | 0/-0.020 | 0.30 | 0/-0.020 | 12 | 25 | | 75 | 4 | MEXCS4R12003 | ● |
| **12** | 0/-0.020 | 0.50 | 0/-0.020 | 12 | 25 | | 75 | 4 | MEXCS4R12005 | ● |
| **12** | 0/-0.020 | 1.00 | 0/-0.020 | 12 | 25 | | 75 | 4 | MEXCS4R12010 | ● |
| **12** | 0/-0.020 | 1.50 | 0/-0.020 | 12 | 25 | | 75 | 4 | MEXCS4R12015 | ● |
| **12** | 0/-0.020 | 2.00 | 0/-0.020 | 12 | 25 | | 75 | 4 | MEXCS4R12020 | ● |
| **12** | 0/-0.020 | 3.00 | 0/-0.020 | 12 | 25 | | 75 | 4 | MEXCS4R12030 | ● |
| **14** | 0/-0.020 | 0.50 | 0/-0.020 | 14 | 32 | | 90 | 4 | MEXCS4R14005 | ○ |
| **14** | 0/-0.020 | 1.00 | 0/-0.020 | 14 | 32 | | 90 | 4 | MEXCS4R14010 | ● |
| **14** | 0/-0.020 | 2.00 | 0/-0.020 | 14 | 32 | | 90 | 4 | MEXCS4R14020 | ○ |
| **16** | 0/-0.020 | 0.50 | 0/-0.020 | 16 | 32 | | 90 | 4 | MEXCS4R16005 | ● |
| **16** | 0/-0.020 | 1.00 | 0/-0.020 | 16 | 32 | | 90 | 4 | MEXCS4R16010 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

# MEXCS4R

cylindrical shank, 4 flutes, corner radius

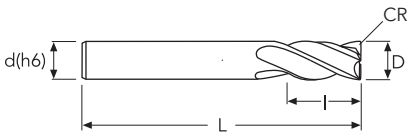
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **16** | 0/-0.020 | 2.00 | 0/-0.020 | 16 | 32 | | 90 | 4 | MEXCS4R16020 | ● |
| **16** | 0/-0.020 | 3.00 | 0/-0.020 | 16 | 32 | | 90 | 4 | MEXCS4R16030 | ● |
| **18** | 0/-0.020 | 0.50 | 0/-0.020 | 18 | 38 | | 100 | 4 | MEXCS4R18005 | ● |
| **18** | 0/-0.020 | 1.00 | 0/-0.020 | 18 | 38 | | 100 | 4 | MEXCS4R18010 | ● |
| **20** | 0/-0.020 | 0.50 | 0/-0.020 | 20 | 38 | | 100 | 4 | MEXCS4R20005 | ● |
| **20** | 0/-0.020 | 1.00 | 0/-0.020 | 20 | 38 | | 100 | 4 | MEXCS4R20010 | ● |
| **20** | 0/-0.020 | 2.00 | 0/-0.020 | 20 | 38 | | 100 | 4 | MEXCS4R20020 | ● |
| **20** | 0/-0.020 | 3.00 | 0/-0.020 | 20 | 38 | | 100 | 4 | MEXCS4R20030 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

## MEXCS4R

| | Material Group ISO 513 | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | **D x 0.1D** | **D x 0.1D** | **D x 0.05D** | **D x 0.05D** |
| | Vc (m/min) | **80÷120** | **50÷90** | **40÷60** | **20÷40** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.009 | 0.008 | 0.007 | 0.006 |
| | **2** | 0.017 | 0.015 | 0.014 | 0.012 |
| | **3** | 0.026 | 0.023 | 0.020 | 0.018 |
| | **4** | 0.034 | 0.031 | 0.027 | 0.024 |
| | **5** | 0.038 | 0.034 | 0.031 | 0.027 |
| | **6** | 0.043 | 0.038 | 0.034 | 0.030 |
| | **8** | 0.055 | 0.050 | 0.044 | 0.039 |
| | **10** | 0.071 | 0.064 | 0.057 | 0.050 |
| | **12** | 0.085 | 0.077 | 0.068 | 0.060 |
| | **14** | 0.098 | 0.088 | 0.078 | 0.068 |
| | **16** | 0.110 | 0.099 | 0.088 | 0.077 |
| | **18** | 0.125 | 0.113 | 0.100 | 0.088 |
| | **20** | 0.140 | 0.126 | 0.112 | 0.098 |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
**MEX/MH**
UH/MH

HSS END-MILLS

CARBIDE BURRS

# MEX410R

cylindrical shank, 4 flutes, short, corner radius

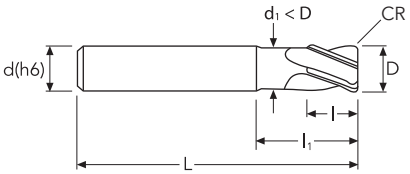
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.012 | 0.20 | +/-0.020 | 6 | 2.5 | 5 | 1.90 | 50 | 4 | MEX410R02020 | ● |
| **2.5** | 0/-0.012 | 0.25 | +/-0.020 | 6 | 3 | 6 | 2.40 | 50 | 4 | MEX410R025025 | ● |
| **3** | 0/-0.012 | 0.30 | +/-0.020 | 6 | 4 | 7 | 2.85 | 50 | 4 | MEX410R03030 | ● |
| **4** | 0/-0.012 | 0.50 | +/-0.020 | 6 | 5 | 9 | 3.85 | 50 | 4 | MEX410R05040 | ● |
| **5** | 0/-0.015 | 0.50 | +/-0.020 | 6 | 6 | 12 | 4.85 | 50 | 4 | MEX410R05050 | ● |
| **6** | 0/-0.015 | 0.50 | +/-0.020 | 6 | 7 | 14 | 5.80 | 60 | 4 | MEX410R05060 | ● |
| **8** | 0/-0.015 | 1.00 | +/-0.020 | 8 | 10 | 18 | 7.80 | 70 | 4 | MEX410R10080 | ● |
| **10** | 0/-0.015 | 1.00 | +/-0.020 | 10 | 12 | 25 | 9.80 | 75 | 4 | MEX410R10100 | ● |
| **12** | 0/-0.015 | 1.00 | +/-0.020 | 12 | 15 | 30 | 11.80 | 80 | 4 | MEX410R10120 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

# MEX410R

| | Material Group ISO 513 | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | **D x 0.1D** | **D x 0.1D** | **D x 0.05D** | **D x 0.05D** |
| | Vc (m/min) | **80÷120** | **50÷90** | **40÷60** | **20÷40** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **2** | 0.015 | 0.014 | 0.012 | 0.011 |
| | **3** | 0.023 | 0.021 | 0.018 | 0.016 |
| | **4** | 0.031 | 0.028 | 0.024 | 0.021 |
| | **5** | 0.034 | 0.031 | 0.028 | 0.024 |
| | **6** | 0.038 | 0.034 | 0.031 | 0.027 |
| | **8** | 0.050 | 0.045 | 0.040 | 0.035 |
| | **10** | 0.065 | 0.059 | 0.052 | 0.046 |
| | **12** | 0.077 | 0.069 | 0.061 | 0.054 |

# MEXLS4R

cylindrical shank, 4 flutes, long, corner radius

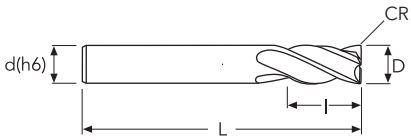
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 40° | RADIUS | Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.015 | 0.30 | 0/-0.010 | 6 | 4 | | 75 | 4 | MEXLS4R03020 | ● |
| **3** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 5 | | 75 | 4 | MEXLS4R03030 | ● |
| **3** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 5 | | 75 | 4 | MEXLS4R05030 | ● |
| **4** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 8 | | 75 | 4 | MEXLS4R03040 | ● |
| **4** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 8 | | 75 | 4 | MEXLS4R05040 | ● |
| **5** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 9 | | 75 | 4 | MEXLS4R03050 | ● |
| **5** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 9 | | 75 | 4 | MEXLS4R05050 | ● |
| **6** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 10 | | 75 | 4 | MEXLS4R03060 | ● |
| **6** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 10 | | 75 | 4 | MEXLS4R05060 | ● |
| **6** | 0/-0.020 | 1.00 | 0/-0.015 | 6 | 10 | | 75 | 4 | MEXLS4R10060 | ● |
| **8** | 0/-0.020 | 0.30 | 0/-0.015 | 8 | 12 | | 75 | 4 | MEXLS4R03080 | ● |
| **8** | 0/-0.020 | 0.50 | 0/-0.015 | 8 | 12 | | 75 | 4 | MEXLS4R05080 | ● |
| **8** | 0/-0.020 | 1.00 | 0/-0.015 | 8 | 12 | | 75 | 4 | MEXLS4R10080 | ● |
| **10** | 0/-0.020 | 0.50 | 0/-0.020 | 10 | 14 | | 100 | 4 | MEXLS4R05100 | ● |
| **10** | 0/-0.020 | 1.00 | 0/-0.020 | 10 | 14 | | 100 | 4 | MEXLS4R10100 | ● |
| **12** | 0/-0.020 | 0.50 | 0/-0.020 | 12 | 16 | | 100 | 4 | MEXLS4R05120 | ● |
| **12** | 0/-0.020 | 1.00 | 0/-0.020 | 12 | 16 | | 100 | 4 | MEXLS4R10120 | ● |
| **16** | 0/-0.020 | 0.50 | 0/-0.020 | 16 | 22 | | 125 | 4 | MEXLS4R05160 | ● |
| **16** | 0/-0.020 | 1.00 | 0/-0.020 | 16 | 22 | | 125 | 4 | MEXLS4R10160 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

## MEXLS4R

| | Material Group ISO 513 | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | **D x 0.1D** | **D x 0.05D** | **D x 0.05D** | **D x 0.05D** |
| | Vc (m/min) | **70÷110** | **50÷90** | **40÷60** | **20÷40** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **2** | 0.014 | 0.013 | 0.012 | 0.010 |
| | **3** | 0.022 | 0.020 | 0.017 | 0.015 |
| | **4** | 0.029 | 0.026 | 0.023 | 0.020 |
| | **5** | 0.033 | 0.029 | 0.026 | 0.023 |
| | **6** | 0.036 | 0.033 | 0.029 | 0.025 |
| | **8** | 0.047 | 0.042 | 0.038 | 0.033 |
| | **10** | 0.060 | 0.054 | 0.048 | 0.042 |
| | **12** | 0.072 | 0.065 | 0.058 | 0.051 |
| | **16** | 0.094 | 0.084 | 0.075 | 0.065 |

# MEX610R

cylindrical shank, multi flute, short, corner radius

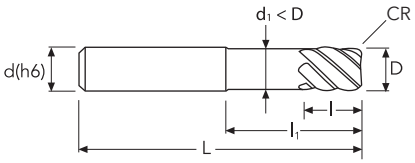
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 45° | RADIUS | Z6




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 6 | 14 | 5.80 | 50 | 6 | MEX610R05060 | ● |
| **8** | 0/-0.030 | 0.50 | +/-0.020 | 8 | 8 | 24 | 7.80 | 60 | 6 | MEX610R05080 | ● |
| **10** | 0/-0.030 | 1.00 | +/-0.020 | 10 | 10 | 30 | 9.80 | 70 | 6 | MEX610R10100 | ● |
| **12** | 0/-0.030 | 1.00 | +/-0.020 | 12 | 12 | 30 | 11.80 | 75 | 6 | MEX610R10120 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

## MEX610R

| | Material Group ISO 513 | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| SIDE MILLING | Hardness/Rm | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | **D x 0.1D** | **D x 0.1D** | **D x 0.05D** | **D x 0.05D** |
| | Vc (m/min) | **120÷160** | **90÷130** | **60÷100** | **50÷70** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.018 | 0.016 | 0.014 | 0.013 |
| | **8** | 0.028 | 0.025 | 0.022 | 0.019 |
| | **10** | 0.034 | 0.030 | 0.027 | 0.024 |
| | **12** | 0.041 | 0.037 | 0.033 | 0.029 |

# MEX611R

cylindrical shank, multi flute, long, corner radius

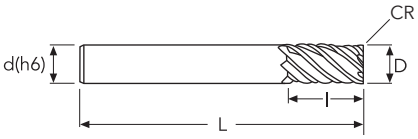
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 45° | RADIUS | Z6




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 15 | | 90 | 6 | MEX611R05060 | ● |
| **8** | 0/-0.030 | 0.50 | +/-0.020 | 8 | 20 | | 100 | 6 | MEX611R05080 | ● |
| **10** | 0/-0.030 | 0.50 | +/-0.020 | 10 | 25 | | 100 | 6 | MEX611R05100 | ● |
| **10** | 0/-0.030 | 1.00 | +/-0.020 | 10 | 25 | | 100 | 6 | MEX611R10100 | ● |
| **12** | 0/-0.030 | 0.50 | +/-0.020 | 12 | 30 | | 100 | 6 | MEX611R05120 | ● |
| **12** | 0/-0.030 | 1.00 | +/-0.020 | 12 | 30 | | 100 | 6 | MEX611R10120 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

# MEX611R

| | Material Group ISO 513 | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| SIDE MILLING | Hardness/Rm | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| | ap x ae | **1.5D x 0.05D** | **1.5D x 0.05D** | **1.5D x 0.05D** | **1.5D x 0.05D** |
| | Vc (m/min) | **100÷140** | **80÷120** | **50÷70** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.015 | 0.014 | 0.012 | 0.011 |
| | **8** | 0.023 | 0.021 | 0.019 | 0.016 |
| | **10** | 0.029 | 0.026 | 0.023 | 0.020 |
| | **12** | 0.035 | 0.031 | 0.028 | 0.024 |

# MHMB204

cylindrical shank, 2 flutes ball nose, miniature

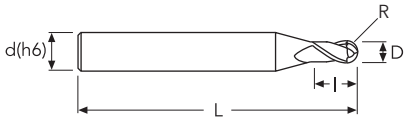
OSAWA NORM | MH | NMG MH COAT | 30÷70 HRC | 30° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ★ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.2** | 0/-0.015 | 0.10 | 0/-0.020 | 4 | 0.2 | | | 50 | 2 | MHMB200204 | ● |
| **0.3** | 0/-0.015 | 0.15 | 0/-0.020 | 4 | 0.3 | | | 50 | 2 | MHMB200304 | ● |
| **0.4** | 0/-0.015 | 0.20 | 0/-0.020 | 4 | 0.4 | | | 50 | 2 | MHMB200404 | ● |
| **0.5** | 0/-0.015 | 0.25 | 0/-0.020 | 4 | 0.4 | | | 50 | 2 | MHMB200504 | ● |
| **0.6** | 0/-0.015 | 0.30 | 0/-0.020 | 4 | 0.5 | | | 50 | 2 | MHMB200604 | ● |
| **0.7** | 0/-0.015 | 0.35 | 0/-0.020 | 4 | 0.6 | | | 50 | 2 | MHMB200704 | ● |
| **0.8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | | | 50 | 2 | MHMB200804 | ● |
| **0.9** | 0/-0.015 | 0.45 | 0/-0.020 | 4 | 0.8 | | | 50 | 2 | MHMB200904 | ● |
| **1.0** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | | | 50 | 2 | MHMB201004 | ● |
| **1.5** | 0/-0.015 | 0.75 | 0/-0.020 | 4 | 1.35 | | | 50 | 2 | MHMB201504 | ● |
| **2** | 0/-0.015 | 1 | 0/-0.020 | 4 | 1.7 | | | 50 | 2 | MHMB202004 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

# MHMB204

| | Material Group ISO 513 | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | **0.05D x 0.1D** | **0.05D x 0.1D** | **0.05D x 0.1D** | **0.05D x 0.1D** |
| | Vc (m/min) | | **80÷120** | **60÷100** | **40÷80** | **20÷60** |
| COPYING | D (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **0.1** | 0.04 | 0.004 | 0.004 | 0.003 | 0.003 |
| | **0.2** | 0.09 | 0.006 | 0.005 | 0.005 | 0.004 |
| | **0.3** | 0.13 | 0.008 | 0.007 | 0.006 | 0.006 |
| | **0.4** | 0.17 | 0.010 | 0.009 | 0.008 | 0.007 |
| | **0.5** | 0.22 | 0.012 | 0.011 | 0.010 | 0.008 |
| | **0.6** | 0.26 | 0.015 | 0.014 | 0.012 | 0.011 |
| | **0.7** | 0.31 | 0.018 | 0.016 | 0.014 | 0.013 |
| | **0.8** | 0.35 | 0.020 | 0.018 | 0.016 | 0.014 |
| | **0.9** | 0.39 | 0.023 | 0.021 | 0.018 | 0.016 |
| | **1** | 0.44 | 0.026 | 0.023 | 0.020 | 0.017 |
| | **1.5** | 0.79 | 0.040 | 0.036 | 0.030 | 0.026 |
| | **2** | 1.20 | 0.055 | 0.050 | 0.041 | 0.036 |

| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 15° | x 1.1 | x 1.1 |

# MHMB206

cylindrical shank, 2 flutes ball nose, miniature, 6 mm. shank

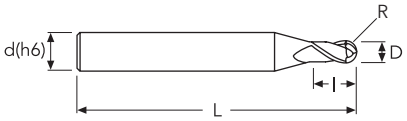
OSAWA NORM | MH | NMG MH COAT | 30÷70 HRC | 30° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ★ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.4** | 0/-0.010 | 0.20 | 0/-0.010 | 6 | 0.4 | - | 0.35 | 50 | 2 | MHMB200406 | ● |
| **0.5** | 0/-0.010 | 0.25 | 0/-0.010 | 6 | 0.5 | - | 0.45 | 50 | 2 | MHMB200506 | ● |
| **0.6** | 0/-0.010 | 0.30 | 0/-0.010 | 6 | 0.6 | - | 0.55 | 50 | 2 | MHMB200606 | ● |
| **0.8** | 0/-0.010 | 0.40 | 0/-0.010 | 6 | 0.8 | - | 0.75 | 50 | 2 | MHMB200806 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

## MHMB206

| | Material Group ISO 513 | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** |
| COPYING | Vc (m/min) | | **80÷120** | **60÷100** | **40÷80** | **20÷60** |
| | D (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **0.4** | 0.17 | 0.010 | 0.009 | 0.008 | 0.007 |
| | **0.5** | 0.22 | 0.012 | 0.011 | 0.010 | 0.008 |
| | **0.6** | 0.26 | 0.015 | 0.014 | 0.012 | 0.011 |
| | **0.8** | 0.35 | 0.020 | 0.018 | 0.016 | 0.014 |

| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 15° | x 1.1 | x 1.1 |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
**MEX/MH**
UH/MH

HSS END-MILLS

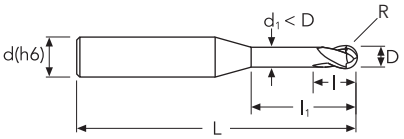
CARBIDE BURRS

# MHLNB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck, miniature

OSAWA NORM | MH | NMG MH COAT | 30÷70 HRC | 30° | BALL NOSE | Z2 BALL

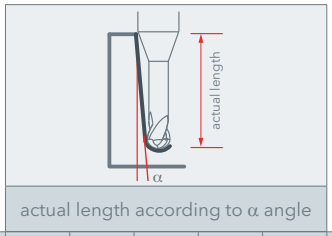





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

ROUND RIB




actual length according to α angle

| D | D Tol. | R | R Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.2** | 0/-0.015 | 0.10 | 0/-0.020 | 4 | 0.2 | 0.5 | 0.17 | 50 | 2 | 0.57 | 0.58 | 0.60 | 0.62 | 0.66 | MHLNB2002005 | ● |
| **0.2** | 0/-0.015 | 0.10 | 0/-0.020 | 4 | 0.2 | 1 | 0.17 | 50 | 2 | 1.08 | 1.12 | 1.15 | 1.19 | 1.27 | MHLNB200201 | ● |
| **0.2** | 0/-0.015 | 0.10 | 0/-0.020 | 4 | 0.2 | 1.5 | 0.17 | 50 | 2 | 1.60 | 1.65 | 1.71 | 1.76 | 1.89 | MHLNB2002015 | ● |
| **0.3** | 0/-0.015 | 0.15 | 0/-0.020 | 4 | 0.3 | 1 | 0.27 | 50 | 2 | 1.08 | 1.11 | 1.15 | 1.18 | 1.26 | MHLNB200301 | ● |
| **0.3** | 0/-0.015 | 0.15 | 0/-0.020 | 4 | 0.3 | 2 | 0.27 | 50 | 2 | 2.12 | 2.18 | 2.25 | 2.33 | 2.49 | MHLNB200302 | ● |
| **0.3** | 0/-0.015 | 0.15 | 0/-0.020 | 4 | 0.3 | 3 | 0.27 | 50 | 2 | 3.15 | 3.25 | 3.36 | 3.48 | 3.73 | MHLNB200303 | ● |
| **0.4** | 0/-0.015 | 0.20 | 0/-0.020 | 4 | 0.4 | 1 | 0.37 | 50 | 2 | 1.08 | 1.11 | 1.14 | 1.18 | 1.25 | MHLNB200401 | ● |
| **0.4** | 0/-0.015 | 0.20 | 0/-0.020 | 4 | 0.4 | 2 | 0.37 | 50 | 2 | 2.11 | 2.18 | 2.25 | 2.32 | 2.48 | MHLNB200402 | ● |
| **0.4** | 0/-0.015 | 0.20 | 0/-0.020 | 4 | 0.4 | 3 | 0.37 | 50 | 2 | 3.15 | 3.25 | 3.36 | 3.47 | 3.72 | MHLNB200403 | ● |
| **0.4** | 0/-0.015 | 0.20 | 0/-0.020 | 4 | 0.4 | 4 | 0.37 | 50 | 2 | 4.18 | 4.32 | 4.46 | 4.62 | 4.95 | MHLNB200404 | ● |
| **0.4** | 0/-0.015 | 0.20 | 0/-0.020 | 4 | 0.4 | 5 | 0.37 | 50 | 2 | 5.21 | 5.39 | 5.57 | 5.77 | 6.18 | MHLNB200405 | ● |
| **0.5** | 0/-0.015 | 0.25 | 0/-0.020 | 4 | 0.4 | 2 | 0.45 | 50 | 2 | 2.15 | 2.22 | 2.29 | 2.36 | 2.52 | MHLNB200502 | ● |
| **0.5** | 0/-0.015 | 0.25 | 0/-0.020 | 4 | 0.4 | 3 | 0.45 | 50 | 2 | 3.18 | 3.29 | 3.39 | 3.51 | 3.75 | MHLNB200503 | ● |
| **0.5** | 0/-0.015 | 0.25 | 0/-0.020 | 4 | 0.4 | 4 | 0.45 | 50 | 2 | 4.22 | 4.35 | 4.50 | 4.65 | 4.98 | MHLNB200504 | ● |
| **0.5** | 0/-0.015 | 0.25 | 0/-0.020 | 4 | 0.4 | 5 | 0.45 | 50 | 2 | 5.25 | 5.42 | 5.61 | 5.80 | 6.22 | MHLNB200505 | ● |
| **0.5** | 0/-0.015 | 0.25 | 0/-0.020 | 4 | 0.4 | 6 | 0.45 | 50 | 2 | 6.28 | 6.49 | 6.71 | 6.95 | 7.45 | MHLNB200506 | ● |
| **0.5** | 0/-0.015 | 0.25 | 0/-0.020 | 4 | 0.4 | 8 | 0.45 | 50 | 2 | 8.35 | 8.63 | 8.93 | 9.24 | 9.92 | MHLNB200508 | ● |
| **0.6** | 0/-0.015 | 0.30 | 0/-0.020 | 4 | 0.5 | 2 | 0.55 | 50 | 2 | 2.15 | 2.21 | 2.28 | 2.35 | 2.50 | MHLNB200602 | ● |
| **0.6** | 0/-0.015 | 0.30 | 0/-0.020 | 4 | 0.5 | 3 | 0.55 | 50 | 2 | 3.18 | 3.28 | 3.39 | 3.50 | 3.74 | MHLNB200603 | ● |
| **0.6** | 0/-0.015 | 0.30 | 0/-0.020 | 4 | 0.5 | 4 | 0.55 | 50 | 2 | 4.22 | 4.35 | 4.49 | 4.65 | 4.97 | MHLNB200604 | ● |
| **0.6** | 0/-0.015 | 0.30 | 0/-0.020 | 4 | 0.5 | 5 | 0.55 | 50 | 2 | 5.25 | 5.42 | 5.60 | 5.79 | 6.21 | MHLNB200605 | ● |
| **0.6** | 0/-0.015 | 0.30 | 0/-0.020 | 4 | 0.5 | 6 | 0.55 | 50 | 2 | 6.28 | 6.49 | 6.71 | 6.94 | 7.44 | MHLNB200606 | ● |
| **0.6** | 0/-0.015 | 0.30 | 0/-0.020 | 4 | 0.5 | 8 | 0.55 | 50 | 2 | 8.35 | 8.63 | 8.92 | 9.23 | 9.91 | MHLNB200608 | ● |
| **0.8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | 2 | 0.75 | 50 | 2 | 2.15 | 2.21 | 2.27 | 2.34 | 2.48 | MHLNB200802 | ● |
| **0.8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | 4 | 0.75 | 50 | 2 | 4.21 | 4.34 | 4.48 | 4.63 | 4.95 | MHLNB200804 | ● |
| **0,8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | 5 | 0.75 | 50 | 2 | 5.25 | 5.41 | 5.59 | 5.78 | 6.18 | MHLNB200805 | ● |
| **0.8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | 6 | 0.75 | 50 | 2 | 6.28 | 6.48 | 6.70 | 6.93 | 7.42 | MHLNB200806 | ● |
| **0,8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | 7 | 0.75 | 50 | 2 | 7.31 | 7.55 | 7.81 | 8.07 | 8.65 | MHLNB200807 | ● |
| **0.8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | 8 | 0.75 | 50 | 2 | 8.35 | 8.62 | 8.91 | 9.22 | 9.88 | MHLNB200808 | ● |
| **0.8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | 10 | 0.75 | 50 | 2 | 10.41 | 10.76 | 11.13 | 11.51 | 12.35 | MHLNB200810 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 3 | 0.9 | 50 | 2 | 3.27 | 3.37 | 3.47 | 3.57 | 3.80 | MHLNB201003 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 4 | 0.9 | 50 | 2 | 4.31 | 4.44 | 4.58 | 4.72 | 5.04 | MHLNB201004 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 5 | 0.9 | 50 | 2 | 5.34 | 5.51 | 5.68 | 5.87 | 6.27 | MHLNB201005 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 6 | 0.9 | 50 | 2 | 6.37 | 6.58 | 6.79 | 7.02 | 7.50 | MHLNB201006 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 7 | 0.9 | 50 | 2 | 7.41 | 7.64 | 7.90 | 8.16 | 8.74 | MHLNB201007 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 8 | 0.9 | 50 | 2 | 8.44 | 8.71 | 9.00 | 9.31 | 9.97 | MHLNB201008 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 9 | 0.9 | 50 | 2 | 9.47 | 9.78 | 10.11 | 10.46 | 11.21 | MHLNB201009 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 10 | 0.9 | 50 | 2 | 10.51 | 10.85 | 11.22 | 11.61 | 12.44 | MHLNB201010 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 12 | 0.9 | 50 | 2 | 12.57 | 12.99 | 13.43 | 13.90 | 14.91 | MHLNB201012 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

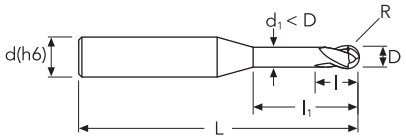
# MHLNB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck, miniature

OSAWA NORM | MH | NMG MH COAT | 30÷70 HRC | 30° | BALL NOSE | Z2 BALL



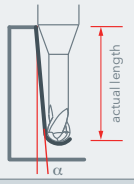





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

ROUND RIB




actual length according to α angle

| D | D Tol. | R | R Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 14 | 0.9 | 50 | 2 | 14.64 | 15.13 | 15.65 | 16.19 | 17.37 | MHLNB201014 | ● |
| 1 | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 16 | 0.9 | 50 | 2 | 16.71 | 17.27 | 17.86 | 18.49 | 19.84 | MHLNB201016 | ● |
| 1 | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 20 | 0.9 | 60 | 2 | 20.84 | 21.55 | 22.29 | 23.08 | 24.78 | MHLNB201020 | ● |
| 1.2 | 0/-0.015 | 0.60 | 0/-0.020 | 4 | 1.0 | 6 | 1.1 | 50 | 2 | 6.37 | 6.57 | 6.78 | 7.00 | 7.48 | MHLNB201206 | ● |
| 1.2 | 0/-0.015 | 0.60 | 0/-0.020 | 4 | 1.0 | 8 | 1.1 | 50 | 2 | 8.44 | 8.71 | 8.99 | 9.30 | 9.95 | MHLNB201208 | ● |
| 1.2 | 0/-0.015 | 0.60 | 0/-0.020 | 4 | 1.0 | 10 | 1.1 | 50 | 2 | 10.50 | 10.85 | 11.21 | 11.59 | 12.42 | MHLNB201210 | ● |
| 1.2 | 0/-0.015 | 0.60 | 0/-0.020 | 4 | 1.0 | 12 | 1.1 | 50 | 2 | 12.57 | 12.98 | 13.42 | 13.89 | 14.88 | MHLNB201212 | ● |
| 1.4 | 0/-0.015 | 0.70 | 0/-0.020 | 4 | 1.1 | 8 | 1.3 | 50 | 2 | 8.43 | 8.70 | 8.98 | 9.28 | 9.93 | MHLNB201408 | ● |
| 1.4 | 0/-0.015 | 0.70 | 0/-0.020 | 4 | 1.1 | 12 | 1.3 | 50 | 2 | 12.57 | 12.98 | 13.41 | 13.87 | 14.86 | MHLNB201412 | ● |
| 1.4 | 0/-0.015 | 0.70 | 0/-0.020 | 4 | 1.1 | 16 | 1.3 | 50 | 2 | 16.70 | 17.26 | 17.84 | 18.46 | 19.80 | MHLNB201416 | ● |
| 1.5 | 0/-0.015 | 0.75 | 0/-0.020 | 4 | 1.2 | 8 | 1.4 | 50 | 2 | 8.43 | 8.70 | 8.98 | 9.27 | 9.91 | MHLNB201508 | ● |
| 1.5 | 0/-0.015 | 0.75 | 0/-0.020 | 4 | 1.2 | 12 | 1.4 | 50 | 2 | 12.57 | 12.97 | 13.41 | 13.86 | 14.85 | MHLNB201512 | ● |
| 1.5 | 0/-0.015 | 0.75 | 0/-0.020 | 4 | 1.2 | 16 | 1.4 | 50 | 2 | 16.70 | 17.25 | 17.84 | 18.45 | 19.78 | MHLNB201516 | ● |
| 1.5 | 0/-0.015 | 0.75 | 0/-0.020 | 4 | 1.2 | 18 | 1.4 | 60 | 2 | 18.77 | 19.39 | 20.05 | 20.75 | 22.25 | MHLNB201518 | ● |
| 1.5 | 0/-0.015 | 0.75 | 0/-0.020 | 6 | 2.4 | 20 | 1.4 | 50 | 2 | 20.84 | 21.53 | 22.26 | 23.04 | 24.72 | MHLNB201520 | ● |
| 1.6 | 0/-0.015 | 0.80 | 0/-0.020 | 4 | 1.3 | 8 | 1.5 | 50 | 2 | 8.43 | 8.69 | 8.97 | 9.27 | 9.90 | MHLNB201608 | ● |
| 1.6 | 0/-0.015 | 0.80 | 0/-0.020 | 4 | 1.3 | 12 | 1.5 | 50 | 2 | 12.56 | 12.97 | 13.40 | 13.86 | 14.84 | MHLNB201612 | ● |
| 1.6 | 0/-0.015 | 0.80 | 0/-0.020 | 4 | 1.3 | 16 | 1.5 | 50 | 2 | 16.70 | 17.25 | 17.83 | 18.45 | 19.77 | MHLNB201616 | ● |
| 1.6 | 0/-0.015 | 0.80 | 0/-0.020 | 4 | 1.3 | 20 | 1.5 | 60 | 2 | 20.83 | 21.53 | 22.26 | 23.03 | - | MHLNB201620 | ● |
| 1.8 | 0/-0.015 | 0.90 | 0/-0.020 | 4 | 1.4 | 8 | 1.7 | 50 | 2 | 8.43 | 8.69 | 8.96 | 9.25 | 9.88 | MHLNB201808 | ● |
| 1.8 | 0/-0.015 | 0.90 | 0/-0.020 | 4 | 1.4 | 12 | 1.7 | 50 | 2 | 12.56 | 12.96 | 13.39 | 13.84 | 14.81 | MHLNB201812 | ● |
| 1.8 | 0/-0.015 | 0.90 | 0/-0.020 | 4 | 1.4 | 16 | 1.7 | 50 | 2 | 16.70 | 17.24 | 17.82 | 18.43 | 19.75 | MHLNB201816 | ● |
| 1.8 | 0/-0.015 | 0.90 | 0/-0.020 | 4 | 1.4 | 20 | 1.7 | 60 | 2 | 20.83 | 21.52 | 22.25 | 23.02 | - | MHLNB201820 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 4 | 1.9 | 50 | 2 | 4.29 | 4.40 | 4.52 | 4.65 | 4.92 | MHLNB202004 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 6 | 1.9 | 50 | 2 | 6.36 | 6.54 | 6.74 | 6.94 | 7.39 | MHLNB202006 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 8 | 1.9 | 50 | 2 | 8.42 | 8.68 | 8.95 | 9.24 | 9.86 | MHLNB202008 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 10 | 1.9 | 50 | 2 | 10.49 | 10.82 | 11.17 | 11.53 | 12.32 | MHLNB202010 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 12 | 1.9 | 50 | 2 | 12.56 | 12.96 | 13.38 | 13.83 | 14.79 | MHLNB202012 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 14 | 1.9 | 50 | 2 | 14.62 | 15.10 | 15.59 | 16.12 | 17.26 | MHLNB202014 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 16 | 1.9 | 50 | 2 | 16.69 | 17.23 | 17.81 | 18.42 | 19.73 | MHLNB202016 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 18 | 1.9 | 60 | 2 | 18.76 | 19.37 | 20.02 | 20.71 | - | MHLNB202018 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 20 | 1.9 | 60 | 2 | 20.83 | 21.51 | 22.24 | 23.00 | - | MHLNB202020 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 22 | 1.9 | 60 | 2 | 22.89 | 23.65 | 24.45 | 25.30 | - | MHLNB202022 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 25 | 1.9 | 75 | 2 | 25.99 | 26.86 | 27.77 | 28.74 | - | MHLNB202025 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 30 | 1.9 | 75 | 2 | 31.16 | 32.21 | 33.31 | - | - | MHLNB202030 | ● |
| 3 | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 8 | 2.8 | 50 | 2 | 8.60 | 8.84 | 9.10 | 9.37 | 9.96 | MHLNB203008 | ● |
| 3 | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 10 | 2.8 | 50 | 2 | 10.67 | 10.98 | 11.32 | 11.67 | 12.43 | MHLNB203010 | ● |
| 3 | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 12 | 2.8 | 50 | 2 | 12.73 | 13.12 | 13.53 | 13.96 | 14.90 | MHLNB203012 | ● |
| 3 | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 16 | 2.8 | 60 | 2 | 16.87 | 17.40 | 17.96 | 18.55 | 19.83 | MHLNB203016 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
**MEX/MH**
UH/MH

HSS END-MILLS

CARBIDE BURRS

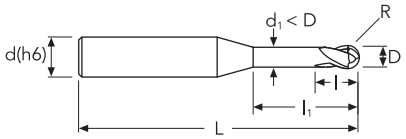
# MHLNB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck, miniature

OSAWA NORM | MH | NMG MH COAT | 30÷70 HRC | 30° | BALL NOSE | Z2 BALL



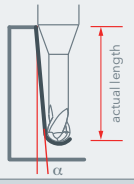





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

ROUND RIB




actual length according to α angle

| D | D Tol. | R | R Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 20 | 2.8 | 60 | 2 | 21.00 | 21.68 | 22.39 | 23.14 | 24.77 | MHLNB203020 | ● |
| **3** | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 25 | 2.8 | 75 | 2 | 26.17 | 27.02 | 27.93 | 28.88 | - | MHLNB203025 | ● |
| **3** | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 30 | 2.8 | 75 | 2 | 31.34 | 32.37 | 33.46 | 34.62 | - | MHLNB203030 | ● |
| **3** | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 35 | 2.8 | 75 | 2 | 36.51 | 37.72 | 39.00 | 40.35 | - | MHLNB203035 | ● |
| **4** | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 10 | 3.7 | 50 | 2 | 10.84 | 11.15 | 11.47 | 11.81 | 12.54 | MHLNB204010 | ● |
| **4** | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 16 | 3.7 | 60 | 2 | 17.04 | 17.56 | 18.11 | 18.69 | 19.94 | MHLNB204016 | ● |
| **4** | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 20 | 3.7 | 60 | 2 | 21.18 | 21.84 | 22.54 | 23.28 | - | MHLNB204020 | ● |
| **4** | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 25 | 3.7 | 75 | 2 | 26.35 | 27.19 | 28.08 | 29.02 | - | MHLNB204025 | ● |
| **4** | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 30 | 3.7 | 75 | 2 | 31.51 | 32.53 | 33.61 | - | - | MHLNB204030 | ● |
| **4** | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 35 | 3.7 | 75 | 2 | 36.68 | 37.88 | 39.15 | - | - | MHLNB204035 | ● |
| **4** | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 40 | 3.7 | 100 | 2 | 41.85 | 43.23 | - | - | - | MHLNB204040 | ● |
| **4** | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 45 | 3.7 | 100 | 2 | 47.02 | 48.57 | - | - | - | MHLNB204045 | ● |
| **4** | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 50 | 3.7 | 100 | 2 | 52.19 | 53.92 | - | - | - | MHLNB204050 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# MHLNB2

| | Material Group ISO 513 | | | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | | | **ap x 0.2D** | **ap x 0.2D** | **ap x 0.2D** | **ap x 0.2D** |
| | Vc (m/min) | | | | **140÷160** | **110÷130** | **80÷100** | **50÷70** |
| | D (mm) | l1 (mm) | ap (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| ROUND RIB | **0.2** | ≤ 6D | 0.01 | 0.09 | 0.008 | 0.007 | 0.006 | 0.006 |
| | | ≤ 8D | 0.01 | 0.08 | 0.007 | 0.006 | 0.005 | 0.005 |
| | | ≤ 10D | 0.01 | 0.07 | 0.006 | 0.005 | 0.004 | 0.004 |
| | **0.3** | ≤ 6D | 0.02 | 0.13 | 0.010 | 0.009 | 0.008 | 0.007 |
| | | ≤ 8D | 0.01 | 0.12 | 0.009 | 0.007 | 0.006 | 0.006 |
| | | ≤ 10D | 0.01 | 0.11 | 0.008 | 0.006 | 0.005 | 0.004 |
| | **0.4** | ≤ 6D | 0.02 | 0.17 | 0.013 | 0.012 | 0.010 | 0.009 |
| | | ≤ 8D | 0.02 | 0.16 | 0.012 | 0.009 | 0.008 | 0.007 |
| | | ≤ 10D | 0.01 | 0.15 | 0.010 | 0.007 | 0.007 | 0.006 |
| | **0.5** | ≤ 6D | 0.03 | 0.22 | 0.017 | 0.015 | 0.014 | 0.012 |
| | | ≤ 8D | 0.02 | 0.20 | 0.015 | 0.012 | 0.011 | 0.010 |
| | | ≤ 10D | 0.02 | 0.18 | 0.014 | 0.010 | 0.009 | 0.008 |
| | **0.6** | ≤ 6D | 0.03 | 0.26 | 0.021 | 0.019 | 0.017 | 0.015 |
| | | ≤ 8D | 0.03 | 0.24 | 0.019 | 0.015 | 0.014 | 0.012 |
| | | ≤ 10D | 0.02 | 0.22 | 0.017 | 0.012 | 0.011 | 0.009 |
| | **0.8** | ≤ 6D | 0.04 | 0.35 | 0.025 | 0.023 | 0.020 | 0.018 |
| | | ≤ 8D | 0.03 | 0.32 | 0.023 | 0.018 | 0.016 | 0.014 |
| | | ≤ 10D | 0.03 | 0.29 | 0.020 | 0.014 | 0.013 | 0.011 |
| | **1** | ≤ 6D | 0.05 | 0.44 | 0.030 | 0.027 | 0.024 | 0.021 |
| | | ≤ 8D | 0.04 | 0.40 | 0.027 | 0.022 | 0.019 | 0.017 |
| | | ≤ 10D | 0.04 | 0.37 | 0.024 | 0.017 | 0.015 | 0.013 |
| | | ≤ 12D | 0.03 | 0.33 | 0.021 | 0.013 | 0.012 | 0.010 |
| | | >12D | 0.02 | 0.30 | 0.018 | 0.010 | 0.009 | 0.008 |
| | **1.2** | ≤ 6D | 0.06 | 0.52 | 0.035 | 0.032 | 0.028 | 0.025 |
| | | ≤ 8D | 0.05 | 0.48 | 0.032 | 0.026 | 0.023 | 0.020 |
| | | ≤ 10D | 0.04 | 0.44 | 0.028 | 0.020 | 0.018 | 0.016 |
| | | ≤ 12D | 0.03 | 0.39 | 0.025 | 0.015 | 0.014 | 0.012 |
| | | >12D | 0.03 | 0.36 | 0.021 | 0.011 | 0.010 | 0.009 |
| | **1.5** | ≤ 6D | 0.08 | 0.65 | 0.045 | 0.041 | 0.036 | 0.032 |
| | | ≤ 8D | 0.06 | 0.61 | 0.041 | 0.033 | 0.029 | 0.026 |
| | | ≤ 10D | 0.05 | 0.55 | 0.036 | 0.026 | 0.023 | 0.020 |
| | | ≤ 12D | 0.04 | 0.49 | 0.032 | 0.020 | 0.018 | 0.015 |
| | | >12D | 0.03 | 0.44 | 0.027 | 0.015 | 0.013 | 0.011 |
| | **2** | ≤ 6D | 0.10 | 0.87 | 0.060 | 0.054 | 0.048 | 0.042 |
| | | ≤ 8D | 0.09 | 0.81 | 0.054 | 0.044 | 0.039 | 0.034 |
| | | ≤ 10D | 0.07 | 0.74 | 0.048 | 0.035 | 0.031 | 0.027 |
| | | ≤ 12D | 0.06 | 0.65 | 0.042 | 0.026 | 0.024 | 0.021 |
| | | >12D | 0.05 | 0.59 | 0.036 | 0.019 | 0.017 | 0.015 |
| | **2.5** | ≤ 6D | 0.13 | 1.09 | 0.060 | 0.054 | 0.048 | 0.042 |
| | | ≤ 8D | 0.11 | 1.01 | 0.054 | 0.044 | 0.039 | 0.034 |
| | | ≤ 10D | 0.09 | 0.92 | 0.048 | 0.035 | 0.031 | 0.027 |
| | | ≤ 12D | 0.07 | 0.82 | 0.042 | 0.026 | 0.024 | 0.021 |
| | | >12D | 0.06 | 0.74 | 0.036 | 0.019 | 0.017 | 0.015 |
| | **3** | ≤ 6D | 0.15 | 1.31 | 0.075 | 0.068 | 0.060 | 0.053 |
| | | ≤ 8D | 0.13 | 1.21 | 0.068 | 0.055 | 0.049 | 0.043 |
| | | ≤ 10D | 0.11 | 1.10 | 0.060 | 0.043 | 0.038 | 0.034 |
| | | ≤ 12D | 0.08 | 0.98 | 0.053 | 0.033 | 0.029 | 0.026 |
| | | >12D | 0.07 | 0.89 | 0.045 | 0.024 | 0.022 | 0.019 |

| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 45° | x 1.65 | x 1.65 |
| 30° | x 1.30 | x 1.30 |
| 15° | x 1.15 | x 1.15 |

INFO
CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA
HSS DRILLS
LFTA
SUTA
HSS-HSS/CO
CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH
HSS END-MILLS
CARBIDE BURRS

CUTTING PARAMETERS

# MHLNB2

| ROUND RIB | Material Group ISO 513 | | | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | | | **ap x 0.2D** | **ap x 0.2D** | **ap x 0.2D** | **ap x 0.2D** |
| | Vc (m/min) | | | | **140÷160** | **110÷130** | **80÷100** | **50÷70** |
| | D (mm) | l1 (mm) | ap (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **4** | ≤ 6D | 0.20 | 1.74 | 0.095 | 0.086 | 0.076 | 0.067 |
| | | ≤ 8D | 0.17 | 1.61 | 0.086 | 0.069 | 0.062 | 0.054 |
| | | ≤ 10D | 0.14 | 1.47 | 0.076 | 0.055 | 0.049 | 0.043 |
| | | ≤ 12D | 0.11 | 1.31 | 0.067 | 0.042 | 0.037 | 0.033 |
| | | >12D | 0.09 | 1.19 | 0.057 | 0.031 | 0.027 | 0.024 |

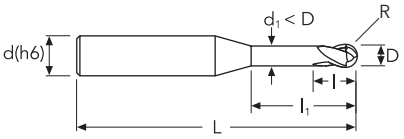
| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 45° | x 1.65 | x 1.65 |
| 30° | x 1.30 | x 1.30 |
| 15° | x 1.15 | x 1.15 |

# MHCRB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck, miniature, 6 mm. shank

OSAWA NORM | MH | NMG MH COAT | 30÷70 HRC | 30° | BALL NOSE | Z2 BALL

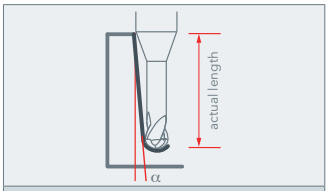





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ★ suitable

ROUND RIB




actual length according to α angle

| D | D Tol. | R | R Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.5** | 0/-0.012 | 0.25 | +/-0.005 | 6 | 0.5 | 2 | 0.45 | 50 | 2 | 2.15 | 2.22 | 2.29 | 2.36 | 2.52 | MHCRB20050206 | ● |
| **0.5** | 0/-0.012 | 0.25 | +/-0.005 | 6 | 0.5 | 4 | 0.45 | 50 | 2 | 4.22 | 4.35 | 4.50 | 4.65 | 4.98 | MHCRB20050406 | ● |
| **0.6** | 0/-0.012 | 0.30 | +/-0.005 | 6 | 0.5 | 2 | 0.55 | 50 | 2 | 2.15 | 2.21 | 2.28 | 2.35 | 2.50 | MHCRB20060206 | ● |
| **0.6** | 0/-0.012 | 0.30 | +/-0.005 | 6 | 0.5 | 4 | 0.55 | 50 | 2 | 4.22 | 4.35 | 4.49 | 4.65 | 4.97 | MHCRB20060406 | ● |
| **0.6** | 0/-0.012 | 0.30 | +/-0.005 | 6 | 0.5 | 6 | 0.55 | 50 | 2 | 6.28 | 6.49 | 6.71 | 6.94 | 7.44 | MHCRB20060606 | ● |
| **0.8** | 0/-0.012 | 0.40 | +/-0.005 | 6 | 0.8 | 2 | 0.75 | 50 | 2 | 2.15 | 2.21 | 2.27 | 2.34 | 2.48 | MHCRB20080206 | ● |
| **0.8** | 0/-0.012 | 0.40 | +/-0.005 | 6 | 0.8 | 4 | 0.75 | 50 | 2 | 4.21 | 4.34 | 4.48 | 4.63 | 4.95 | MHCRB20080406 | ● |
| **0.8** | 0/-0.012 | 0.40 | +/-0.005 | 6 | 0.8 | 6 | 0.75 | 50 | 2 | 6.28 | 6.48 | 6.70 | 6.93 | 7.42 | MHCRB20080606 | ● |
| **1** | 0/-0.012 | 0.50 | +/-0.005 | 6 | 1 | 3 | 0.90 | 50 | 2 | 3.27 | 3.37 | 3.47 | 3.57 | 3.80 | MHCRB20100306 | ● |
| **1** | 0/-0.012 | 0.50 | +/-0.005 | 6 | 1 | 6 | 0.90 | 50 | 2 | 6.37 | 6.58 | 6.79 | 7.02 | 7.50 | MHCRB20100606 | ● |
| **1** | 0/-0.012 | 0.50 | +/-0.005 | 6 | 1 | 8 | 0.90 | 50 | 2 | 8.44 | 8.71 | 9.00 | 9.31 | 9.97 | MHCRB20100806 | ● |
| **1** | 0/-0.012 | 0.50 | +/-0.005 | 6 | 1 | 10 | 0.90 | 50 | 2 | 10.51 | 10.85 | 11.22 | 11.61 | 12.44 | MHCRB20101006 | ● |
| **1.2** | 0/-0.012 | 0.60 | +/-0.005 | 6 | 1.2 | 6 | 1.10 | 50 | 2 | 6.37 | 6.57 | 6.78 | 7.00 | 7.48 | MHCRB20120606 | ● |
| **1.2** | 0/-0.012 | 0.60 | +/-0.005 | 6 | 1.2 | 8 | 1.10 | 50 | 2 | 8.44 | 8.71 | 8.99 | 9.30 | 9.95 | MHCRB20120806 | ● |
| **1.2** | 0/-0.012 | 0.60 | +/-0.005 | 6 | 1.2 | 10 | 1.10 | 50 | 2 | 10.50 | 10.85 | 11.21 | 11.59 | 12.42 | MHCRB20121006 | ● |
| **1.5** | 0/-0.012 | 0.75 | +/-0.005 | 6 | 1.5 | 4 | 1.40 | 50 | 2 | 4.30 | 4.42 | 4.55 | 4.68 | 4.98 | MHCRB20150406 | ● |
| **1.5** | 0/-0.012 | 0.75 | +/-0.005 | 6 | 1.5 | 8 | 1.40 | 50 | 2 | 8.43 | 8.70 | 8.98 | 9.27 | 9.91 | MHCRB20150806 | ● |
| **1.5** | 0/-0.012 | 0.75 | +/-0.005 | 6 | 1.5 | 10 | 1.40 | 50 | 2 | 10.50 | 10.84 | 11.19 | 11.57 | 12.38 | MHCRB20151006 | ● |
| **1.5** | 0/-0.012 | 0.75 | +/-0.005 | 6 | 1.5 | 12 | 1.40 | 50 | 2 | 12.57 | 12.97 | 13.41 | 13.86 | 14.85 | MHCRB20151206 | ● |
| **1.5** | 0/-0.012 | 0.75 | +/-0.005 | 6 | 1.5 | 16 | 1.40 | 50 | 2 | 16.70 | 17.25 | 17.84 | 18.45 | 19.78 | MHCRB20151606 | ● |
| **2** | 0/-0.012 | 1.00 | +/-0.005 | 6 | 3 | 6 | 1.90 | 50 | 2 | 6.36 | 6.54 | 6.74 | 6.94 | 7.39 | MHCRB20200606 | ● |
| **2** | 0/-0.012 | 1.00 | +/-0.005 | 6 | 3 | 8 | 1.90 | 50 | 2 | 8.42 | 8.68 | 8.95 | 9.24 | 9.86 | MHCRB20200806 | ● |
| **2** | 0/-0.012 | 1.00 | +/-0.005 | 6 | 3 | 10 | 1.90 | 50 | 2 | 10.49 | 10.82 | 11.17 | 11.53 | 12.32 | MHCRB20201006 | ● |
| **2** | 0/-0.012 | 1.00 | +/-0.005 | 6 | 3 | 12 | 1.90 | 50 | 2 | 12.56 | 12.96 | 13.38 | 13.83 | 14.79 | MHCRB20201206 | ● |
| **2** | 0/-0.012 | 1.00 | +/-0.005 | 6 | 3 | 16 | 1.90 | 50 | 2 | 16.69 | 17.23 | 17.81 | 18.42 | 19.73 | MHCRB20201606 | ● |
| **2** | 0/-0.012 | 1.00 | +/-0.005 | 6 | 3 | 20 | 1.90 | 50 | 2 | 20.83 | 21.51 | 22.24 | 23.00 | 24.66 | MHCRB20202006 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
**MEX/MH**
UH/MH

HSS END-MILLS

CARBIDE BURRS

# MHCRB2

ROUND RIB

| Material Group ISO 513 | | | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|---|
| Hardness/Rm | | | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| ap x ae | | | | **ap x 0.2D** | **ap x 0.2D** | **ap x 0.2D** | **ap x 0.2D** |
| Vc (m/min) | | | | **140÷160** | **110÷130** | **80÷100** | **50÷70** |
| D (mm) | l1 (mm) | ap (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **0.5** | ≤ 6D | 0.03 | 0.22 | 0.020 | 0.018 | 0.016 | 0.014 |
| | ≤ 8D | 0.02 | 0.20 | 0.018 | 0.015 | 0.013 | 0.011 |
| | ≤ 10D | 0.02 | 0.18 | 0.016 | 0.012 | 0.010 | 0.009 |
| **0.6** | ≤ 6D | 0.03 | 0.26 | 0.022 | 0.020 | 0.018 | 0.015 |
| | ≤ 8D | 0.03 | 0.24 | 0.020 | 0.016 | 0.014 | 0.012 |
| | ≤ 10D | 0.02 | 0.22 | 0.018 | 0.013 | 0.011 | 0.010 |
| **0.8** | ≤ 6D | 0.04 | 0.35 | 0.025 | 0.023 | 0.020 | 0.018 |
| | ≤ 8D | 0.03 | 0.32 | 0.023 | 0.018 | 0.016 | 0.014 |
| | ≤ 10D | 0.03 | 0.29 | 0.020 | 0.014 | 0.013 | 0.011 |
| **1** | ≤ 6D | 0.05 | 0.44 | 0.030 | 0.027 | 0.024 | 0.021 |
| | ≤ 8D | 0.04 | 0.40 | 0.027 | 0.022 | 0.019 | 0.017 |
| | ≤ 10D | 0.04 | 0.37 | 0.024 | 0.017 | 0.015 | 0.013 |
| | ≤ 12D | 0.03 | 0.33 | 0.021 | 0.013 | 0.012 | 0.010 |
| | >12D | 0.02 | 0.30 | 0.018 | 0.010 | 0.009 | 0.008 |
| **1.2** | ≤ 6D | 0.06 | 0.52 | 0.035 | 0.032 | 0.028 | 0.025 |
| | ≤ 8D | 0.05 | 0.48 | 0.032 | 0.026 | 0.023 | 0.020 |
| | ≤ 10D | 0.04 | 0.44 | 0.028 | 0.020 | 0.018 | 0.016 |
| | ≤ 12D | 0.03 | 0.39 | 0.025 | 0.015 | 0.014 | 0.012 |
| | >12D | 0.03 | 0.36 | 0.021 | 0.011 | 0.010 | 0.009 |
| **1.5** | ≤ 6D | 0.08 | 0.65 | 0.045 | 0.041 | 0.036 | 0.032 |
| | ≤ 8D | 0.06 | 0.61 | 0.041 | 0.033 | 0.029 | 0.026 |
| | ≤ 10D | 0.05 | 0.55 | 0.036 | 0.026 | 0.023 | 0.020 |
| | ≤ 12D | 0.04 | 0.49 | 0.032 | 0.020 | 0.018 | 0.015 |
| | >12D | 0.03 | 0.44 | 0.027 | 0.015 | 0.013 | 0.011 |
| **2** | ≤ 6D | 0.10 | 0.87 | 0.060 | 0.054 | 0.048 | 0.042 |
| | ≤ 8D | 0.09 | 0.81 | 0.054 | 0.044 | 0.039 | 0.034 |
| | ≤ 10D | 0.07 | 0.74 | 0.048 | 0.035 | 0.031 | 0.027 |
| | ≤ 12D | 0.06 | 0.65 | 0.042 | 0.026 | 0.024 | 0.021 |
| | >12D | 0.05 | 0.59 | 0.036 | 0.019 | 0.017 | 0.015 |
| | ≥ 15D | 0.06 | 0.06 | 0.030 | 0.027 | 0.024 | 0.021 |

| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 45° | x 1.65 | x 1.65 |
| 30° | x 1.30 | x 1.30 |
| 15° | x 1.15 | x 1.15 |

# MEXCSB2

cylindrical shank, 2 flutes ball nose

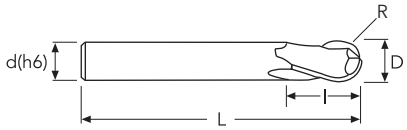
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | 0.50 | 0/-0.010 | 3 | 3 | | 38 | 2 | MEXCSB2010 | ● |
| **1.5** | 0/-0.020 | 0.75 | 0/-0.010 | 3 | 3 | | 38 | 2 | MEXCSB2015 | ● |
| **2** | 0/-0.020 | 1.00 | 0/-0.010 | 6 | 3 | | 50 | 2 | MEXCSB2020 | ● |
| **2.5** | 0/-0.020 | 1.25 | 0/-0.015 | 4 | 4 | | 50 | 2 | MEXCSB202550 | ● |
| **3** | 0/-0.020 | 1.50 | 0/-0.010 | 6 | 4 | | 50 | 2 | MEXCSB2030 | ● |
| **4** | 0/-0.020 | 2.00 | 0/-0.010 | 6 | 5 | | 54 | 2 | MEXCSB2040 | ● |
| **5** | 0/-0.020 | 2.50 | 0/-0.010 | 6 | 6 | | 54 | 2 | MEXCSB2050 | ● |
| **6** | 0/-0.020 | 3.00 | 0/-0.010 | 6 | 12 | | 60 | 2 | MEXCSB2060 | ● |
| **8** | 0/-0.020 | 4.00 | 0/-0.010 | 8 | 14 | | 60 | 2 | MEXCSB2080 | ● |
| **10** | 0/-0.020 | 5.00 | 0/-0.010 | 10 | 18 | | 70 | 2 | MEXCSB2100 | ● |
| **12** | 0/-0.020 | 6.00 | 0/-0.010 | 12 | 22 | | 80 | 2 | MEXCSB2120 | ● |
| **14** | 0/-0.020 | 7.00 | 0/-0.020 | 14 | 32 | | 90 | 2 | MEXCSB2140 | ● |
| **16** | 0/-0.020 | 8.00 | 0/-0.020 | 16 | 32 | | 90 | 2 | MEXCSB2160 | ● |
| **18** | 0/-0.020 | 9.00 | 0/-0.020 | 18 | 38 | | 100 | 2 | MEXCSB2180 | ● |
| **20** | 0/-0.020 | 10.00 | 0/-0.020 | 20 | 38 | | 100 | 2 | MEXCSB2200 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

CUTTING PARAMETERS

# MEXCSB2




| Material Group ISO 513 | | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| Hardness/Rm | | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| ap x ae | | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** |
| Vc (m/min) | | **120÷160** | **80÷120** | **60÷100** | **50÷70** |
| **D (mm)** | **ap (mm)** | **fz (mm/z)** | **fz (mm/z)** | **fz (mm/z)** | **fz (mm/z)** |
| **1** | 0.44 | 0.009 | 0.008 | 0.007 | 0.006 |
| **1.5** | 0.79 | 0.012 | 0.011 | 0.010 | 0.008 |
| **2** | 1.20 | 0.012 | 0.011 | 0.010 | 0.008 |
| **2.5** | 1.65 | 0.015 | 0.014 | 0.012 | 0.011 |
| **3** | 2.14 | 0.018 | 0.016 | 0.014 | 0.013 |
| **4** | 3.20 | 0.025 | 0.023 | 0.020 | 0.018 |
| **5** | 4.33 | 0.032 | 0.029 | 0.026 | 0.022 |
| **6** | 5.50 | 0.038 | 0.034 | 0.030 | 0.027 |
| **8** | 7.84 | 0.048 | 0.043 | 0.038 | 0.034 |
| **10** | 10.00 | 0.057 | 0.051 | 0.046 | 0.040 |
| **12** | 11.76 | 0.067 | 0.060 | 0.054 | 0.047 |
| **14** | 12.83 | 0.080 | 0.072 | 0.064 | 0.056 |
| **16** | 12.80 | 0.095 | 0.086 | 0.076 | 0.067 |
| **18** | 10.80 | 0.108 | 0.097 | 0.086 | 0.076 |
| **20** | 12.00 | 0.108 | 0.097 | 0.086 | 0.076 |




| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 15° | x 1.1 | x 1.1 |

# MEXCLSB2

cylindrical shank, 2 flutes ball nose, long reach

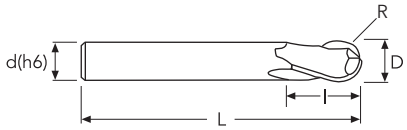
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.012 | 0.50 | 0/-0.010 | 4 | 2.5 | | 50 | 2 | MEXCLSB2010 | ● |
| **1.2** | 0/-0.012 | 0.60 | 0/-0.010 | 4 | 3 | | 50 | 2 | MEXCLSB2012 | ● |
| **1.5** | 0/-0.012 | 0.75 | 0/-0.010 | 4 | 4 | | 50 | 2 | MEXCLSB2015 | ● |
| **2** | 0/-0.012 | 1.00 | 0/-0.010 | 6 | 5 | | 50 | 2 | MEXCLSB2020 | ● |
| **2.5** | 0/-0.012 | 1.25 | 0/-0.010 | 6 | 6 | | 60 | 2 | MEXCLSB2025 | ● |
| **3** | 0/-0.012 | 1.50 | 0/-0.010 | 6 | 8 | | 60 | 2 | MEXCLSB2030 | ● |
| **4** | 0/-0.012 | 2.00 | 0/-0.010 | 6 | 8 | | 70 | 2 | MEXCLSB2040 | ● |
| **5** | 0/-0.012 | 2.50 | 0/-0.010 | 6 | 10 | | 80 | 2 | MEXCLSB2050 | ● |
| **6** | 0/-0.015 | 3.00 | 0/-0.010 | 6 | 12 | | 90 | 2 | MEXCLSB2060 | ● |
| **8** | 0/-0.015 | 4.00 | 0/-0.010 | 8 | 14 | | 100 | 2 | MEXCLSB2080 | ● |
| **10** | 0/-0.015 | 5.00 | 0/-0.010 | 10 | 18 | | 100 | 2 | MEXCLSB2100 | ● |
| **12** | 0/-0.015 | 6.00 | 0/-0.010 | 12 | 22 | | 110 | 2 | MEXCLSB2120 | ● |
| **14** | 0/-0.035 | 7.00 | 0/-0.020 | 14 | 32 | | 125 | 2 | MEXCLSB2140 | ● |
| **16** | 0/-0.035 | 8.00 | 0/-0.020 | 16 | 32 | | 150 | 2 | MEXCLSB2160 | ● |
| **20** | 0/-0.035 | 10.00 | 0/-0.020 | 20 | 38 | | 150 | 2 | MEXCLSB2200 | ● |

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
**MEX/MH**
UH/MH

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-stock standard ▽ stock exhaustion

CUTTING PARAMETERS

# MEXCLSB2




| Material Group ISO 513 | | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| Hardness/Rm | | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| ap x ae | | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** |
| Vc (m/min) | | **100÷140** | **80÷120** | **60÷80** | **40÷60** |
| D (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **1** | 0.44 | 0.015 | 0.014 | 0.012 | 0.011 |
| **2** | 0.87 | 0.021 | 0.019 | 0.017 | 0.015 |
| **3** | 1.31 | 0.027 | 0.024 | 0.022 | 0.019 |
| **4** | 1.74 | 0.037 | 0.033 | 0.029 | 0.026 |
| **5** | 2.18 | 0.045 | 0.041 | 0.036 | 0.032 |
| **6** | 2.62 | 0.051 | 0.046 | 0.041 | 0.036 |
| **8** | 3.49 | 0.060 | 0.054 | 0.048 | 0.042 |
| **10** | 4.36 | 0.068 | 0.061 | 0.054 | 0.048 |
| **12** | 5.23 | 0.077 | 0.069 | 0.061 | 0.054 |
| **14** | 6.10 | 0.089 | 0.080 | 0.071 | 0.062 |
| **16** | 6.97 | 0.102 | 0.092 | 0.082 | 0.071 |
| **18** | 7.85 | 0.115 | 0.103 | 0.092 | 0.080 |
| **20** | 8.72 | 0.132 | 0.119 | 0.106 | 0.092 |




| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 30° | x 0.8 | x 0.8 |
| 15° | x 0.7 | x 0.7 |
| 0° | x 0.6 | x 0.6 |

# MEX253

cylindrical shank, 2 flutes ball nose, extra long reach

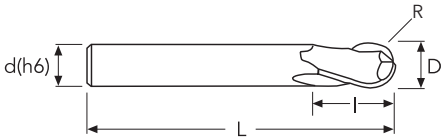
OSAWA NORM | MEX | UMG ENDLESS ORANGE | <55 HRC | 30° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | 0.50 | 0/-0.010 | 4 | 3 | | 75 | 2 | MEX25301075 | ● |
| **1** | 0/-0.020 | 0.50 | 0/-0.010 | 4 | 3 | | 100 | 2 | MEX253010100 | ● |
| **1.5** | 0/-0.020 | 0.75 | 0/-0.010 | 4 | 3 | | 75 | 2 | MEX25301575 | ● |
| **1.5** | 0/-0.020 | 0.75 | 0/-0.010 | 4 | 3 | | 100 | 2 | MEX253015100 | ● |
| **2** | 0/-0.020 | 1.00 | 0/-0.010 | 4 | 4 | | 75 | 2 | MEX25302075 | ● |
| **2** | 0/-0.020 | 1.00 | 0/-0.010 | 4 | 4 | | 100 | 2 | MEX253020100 | ● |
| **3** | 0/-0.030 | 1.50 | 0/-0.015 | 6 | 5 | | 75 | 2 | MEX25303075 | ● |
| **3** | 0/-0.030 | 1.50 | 0/-0.015 | 6 | 5 | | 100 | 2 | MEX253030 | ● |
| **4** | 0/-0.030 | 2.00 | 0/-0.015 | 6 | 8 | | 100 | 2 | MEX253040 | ● |
| **5** | 0/-0.030 | 2.50 | 0/-0.015 | 6 | 9 | | 100 | 2 | MEX253050100 | ● |
| **6** | 0/-0.030 | 3.00 | 0/-0.015 | 6 | 10 | | 150 | 2 | MEX253060150 | ● |
| **8** | 0/-0.030 | 4.00 | 0/-0.015 | 8 | 12 | | 150 | 2 | MEX253080 | ● |
| **10** | 0/-0.035 | 5.00 | 0/-0.020 | 10 | 14 | | 150 | 2 | MEX25310150 | ● |
| **12** | 0/-0.035 | 6.00 | 0/-0.020 | 12 | 16 | | 150 | 2 | MEX25312150 | ● |
| **16** | 0/-0.035 | 8.00 | 0/-0.020 | 16 | 32 | | 200 | 2 | MEX253160 | ● |
| **20** | 0/-0.035 | 10.00 | 0/-0.020 | 20 | 38 | | 200 | 2 | MEX253200 | ● |

● stock standard ○ non-stock standard ▽ stock exhaustion

CUTTING PARAMETERS

# MEX253




| Material Group ISO 513 | | P2 P3 P4 K1 K2 | P4 P5 K3 | P6 K4 | H1 H4 H5 |
|---|---|---|---|---|---|
| Hardness/Rm | | ≤1000 N/mm² | ≤35 HRC | 35÷45 HRC | 45÷55 HRC |
| ap x ae | | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** |
| Vc (m/min) | | **90÷130** | **60÷100** | **50÷70** | **30÷50** |
| **D (mm)** | **ap (mm)** | **fz (mm/z)** | **fz (mm/z)** | **fz (mm/z)** | **fz (mm/z)** |
| **1** | 0.44 | 0.015 | 0.014 | 0.012 | 0.011 |
| **2** | 0.87 | 0.021 | 0.019 | 0.017 | 0.015 |
| **3** | 1.31 | 0.027 | 0.024 | 0.022 | 0.019 |
| **4** | 1.74 | 0.037 | 0.033 | 0.029 | 0.026 |
| **5** | 2.18 | 0.045 | 0.041 | 0.036 | 0.032 |
| **6** | 2.62 | 0.051 | 0.046 | 0.041 | 0.036 |
| **8** | 3.49 | 0.060 | 0.054 | 0.048 | 0.042 |
| **10** | 4.36 | 0.068 | 0.061 | 0.054 | 0.048 |
| **12** | 5.23 | 0.077 | 0.069 | 0.061 | 0.054 |
| **14** | 6.10 | 0.089 | 0.080 | 0.071 | 0.062 |
| **16** | 6.97 | 0.102 | 0.092 | 0.082 | 0.071 |
| **18** | 7.85 | 0.115 | 0.103 | 0.092 | 0.080 |
| **20** | 8.72 | 0.132 | 0.119 | 0.106 | 0.092 |




| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 30° | x 0.8 | x 0.8 |
| 15° | x 0.7 | x 0.7 |
| 0° | x 0.6 | x 0.6 |





# UH AND MH

STEEL AND HARDENED STEEL
< 70 HRC (UH) AND 30÷ 70 HRC (MH)

Nano micrograin and UH RED and MH, TiSi base coating for high performance milling on hardened steel up to 70 HRC. High reliability and long life in dry milling operation adopting high speed or high feed strategy. The cutting geometry has been specifically designed to obtain high precision and high quality surface finishing.

Nano micrograna e rivestimento UH RED e MH, a base TiSi per la fresatura di materiali temprati sino a 70 HRC. Grande affidabilità e durata nell'utilizzo di strategie di lavorazione ad alta velocità o alto avanzamento e con la possibilità di evitare l'utilizzo del refrigerante. Le geometrie di taglio specifiche garantiscono elevata precisione ed eccellente finitura della superficie lavorata.

Nano-Mikrokörnung und Beschichtung UH RED und MH auf TiSi-Basis für das Fräsen von gehärteten Materialien bis zu 70 HRC. Hohe Zuverlässigkeit und lange Standzeit auch bei Bearbeitungsverfahren mit hoher Geschwindigkeit und großem Vorschub und mit der Möglichkeit, ohne Kühlmittel zu arbeiten. Die spezifischen Schnittgeometrien gewährleisten eine hohe Präzision und eine hervorragende Endbearbeitung der bearbeiteten Fläche.

Nano micrograin et revêtement UH RED et MH à base TiSi pour le fraisage de matériaux trempés jusqu'à 70 HRC. Grande fiabilité et durée dans l'utilisation stratégique d'usinage à haute vitesse ou avancement élevé et avec la possibilité d'éviter l'utilisation de lubrifiant. Les géométries de coupe spécifiques garantissent une précision élevée et une excellente finition de la surface usinée.

Nano micrograno y revestimiento UH RED e MH a base de TiSi para el fresado de materiales templados hasta 70 HRC. Gran fiabilidad y duración en la utilización de estrategias de elaboración a alta velocidad o alto avance con la posibilidad de evitar la utilización del refrigerante. Las geometrías de corte específicas garantizan una elevada precisión y excelente acabado de la superficie trabajada.

Нано-микрозернистость и покрытие UH RED и MH на основе TiSi для фрезерования материалов с твердостью до 70 HRC. Высокая надежность и долговечность при использовании стратегий обработки с высокой скоростью или высокой подачей и с возможностью без использования СОЖ. Особая геометрия резания гарантирует высокую точность и отличное качество обработанной поверхности.

# UHM204

cylindrical shank, 2F, miniature

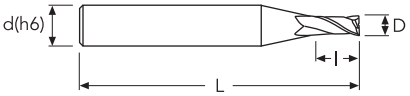
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | SQUARE | Z2



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SLOTTING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **0.1** | 0/-0.010 | | | 4 | 0.2 | | 40 | 2 | UHM200104 | ● |
| **0.2** | 0/-0.010 | | | 4 | 0.3 | | 50 | 2 | UHM200204 | ● |
| **0.3** | 0/-0.010 | | | 4 | 0.4 | | 50 | 2 | UHM200304 | ● |
| **0.4** | 0/-0.010 | | | 4 | 0.6 | | 50 | 2 | UHM200404 | ● |
| **0.5** | 0/-0.010 | | | 4 | 0.7 | | 50 | 2 | UHM200504 | ● |
| **0.6** | 0/-0.010 | | | 4 | 0.9 | | 50 | 2 | UHM200604 | ● |
| **0.7** | 0/-0.010 | | | 4 | 1 | | 50 | 2 | UHM200704 | ● |
| **0.8** | 0/-0.010 | | | 4 | 1.2 | | 50 | 2 | UHM200804 | ● |
| **0.9** | 0/-0.010 | | | 4 | 1.4 | | 50 | 2 | UHM200904 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# UHM204

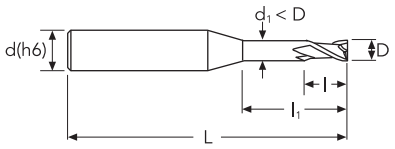
| | Material Group ISO 513 | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | **ap x D** | **ap x D** | **ap x D** | **ap x D** |
| | Vc (m/min) | | **80÷120** | **60÷100** | **50÷70** | **30÷50** |
| SLOTTING | D (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **0.1** | 0.01 | 0.002 | 0.002 | 0.002 | 0.001 |
| | **0.2** | 0.01 | 0.003 | 0.003 | 0.002 | 0.002 |
| | **0.3** | 0.02 | 0.004 | 0.004 | 0.003 | 0.003 |
| | **0.4** | 0.02 | 0.006 | 0.005 | 0.005 | 0.004 |
| | **0.5** | 0.03 | 0.007 | 0.006 | 0.006 | 0.005 |
| | **0.6** | 0.03 | 0.008 | 0.007 | 0.006 | 0.006 |
| | **0.8** | 0.04 | 0.010 | 0.009 | 0.008 | 0.007 |
| | **0.9** | 0.05 | 0.012 | 0.011 | 0.010 | 0.008 |

# UHLN2

cylindrical shank, 2F, extended and reduced neck

OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | SQUARE | Z2

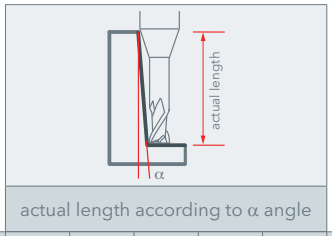





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | C | C Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.2** | 0/-0.010 | | | 4 | 0.3 | 0.5 | 0.16 | 50 | 2 | 0.57 | 0.59 | 0.61 | 0.63 | 0.68 | UHLN2002005 | ● |
| **0.2** | 0/-0.010 | | | 4 | 0.3 | 1 | 0.16 | 50 | 2 | 1.09 | 1.12 | 1.16 | 1.21 | 1.30 | UHLN200201 | ● |
| **0.2** | 0/-0.010 | | | 4 | 0.3 | 1.5 | 0.16 | 50 | 2 | 1.60 | 1.66 | 1.72 | 1.78 | 1.91 | UHLN2002015 | ● |
| **0.3** | 0/-0.010 | | | 4 | 0.4 | 1 | 0.26 | 50 | 2 | 1.09 | 1.12 | 1.16 | 1.21 | 1.30 | UHLN200301 | ● |
| **0.3** | 0/-0.010 | | | 4 | 0.4 | 2 | 0.26 | 50 | 2 | 2.12 | 2.19 | 2.27 | 2.35 | 2.53 | UHLN200302 | ● |
| **0.3** | 0/-0.010 | | | 4 | 0.4 | 3 | 0.26 | 50 | 2 | 3.15 | 3.26 | 3.38 | 3.50 | 3.76 | UHLN200303 | ● |
| **0.4** | 0/-0.010 | | | 4 | 0.6 | 2 | 0.37 | 50 | 2 | 2.12 | 2.19 | 2.27 | 2.35 | 2.53 | UHLN200402 | ● |
| **0.4** | 0/-0.010 | | | 4 | 0.6 | 3 | 0.37 | 50 | 2 | 3.15 | 3.26 | 3.38 | 3.50 | 3.76 | UHLN200403 | ● |
| **0.4** | 0/-0.010 | | | 4 | 0.6 | 4 | 0.37 | 50 | 2 | 4.19 | 4.33 | 4.49 | 4.65 | 5.00 | UHLN200404 | ● |
| **0.4** | 0/-0.010 | | | 4 | 0.6 | 5 | 0.37 | 50 | 2 | 5.22 | 5.40 | 5.59 | 5.79 | 6.23 | UHLN200405 | ● |
| **0.5** | 0/-0.010 | | | 4 | 0.7 | 2 | 0.45 | 50 | 2 | 2.16 | 2.23 | 2.31 | 2.40 | 2.57 | UHLN200502 | ● |
| **0.5** | 0/-0.010 | | | 4 | 0.7 | 4 | 0.45 | 50 | 2 | 4.23 | 4.37 | 4.53 | 4.69 | 5.04 | UHLN200504 | ● |
| **0.5** | 0/-0.010 | | | 4 | 0.7 | 6 | 0.45 | 50 | 2 | 6.29 | 6.51 | 6.74 | 6.98 | 7.51 | UHLN200506 | ● |
| **0.5** | 0/-0.010 | | | 4 | 0.7 | 8 | 0.45 | 50 | 2 | 8.36 | 8.65 | 8.96 | 9.28 | 9.98 | UHLN200508 | ● |
| **0.6** | 0/-0.010 | | | 4 | 0.9 | 2 | 0.55 | 50 | 2 | 2.16 | 2.23 | 2.31 | 2.40 | 2.57 | UHLN200602 | ● |
| **0.6** | 0/-0.010 | | | 4 | 0.9 | 4 | 0.55 | 50 | 2 | 4.23 | 4.37 | 4.53 | 4.69 | 5.04 | UHLN200604 | ● |
| **0.6** | 0/-0.010 | | | 4 | 0.9 | 6 | 0.55 | 50 | 2 | 6.29 | 6.51 | 6.74 | 6.98 | 7.51 | UHLN200606 | ● |
| **0.6** | 0/-0.010 | | | 4 | 0.9 | 8 | 0.55 | 50 | 2 | 8.36 | 8.65 | 8.96 | 9.28 | 9.98 | UHLN200608 | ● |
| **0.6** | 0/-0.010 | | | 4 | 0.9 | 10 | 0.55 | 50 | 2 | 10.43 | 10.79 | 11.17 | 11.57 | 12.44 | UHLN200610 | ● |
| **0.7** | 0/-0.010 | | | 4 | 1.0 | 2 | 0.65 | 50 | 2 | 2.16 | 2.23 | 2.31 | 2.40 | 2.57 | UHLN200702 | ● |
| **0.7** | 0/-0.010 | | | 4 | 1.0 | 4 | 0.65 | 50 | 2 | 4.23 | 4.37 | 4.53 | 4.69 | 5.04 | UHLN200704 | ● |
| **0.7** | 0/-0.010 | | | 4 | 1.0 | 6 | 0.65 | 50 | 2 | 6.29 | 6.51 | 6.74 | 6.98 | 7.51 | UHLN200706 | ● |
| **0.7** | 0/-0.010 | | | 4 | 1.0 | 8 | 0.65 | 50 | 2 | 8.36 | 8.65 | 8.96 | 9.28 | 9.98 | UHLN200708 | ● |
| **0.7** | 0/-0.010 | | | 4 | 1.0 | 10 | 0.65 | 50 | 2 | 10.43 | 10.79 | 11.17 | 11.57 | 12.44 | UHLN200710 | ● |
| **0.8** | 0/-0.010 | | | 4 | 1.2 | 4 | 0.75 | 50 | 2 | 4.23 | 4.37 | 4.53 | 4.69 | 5.04 | UHLN200804 | ● |
| **0.8** | 0/-0.010 | | | 4 | 1.2 | 6 | 0.75 | 50 | 2 | 6.29 | 6.51 | 6.74 | 6.98 | 7.51 | UHLN200806 | ● |
| **0.8** | 0/-0.010 | | | 4 | 1.2 | 8 | 0.75 | 50 | 2 | 8.36 | 8.65 | 8.96 | 9.28 | 9.98 | UHLN200808 | ● |
| **0.8** | 0/-0.010 | | | 4 | 1.2 | 10 | 0.75 | 50 | 2 | 10.43 | 10.79 | 11.17 | 11.57 | 12.44 | UHLN200810 | ● |
| **0.8** | 0/-0.010 | | | 4 | 1.2 | 12 | 0.75 | 50 | 2 | 12.49 | 12.93 | 13.38 | 13.87 | 14.91 | UHLN200812 | ● |
| **0.9** | 0/-0.010 | | | 4 | 1.4 | 6 | 0.85 | 50 | 2 | 6.29 | 6.51 | 6.74 | 6.98 | 7.51 | UHLN200906 | ● |
| **0.9** | 0/-0.010 | | | 4 | 1.4 | 8 | 0.85 | 50 | 2 | 8.36 | 8.65 | 8.96 | 9.28 | 9.98 | UHLN200908 | ● |
| **0.9** | 0/-0.010 | | | 4 | 1.4 | 10 | 0.85 | 50 | 2 | 10.43 | 10.79 | 11.17 | 11.57 | 12.44 | UHLN200910 | ● |
| **0.9** | 0/-0.010 | | | 4 | 1.4 | 15 | 0.85 | 50 | 2 | 15.6 | 16.14 | 16.71 | 17.31 | 18.61 | UHLN200915 | ● |
| **1** | 0/-0.015 | | | 4 | 1.5 | 6 | 0.95 | 50 | 2 | 6.39 | 6.61 | 6.84 | 7.09 | 7.62 | UHLN201006 | ● |
| **1** | 0/-0.015 | | | 4 | 1.5 | 8 | 0.95 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | UHLN201008 | ● |
| **1** | 0/-0.015 | | | 4 | 1.5 | 10 | 0.95 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | UHLN201010 | ● |
| **1** | 0/-0.015 | | | 4 | 1.5 | 12 | 0.95 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | 15.02 | UHLN201012 | ● |
| **1** | 0/-0.015 | | | 4 | 1.5 | 14 | 0.95 | 50 | 2 | 14.66 | 15.17 | 15.70 | 16.27 | 17.49 | UHLN201014 | ● |
| **1** | 0/-0.015 | | | 4 | 1.5 | 16 | 0.95 | 50 | 2 | 16.73 | 17.30 | 17.92 | 18.56 | 19.96 | UHLN201016 | ● |

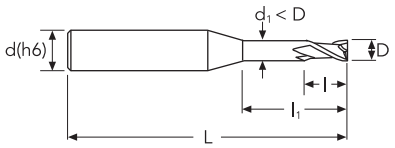
● stock standard ○ non-standard stock ▽ stock exhaustion

# UHLN2

cylindrical shank, 2F, extended and reduced neck

OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | SQUARE | Z2

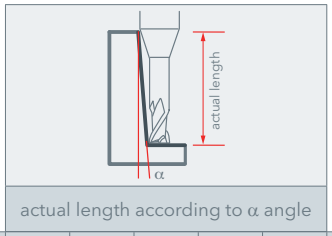





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | C | C Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.2** | 0/-0.015 | | | 4 | 1.8 | 6 | 1.15 | 50 | 2 | 6.39 | 6.61 | 6.84 | 7.09 | 7.62 | UHLN201206 | ● |
| **1.2** | 0/-0.015 | | | 4 | 1.8 | 8 | 1.15 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | UHLN201208 | ● |
| **1.2** | 0/-0.015 | | | 4 | 1.8 | 10 | 1.15 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | UHLN201210 | ● |
| **1.2** | 0/-0.015 | | | 4 | 1.8 | 12 | 1.15 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | 15.02 | UHLN201212 | ● |
| **1.4** | 0/-0.015 | | | 4 | 2.1 | 6 | 1.35 | 50 | 2 | 6.39 | 6.61 | 6.84 | 7.09 | 7.62 | UHLN201406 | ● |
| **1.4** | 0/-0.015 | | | 4 | 2.1 | 8 | 1.35 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | UHLN201408 | ● |
| **1.4** | 0/-0.015 | | | 4 | 2.1 | 10 | 1.35 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | UHLN201410 | ● |
| **1.4** | 0/-0.015 | | | 4 | 2.1 | 12 | 1.35 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | 15.02 | UHLN201412 | ● |
| **1.4** | 0/-0.015 | | | 4 | 2.1 | 14 | 1.35 | 50 | 2 | 14.66 | 15.17 | 15.70 | 16.27 | 17.49 | UHLN201414 | ● |
| **1.4** | 0/-0.015 | | | 4 | 2.1 | 16 | 1.35 | 50 | 2 | 16.73 | 17.30 | 17.92 | 18.56 | 19.96 | UHLN201416 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 6 | 1.45 | 50 | 2 | 6.39 | 6.61 | 6.84 | 7.09 | 7.62 | UHLN201506 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 8 | 1.45 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | UHLN201508 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 10 | 1.45 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | UHLN201510 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 12 | 1.45 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | 15.02 | UHLN201512 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 14 | 1.45 | 50 | 2 | 14.66 | 15.17 | 15.7 | 16.27 | 17.49 | UHLN201514 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 16 | 1.45 | 50 | 2 | 16.73 | 17.30 | 17.92 | 18.56 | 19.96 | UHLN201516 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 18 | 1.45 | 60 | 2 | 18.79 | 19.44 | 20.13 | 20.86 | 22.43 | UHLN201518 | ● |
| **1.5** | 0/-0.015 | | | 4 | 2.3 | 20 | 1.45 | 60 | 2 | 20.86 | 21.58 | 22.35 | 23.15 | - | UHLN201520 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 6 | 1.55 | 50 | 2 | 6.39 | 6.61 | 6.84 | 7.09 | 7.62 | UHLN201606 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 8 | 1.55 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | UHLN201608 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 10 | 1.55 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | UHLN201610 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 12 | 1.55 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | 15.02 | UHLN201612 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 14 | 1.55 | 50 | 2 | 14.66 | 15.17 | 15.70 | 16.27 | 17.49 | UHLN201614 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 16 | 1.55 | 50 | 2 | 16.73 | 17.30 | 17.92 | 18.56 | 19.96 | UHLN201616 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 18 | 1.55 | 60 | 2 | 18.79 | 19.44 | 20.13 | 20.86 | 22.43 | UHLN201618 | ● |
| **1.6** | 0/-0.015 | | | 4 | 2.4 | 20 | 1.55 | 60 | 2 | 20.86 | 21.58 | 22.35 | 23.15 | - | UHLN201620 | ● |
| **1.8** | 0/-0.015 | | | 4 | 2.7 | 6 | 1.75 | 50 | 2 | 6.39 | 6.61 | 6.84 | 7.09 | 7.62 | UHLN201806 | ● |
| **1.8** | 0/-0.015 | | | 4 | 2.7 | 8 | 1.75 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | UHLN201808 | ● |
| **1.8** | 0/-0.015 | | | 4 | 2.7 | 10 | 1.75 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | UHLN201810 | ● |
| **1.8** | 0/-0.015 | | | 4 | 2.7 | 12 | 1.75 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | 15.02 | UHLN201812 | ● |
| **1.8** | 0/-0.015 | | | 4 | 2.7 | 14 | 1.75 | 50 | 2 | 14.66 | 15.17 | 15.70 | 16.27 | 17.49 | UHLN201814 | ● |
| **1.8** | 0/-0.015 | | | 4 | 2.7 | 16 | 1.75 | 50 | 2 | 16.73 | 17.30 | 17.92 | 18.56 | 19.96 | UHLN201816 | ● |
| **1.8** | 0/-0.015 | | | 4 | 2.7 | 18 | 1.75 | 60 | 2 | 18.79 | 19.44 | 20.13 | 20.86 | - | UHLN201818 | ● |
| **1.8** | 0/-0.015 | | | 4 | 2.7 | 20 | 1.75 | 60 | 2 | 20.86 | 21.58 | 22.35 | 23.15 | - | UHLN201820 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 6 | 1.95 | 50 | 2 | 6.39 | 6.61 | 6.84 | 7.09 | 7.62 | UHLN202006 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 8 | 1.95 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | UHLN202008 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 10 | 1.95 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | UHLN202010 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 12 | 1.95 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | 15.02 | UHLN202012 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 14 | 1.95 | 50 | 2 | 14.66 | 15.17 | 15.70 | 16.27 | 17.49 | UHLN202014 | ● |

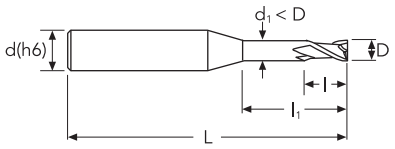
● stock standard ○ non-standard stock ∇ stock exhaustion

# UHLN2

cylindrical shank, 2F, extended and reduced neck

OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | SQUARE | Z2

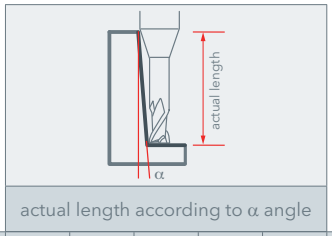





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | C | C Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.015 | | | 4 | 3 | 16 | 1.95 | 50 | 2 | 16.73 | 17.30 | 17.92 | 18.56 | - | UHLN202016 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 18 | 1.95 | 60 | 2 | 18.79 | 19.44 | 20.13 | 20.86 | - | UHLN202018 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 20 | 1.95 | 60 | 2 | 20.86 | 21.58 | 22.35 | 23.15 | - | UHLN202020 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 25 | 1.95 | 75 | 2 | 26.03 | 26.93 | 27.88 | - | - | UHLN202025 | ● |
| **2** | 0/-0.015 | | | 4 | 3 | 30 | 1.95 | 75 | 2 | 31.2 | 32.28 | 33.42 | - | - | UHLN202030 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 8 | 2.4 | 50 | 2 | 8.46 | 8.75 | 9.06 | 9.38 | 10.09 | UHLN202508 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 10 | 2.4 | 50 | 2 | 10.52 | 10.89 | 11.27 | 11.68 | 12.56 | UHLN202510 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 12 | 2.4 | 50 | 2 | 12.59 | 13.03 | 13.49 | 13.97 | - | UHLN202512 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 14 | 2.4 | 50 | 2 | 14.66 | 15.17 | 15.70 | 16.27 | - | UHLN202514 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 16 | 2.4 | 50 | 2 | 16.73 | 17.30 | 17.92 | 18.56 | - | UHLN202516 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 18 | 2.4 | 60 | 2 | 18.79 | 19.44 | 20.13 | 20.86 | - | UHLN202518 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 20 | 2.4 | 60 | 2 | 20.86 | 21.58 | 22.35 | - | - | UHLN202520 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 25 | 2.4 | 75 | 2 | 24.1 | 24.94 | 25.83 | - | - | UHLN202525 | ● |
| **2.5** | 0/-0.020 | | | 4 | 3.7 | 30 | 2.4 | 75 | 2 | 31.2 | 32.28 | - | - | - | UHLN202530 | ● |
| **3** | 0/-0.020 | | | 6 | 4.5 | 8 | 2.85 | 50 | 2 | 8.65 | 8.95 | 9.26 | 9.60 | 10.31 | UHLN203008 | ● |
| **3** | 0/-0.020 | | | 6 | 4.5 | 10 | 2.85 | 50 | 2 | 10.72 | 11.09 | 11.48 | 11.89 | 12.78 | UHLN203010 | ● |
| **3** | 0/-0.020 | | | 6 | 4.5 | 12 | 2.85 | 50 | 2 | 12.78 | 13.23 | 13.69 | 14.18 | 15.25 | UHLN203012 | ● |
| **3** | 0/-0.020 | | | 6 | 4.5 | 14 | 2.85 | 50 | 2 | 14.85 | 15.36 | 15.91 | 16.48 | 17.72 | UHLN203014 | ● |
| **3** | 0/-0.020 | | | 6 | 4.5 | 16 | 2.85 | 60 | 2 | 16.92 | 17.50 | 18.12 | 18.77 | 20.18 | UHLN203016 | ● |
| **3** | 0/-0.020 | | | 6 | 4.5 | 18 | 2.85 | 60 | 2 | 18.99 | 19.64 | 20.34 | 21.07 | 22.65 | UHLN203018 | ● |
| **3** | 0/-0.020 | | | 6 | 4.5 | 20 | 2.85 | 60 | 2 | 21.05 | 21.78 | 22.55 | 23.36 | 25.12 | UHLN203020 | ● |
| **3** | 0/-0.020 | | | 6 | 4.5 | 25 | 2.85 | 75 | 2 | 26.22 | 27.13 | 28.09 | 29.10 | - | UHLN203025 | ● |
| **4** | 0/-0.020 | | | 6 | 4.5 | 10 | 3.85 | 60 | 2 | 10.91 | 11.29 | 11.68 | 12.10 | 13.00 | UHLN204010 | ● |
| **4** | 0/-0.020 | | | 6 | 4.5 | 15 | 3.85 | 60 | 2 | 16.08 | 16.63 | 17.22 | 17.84 | 19.17 | UHLN204015 | ● |
| **4** | 0/-0.020 | | | 6 | 4.5 | 20 | 3.85 | 60 | 2 | 21.25 | 21.98 | 22.76 | 23.57 | - | UHLN204020 | ● |
| **4** | 0/-0.020 | | | 6 | 4.5 | 25 | 3.85 | 75 | 2 | 26.41 | 27.33 | 28.29 | - | - | UHLN204025 | ● |
| **4** | 0/-0.020 | | | 6 | 4.5 | 30 | 3.85 | 75 | 2 | 31.58 | 32.67 | 33.83 | - | - | UHLN204030 | ● |
| **4** | 0/-0.020 | | | 6 | 4.5 | 40 | 3.85 | 75 | 2 | 41.92 | 43.37 | - | - | - | UHLN204040 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# UHLN2

| | Material Group ISO 513 | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | **ap x D** | **ap x D** | **ap x D** | **ap x D** |
| | Vc (m/min) | | **80÷120** | **60÷100** | **50÷70** | **30÷50** |
| | D (mm) | l1 (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| SQUARE RIB | **0.2** | ≤ 6D | 0.01 | 0.003 | 0.003 | 0.002 | 0.002 |
| | | ≤ 8D | 0.01 | 0.003 | 0.002 | 0.002 | 0.002 |
| | | ≤ 10D | 0.01 | 0.002 | 0.002 | 0.002 | 0.001 |
| | | ≤ 12D | 0.01 | 0.002 | 0.001 | 0.001 | 0.001 |
| | **0.3** | ≤ 6D | 0.02 | 0.004 | 0.004 | 0.003 | 0.003 |
| | | ≤ 8D | 0.01 | 0.003 | 0.003 | 0.003 | 0.002 |
| | | ≤ 10D | 0.01 | 0.003 | 0.003 | 0.002 | 0.002 |
| | | ≤ 12D | 0.01 | 0.002 | 0.002 | 0.002 | 0.002 |
| | **0.4** | ≤ 6D | 0.02 | 0.006 | 0.005 | 0.005 | 0.004 |
| | | ≤ 8D | 0.02 | 0.005 | 0.005 | 0.004 | 0.004 |
| | | ≤ 10D | 0.01 | 0.004 | 0.004 | 0.003 | 0.003 |
| | | ≤ 12D | 0.01 | 0.003 | 0.003 | 0.003 | 0.002 |
| | **0.5** | ≤ 6D | 0.03 | 0.007 | 0.006 | 0.006 | 0.005 |
| | | ≤ 8D | 0.02 | 0.006 | 0.005 | 0.005 | 0.004 |
| | | ≤ 10D | 0.02 | 0.005 | 0.004 | 0.004 | 0.003 |
| | | ≤ 12D | 0.01 | 0.004 | 0.003 | 0.003 | 0.003 |
| | **0.6** | ≤ 6D | 0.03 | 0.008 | 0.007 | 0.006 | 0.006 |
| | | ≤ 8D | 0.03 | 0.007 | 0.006 | 0.005 | 0.005 |
| | | ≤ 10D | 0.02 | 0.006 | 0.005 | 0.004 | 0.004 |
| | | ≤ 12D | 0.02 | 0.004 | 0.004 | 0.004 | 0.003 |
| | **0.8** | ≤ 6D | 0.04 | 0.010 | 0.009 | 0.008 | 0.007 |
| | | ≤ 8D | 0.03 | 0.009 | 0.008 | 0.007 | 0.006 |
| | | ≤ 10D | 0.03 | 0.007 | 0.006 | 0.006 | 0.005 |
| | | ≤ 12D | 0.02 | 0.006 | 0.005 | 0.004 | 0.004 |
| | **1** | ≤ 6D | 0.05 | 0.012 | 0.011 | 0.010 | 0.008 |
| | | ≤ 8D | 0.04 | 0.010 | 0.009 | 0.008 | 0.007 |
| | | ≤ 10D | 0.04 | 0.008 | 0.008 | 0.007 | 0.006 |
| | | ≤ 12D | 0.03 | 0.007 | 0.006 | 0.005 | 0.005 |
| | **1.2** | ≤ 6D | 0.06 | 0.022 | 0.020 | 0.018 | 0.015 |
| | | ≤ 8D | 0.05 | 0.019 | 0.017 | 0.015 | 0.013 |
| | | ≤ 10D | 0.04 | 0.015 | 0.014 | 0.012 | 0.011 |
| | | ≤ 12D | 0.03 | 0.012 | 0.011 | 0.010 | 0.008 |
| | **1.4** | ≤ 6D | 0.07 | 0.024 | 0.022 | 0.019 | 0.017 |
| | | ≤ 8D | 0.06 | 0.020 | 0.018 | 0.016 | 0.014 |
| | | ≤ 10D | 0.05 | 0.017 | 0.015 | 0.013 | 0.012 |
| | | ≤ 12D | 0.04 | 0.013 | 0.012 | 0.011 | 0.009 |
| | | ≤ 15D | 0.03 | 0.011 | 0.010 | 0.009 | 0.008 |
| | | > 15D | 0.02 | 0.007 | 0.006 | 0.006 | 0.005 |
| | **1.5** | ≤ 6D | 0.08 | 0.025 | 0.023 | 0.020 | 0.018 |
| | | ≤ 8D | 0.06 | 0.021 | 0.019 | 0.017 | 0.015 |
| | | ≤ 10D | 0.05 | 0.018 | 0.016 | 0.014 | 0.012 |
| | | ≤ 12D | 0.04 | 0.014 | 0.012 | 0.011 | 0.010 |
| | | ≤ 15D | 0.03 | 0.011 | 0.010 | 0.009 | 0.008 |
| | | > 15D | 0.02 | 0.008 | 0.007 | 0.006 | 0.005 |
| | **1.6** | ≤ 6D | 0.08 | 0.026 | 0.023 | 0.021 | 0.018 |
| | | ≤ 8D | 0.07 | 0.022 | 0.020 | 0.018 | 0.015 |
| | | ≤ 10D | 0.06 | 0.018 | 0.016 | 0.015 | 0.013 |
| | | ≤ 12D | 0.04 | 0.014 | 0.013 | 0.011 | 0.010 |
| | | ≤ 15D | 0.04 | 0.012 | 0.011 | 0.009 | 0.008 |
| | | > 15D | 0.02 | 0.008 | 0.007 | 0.006 | 0.005 |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# UHLN2




| Material Group ISO 513 | | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| ap x ae | | | **ap x D** | **ap x D** | **ap x D** | **ap x D** |
| Vc (m/min) | | | **80÷120** | **60÷100** | **50÷70** | **30÷50** |
| D (mm) | l1 (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 1.8 | ≤ 6D | 0.09 | 0.028 | 0.025 | 0.022 | 0.020 |
| | ≤ 8D | 0.08 | 0.024 | 0.021 | 0.019 | 0.017 |
| | ≤ 10D | 0.06 | 0.020 | 0.018 | 0.016 | 0.014 |
| | ≤ 12D | 0.05 | 0.015 | 0.014 | 0.012 | 0.011 |
| | ≤ 15D | 0.04 | 0.013 | 0.011 | 0.010 | 0.009 |
| | > 15D | 0.03 | 0.008 | 0.008 | 0.007 | 0.006 |
| 2 | ≤ 6D | 0.10 | 0.030 | 0.027 | 0.024 | 0.021 |
| | ≤ 8D | 0.09 | 0.026 | 0.023 | 0.020 | 0.018 |
| | ≤ 10D | 0.07 | 0.021 | 0.019 | 0.017 | 0.015 |
| | ≤ 12D | 0.06 | 0.017 | 0.015 | 0.013 | 0.012 |
| | ≤ 15D | 0.05 | 0.014 | 0.012 | 0.011 | 0.009 |
| | > 15D | 0.03 | 0.009 | 0.008 | 0.007 | 0.006 |
| 2.5 | ≤ 6D | 0.13 | 0.035 | 0.032 | 0.028 | 0.025 |
| | ≤ 8D | 0.11 | 0.030 | 0.027 | 0.024 | 0.021 |
| | ≤ 10D | 0.09 | 0.025 | 0.022 | 0.020 | 0.017 |
| | ≤ 12D | 0.07 | 0.019 | 0.017 | 0.015 | 0.013 |
| | ≤ 15D | 0.06 | 0.016 | 0.014 | 0.013 | 0.011 |
| | > 15D | 0.04 | 0.011 | 0.009 | 0.008 | 0.007 |
| 3 | ≤ 6D | 0.15 | 0.040 | 0.036 | 0.032 | 0.028 |
| | ≤ 8D | 0.13 | 0.034 | 0.031 | 0.027 | 0.024 |
| | ≤ 10D | 0.11 | 0.028 | 0.025 | 0.022 | 0.020 |
| | ≤ 12D | 0.08 | 0.022 | 0.020 | 0.018 | 0.015 |
| | ≤ 15D | 0.07 | 0.018 | 0.016 | 0.014 | 0.013 |
| | > 15D | 0.05 | 0.012 | 0.011 | 0.010 | 0.008 |
| 4 | ≤ 6D | 0.20 | 0.050 | 0.045 | 0.040 | 0.035 |
| | ≤ 8D | 0.17 | 0.043 | 0.038 | 0.034 | 0.030 |
| | ≤ 10D | 0.14 | 0.035 | 0.032 | 0.028 | 0.025 |
| | ≤ 12D | 0.11 | 0.028 | 0.025 | 0.022 | 0.019 |
| | ≤ 15D | 0.09 | 0.023 | 0.020 | 0.018 | 0.016 |
| | > 15D | 0.06 | 0.015 | 0.014 | 0.012 | 0.011 |

# UH600

cylindrical shank, multi flute

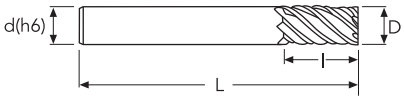
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 50° | SQUARE | Z6~Z8



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.020 | | | 6 | 8 | | 50 | 6 | UH600030 | ● |
| **4** | 0/-0.020 | | | 6 | 11 | | 50 | 6 | UH600040 | ● |
| **5** | 0/-0.020 | | | 6 | 13 | | 50 | 6 | UH600050 | ● |
| **6** | 0/-0.020 | | | 6 | 20 | | 60 | 6 | UH600060 | ● |
| **8** | 0/-0.020 | | | 8 | 20 | | 64 | 6 | UH600080 | ● |
| **10** | 0/-0.020 | | | 10 | 22 | | 70 | 6 | UH600100 | ● |
| **12** | 0/-0.020 | | | 12 | 25 | | 75 | 6 | UH600120 | ● |
| **14** | 0/-0.020 | | | 14 | 30 | | 90 | 6 | UH600140 | ● |
| **16** | 0/-0.020 | | | 16 | 30 | | 90 | 8 | UH600160 | ● |
| **20** | 0/-0.020 | | | 20 | 38 | | 100 | 8 | UH600200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# UH600

| | Material Group ISO 513 | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | **1.5D x 0.1D** | **1.5D x 0.05D** | **1.5D x 0.05D** | **1.5D x 0.05D** |
| | Vc (m/min) | **140÷180** | **100÷140** | **80÷100** | **60÷80** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.008 | 0.008 | 0.007 | 0.006 |
| | **4** | 0.012 | 0.011 | 0.010 | 0.008 |
| | **5** | 0.014 | 0.013 | 0.012 | 0.010 |
| | **6** | 0.018 | 0.016 | 0.014 | 0.013 |
| | **8** | 0.028 | 0.025 | 0.022 | 0.019 |
| | **10** | 0.034 | 0.030 | 0.027 | 0.024 |
| | **12** | 0.041 | 0.037 | 0.033 | 0.029 |
| | **14** | 0.048 | 0.043 | 0.038 | 0.034 |
| | **16** | 0.056 | 0.051 | 0.045 | 0.039 |
| | **18** | 0.066 | 0.059 | 0.053 | 0.046 |
| | **20** | 0.078 | 0.070 | 0.062 | 0.055 |

# UH612

cylindrical shank, multi flute, long

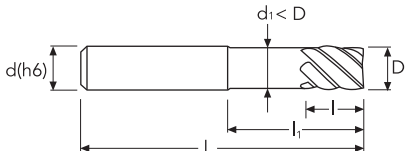
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 50° | SQUARE | Z6~Z8



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | C | C Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.025 | | | 6 | 19 | 30 | 2.80 | 75 | 6 | UH612030 | ● |
| **4** | 0/-0.025 | | | 6 | 19 | 32 | 3.70 | 75 | 6 | UH612040 | ● |
| **5** | 0/-0.025 | | | 6 | 19 | 32 | 4.60 | 75 | 6 | UH612050 | ● |
| **6** | 0/-0.025 | | | 6 | 38 | 60 | 5.50 | 100 | 6 | UH612060 | ● |
| **8** | 0/-0.025 | | | 8 | 41 | 60 | 7.40 | 100 | 6 | UH612080 | ● |
| **10** | 0/-0.025 | | | 10 | 57 | 85 | 9.20 | 125 | 6 | UH612100 | ● |
| **12** | 0/-0.025 | | | 12 | 75 | 110 | 11.00 | 150 | 6 | UH612120 | ● |
| **16** | 0/-0.025 | | | 16 | 75 | 110 | 15.00 | 150 | 8 | UH612160 | ● |
| **20** | 0/-0.025 | | | 20 | 75 | 110 | 19.00 | 150 | 8 | UH612200 | ● |

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
**UH/MH**

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# UH612

| SIDE MILLING | Material Group ISO 513 | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | **1.5D x 0.05D** | **1.5D x 0.05D** | **1.5D x 0.05D** | **1.5D x 0.05D** |
| | Vc (m/min) | **90÷130** | **70÷110** | **50÷70** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.007 | 0.006 | 0.006 | 0.005 |
| | **4** | 0.010 | 0.009 | 0.008 | 0.007 |
| | **5** | 0.012 | 0.011 | 0.010 | 0.009 |
| | **6** | 0.015 | 0.014 | 0.012 | 0.011 |
| | **8** | 0.023 | 0.021 | 0.019 | 0.016 |
| | **10** | 0.029 | 0.026 | 0.023 | 0.020 |
| | **12** | 0.035 | 0.031 | 0.028 | 0.024 |
| | **14** | 0.041 | 0.037 | 0.033 | 0.029 |
| | **16** | 0.048 | 0.043 | 0.038 | 0.034 |
| | **20** | 0.066 | 0.060 | 0.053 | 0.046 |

# UHM206

cylindrical shank, 2F, miniature, 6 mm. shank

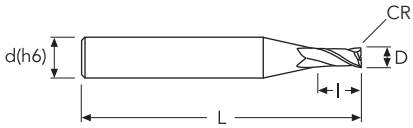
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | SQUARE (< Ø0.5) | RADIUS (≤ Ø0.5) | Z2




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SLOTTING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **0.3** | 0/-0.012 | | | 6 | 0.45 | | 50 | 2 | UHM200306 | ● |
| **0.4** | 0/-0.012 | | | 6 | 0.6 | | 50 | 2 | UHM200406 | ● |
| **0.5** | 0/-0.012 | 0.05 | +/-0.010 | 6 | 0.7 | | 50 | 2 | UHM200506 | ● |
| **0.6** | 0/-0.012 | 0.05 | +/-0.010 | 6 | 0.9 | | 50 | 2 | UHM200606 | ● |
| **0.8** | 0/-0.012 | 0.05 | +/-0.010 | 6 | 1.2 | | 50 | 2 | UHM200806 | ● |
| **1** | 0/-0.012 | 0.10 | +/-0.010 | 6 | 1.5 | | 50 | 2 | UHM201006 | ● |
| **1.5** | 0/-0.012 | 0.15 | +/-0.010 | 6 | 2.2 | | 50 | 2 | UHM201506 | ● |
| **2** | 0/-0.012 | 0.15 | +/-0.010 | 6 | 2.2 | | 50 | 2 | UHM202006 | ● |

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
**UH/MH**

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
**UH/MH**

HSS END-MILLS

CARBIDE BURRS

CUTTING PARAMETERS

# UHM206

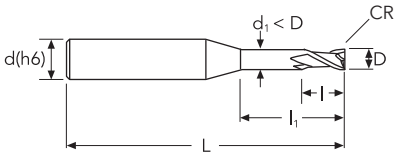
| | Material Group ISO 513 | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | **ap x D** | **ap x D** | **ap x D** | **ap x D** |
| | Vc (m/min) | | **80÷120** | **60÷100** | **50÷70** | **30÷50** |
| SLOTTING | D (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **0.3** | 0.02 | 0.004 | 0.004 | 0.003 | 0.003 |
| | **0.4** | 0.02 | 0.006 | 0.005 | 0.005 | 0.004 |
| | **0.5** | 0.03 | 0.007 | 0.006 | 0.006 | 0.005 |
| | **0.6** | 0.03 | 0.008 | 0.007 | 0.006 | 0.006 |
| | **0.8** | 0.04 | 0.010 | 0.009 | 0.008 | 0.007 |
| | **1** | 0.05 | 0.012 | 0.011 | 0.010 | 0.008 |
| | **1.5** | 0.08 | 0.025 | 0.023 | 0.020 | 0.018 |
| | **2** | 0.10 | 0.030 | 0.027 | 0.024 | 0.021 |

# UH211

cylindrical shank, 2F, extended and reduced neck, corner radius

OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | RADIUS | Z2

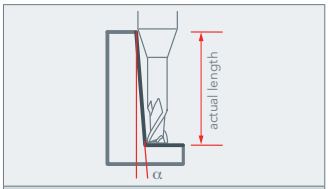



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.012 | 0.10 | 0/-0.010 | 4 | 2 | 4 | 0.95 | 50 | 2 | 4.36 | 4.60 | 4.86 | 5.16 | 5.89 | UH2110100104 | ● |
| **1** | 0/-0.012 | 0.10 | 0/-0.010 | 4 | 2 | 6 | 0.95 | 50 | 2 | 6.46 | 6.82 | 7.21 | 7.66 | 8.74 | UH2110100106 | ● |
| **1** | 0/-0.012 | 0.10 | 0/-0.010 | 4 | 2 | 8 | 0.90 | 50 | 2 | 8.45 | 8.73 | 9.00 | 9.27 | 9.81 | UH2110100108 | ● |
| **1** | 0/-0.012 | 0.20 | 0/-0.010 | 4 | 2 | 4 | 0.95 | 50 | 2 | 4.36 | 4.60 | 4.86 | 5.16 | 5.89 | UH2110100204 | ● |
| **1** | 0/-0.012 | 0.20 | 0/-0.010 | 4 | 2 | 8 | 0.95 | 50 | 2 | 8.57 | 9.04 | 9.56 | 10.15 | 11.18 | UH2110100208 | ● |
| **1** | 0/-0.012 | 0.30 | 0/-0.010 | 4 | 2 | 4 | 0.90 | 50 | 2 | 4.31 | 4.44 | 4.57 | 4.70 | 4.97 | UH2110100304 | ● |
| **1** | 0/-0.012 | 0.30 | 0/-0.010 | 4 | 2 | 8 | 0.95 | 50 | 2 | 8.57 | 9.04 | 9.56 | 10.15 | 11.18 | UH2110100308 | ● |
| **1.5** | 0/-0.012 | 0.10 | 0/-0.010 | 4 | 2.5 | 6 | 1.45 | 50 | 2 | 6.30 | 6.52 | 6.75 | 7.01 | 7.57 | UH2110150106 | ● |
| **1.5** | 0/-0.012 | 0.10 | 0/-0.010 | 4 | 2.5 | 10 | 1.45 | 50 | 2 | 10.43 | 10.8 | 11.19 | 11.61 | 12.55 | UH2110150110 | ● |
| **1.5** | 0/-0.012 | 0.20 | 0/-0.010 | 4 | 2.5 | 8 | 1.45 | 50 | 2 | 8.37 | 8.66 | 8.97 | 9.31 | 10.06 | UH2110150208 | ● |
| **1.5** | 0/-0.012 | 0.20 | 0/-0.010 | 4 | 2.5 | 12 | 1.45 | 50 | 2 | 12.50 | 12.94 | 13.40 | 13.91 | 15.03 | UH2110150212 | ● |
| **2** | 0/-0.012 | 0.10 | 0/-0.010 | 4 | 3 | 6 | 1.95 | 50 | 2 | 6.30 | 6.52 | 6.75 | 7.01 | 7.57 | UH2110200106 | ● |
| **2** | 0/-0.012 | 0.10 | 0/-0.010 | 4 | 3 | 12 | 1.95 | 50 | 2 | 12.50 | 12.94 | 13.40 | 13.91 | 15.03 | UH2110200112 | ● |
| **2** | 0/-0.012 | 0.20 | 0/-0.010 | 4 | 3 | 6 | 1.95 | 50 | 2 | 6.30 | 6.52 | 6.75 | 7.01 | 7.57 | UH2110200206 | ● |
| **2** | 0/-0.012 | 0.20 | 0/-0.010 | 4 | 3 | 12 | 1.95 | 50 | 2 | 12.50 | 12.94 | 13.40 | 13.91 | 15.03 | UH2110200212 | ● |
| **2** | 0/-0.012 | 0.30 | 0/-0.010 | 4 | 3 | 8 | 1.95 | 50 | 2 | 8.37 | 8.66 | 8.97 | 9.31 | 10.06 | UH2110200308 | ● |
| **2** | 0/-0.012 | 0.30 | 0/-0.010 | 4 | 3 | 12 | 1.95 | 50 | 2 | 12.50 | 12.94 | 13.40 | 13.91 | 15.03 | UH2110200312 | ● |
| **2** | 0/-0.012 | 0.30 | 0/-0.010 | 4 | 3 | 16 | 1.95 | 50 | 2 | 16.64 | 17.21 | 17.84 | 18.50 | - | UH2110200316 | ● |
| **2** | 0/-0.012 | 0.50 | 0/-0.010 | 4 | 3 | 6 | 1.95 | 50 | 2 | 6.30 | 6.52 | 6.75 | 7.01 | 7.57 | UH2110200506 | ● |
| **2** | 0/-0.012 | 0.50 | 0/-0.010 | 4 | 3 | 12 | 1.95 | 50 | 2 | 12.50 | 12.94 | 13.40 | 13.91 | 15.03 | UH2110200512 | ● |
| **3** | 0/-0.012 | 0.30 | 0/-0.010 | 6 | 4.5 | 10 | 2.80 | 55 | 2 | 10.71 | 11.04 | 11.38 | 11.72 | 12.40 | UH2110300310 | ● |
| **3** | 0/-0.012 | 0.30 | 0/-0.010 | 6 | 4.5 | 16 | 2.85 | 55 | 2 | 16.83 | 17.41 | 18.04 | 18.72 | 20.24 | UH2110300316 | ● |
| **3** | 0/-0.012 | 0.50 | 0/-0.010 | 6 | 4.5 | 10 | 2.85 | 55 | 2 | 10.63 | 11.00 | 11.39 | 11.82 | 12.78 | UH2110300510 | ● |
| **3** | 0/-0.012 | 0.50 | 0/-0.010 | 6 | 4.5 | 16 | 2.85 | 55 | 2 | 16.83 | 17.41 | 18.04 | 18.72 | 20.24 | UH2110300516 | ● |
| **4** | 0/-0.012 | 0.20 | 0/-0.010 | 6 | 6 | 20 | 3.85 | 60 | 2 | 20.96 | 21.69 | 22.48 | 23.32 | - | UH2110400220 | ● |
| **4** | 0/-0.012 | 0.30 | 0/-0.010 | 6 | 6 | 12 | 3.85 | 55 | 2 | 12.69 | 13.14 | 13.61 | 14.12 | 15.27 | UH2110400312 | ● |
| **4** | 0/-0.012 | 0.30 | 0/-0.010 | 6 | 6 | 20 | 3.85 | 60 | 2 | 20.96 | 21.69 | 22.48 | 23.32 | - | UH2110400320 | ● |
| **4** | 0/-0.012 | 0.50 | 0/-0.010 | 6 | 6 | 12 | 3.85 | 55 | 2 | 12.69 | 13.14 | 13.61 | 14.12 | 15.27 | UH2110400512 | ● |
| **4** | 0/-0.012 | 0.50 | 0/-0.010 | 6 | 6 | 20 | 3.85 | 60 | 2 | 20.96 | 21.69 | 22.48 | 23.32 | - | UH2110400520 | ● |
| **4** | 0/-0.012 | 1.00 | 0/-0.010 | 6 | 6 | 16 | 3.85 | 55 | 2 | 16.83 | 17.41 | 18.04 | 18.72 | - | UH2110401016 | ● |
| **6** | 0/-0.015 | 0.50 | 0/-0.010 | 6 | 9 | 15 | 5.85 | 60 | 2 | - | - | - | - | - | UH2110600520 | ● |
| **6** | 0/-0.015 | 1.00 | 0/-0.010 | 6 | 9 | 15 | 5.85 | 60 | 2 | - | - | - | - | - | UH2110601020 | ● |
| **6** | 0/-0.015 | 2.00 | 0/-0.010 | 6 | 9 | 15 | 5.85 | 60 | 2 | - | - | - | - | - | UH2110602020 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# UH211

SQUARE RIB

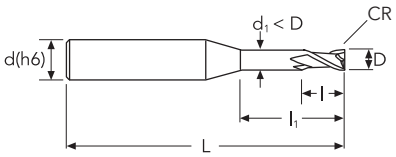
| Material Group ISO 513 | | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| ap x ae | | | **ap x D** | **ap x D** | **ap x D** | **ap x D** |
| Vc (m/min) | | | **80÷120** | **60÷100** | **50÷70** | **30÷50** |
| **D (mm)** | **l1 (mm)** | **ap (mm)** | **fz (mm/z)** | **fz (mm/z)** | **fz (mm/z)** | **fz (mm/z)** |
| **1** | ≤ 6D | 0.05 | 0.012 | 0.011 | 0.010 | 0.008 |
| | ≤ 8D | 0.04 | 0.010 | 0.009 | 0.008 | 0.007 |
| | ≤ 10D | 0.04 | 0.008 | 0.008 | 0.007 | 0.006 |
| | ≤ 12D | 0.03 | 0.007 | 0.006 | 0.005 | 0.005 |
| **1.5** | ≤ 6D | 0.08 | 0.025 | 0.023 | 0.020 | 0.018 |
| | ≤ 8D | 0.06 | 0.021 | 0.019 | 0.017 | 0.015 |
| | ≤ 10D | 0.05 | 0.018 | 0.016 | 0.014 | 0.012 |
| | ≤ 12D | 0.04 | 0.014 | 0.012 | 0.011 | 0.010 |
| | ≤ 15D | 0.03 | 0.011 | 0.010 | 0.009 | 0.008 |
| | > 15D | 0.02 | 0.008 | 0.007 | 0.006 | 0.005 |
| **2** | ≤ 6D | 0.10 | 0.030 | 0.027 | 0.024 | 0.021 |
| | ≤ 8D | 0.09 | 0.026 | 0.023 | 0.020 | 0.018 |
| | ≤ 10D | 0.07 | 0.021 | 0.019 | 0.017 | 0.015 |
| | ≤ 12D | 0.06 | 0.017 | 0.015 | 0.013 | 0.012 |
| | ≤ 15D | 0.05 | 0.014 | 0.012 | 0.011 | 0.009 |
| | > 15D | 0.03 | 0.009 | 0.008 | 0.007 | 0.006 |
| **2.5** | ≤ 6D | 0.13 | 0.035 | 0.032 | 0.028 | 0.025 |
| | ≤ 8D | 0.11 | 0.030 | 0.027 | 0.024 | 0.021 |
| | ≤ 10D | 0.09 | 0.025 | 0.022 | 0.020 | 0.017 |
| | ≤ 12D | 0.07 | 0.019 | 0.017 | 0.015 | 0.013 |
| | ≤ 15D | 0.06 | 0.016 | 0.014 | 0.013 | 0.011 |
| | > 15D | 0.04 | 0.011 | 0.009 | 0.008 | 0.007 |
| **3** | ≤ 6D | 0.15 | 0.040 | 0.036 | 0.032 | 0.028 |
| | ≤ 8D | 0.13 | 0.034 | 0.031 | 0.027 | 0.024 |
| | ≤ 10D | 0.11 | 0.028 | 0.025 | 0.022 | 0.020 |
| | ≤ 12D | 0.08 | 0.022 | 0.020 | 0.018 | 0.015 |
| | ≤ 15D | 0.07 | 0.018 | 0.016 | 0.014 | 0.013 |
| | > 15D | 0.05 | 0.012 | 0.011 | 0.010 | 0.008 |
| **4** | ≤ 6D | 0.20 | 0.050 | 0.045 | 0.040 | 0.035 |
| | ≤ 8D | 0.17 | 0.043 | 0.038 | 0.034 | 0.030 |
| | ≤ 10D | 0.14 | 0.035 | 0.032 | 0.028 | 0.025 |
| | ≤ 12D | 0.11 | 0.028 | 0.025 | 0.022 | 0.019 |
| | ≤ 15D | 0.09 | 0.023 | 0.020 | 0.018 | 0.016 |
| | > 15D | 0.06 | 0.015 | 0.014 | 0.012 | 0.011 |
| **6** | ≤ 6D | 0.30 | 0.070 | 0.063 | 0.056 | 0.049 |
| | ≤ 8D | 0.26 | 0.060 | 0.054 | 0.048 | 0.042 |
| | ≤ 10D | 0.21 | 0.049 | 0.044 | 0.039 | 0.034 |
| | ≤ 12D | 0.17 | 0.039 | 0.035 | 0.031 | 0.027 |
| | > 15D | 0.14 | 0.032 | 0.028 | 0.025 | 0.022 |

# UH212

cylindrical shank, 2F, extended and reduced neck, corner radius

OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | RADIUS | Z2

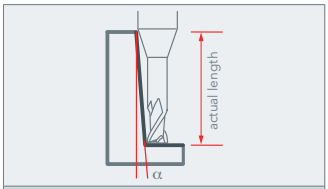



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.2** | 0/-0.010 | 0.02 | 0/-0.010 | 4 | 0.3 | 0.5 | 0.16 | 50 | 2 | 0.57 | 0.59 | 0.6 | 0.62 | 0.66 | UH21200202005 | ● |
| **0.2** | 0/-0.010 | 0.02 | 0/-0.010 | 4 | 0.3 | 1 | 0.16 | 50 | 2 | 1.09 | 1.12 | 1.16 | 1.19 | 1.26 | UH2120020201 | ● |
| **0.2** | 0/-0.010 | 0.02 | 0/-0.010 | 4 | 0.3 | 1.5 | 0.16 | 50 | 2 | 1.60 | 1.65 | 1.71 | 1.76 | 1.86 | UH21200202015 | ● |
| **0.3** | 0/-0.010 | 0.03 | 0/-0.010 | 4 | 0.4 | 1 | 0.26 | 50 | 2 | 1.09 | 1.12 | 1.15 | 1.19 | 1.26 | UH21200300301 | ● |
| **0.3** | 0/-0.010 | 0.03 | 0/-0.010 | 4 | 0.4 | 2 | 0.26 | 50 | 2 | 2.12 | 2.19 | 2.26 | 2.32 | 2.46 | UH21200300302 | ● |
| **0.3** | 0/-0.010 | 0.03 | 0/-0.010 | 4 | 0.4 | 3 | 0.26 | 50 | 2 | 3.15 | 3.25 | 3.36 | 3.46 | 3.66 | UH21200300303 | ● |
| **0.4** | 0/-0.010 | 0.03 | 0/-0.010 | 4 | 0.6 | 2 | 0.37 | 50 | 2 | 2.12 | 2.19 | 2.26 | 2.32 | 2.46 | UH21200400302 | ● |
| **0.4** | 0/-0.010 | 0.03 | 0/-0.010 | 4 | 0.6 | 3 | 0.37 | 50 | 2 | 3.15 | 3.25 | 3.36 | 3.46 | 3.66 | UH21200400303 | ● |
| **0.4** | 0/-0.010 | 0.03 | 0/-0.010 | 4 | 0.6 | 4 | 0.37 | 50 | 2 | 4.19 | 4.32 | 4.46 | 4.59 | 4.86 | UH21200400304 | ● |
| **0.4** | 0/-0.010 | 0.03 | 0/-0.010 | 4 | 0.6 | 5 | 0.37 | 50 | 2 | 5.22 | 5.39 | 5.56 | 5.73 | 6.07 | UH21200400305 | ● |
| **0.5** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.7 | 2 | 0.45 | 50 | 2 | 2.16 | 2.23 | 2.29 | 2.36 | 2.50 | UH21200500502 | ● |
| **0.5** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.7 | 4 | 0.45 | 50 | 2 | 4.22 | 4.36 | 4.50 | 4.63 | 4.90 | UH21200500504 | ● |
| **0.5** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.7 | 6 | 0.45 | 50 | 2 | 6.29 | 6.49 | 6.70 | 6.90 | 7.31 | UH21200500506 | ● |
| **0.5** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.7 | 8 | 0.45 | 50 | 2 | 8.36 | 8.63 | 8.90 | 9.17 | 9.71 | UH21200500508 | ● |
| **0.6** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.9 | 2 | 0.55 | 50 | 2 | 2.16 | 2.23 | 2.29 | 2.36 | 2.50 | UH21200600502 | ● |
| **0.6** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.9 | 4 | 0.55 | 50 | 2 | 4.22 | 4.36 | 4.50 | 4.63 | 4.90 | UH21200600504 | ● |
| **0.6** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.9 | 6 | 0.55 | 50 | 2 | 6.29 | 6.49 | 6.70 | 6.90 | 7.31 | UH21200600506 | ● |
| **0.6** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.9 | 8 | 0.55 | 50 | 2 | 8.36 | 8.63 | 8.90 | 9.17 | 9.71 | UH21200600508 | ● |
| **0.6** | 0/-0.010 | 0.05 | 0/-0.010 | 4 | 0.9 | 10 | 0.55 | 50 | 2 | 10.43 | 10.76 | 11.10 | 11.44 | 12.12 | UH21200600510 | ● |
| **0.7** | 0/-0.010 | 0.08 | 0/-0.010 | 4 | 1.0 | 2 | 0.65 | 50 | 2 | 2.16 | 2.22 | 2.29 | 2.36 | 2.49 | UH21200700802 | ● |
| **0.7** | 0/-0.010 | 0.08 | 0/-0.010 | 4 | 1.0 | 4 | 0.65 | 50 | 2 | 4.22 | 4.36 | 4.49 | 4.63 | 4.90 | UH21200700804 | ● |
| **0.7** | 0/-0.010 | 0.08 | 0/-0.010 | 4 | 1.0 | 6 | 0.65 | 50 | 2 | 6.29 | 6.49 | 6.69 | 6.90 | 7.30 | UH21200700806 | ● |
| **0.7** | 0/-0.010 | 0.08 | 0/-0.010 | 4 | 1.0 | 8 | 0.65 | 50 | 2 | 8.36 | 8.63 | 8.90 | 9.17 | 9.71 | UH21200700808 | ● |
| **0.7** | 0/-0.010 | 0.08 | 0/-0.010 | 4 | 1.0 | 10 | 0.65 | 50 | 2 | 10.42 | 10.76 | 11.10 | 11.44 | 12.11 | UH21200700810 | ● |
| **0.8** | 0/-0.010 | 0.08 | 0/-0.010 | 4 | 1.2 | 4 | 0.75 | 50 | 2 | 4.22 | 4.36 | 4.49 | 4.63 | 4.90 | UH21200800804 | ● |
| **0.8** | 0/-0.010 | 0.08 | 0/-0.010 | 4 | 1.2 | 6 | 0.75 | 50 | 2 | 6.29 | 6.49 | 6.69 | 6.90 | 7.30 | UH21200800806 | ● |
| **0.8** | 0/-0.010 | 0.08 | 0/-0.010 | 4 | 1.2 | 8 | 0.75 | 50 | 2 | 8.36 | 8.63 | 8.90 | 9.17 | 9.71 | UH21200800808 | ● |
| **0.8** | 0/-0.010 | 0.08 | 0/-0.010 | 4 | 1.2 | 10 | 0.75 | 50 | 2 | 10.42 | 10.76 | 11.10 | 11.44 | 12.11 | UH21200800810 | ● |
| **0.8** | 0/-0.010 | 0.08 | 0/-0.010 | 4 | 1.2 | 12 | 0.75 | 50 | 2 | 12.49 | 12.90 | 13.30 | 13.7 | 14.51 | UH21200800812 | ● |
| **0.9** | 0/-0.010 | 0.08 | 0/-0.010 | 4 | 1.4 | 6 | 0.85 | 50 | 2 | 6.29 | 6.49 | 6.69 | 6.90 | 7.30 | UH21200900806 | ● |
| **0.9** | 0/-0.010 | 0.08 | 0/-0.010 | 4 | 1.4 | 8 | 0.85 | 50 | 2 | 8.36 | 8.63 | 8.90 | 9.17 | 9.71 | UH21200900808 | ● |
| **0.9** | 0/-0.010 | 0.08 | 0/-0.010 | 4 | 1.4 | 10 | 0.85 | 50 | 2 | 10.42 | 10.76 | 11.10 | 11.44 | 12.11 | UH21200900810 | ● |
| **0.9** | 0/-0.010 | 0.08 | 0/-0.010 | 4 | 1.4 | 15 | 0.85 | 50 | 2 | 15.59 | 16.1 | 16.60 | 17.11 | 18.12 | UH21200900815 | ● |
| **1.0** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.5 | 6 | 0.95 | 50 | 2 | 6.39 | 6.59 | 6.80 | 7.00 | 7.41 | UH2120100106 | ● |
| **1.0** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.5 | 8 | 0.95 | 50 | 2 | 8.45 | 8.73 | 9.00 | 9.27 | 9.81 | UH2120100108 | ● |
| **1.0** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.5 | 10 | 0.95 | 50 | 2 | 10.52 | 10.86 | 11.20 | 11.54 | 12.22 | UH2120100110 | ● |
| **1.0** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.5 | 12 | 0.95 | 50 | 2 | 12.59 | 12.99 | 13.40 | 13.81 | 14.62 | UH2120100112 | ● |
| **1.0** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.5 | 14 | 0.95 | 50 | 2 | 14.66 | 15.13 | 15.60 | 16.08 | 17.03 | UH2120100114 | ● |
| **1.0** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.5 | 16 | 0.95 | 50 | 2 | 16.72 | 17.26 | 17.80 | 18.35 | 19.43 | UH2120100116 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
**UH/MH**

HSS END-MILLS

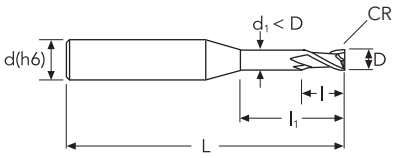
CARBIDE BURRS

# UH212

cylindrical shank, 2F, extended and reduced neck, corner radius

OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | RADIUS | Z2

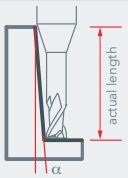



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.2** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.8 | 6 | 1.15 | 50 | 2 | 6.39 | 6.59 | 6.80 | 7.00 | 7.41 | UH2120120106 | ● |
| **1.2** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.8 | 8 | 1.15 | 50 | 2 | 8.45 | 8.73 | 9.00 | 9.27 | 9.81 | UH2120120108 | ● |
| **1.2** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.8 | 10 | 1.15 | 50 | 2 | 10.52 | 10.86 | 11.20 | 11.54 | 12.22 | UH2120120110 | ● |
| **1.2** | 0/-0.015 | 0.10 | 0/-0.010 | 4 | 1.8 | 12 | 1.15 | 50 | 2 | 12.59 | 12.99 | 13.40 | 13.81 | 14.62 | UH2120120112 | ● |
| **1.4** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.1 | 6 | 1.35 | 50 | 2 | 6.38 | 6.59 | 6.79 | 6.99 | 7.40 | UH21201401506 | ● |
| **1.4** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.1 | 8 | 1.35 | 50 | 2 | 8.45 | 8.72 | 8.99 | 9.26 | 9.80 | UH21201401508 | ● |
| **1.4** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.1 | 10 | 1.35 | 50 | 2 | 10.52 | 10.86 | 11.19 | 11.53 | 12.21 | UH21201401510 | ● |
| **1.4** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.1 | 12 | 1.35 | 50 | 2 | 12.59 | 12.99 | 13.40 | 13.80 | 14.61 | UH21201401512 | ● |
| **1.4** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.1 | 14 | 1.35 | 50 | 2 | 14.65 | 15.13 | 15.60 | 16.07 | 17.02 | UH21201401514 | ● |
| **1.4** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.1 | 16 | 1.35 | 50 | 2 | 16.72 | 17.26 | 17.80 | 18.34 | 19.42 | UH21201401516 | ● |
| **1.5** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.3 | 6 | 1.45 | 50 | 2 | 6.38 | 6.59 | 6.79 | 6.99 | 7.40 | UH21201501506 | ● |
| **1.5** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.3 | 8 | 1.45 | 50 | 2 | 8.45 | 8.72 | 8.99 | 9.26 | 9.80 | UH21201501508 | ● |
| **1.5** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.3 | 10 | 1.45 | 50 | 2 | 10.52 | 10.86 | 11.19 | 11.53 | 12.21 | UH21201501510 | ● |
| **1.5** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.3 | 12 | 1.45 | 50 | 2 | 12.59 | 12.99 | 13.40 | 13.80 | 14.61 | UH21201501512 | ● |
| **1.5** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.3 | 14 | 1.45 | 50 | 2 | 14.65 | 15.13 | 15.60 | 16.07 | 17.02 | UH21201501514 | ● |
| **1.5** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.3 | 16 | 1.45 | 50 | 2 | 16.72 | 17.26 | 17.80 | 18.34 | 19.42 | UH21201501516 | ● |
| **1.5** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.3 | 18 | 1.45 | 60 | 2 | 18.79 | 19.39 | 20.00 | 20.61 | 21.82 | UH21201501518 | ● |
| **1.5** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.3 | 20 | 1.45 | 60 | 2 | 20.86 | 21.53 | 22.20 | 22.88 | 24.23 | UH21201501520 | ● |
| **1.6** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.4 | 6 | 1.55 | 50 | 2 | 6.38 | 6.59 | 6.79 | 6.99 | 7.40 | UH21201601506 | ● |
| **1.6** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.4 | 8 | 1.55 | 50 | 2 | 8.45 | 8.72 | 8.99 | 9.26 | 9.80 | UH21201601508 | ● |
| **1.6** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.4 | 10 | 1.55 | 50 | 2 | 10.52 | 10.86 | 11.19 | 11.53 | 12.21 | UH21201601510 | ● |
| **1.6** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.4 | 12 | 1.55 | 50 | 2 | 12.59 | 12.99 | 13.40 | 13.80 | 14.61 | UH21201601512 | ● |
| **1.6** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.4 | 14 | 1.55 | 50 | 2 | 14.65 | 15.13 | 15.60 | 16.07 | 17.02 | UH21201601514 | ● |
| **1.6** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.4 | 16 | 1.55 | 50 | 2 | 16.72 | 17.26 | 17.80 | 18.34 | 19.42 | UH21201601516 | ● |
| **1.6** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.4 | 18 | 1.55 | 60 | 2 | 18.79 | 19.39 | 20.00 | 20.61 | 21.82 | UH21201601518 | ● |
| **1.6** | 0/-0.015 | 0.15 | 0/-0.010 | 4 | 2.4 | 20 | 1.55 | 60 | 2 | 20.86 | 21.53 | 22.20 | 22.88 | 24.23 | UH21201601520 | ● |
| **1.8** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.7 | 6 | 1.75 | 50 | 2 | 6.38 | 6.58 | 6.79 | 6.99 | 7.39 | UH2120180206 | ● |
| **1.8** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.7 | 8 | 1.75 | 50 | 2 | 8.45 | 8.72 | 8.99 | 9.26 | 9.79 | UH2120180208 | ● |
| **1.8** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.7 | 10 | 1.75 | 50 | 2 | 10.52 | 10.85 | 11.19 | 11.52 | 12.20 | UH2120180210 | ● |
| **1.8** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.7 | 12 | 1.75 | 50 | 2 | 12.58 | 12.99 | 13.39 | 13.79 | 14.60 | UH2120180212 | ● |
| **1.8** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.7 | 14 | 1.75 | 50 | 2 | 14.65 | 15.12 | 15.59 | 16.06 | 17.01 | UH2120180214 | ● |
| **1.8** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.7 | 16 | 1.75 | 50 | 2 | 16.72 | 17.26 | 17.79 | 18.33 | 19.41 | UH2120180216 | ● |
| **1.8** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.7 | 18 | 1.75 | 60 | 2 | 18.79 | 19.39 | 20.00 | 20.6 | 21.81 | UH2120180218 | ● |
| **1.8** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 2.7 | 20 | 1.75 | 60 | 2 | 20.85 | 21.53 | 22.20 | 22.87 | 24.22 | UH2120180220 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 6 | 1.95 | 50 | 2 | 6.38 | 6.58 | 6.79 | 6.99 | 7.39 | UH2120200206 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 8 | 1.95 | 50 | 2 | 8.45 | 8.72 | 8.99 | 9.26 | 9.79 | UH2120200208 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 10 | 1.95 | 50 | 2 | 10.52 | 10.85 | 11.19 | 11.52 | 12.20 | UH2120200210 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 12 | 1.95 | 50 | 2 | 12.58 | 12.99 | 13.39 | 13.79 | 14.60 | UH2120200212 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 14 | 1.95 | 50 | 2 | 14.65 | 15.12 | 15.59 | 16.06 | 17.01 | UH2120200214 | ● |

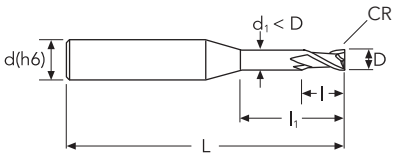
● stock standard ○ non-standard stock ▽ stock exhaustion

# UH212

cylindrical shank, 2F, extended and reduced neck, corner radius

OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | RADIUS | Z2

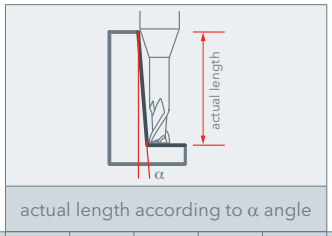



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 16 | 1.95 | 50 | 2 | 16.72 | 17.26 | 17.79 | 18.33 | 19.41 | UH2120200216 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 18 | 1.95 | 60 | 2 | 18.79 | 19.39 | 20.00 | 20.60 | 21.81 | UH2120200218 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 20 | 1.95 | 60 | 2 | 20.85 | 21.53 | 22.20 | 22.87 | - | UH2120200220 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 25 | 1.95 | 75 | 2 | 26.02 | 26.86 | 27.70 | 28.54 | - | UH2120200225 | ● |
| **2** | 0/-0.015 | 0.20 | 0/-0.010 | 4 | 3 | 30 | 1.95 | 75 | 2 | 31.19 | 32.20 | 33.21 | - | - | UH2120200230 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 8 | 2.40 | 50 | 2 | 8.45 | 8.71 | 8.98 | 9.24 | 9.77 | UH2120250308 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 10 | 2.40 | 50 | 2 | 10.51 | 10.85 | 11.18 | 11.51 | 12.18 | UH2120250310 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 12 | 2.40 | 50 | 2 | 12.58 | 12.98 | 13.38 | 13.78 | 14.58 | UH2120250312 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 14 | 2.40 | 50 | 2 | 14.65 | 15.12 | 15.58 | 16.05 | - | UH2120250314 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 16 | 2.40 | 50 | 2 | 16.72 | 17.25 | 17.78 | 18.32 | - | UH2120250316 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 18 | 2.40 | 60 | 2 | 18.78 | 19.38 | 19.99 | 20.59 | - | UH2120250318 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 20 | 2.40 | 60 | 2 | 20.85 | 21.52 | 22.19 | 22.86 | - | UH2120250320 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 25 | 2.40 | 60 | 2 | 26.02 | 26.86 | 27.69 | - | - | UH2120250325 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 4 | 3.7 | 30 | 2.40 | 75 | 2 | 31.19 | 32.19 | - | - | - | UH2120250330 | ● |
| **3** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 8 | 2.85 | 50 | 2 | 8.64 | 8.91 | 9.18 | 9.45 | 10.00 | UH2120300308 | ● |
| **3** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 10 | 2.85 | 50 | 2 | 10.71 | 11.04 | 11.38 | 11.72 | 12.40 | UH2120300310 | ● |
| **3** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 12 | 2.85 | 50 | 2 | 12.77 | 13.18 | 13.59 | 13.99 | 14.80 | UH2120300312 | ● |
| **3** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 14 | 2.85 | 50 | 2 | 14.84 | 15.31 | 15.79 | 16.26 | 17.21 | UH2120300314 | ● |
| **3** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 16 | 2.85 | 60 | 2 | 16.91 | 17.45 | 17.99 | 18.53 | 19.61 | UH2120300316 | ● |
| **3** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 18 | 2.85 | 60 | 2 | 18.98 | 19.58 | 20.19 | 20.80 | 22.02 | UH2120300318 | ● |
| **3** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 20 | 2.85 | 60 | 2 | 21.04 | 21.72 | 22.39 | 23.07 | 24.42 | UH2120300320 | ● |
| **3** | 0/-0.025 | 0.30 | 0/-0.015 | 6 | 4.5 | 25 | 2.85 | 75 | 2 | 26.21 | 27.05 | 27.90 | 28.74 | 30.43 | UH2120300325 | ● |
| **4** | 0/-0.025 | 0.40 | 0/-0.015 | 6 | 4.5 | 10 | 3.85 | 60 | 2 | 10.90 | 11.24 | 11.58 | 11.92 | 12.60 | UH2120400410 | ● |
| **4** | 0/-0.025 | 0.40 | 0/-0.015 | 6 | 4.5 | 15 | 3.85 | 60 | 2 | 16.06 | 16.57 | 17.08 | 17.59 | 18.61 | UH2120400415 | ● |
| **4** | 0/-0.025 | 0.40 | 0/-0.015 | 6 | 4.5 | 20 | 3.85 | 60 | 2 | 21.23 | 21.91 | 22.59 | 23.27 | - | UH2120400420 | ● |
| **4** | 0/-0.025 | 0.40 | 0/-0.015 | 6 | 4.5 | 25 | 3.85 | 75 | 2 | 26.40 | 27.25 | 28.09 | 28.94 | - | UH2120400425 | ● |
| **4** | 0/-0.025 | 0.40 | 0/-0.015 | 6 | 4.5 | 30 | 3.85 | 75 | 2 | 31.57 | 32.58 | 33.60 | - | - | UH2120400430 | ● |
| **4** | 0/-0.025 | 0.40 | 0/-0.015 | 6 | 4.5 | 40 | 3.85 | 75 | 2 | 41.90 | 43.25 | - | - | - | UH2120400440 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
**UH/MH**

HSS END-MILLS

CARBIDE BURRS

# UH212

SQUARE RIB

| Material Group ISO 513 | | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|
| Hardness/Rm | | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| ap x ae | | | **ap x D** | **ap x D** | **ap x D** | **ap x D** |
| Vc (m/min) | | | **80÷120** | **60÷100** | **50÷70** | **30÷50** |
| D (mm) | l1 (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **0.2** | ≤ 6D | 0.01 | 0.003 | 0.003 | 0.002 | 0.002 |
| | ≤ 8D | 0.01 | 0.003 | 0.002 | 0.002 | 0.002 |
| | ≤ 10D | 0.01 | 0.002 | 0.002 | 0.002 | 0.001 |
| | ≤ 12D | 0.01 | 0.002 | 0.001 | 0.001 | 0.001 |
| **0.3** | ≤ 6D | 0.02 | 0.004 | 0.004 | 0.003 | 0.003 |
| | ≤ 8D | 0.01 | 0.003 | 0.003 | 0.003 | 0.002 |
| | ≤ 10D | 0.01 | 0.003 | 0.003 | 0.002 | 0.002 |
| | ≤ 12D | 0.01 | 0.002 | 0.002 | 0.002 | 0.002 |
| **0.4** | ≤ 6D | 0.02 | 0.006 | 0.005 | 0.005 | 0.004 |
| | ≤ 8D | 0.02 | 0.005 | 0.005 | 0.004 | 0.004 |
| | ≤ 10D | 0.01 | 0.004 | 0.004 | 0.003 | 0.003 |
| | ≤ 12D | 0.01 | 0.003 | 0.003 | 0.003 | 0.002 |
| **0.5** | ≤ 6D | 0.03 | 0.007 | 0.006 | 0.006 | 0.005 |
| | ≤ 8D | 0.02 | 0.006 | 0.005 | 0.005 | 0.004 |
| | ≤ 10D | 0.02 | 0.005 | 0.004 | 0.004 | 0.003 |
| | ≤ 12D | 0.01 | 0.004 | 0.003 | 0.003 | 0.003 |
| **0.6** | ≤ 6D | 0.03 | 0.008 | 0.007 | 0.006 | 0.006 |
| | ≤ 8D | 0.03 | 0.007 | 0.006 | 0.005 | 0.005 |
| | ≤ 10D | 0.02 | 0.006 | 0.005 | 0.004 | 0.004 |
| | ≤ 12D | 0.02 | 0.004 | 0.004 | 0.004 | 0.003 |
| **0.8** | ≤ 6D | 0.04 | 0.010 | 0.009 | 0.008 | 0.007 |
| | ≤ 8D | 0.03 | 0.009 | 0.008 | 0.007 | 0.006 |
| | ≤ 10D | 0.03 | 0.007 | 0.006 | 0.006 | 0.005 |
| | ≤ 12D | 0.02 | 0.006 | 0.005 | 0.004 | 0.004 |
| **1** | ≤ 6D | 0.05 | 0.012 | 0.011 | 0.010 | 0.008 |
| | ≤ 8D | 0.04 | 0.010 | 0.009 | 0.008 | 0.007 |
| | ≤ 10D | 0.04 | 0.008 | 0.008 | 0.007 | 0.006 |
| | ≤ 12D | 0.03 | 0.007 | 0.006 | 0.005 | 0.005 |
| **1.2** | ≤ 6D | 0.06 | 0.022 | 0.020 | 0.018 | 0.015 |
| | ≤ 8D | 0.05 | 0.019 | 0.017 | 0.015 | 0.013 |
| | ≤ 10D | 0.04 | 0.015 | 0.014 | 0.012 | 0.011 |
| | ≤ 12D | 0.03 | 0.012 | 0.011 | 0.010 | 0.008 |
| **1.4** | ≤ 6D | 0.07 | 0.024 | 0.022 | 0.019 | 0.017 |
| | ≤ 8D | 0.06 | 0.020 | 0.018 | 0.016 | 0.014 |
| | ≤ 10D | 0.05 | 0.017 | 0.015 | 0.013 | 0.012 |
| | ≤ 12D | 0.04 | 0.013 | 0.012 | 0.011 | 0.009 |
| | ≤ 15D | 0.03 | 0.011 | 0.010 | 0.009 | 0.008 |
| | > 15D | 0.02 | 0.007 | 0.006 | 0.006 | 0.005 |
| **1.5** | ≤ 6D | 0.08 | 0.025 | 0.023 | 0.020 | 0.018 |
| | ≤ 8D | 0.06 | 0.021 | 0.019 | 0.017 | 0.015 |
| | ≤ 10D | 0.05 | 0.018 | 0.016 | 0.014 | 0.012 |
| | ≤ 12D | 0.04 | 0.014 | 0.012 | 0.011 | 0.010 |
| | ≤ 15D | 0.03 | 0.011 | 0.010 | 0.009 | 0.008 |
| | ≥ 15D | 0.02 | 0.008 | 0.007 | 0.006 | 0.005 |
| **1.6** | ≤ 6D | 0.08 | 0.026 | 0.023 | 0.021 | 0.018 |
| | ≤ 8D | 0.07 | 0.022 | 0.020 | 0.018 | 0.015 |
| | ≤ 10D | 0.06 | 0.018 | 0.016 | 0.015 | 0.013 |
| | ≤ 12D | 0.04 | 0.014 | 0.013 | 0.011 | 0.010 |
| | ≤ 15D | 0.04 | 0.012 | 0.011 | 0.009 | 0.008 |
| | > 15D | 0.02 | 0.008 | 0.007 | 0.006 | 0.005 |

# UH212

| | Material Group ISO 513 | | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | | **ap x D** | **ap x D** | **ap x D** | **ap x D** |
| | Vc (m/min) | | | **80÷120** | **60÷100** | **50÷70** | **30÷50** |
| | D (mm) | l1 (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| SQUARE RIB | 1.8 | ≤ 6D | 0.09 | 0.028 | 0.025 | 0.022 | 0.020 |
| | | ≤ 8D | 0.08 | 0.024 | 0.021 | 0.019 | 0.017 |
| | | ≤ 10D | 0.06 | 0.020 | 0.018 | 0.016 | 0.014 |
| | | ≤ 12D | 0.05 | 0.015 | 0.014 | 0.012 | 0.011 |
| | | ≤ 15D | 0.04 | 0.013 | 0.011 | 0.010 | 0.009 |
| | | > 15D | 0.03 | 0.008 | 0.008 | 0.007 | 0.006 |
| | 2 | ≤ 6D | 0.10 | 0.030 | 0.027 | 0.024 | 0.021 |
| | | ≤ 8D | 0.09 | 0.026 | 0.023 | 0.020 | 0.018 |
| | | ≤ 10D | 0.07 | 0.021 | 0.019 | 0.017 | 0.015 |
| | | ≤ 12D | 0.06 | 0.017 | 0.015 | 0.013 | 0.012 |
| | | ≤ 15D | 0.05 | 0.014 | 0.012 | 0.011 | 0.009 |
| | | > 15D | 0.03 | 0.009 | 0.008 | 0.007 | 0.006 |
| | 2.5 | ≤ 6D | 0.13 | 0.035 | 0.032 | 0.028 | 0.025 |
| | | ≤ 8D | 0.11 | 0.030 | 0.027 | 0.024 | 0.021 |
| | | ≤ 10D | 0.09 | 0.025 | 0.022 | 0.020 | 0.017 |
| | | ≤ 12D | 0.07 | 0.019 | 0.017 | 0.015 | 0.013 |
| | | ≤ 15D | 0.06 | 0.016 | 0.014 | 0.013 | 0.011 |
| | | > 15D | 0.04 | 0.011 | 0.009 | 0.008 | 0.007 |
| | 3 | ≤ 6D | 0.15 | 0.040 | 0.036 | 0.032 | 0.028 |
| | | ≤ 8D | 0.13 | 0.034 | 0.031 | 0.027 | 0.024 |
| | | ≤ 10D | 0.11 | 0.028 | 0.025 | 0.022 | 0.020 |
| | | ≤ 12D | 0.08 | 0.022 | 0.020 | 0.018 | 0.015 |
| | | ≤ 15D | 0.07 | 0.018 | 0.016 | 0.014 | 0.013 |
| | | > 15D | 0.05 | 0.012 | 0.011 | 0.010 | 0.008 |
| | 4 | ≤ 6D | 0.20 | 0.050 | 0.045 | 0.040 | 0.035 |
| | | ≤ 8D | 0.17 | 0.043 | 0.038 | 0.034 | 0.030 |
| | | ≤ 10D | 0.14 | 0.035 | 0.032 | 0.028 | 0.025 |
| | | ≤ 12D | 0.11 | 0.028 | 0.025 | 0.022 | 0.019 |
| | | ≤ 15D | 0.09 | 0.023 | 0.020 | 0.018 | 0.016 |
| | | > 15D | 0.06 | 0.015 | 0.014 | 0.012 | 0.011 |

# UHCS2

cylindrical shank, 2F, reduced neck, corner radius

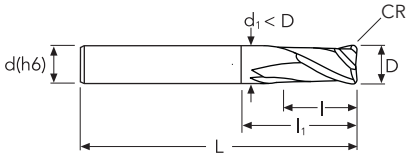
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | RADIUS | Z2




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SLOTTING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.012 | 0.10 | +/-0.010 | 4 | 2 | 3 | 0.95 | 50 | 2 | UHCS2010 | ● |
| **1.5** | 0/-0.012 | 0.10 | +/-0.010 | 4 | 2.5 | 4 | 1.45 | 50 | 2 | UHCS2015 | ● |
| **2** | 0/-0.012 | 0.10 | +/-0.010 | 4 | 3 | 6 | 1.95 | 50 | 2 | UHCS2020 | ● |
| **3** | 0/-0.012 | 0.10 | +/-0.010 | 6 | 4.5 | 8 | 2.85 | 55 | 2 | UHCS2030 | ● |
| **4** | 0/-0.012 | 0.10 | +/-0.010 | 6 | 6 | 10 | 3.85 | 55 | 2 | UHCS2040 | ● |
| **5** | 0/-0.012 | 0.20 | +/-0.010 | 6 | 6 | 11 | 4.85 | 50 | 2 | UHCS2050 | ● |
| **6** | 0/-0.015 | 0.20 | +/-0.010 | 6 | 9 | 15 | 5.85 | 60 | 2 | UHCS2060 | ● |
| **8** | 0/-0.015 | 0.20 | +/-0.015 | 8 | 12 | 20 | 7.70 | 70 | 2 | UHCS2080 | ● |
| **10** | 0/-0.015 | 0.20 | +/-0.015 | 10 | 15 | 25 | 9.70 | 70 | 2 | UHCS2100 | ● |
| **12** | 0/-0.015 | 0.30 | +/-0.015 | 12 | 18 | 30 | 11.70 | 80 | 2 | UHCS2120 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

## UHCS2

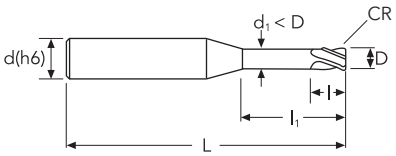
| | Material Group ISO 513 | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | **0.3D x D** | **0.2D x D** | **0.2D x D** | **0.1D x D** |
| | Vc (m/min) | **80÷120** | **60÷100** | **50÷70** | **30÷50** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.007 | 0.006 | 0.006 | 0.005 |
| | **2** | 0.012 | 0.011 | 0.010 | 0.008 |
| | **3** | 0.017 | 0.015 | 0.014 | 0.012 |
| | **4** | 0.023 | 0.021 | 0.018 | 0.016 |
| | **5** | 0.030 | 0.027 | 0.024 | 0.021 |
| | **6** | 0.038 | 0.034 | 0.030 | 0.027 |
| | **8** | 0.050 | 0.045 | 0.040 | 0.035 |
| | **10** | 0.065 | 0.059 | 0.052 | 0.046 |
| | **12** | 0.080 | 0.072 | 0.064 | 0.056 |

# UHF4LN

cylindrical shank, 4F Unequal Pitch,
extended and reduced neck, corner radius

OSAWA NORM | UH | NMG / UH RED | <70 HRC | 25° | RADIUS | Z4 UP

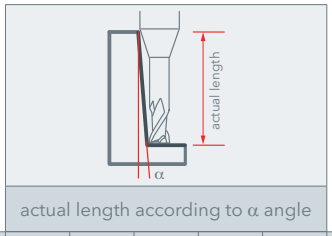



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.010 | 0.10 | +/-0.005 | 4 | 1 | 4 | 0.90 | 50 | 4 | 4.32 | 4.46 | 4.62 | 4.78 | 5.13 | UHF4LN0100104 | ● |
| **1** | 0/-0.010 | 0.10 | +/-0.005 | 4 | 1 | 6 | 0.90 | 50 | 4 | 6.39 | 6.60 | 6.83 | 7.08 | 7.60 | UHF4LN0100106 | ● |
| **1** | 0/-0.010 | 0.10 | +/-0.005 | 4 | 1 | 8 | 0.90 | 50 | 4 | 8.45 | 8.74 | 9.05 | 9.37 | 10.07 | UHF4LN0100108 | ● |
| **1** | 0/-0.010 | 0.10 | +/-0.005 | 4 | 1 | 10 | 0.90 | 50 | 4 | 10.52 | 10.88 | 11.26 | 11.66 | 12.53 | UHF4LN0100110 | ● |
| **1** | 0/-0.010 | 0.10 | +/-0.005 | 4 | 1 | 12 | 0.90 | 50 | 4 | 12.59 | 13.02 | 13.48 | 13.96 | 15.00 | UHF4LN0100112 | ● |
| **1** | 0/-0.010 | 0.10 | +/-0.005 | 4 | 1 | 14 | 0.90 | 50 | 4 | 14.66 | 15.16 | 15.69 | 16.25 | 17.47 | UHF4LN0100114 | ● |
| **1** | 0/-0.010 | 0.10 | +/-0.005 | 4 | 1 | 16 | 0.90 | 50 | 4 | 16.72 | 17.30 | 17.91 | 18.55 | 19.94 | UHF4LN0100116 | ● |
| **1** | 0/-0.010 | 0.10 | +/-0.005 | 4 | 1 | 20 | 0.90 | 75 | 4 | 20.86 | 21.57 | 22.33 | 23.14 | 24.87 | UHF4LN0100120 | ● |
| **1** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1 | 4 | 0.90 | 50 | 4 | 4.32 | 4.46 | 4.61 | 4.77 | 5.11 | UHF4LN0100204 | ● |
| **1** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1 | 6 | 0.90 | 50 | 4 | 6.38 | 6.60 | 6.82 | 7.06 | 7.57 | UHF4LN0100206 | ● |
| **1** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1 | 8 | 0.90 | 50 | 4 | 8.45 | 8.73 | 9.04 | 9.35 | 10.04 | UHF4LN0100208 | ● |
| **1** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1 | 10 | 0.90 | 50 | 4 | 10.52 | 10.87 | 11.25 | 11.65 | 12.51 | UHF4LN0100210 | ● |
| **1** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1 | 12 | 0.90 | 50 | 4 | 12.58 | 13.01 | 13.47 | 13.94 | 14.98 | UHF4LN0100212 | ● |
| **1** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1 | 14 | 0.90 | 50 | 4 | 14.65 | 15.15 | 15.68 | 16.24 | 17.45 | UHF4LN0100214 | ● |
| **1** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1 | 16 | 0.90 | 50 | 4 | 16.72 | 17.29 | 17.89 | 18.53 | 19.91 | UHF4LN0100216 | ● |
| **1** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1 | 20 | 0.90 | 60 | 4 | 20.85 | 21.57 | 22.32 | 23.12 | 24.85 | UHF4LN0100220 | ● |
| **1** | 0/-0.010 | 0.30 | +/-0.005 | 4 | 1 | 6 | 0.90 | 50 | 4 | 6.38 | 6.59 | 6.81 | 7.05 | 7.55 | UHF4LN0100306 | ● |
| **1** | 0/-0.010 | 0.30 | +/-0.005 | 4 | 1 | 10 | 0.90 | 50 | 4 | 10.51 | 10.87 | 11.24 | 11.63 | 12.49 | UHF4LN0100310 | ● |
| **1** | 0/-0.010 | 0.30 | +/-0.005 | 4 | 1 | 16 | 0.90 | 50 | 4 | 16.72 | 17.28 | 17.88 | 18.52 | 19.89 | UHF4LN0100316 | ● |
| **1** | 0/-0.010 | 0.30 | +/-0.005 | 4 | 1 | 20 | 0.90 | 60 | 4 | 20.85 | 21.56 | 22.31 | 23.11 | 24.82 | UHF4LN0100320 | ● |
| **1.5** | 0/-0.010 | 0.10 | +/-0.005 | 4 | 1.5 | 6 | 1.40 | 50 | 4 | 6.39 | 6.60 | 6.83 | 7.08 | 7.60 | UHF4LN0150106 | ● |
| **1.5** | 0/-0.010 | 0.10 | +/-0.005 | 4 | 1.5 | 8 | 1.40 | 50 | 4 | 8.45 | 8.74 | 9.05 | 9.37 | 10.07 | UHF4LN0150108 | ● |
| **1.5** | 0/-0.010 | 0.10 | +/-0.005 | 4 | 1.5 | 12 | 1.40 | 50 | 4 | 12.59 | 13.02 | 13.48 | 13.96 | 15.00 | UHF4LN0150112 | ● |
| **1.5** | 0/-0.010 | 0.10 | +/-0.005 | 4 | 1.5 | 16 | 1.40 | 50 | 4 | 16.72 | 17.3 | 17.91 | 18.55 | 19.94 | UHF4LN0150116 | ● |
| **1.5** | 0/-0.010 | 0.10 | +/-0.005 | 4 | 1.5 | 20 | 1.40 | 60 | 4 | 20.86 | 21.57 | 22.33 | 23.14 | - | UHF4LN0150120 | ● |
| **1.5** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1.5 | 6 | 1.40 | 50 | 4 | 6.38 | 6.60 | 6.82 | 7.06 | 7.57 | UHF4LN0150206 | ● |
| **1.5** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1.5 | 8 | 1.40 | 50 | 4 | 8.45 | 8.73 | 9.04 | 9.35 | 10.04 | UHF4LN0150208 | ● |
| **1.5** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1.5 | 10 | 1.40 | 50 | 4 | 10.52 | 10.87 | 11.25 | 11.65 | 12.51 | UHF4LN0150210 | ● |
| **1.5** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1.5 | 12 | 1.40 | 50 | 4 | 12.58 | 13.01 | 13.47 | 13.94 | 14.98 | UHF4LN0150212 | ● |
| **1.5** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1.5 | 14 | 1.40 | 50 | 4 | 14.65 | 15.15 | 15.68 | 16.24 | 17.45 | UHF4LN0150214 | ● |
| **1.5** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1.5 | 16 | 1.40 | 50 | 4 | 16.72 | 17.29 | 17.89 | 18.53 | 19.91 | UHF4LN0150216 | ● |
| **1.5** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1.5 | 18 | 1.40 | 60 | 4 | 18.79 | 19.43 | 20.11 | 20.83 | 22.38 | UHF4LN0150218 | ● |
| **1.5** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 1.5 | 20 | 1.40 | 60 | 4 | 20.85 | 21.57 | 22.32 | 23.12 | - | UHF4LN0150220 | ● |
| **1.5** | 0/-0.010 | 0.30 | +/-0.005 | 4 | 1.5 | 8 | 1.40 | 50 | 4 | 8.45 | 8.73 | 9.03 | 9.34 | 10.02 | UHF4LN0150308 | ● |
| **1.5** | 0/-0.010 | 0.30 | +/-0.005 | 4 | 1.5 | 16 | 1.40 | 50 | 4 | 16.72 | 17.28 | 17.88 | 18.52 | 19.89 | UHF4LN0150316 | ● |
| **1.5** | 0/-0.010 | 0.30 | +/-0.005 | 4 | 1.5 | 20 | 1.40 | 60 | 4 | 20.85 | 21.56 | 22.31 | 23.11 | - | UHF4LN0150320 | ● |
| **2** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 2 | 6 | 1.90 | 50 | 4 | 6.38 | 6.60 | 6.82 | 7.06 | 7.57 | UHF4LN0200206 | ● |
| **2** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 2 | 8 | 1.90 | 50 | 4 | 8.45 | 8.73 | 9.04 | 9.35 | 10.04 | UHF4LN0200208 | ● |
| **2** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 2 | 10 | 1.90 | 50 | 4 | 10.52 | 10.87 | 11.25 | 11.65 | 12.51 | UHF4LN0200210 | ● |

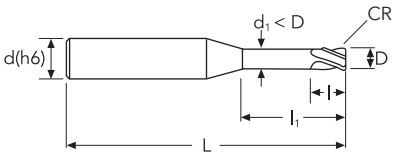
● stock standard ○ non-standard stock ▽ stock exhaustion

# UHF4LN

cylindrical shank, 4F Unequal Pitch,
extended and reduced neck, corner radius

OSAWA NORM | UH | NMG / UH RED | <70 HRC | 25° | RADIUS | Z4 UP

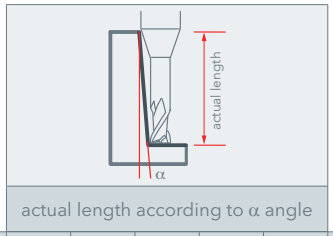



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 2 | 12 | 1.90 | 50 | 4 | 12.58 | 13.01 | 13.47 | 13.94 | 14.98 | UHF4LN0200212 | ● |
| **2** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 2 | 14 | 1.90 | 50 | 4 | 14.65 | 15.15 | 15.68 | 16.24 | 17.45 | UHF4LN0200214 | ● |
| **2** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 2 | 16 | 1.90 | 50 | 4 | 16.72 | 17.29 | 17.89 | 18.53 | - | UHF4LN0200216 | ● |
| **2** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 2 | 18 | 1.90 | 60 | 4 | 18.79 | 19.43 | 20.11 | 20.83 | - | UHF4LN0200218 | ● |
| **2** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 2 | 20 | 1.90 | 60 | 4 | 20.85 | 21.57 | 22.32 | 23.12 | - | UHF4LN0200220 | ● |
| **2** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 2 | 25 | 1.90 | 75 | 4 | 26.02 | 26.91 | 27.86 | - | - | UHF4LN0200225 | ● |
| **2** | 0/-0.010 | 0.20 | +/-0.005 | 4 | 2 | 30 | 1.90 | 75 | 4 | 31.19 | 32.26 | 33.40 | - | - | UHF4LN0200230 | ● |
| **2** | 0/-0.010 | 0.30 | +/-0.005 | 4 | 2 | 8 | 1.90 | 50 | 4 | 8.45 | 8.73 | 9.03 | 9.34 | 10.02 | UHF4LN0200308 | ● |
| **2** | 0/-0.010 | 0.30 | +/-0.005 | 4 | 2 | 16 | 1.90 | 50 | 4 | 16.72 | 17.28 | 17.88 | 18.52 | - | UHF4LN0200316 | ● |
| **2** | 0/-0.010 | 0.30 | +/-0.005 | 4 | 2 | 20 | 1.90 | 60 | 4 | 20.85 | 21.56 | 22.31 | 23.11 | - | UHF4LN0200320 | ● |
| **2** | 0/-0.010 | 0.50 | +/-0.005 | 4 | 2 | 6 | 1.90 | 50 | 4 | 6.37 | 6.58 | 6.79 | 7.02 | 7.50 | UHF4LN0200506 | ● |
| **2** | 0/-0.010 | 0.50 | +/-0.005 | 4 | 2 | 8 | 1.90 | 50 | 4 | 8.44 | 8.71 | 9.00 | 9.31 | 9.97 | UHF4LN0200508 | ● |
| **2** | 0/-0.010 | 0.50 | +/-0.005 | 4 | 2 | 12 | 1.90 | 50 | 4 | 12.57 | 12.99 | 13.43 | 13.9 | 14.91 | UHF4LN0200512 | ● |
| **2** | 0/-0.010 | 0.50 | +/-0.005 | 4 | 2 | 16 | 1.90 | 50 | 4 | 16.71 | 17.27 | 17.86 | 18.49 | - | UHF4LN0200516 | ● |
| **2** | 0/-0.010 | 0.50 | +/-0.005 | 4 | 2 | 20 | 1.90 | 60 | 4 | 20.84 | 21.55 | 22.29 | 23.08 | - | UHF4LN0200520 | ● |
| **2** | 0/-0.010 | 0.50 | +/-0.005 | 4 | 2 | 25 | 1.90 | 75 | 4 | 26.01 | 26.89 | 27.83 | 28.82 | - | UHF4LN0200525 | ● |
| **2** | 0/-0.010 | 0.50 | +/-0.005 | 4 | 2 | 30 | 1.90 | 75 | 4 | 31.18 | 32.24 | 33.36 | - | - | UHF4LN0200530 | ● |
| **2.5** | 0/-0.015 | 0.30 | +/-0.005 | 4 | 2.5 | 8 | 2.40 | 50 | 4 | 8.45 | 8.73 | 9.03 | 9.34 | 10.02 | UHF4LN0250308 | ● |
| **2.5** | 0/-0.015 | 0.30 | +/-0.005 | 4 | 2.5 | 10 | 2.40 | 50 | 4 | 10.51 | 10.87 | 11.24 | 11.63 | 12.49 | UHF4LN0250310 | ● |
| **2.5** | 0/-0.015 | 0.30 | +/-0.005 | 4 | 2.5 | 12 | 2.40 | 50 | 4 | 12.58 | 13.01 | 13.45 | 13.93 | - | UHF4LN0250312 | ● |
| **2.5** | 0/-0.015 | 0.30 | +/-0.005 | 4 | 2.5 | 14 | 2.40 | 50 | 4 | 14.65 | 15.14 | 15.67 | 16.22 | - | UHF4LN0250314 | ● |
| **2.5** | 0/-0.015 | 0.30 | +/-0.005 | 4 | 2.5 | 16 | 2.40 | 50 | 4 | 16.72 | 17.28 | 17.88 | 18.52 | - | UHF4LN0250316 | ● |
| **2.5** | 0/-0.015 | 0.30 | +/-0.005 | 4 | 2.5 | 18 | 2.40 | 60 | 4 | 18.78 | 19.42 | 20.10 | 20.81 | - | UHF4LN0250318 | ● |
| **2.5** | 0/-0.015 | 0.30 | +/-0.005 | 4 | 2.5 | 20 | 2.40 | 60 | 4 | 20.85 | 21.56 | 22.31 | - | - | UHF4LN0250320 | ● |
| **2.5** | 0/-0.015 | 0.30 | +/-0.005 | 4 | 2.5 | 25 | 2.40 | 60 | 4 | 26.02 | 26.91 | 27.85 | - | - | UHF4LN0250325 | ● |
| **2.5** | 0/-0.015 | 0.30 | +/-0.005 | 4 | 2.5 | 30 | 2.40 | 75 | 4 | 31.19 | 32.25 | - | - | - | UHF4LN0250330 | ● |
| **2.5** | 0/-0.015 | 0.50 | +/-0.005 | 4 | 2.5 | 8 | 2.40 | 50 | 4 | 8.44 | 8.71 | 9.00 | 9.31 | 9.97 | UHF4LN0250508 | ● |
| **2.5** | 0/-0.015 | 0.50 | +/-0.005 | 4 | 2.5 | 12 | 2.40 | 50 | 4 | 12.57 | 12.99 | 13.43 | 13.90 | - | UHF4LN0250512 | ● |
| **2.5** | 0/-0.015 | 0.50 | +/-0.005 | 4 | 2.5 | 16 | 2.40 | 50 | 4 | 16.71 | 17.27 | 17.86 | 18.49 | - | UHF4LN0250516 | ● |
| **2.5** | 0/-0.015 | 0.50 | +/-0.005 | 4 | 2.5 | 20 | 2.40 | 60 | 4 | 20.84 | 21.55 | 22.29 | - | - | UHF4LN0250520 | ● |
| **2.5** | 0/-0.015 | 0.50 | +/-0.005 | 4 | 2.5 | 25 | 2.40 | 60 | 4 | 26.01 | 26.89 | 27.83 | - | - | UHF4LN0250525 | ● |
| **2.5** | 0/-0.015 | 0.50 | +/-0.005 | 4 | 2.5 | 30 | 2.40 | 75 | 4 | 31.18 | 32.24 | - | - | - | UHF4LN0250530 | ● |
| **3** | 0/-0.015 | 0.20 | +/-0.010 | 6 | 3 | 8 | 2.80 | 50 | 4 | 8.64 | 8.93 | 9.24 | 9.57 | 10.27 | UHF4LN0300208 | ● |
| **3** | 0/-0.015 | 0.20 | +/-0.010 | 6 | 3 | 10 | 2.80 | 50 | 4 | 10.71 | 11.07 | 11.46 | 11.86 | 12.73 | UHF4LN0300210 | ● |
| **3** | 0/-0.015 | 0.20 | +/-0.010 | 6 | 3 | 12 | 2.80 | 50 | 4 | 12.78 | 13.21 | 13.67 | 14.16 | 15.20 | UHF4LN0300212 | ● |
| **3** | 0/-0.015 | 0.20 | +/-0.010 | 6 | 3 | 14 | 2.80 | 50 | 4 | 14.84 | 15.35 | 15.89 | 16.45 | 17.67 | UHF4LN0300214 | ● |
| **3** | 0/-0.015 | 0.20 | +/-0.010 | 6 | 3 | 16 | 2.80 | 60 | 4 | 16.91 | 17.49 | 18.10 | 18.74 | 20.14 | UHF4LN0300216 | ● |
| **3** | 0/-0.015 | 0.20 | +/-0.010 | 6 | 3 | 18 | 2.80 | 60 | 4 | 18.98 | 19.63 | 20.31 | 21.04 | 22.60 | UHF4LN0300218 | ● |
| **3** | 0/-0.015 | 0.20 | +/-0.010 | 6 | 3 | 20 | 2.80 | 60 | 4 | 21.05 | 21.77 | 22.53 | 23.33 | 25.07 | UHF4LN0300220 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
**UH/MH**

HSS END-MILLS

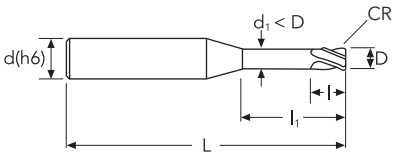
CARBIDE BURRS

# UHF4LN

cylindrical shank, 4F Unequal Pitch,
extended and reduced neck, corner radius

OSAWA NORM | UH | NMG / UH RED | <70 HRC | 25° | RADIUS | Z4 UP

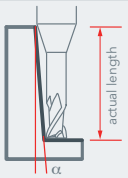



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SQUARE RIB




actual length according to α angle

| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 0/-0.015 | 0.20 | +/-0.010 | 6 | 3 | 25 | 2.80 | 75 | 4 | 26.21 | 27.11 | 28.07 | 29.07 | - | UHF4LN0300225 | ● |
| 3 | 0/-0.015 | 0.30 | +/-0.010 | 6 | 3 | 8 | 2.80 | 50 | 4 | 8.64 | 8.93 | 9.23 | 9.55 | 10.24 | UHF4LN0300308 | ● |
| 3 | 0/-0.015 | 0.30 | +/-0.010 | 6 | 3 | 10 | 2.80 | 50 | 4 | 10.71 | 11.07 | 11.45 | 11.85 | 12.71 | UHF4LN0300310 | ● |
| 3 | 0/-0.015 | 0.30 | +/-0.010 | 6 | 3 | 12 | 2.80 | 50 | 4 | 12.77 | 13.20 | 13.66 | 14.14 | 15.18 | UHF4LN0300312 | ● |
| 3 | 0/-0.015 | 0.30 | +/-0.010 | 6 | 3 | 14 | 2.80 | 50 | 4 | 14.84 | 15.34 | 15.87 | 16.44 | 17.64 | UHF4LN0300314 | ● |
| 3 | 0/-0.015 | 0.30 | +/-0.010 | 6 | 3 | 16 | 2.80 | 60 | 4 | 16.91 | 17.48 | 18.09 | 18.73 | 20.11 | UHF4LN0300316 | ● |
| 3 | 0/-0.015 | 0.30 | +/-0.010 | 6 | 3 | 18 | 2.80 | 60 | 4 | 18.98 | 19.62 | 20.30 | 21.02 | 22.58 | UHF4LN0300318 | ● |
| 3 | 0/-0.015 | 0.30 | +/-0.010 | 6 | 3 | 20 | 2.80 | 60 | 4 | 21.04 | 21.76 | 22.52 | 23.32 | 25.05 | UHF4LN0300320 | ● |
| 3 | 0/-0.015 | 0.30 | +/-0.010 | 6 | 3 | 30 | 2.80 | 75 | 4 | 31.38 | 32.45 | 33.59 | 34.79 | - | UHF4LN0300330 | ● |
| 3 | 0/-0.015 | 0.50 | +/-0.010 | 6 | 3 | 8 | 2.80 | 50 | 4 | 8.63 | 8.91 | 9.21 | 9.52 | 10.20 | UHF4LN0300508 | ● |
| 3 | 0/-0.015 | 0.50 | +/-0.010 | 6 | 3 | 10 | 2.80 | 50 | 4 | 10.7 | 11.05 | 11.42 | 11.82 | 12.66 | UHF4LN0300510 | ● |
| 3 | 0/-0.015 | 0.50 | +/-0.010 | 6 | 3 | 12 | 2.80 | 50 | 4 | 12.77 | 13.19 | 13.64 | 14.11 | 15.13 | UHF4LN0300512 | ● |
| 3 | 0/-0.015 | 0.50 | +/-0.010 | 6 | 3 | 14 | 2.80 | 50 | 4 | 14.83 | 15.33 | 15.85 | 16.41 | 17.60 | UHF4LN0300514 | ● |
| 3 | 0/-0.015 | 0.50 | +/-0.010 | 6 | 3 | 16 | 2.80 | 60 | 4 | 16.9 | 17.47 | 18.07 | 18.70 | 20.07 | UHF4LN0300516 | ● |
| 3 | 0/-0.015 | 0.50 | +/-0.010 | 6 | 3 | 18 | 2.80 | 60 | 4 | 18.97 | 19.61 | 20.28 | 20.99 | 22.53 | UHF4LN0300518 | ● |
| 3 | 0/-0.015 | 0.50 | +/-0.010 | 6 | 3 | 20 | 2.80 | 60 | 4 | 21.04 | 21.75 | 22.50 | 23.29 | 25.00 | UHF4LN0300520 | ● |
| 3 | 0/-0.015 | 0.50 | +/-0.010 | 6 | 3 | 30 | 2.80 | 75 | 4 | 31.37 | 32.44 | 33.57 | 34.76 | - | UHF4LN0300530 | ● |
| 4 | 0/-0.015 | 0.30 | +/-0.010 | 6 | 4 | 10 | 3.70 | 60 | 4 | 10.90 | 11.26 | 11.65 | 12.06 | 12.93 | UHF4LN0400310 | ● |
| 4 | 0/-0.015 | 0.30 | +/-0.010 | 6 | 4 | 15 | 3.70 | 60 | 4 | 16.07 | 16.61 | 17.19 | 17.79 | 19.10 | UHF4LN0400315 | ● |
| 4 | 0/-0.015 | 0.30 | +/-0.010 | 6 | 4 | 20 | 3.70 | 60 | 4 | 21.24 | 21.96 | 22.72 | 23.53 | - | UHF4LN0400320 | ● |
| 4 | 0/-0.015 | 0.30 | +/-0.010 | 6 | 4 | 25 | 3.70 | 75 | 4 | 26.4 | 27.31 | 28.26 | - | - | UHF4LN0400325 | ● |
| 4 | 0/-0.015 | 0.30 | +/-0.010 | 6 | 4 | 32 | 3.70 | 75 | 4 | 33.64 | 34.79 | 36.01 | - | - | UHF4LN0400332 | ● |
| 4 | 0/-0.015 | 0.30 | +/-0.010 | 6 | 4 | 40 | 3.70 | 75 | 4 | 41.91 | 43.35 | - | - | - | UHF4LN0400340 | ● |
| 4 | 0/-0.015 | 0.50 | +/-0.010 | 6 | 4 | 10 | 3.70 | 60 | 4 | 10.89 | 11.25 | 11.63 | 12.03 | 12.89 | UHF4LN0400510 | ● |
| 4 | 0/-0.015 | 0.50 | +/-0.010 | 6 | 4 | 15 | 3.70 | 60 | 4 | 16.06 | 16.60 | 17.17 | 17.76 | 19.06 | UHF4LN0400515 | ● |
| 4 | 0/-0.015 | 0.50 | +/-0.010 | 6 | 4 | 20 | 3.70 | 60 | 4 | 21.23 | 21.94 | 22.7 | 23.50 | - | UHF4LN0400520 | ● |
| 4 | 0/-0.015 | 0.50 | +/-0.010 | 6 | 4 | 25 | 3.70 | 75 | 4 | 26.4 | 27.29 | 28.24 | - | - | UHF4LN0400525 | ● |
| 4 | 0/-0.015 | 0.50 | +/-0.010 | 6 | 4 | 32 | 3.70 | 75 | 4 | 33.63 | 34.78 | 35.99 | - | - | UHF4LN0400532 | ● |
| 4 | 0/-0.015 | 0.50 | +/-0.010 | 6 | 4 | 40 | 3.70 | 75 | 4 | 41.9 | 43.33 | - | - | - | UHF4LN0400540 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

# UHF4LN

| | Material Group ISO 513 | | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | | **ap x D** | **ap x D** | **ap x D** | **ap x D** |
| | Vc (m/min) | | | **80÷120** | **60÷100** | **50÷70** | **30÷50** |
| | D (mm) | l1 (mm) | ap (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| SQUARE RIB | 1 | ≤ 6D | 0.05 | 0.010 | 0.009 | 0.008 | 0.007 |
| | | ≤ 8D | 0.04 | 0.009 | 0.008 | 0.007 | 0.006 |
| | | ≤ 10D | 0.04 | 0.007 | 0.006 | 0.006 | 0.005 |
| | | ≤ 12D | 0.03 | 0.006 | 0.005 | 0.004 | 0.004 |
| | 1.5 | ≤ 6D | 0.08 | 0.021 | 0.019 | 0.017 | 0.015 |
| | | ≤ 8D | 0.06 | 0.018 | 0.016 | 0.014 | 0.013 |
| | | ≤ 10D | 0.05 | 0.015 | 0.013 | 0.012 | 0.010 |
| | | ≤ 12D | 0.04 | 0.012 | 0.011 | 0.009 | 0.008 |
| | | ≤ 15D | 0.03 | 0.010 | 0.009 | 0.008 | 0.007 |
| | | > 15D | 0.02 | 0.006 | 0.006 | 0.005 | 0.004 |
| | 2 | ≤ 6D | 0.10 | 0.026 | 0.023 | 0.020 | 0.018 |
| | | ≤ 8D | 0.09 | 0.022 | 0.020 | 0.017 | 0.015 |
| | | ≤ 10D | 0.07 | 0.018 | 0.016 | 0.014 | 0.012 |
| | | ≤ 12D | 0.06 | 0.014 | 0.013 | 0.011 | 0.010 |
| | | ≤ 15D | 0.05 | 0.011 | 0.010 | 0.009 | 0.008 |
| | | > 15D | 0.03 | 0.008 | 0.007 | 0.006 | 0.005 |
| | 2.5 | ≤ 6D | 0.13 | 0.030 | 0.027 | 0.024 | 0.021 |
| | | ≤ 8D | 0.11 | 0.025 | 0.023 | 0.020 | 0.018 |
| | | ≤ 10D | 0.09 | 0.021 | 0.019 | 0.017 | 0.015 |
| | | ≤ 12D | 0.07 | 0.016 | 0.015 | 0.013 | 0.011 |
| | | ≤ 15D | 0.06 | 0.013 | 0.012 | 0.011 | 0.009 |
| | | > 15D | 0.04 | 0.009 | 0.008 | 0.007 | 0.006 |
| | 3 | ≤ 6D | 0.15 | 0.034 | 0.031 | 0.027 | 0.024 |
| | | ≤ 8D | 0.13 | 0.029 | 0.026 | 0.023 | 0.020 |
| | | ≤ 10D | 0.11 | 0.024 | 0.021 | 0.019 | 0.017 |
| | | ≤ 12D | 0.08 | 0.019 | 0.017 | 0.015 | 0.013 |
| | | ≤ 15D | 0.07 | 0.015 | 0.014 | 0.012 | 0.011 |
| | | > 15D | 0.05 | 0.010 | 0.009 | 0.008 | 0.007 |
| | 4 | ≤ 6D | 0.20 | 0.043 | 0.038 | 0.034 | 0.030 |
| | | ≤ 8D | 0.17 | 0.036 | 0.033 | 0.029 | 0.025 |
| | | ≤ 10D | 0.14 | 0.030 | 0.027 | 0.024 | 0.021 |
| | | ≤ 12D | 0.11 | 0.023 | 0.021 | 0.019 | 0.016 |
| | | ≤ 15D | 0.09 | 0.019 | 0.017 | 0.015 | 0.013 |
| | | > 15D | 0.06 | 0.013 | 0.011 | 0.010 | 0.009 |

# UHF-RT

cylindrical shank, multiflutes radius type
for high feed machining

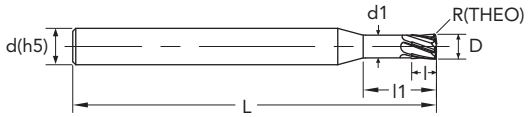
OSAWA NORM | UH | NMG UH RED | <70 HRC | 20° | HIGH FEED | Z4 | Z6



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | | | | ★ |

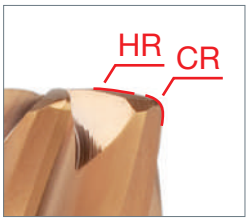
★ 1st choice ☆ suitable

3D MACHINING




| D | D Tol. | R(Theo) | d(h5) | l | l1 | d1 | L | Z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **2** | -0.014/-0.038 | 0.13 | 6 | 2 | 6 | 1.9 | 50 | 4 | UHF470RT020 | ● |
| **3** | -0.014/-0.038 | 0.19 | 6 | 3 | 9 | 2.9 | 60 | 4 | UHF470RT030 | ● |
| **4** | -0.014/-0.038 | 0.25 | 6 | 4 | 12 | 3.9 | 60 | 6 | UHF670RT040 | ● |
| **5** | -0.014/-0.038 | 0.31 | 6 | 5 | 15 | 4.7 | 60 | 6 | UHF670RT050 | ● |
| **6** | -0.014/-0.038 | 0.38 | 6 | 5 | 18 | 5.5 | 60 | 6 | UHF670RT060 | ● |
| **8** | -0.014/-0.038 | 0.50 | 8 | 7 | 24 | 7.5 | 75 | 6 | UHF670RT080 | ● |
| **10** | -0.014/-0.038 | 0.63 | 10 | 8 | 30 | 9.5 | 90 | 6 | UHF670RT100 | ● |
| **12** | -0.014/-0.038 | 0.75 | 12 | 10 | 36 | 11.5 | 100 | 6 | UHF670RT120 | ● |

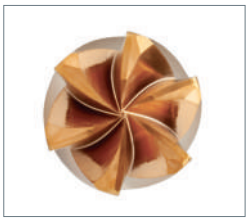
● stock standard ○ non-standard stock




**The geometry with combined radius (corner radius + head radius) create thinner chips in comparison with conventional full radius, allowing a great reduction of cutting forces.**



**Special "no-contact" area in the end mill center, together with low helix geometry, reduce drastically the vibration, even when machining at corners.**

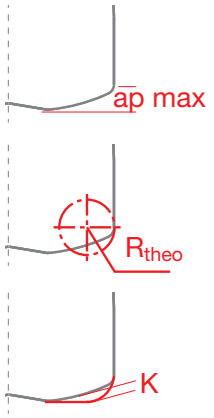


**Curved cutting edges reduce chattering and improve the chips flow.**

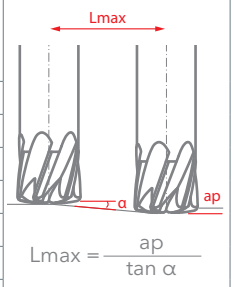
# UHF-RT

| | Material Group ISO 513 | P6 H1 H4 H5 | H2 | H3 | |
|---|---|---|---|---|---|
| | Hardness/Rm | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC | |
| | ap x ae | **0.03D x 0.55D** | **0.03D x 0.55D** | **0.03D x 0.55D** | |
| | Vc (m/min) | **100÷120** | **80÷100** | **50÷70** | |
| 3D MACHINING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | |
| | **2** | 0.070 | 0.050 | 0.040 | |
| | **3** | 0.100 | 0.080 | 0.060 | |
| | **4** | 0.150 | 0.100 | 0.080 | |
| | **5** | 0.200 | 0.120 | 0.100 | |
| | **6** | 0.250 | 0.200 | 0.150 | |
| | **8** | 0.350 | 0.250 | 0.200 | |
| | **10** | 0.400 | 0.300 | 0.250 | |
| | **12** | 0.450 | 0.350 | 0.300 | |

| D | ap max | CAM input | | | Circular interpolation | | | Cutting length for linear ramping Lmax (αmax=5°) EXAMPLE | |
|---|---|---|---|---|---|---|---|---|---|
| | | Rtheo | max unmachined part K | | Ø min | Ø max | | α=0.5° | α=5° |
| 2 | 0.07 | 0.189 | 0.051 | | 2.9 | 3.8 | | 8.02 | 0.80 |
| 3 | 0.10 | 0.283 | 0.076 | | 4.3 | 5.8 | | 11.46 | 1.14 |
| 4 | 0.13 | 0.378 | 0.102 | | 5.7 | 7.8 | | 14.90 | 1.49 |
| 5 | 0.17 | 0.472 | 0.127 | | 7.1 | 9.8 | | 19.48 | 1.94 |
| 6 | 0.20 | 0.567 | 0.152 | | 8.6 | 11.8 | | 22.92 | 2.29 |
| 8 | 0.27 | 0.756 | 0.203 | | 11.4 | 15.8 | | 30.94 | 3.09 |
| 10 | 0.33 | 0.945 | 0.254 | | 14.2 | 19.8 | | 37.81 | 3.77 |
| 12 | 0.40 | 1.134 | 0.305 | | 17.1 | 23.8 | | 45.84 | 4.57 |






(mm)

# UHF4

cylindrical shank, 4F corner radius

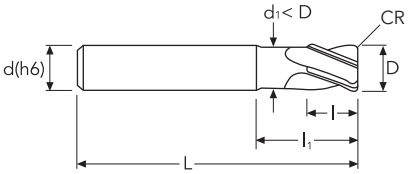
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 25° | RADIUS | Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 1 | 6 | 1.95 | 70 | 4 | UHF405020 | ● |
| **3** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 1.2 | 8 | 2.85 | 70 | 4 | UHF405030 | ● |
| **4** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 1.5 | 10 | 3.85 | 70 | 4 | UHF405040 | ● |
| **5** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 2 | 10 | 4.85 | 70 | 4 | UHF405050 | ● |
| **6** | 0/-0.030 | 0.50 | +/-0.020 | 6 | 2.5 | 12 | 5.85 | 90 | 4 | UHF405060 | ● |
| **6** | 0/-0.030 | 1.00 | +/-0.020 | 6 | 2.5 | 12 | 5.85 | 90 | 4 | UHF410060 | ● |
| **8** | 0/-0.030 | 1.00 | +/-0.020 | 8 | 3.5 | 16 | 7.7 | 100 | 4 | UHF410080 | ● |
| **10** | 0/-0.030 | 1.00 | +/-0.020 | 10 | 4 | 20 | 9.7 | 100 | 4 | UHF410100 | ● |
| **8** | 0/-0.030 | 2.00 | +/-0.020 | 8 | 3.5 | 16 | 7.7 | 100 | 4 | UHF420080 | ● |
| **10** | 0/-0.030 | 2.00 | +/-0.020 | 10 | 4 | 20 | 9.7 | 100 | 4 | UHF420100 | ● |
| **12** | 0/-0.030 | 2.00 | +/-0.020 | 12 | 5 | 25 | 11.7 | 110 | 4 | UHF420120 | ● |
| **12** | 0/-0.030 | 3.00 | +/-0.020 | 12 | 5 | 25 | 11.7 | 110 | 4 | UHF430120 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

## UHF4

| | Material Group ISO 513 | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | **0.03D x 0.3D** | **0.03D x 0.3D** | **0.02D x 0.3D** | **0.02D x 0.3D** |
| | Vc (m/min) | **110÷150** | **90÷130** | **60÷100** | **50÷70** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **2** | 0.033 | 0.029 | 0.026 | 0.023 |
| | **3** | 0.050 | 0.045 | 0.040 | 0.035 |
| | **4** | 0.068 | 0.061 | 0.054 | 0.047 |
| | **5** | 0.086 | 0.077 | 0.068 | 0.060 |
| | **6** | 0.104 | 0.093 | 0.083 | 0.072 |
| | **8** | 0.122 | 0.109 | 0.097 | 0.085 |
| | **10** | 0.140 | 0.126 | 0.112 | 0.098 |
| | **12** | 0.158 | 0.142 | 0.126 | 0.110 |

| | | | | | |
|---|---|---|---|---|---|
| ap x ae | **D2 - D3** | 0.02D x 0.3D | 0.02D x 0.25D | 0.01D x 0.02D | 0.01D x 0.02D |

# UHCS4

cylindrical shank, 4F, reduced neck, corner radius

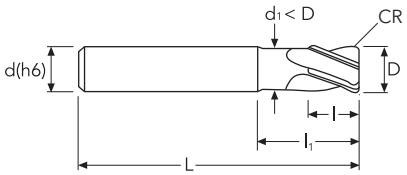
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | RADIUS | Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.012 | 0.10 | +/-0.010 | 4 | 2 | 3 | 0.95 | 50 | 4 | UHCS4010 | ● |
| **1.5** | 0/-0.012 | 0.10 | +/-0.010 | 4 | 2.5 | 4 | 1.45 | 50 | 4 | UHCS4015 | ● |
| **2** | 0/-0.012 | 0.10 | +/-0.010 | 4 | 3 | 6 | 1.95 | 50 | 4 | UHCS4020 | ● |
| **3** | 0/-0.012 | 0.10 | +/-0.010 | 6 | 4 | 8 | 2.85 | 55 | 4 | UHCS4030 | ● |
| **4** | 0/-0.012 | 0.10 | +/-0.010 | 6 | 6 | 10 | 3.85 | 55 | 4 | UHCS4040 | ● |
| **5** | 0/-0.012 | 0.20 | +/-0.010 | 6 | 6 | 11 | 4.85 | 50 | 4 | UHCS4050 | ● |
| **6** | 0/-0.015 | 0.20 | +/-0.010 | 6 | 9 | 15 | 5.85 | 60 | 4 | UHCS4060 | ● |
| **8** | 0/-0.015 | 0.20 | +/-0.015 | 8 | 12 | 20 | 7.70 | 70 | 4 | UHCS4080 | ● |
| **10** | 0/-0.015 | 0.20 | +/-0.015 | 10 | 15 | 25 | 9.70 | 70 | 4 | UHCS4100 | ● |
| **12** | 0/-0.015 | 0.30 | +/-0.015 | 12 | 18 | 30 | 11.70 | 80 | 4 | UHCS4120 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

## UHCS4

| | Material Group ISO 513 | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | **D x 0.1D** | **D x 0.05D** | **D x 0.05D** | **D x 0.05D** |
| | Vc (m/min) | **90÷130** | **60÷100** | **50÷70** | **30÷50** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.010 | 0.009 | 0.008 | 0.007 |
| | **2** | 0.020 | 0.018 | 0.016 | 0.014 |
| | **3** | 0.030 | 0.027 | 0.024 | 0.021 |
| | **4** | 0.040 | 0.036 | 0.032 | 0.028 |
| | **5** | 0.045 | 0.041 | 0.036 | 0.032 |
| | **6** | 0.050 | 0.045 | 0.040 | 0.035 |
| | **8** | 0.065 | 0.059 | 0.052 | 0.046 |
| | **10** | 0.085 | 0.077 | 0.068 | 0.060 |
| | **12** | 0.100 | 0.090 | 0.080 | 0.070 |

# UH410

cylindrical shank, 4F, corner radius

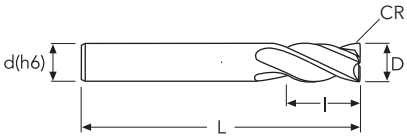
OSAWA NORM | UH | NMG UH RED | <70 HRC | 40° | RADIUS | Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.015 | 0.20 | 0/-0.010 | 6 | 3 | | 50 | 4 | UH41001002 | ● |
| **1.5** | 0/-0.015 | 0.20 | 0/-0.010 | 6 | 4.5 | | 50 | 4 | UH41001502 | ● |
| **2** | 0/-0.015 | 0.30 | 0/-0.010 | 6 | 6.5 | | 50 | 4 | UH41002003 | ● |
| **2.5** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 6.5 | | 50 | 4 | UH41002503 | ● |
| **2.5** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 6.5 | | 50 | 4 | UH41002505 | ● |
| **3** | 0/-0.020 | 0.20 | 0/-0.015 | 6 | 9 | | 50 | 4 | UH41003002 | ● |
| **3** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 9 | | 50 | 4 | UH41003003 | ● |
| **3** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 9 | | 50 | 4 | UH41003005 | ● |
| **4** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 12 | | 50 | 4 | UH41004003 | ● |
| **4** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 12 | | 50 | 4 | UH41004005 | ● |
| **4** | 0/-0.020 | 1.00 | 0/-0.015 | 6 | 12 | | 50 | 4 | UH41004010 | ● |
| **5** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 15 | | 50 | 4 | UH41005003 | ● |
| **5** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 15 | | 50 | 4 | UH41005005 | ● |
| **5** | 0/-0.020 | 1.00 | 0/-0.015 | 6 | 15 | | 50 | 4 | UH41005010 | ● |
| **6** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 16 | | 50 | 4 | UH41006003 | ● |
| **6** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 16 | | 50 | 4 | UH41006005 | ● |
| **6** | 0/-0.020 | 1.00 | 0/-0.015 | 6 | 16 | | 50 | 4 | UH41006010 | ● |
| **8** | 0/-0.020 | 0.30 | 0/-0.015 | 8 | 20 | | 64 | 4 | UH41008003 | ● |
| **8** | 0/-0.020 | 0.50 | 0/-0.015 | 8 | 20 | | 64 | 4 | UH41008005 | ● |
| **8** | 0/-0.020 | 1.00 | 0/-0.015 | 8 | 20 | | 64 | 4 | UH41008010 | ● |
| **8** | 0/-0.020 | 1.50 | 0/-0.015 | 8 | 20 | | 64 | 4 | UH41008015 | ● |
| **8** | 0/-0.020 | 2.00 | 0/-0.015 | 8 | 20 | | 64 | 4 | UH41008020 | ● |
| **10** | 0/-0.020 | 0.30 | 0/-0.020 | 10 | 22 | | 70 | 4 | UH41010003 | ● |
| **10** | 0/-0.020 | 0.50 | 0/-0.020 | 10 | 22 | | 70 | 4 | UH41010005 | ● |
| **10** | 0/-0.020 | 1.00 | 0/-0.020 | 10 | 22 | | 70 | 4 | UH41010010 | ● |
| **10** | 0/-0.020 | 1.50 | 0/-0.020 | 10 | 22 | | 70 | 4 | UH41010015 | ● |
| **10** | 0/-0.020 | 2.00 | 0/-0.020 | 10 | 22 | | 70 | 4 | UH41010020 | ● |
| **12** | 0/-0.020 | 0.30 | 0/-0.020 | 12 | 25 | | 75 | 4 | UH41012003 | ● |
| **12** | 0/-0.020 | 0.50 | 0/-0.020 | 12 | 25 | | 75 | 4 | UH41012005 | ● |
| **12** | 0/-0.020 | 1.00 | 0/-0.020 | 12 | 25 | | 75 | 4 | UH41012010 | ● |
| **12** | 0/-0.020 | 1.50 | 0/-0.020 | 12 | 25 | | 75 | 4 | UH41012015 | ● |
| **12** | 0/-0.020 | 2.00 | 0/-0.020 | 12 | 25 | | 75 | 4 | UH41012020 | ● |
| **12** | 0/-0.020 | 3.00 | 0/-0.020 | 12 | 25 | | 75 | 4 | UH41012030 | ● |
| **14** | 0/-0.020 | 0.50 | 0/-0.020 | 14 | 32 | | 90 | 4 | UH41014005 | ● |
| **14** | 0/-0.020 | 1.00 | 0/-0.020 | 14 | 32 | | 90 | 4 | UH41014010 | ● |
| **14** | 0/-0.020 | 2.00 | 0/-0.020 | 14 | 32 | | 90 | 4 | UH41014020 | ○ |
| **16** | 0/-0.020 | 0.30 | 0/-0.020 | 16 | 32 | | 90 | 4 | UH41016003 | ○ |
| **16** | 0/-0.020 | 0.50 | 0/-0.020 | 16 | 32 | | 90 | 4 | UH41016005 | ● |
| **16** | 0/-0.020 | 1.00 | 0/-0.020 | 16 | 32 | | 90 | 4 | UH41016010 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# UH410

cylindrical shank, 4F, corner radius

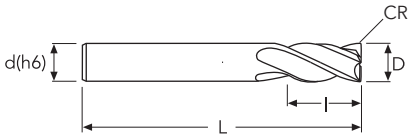
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | RADIUS | Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **16** | 0/-0.020 | 1.50 | 0/-0.020 | 16 | 32 | | 90 | 4 | UH41016015 | ○ |
| **16** | 0/-0.020 | 2.00 | 0/-0.020 | 16 | 32 | | 90 | 4 | UH41016020 | ● |
| **16** | 0/-0.020 | 3.00 | 0/-0.020 | 16 | 32 | | 90 | 4 | UH41016030 | ○ |
| **18** | 0/-0.020 | 0.50 | 0/-0.020 | 18 | 38 | | 100 | 4 | UH41018005 | ○ |
| **18** | 0/-0.020 | 1.00 | 0/-0.020 | 18 | 38 | | 100 | 4 | UH41018010 | ● |
| **18** | 0/-0.020 | 2.00 | 0/-0.020 | 18 | 38 | | 100 | 4 | UH41018020 | ○ |
| **20** | 0/-0.020 | 0.30 | 0/-0.020 | 20 | 38 | | 100 | 4 | UH41020003 | ○ |
| **20** | 0/-0.020 | 0.50 | 0/-0.020 | 20 | 38 | | 100 | 4 | UH41020005 | ● |
| **20** | 0/-0.020 | 1.00 | 0/-0.020 | 20 | 38 | | 100 | 4 | UH41020010 | ● |
| **20** | 0/-0.020 | 1.50 | 0/-0.020 | 20 | 38 | | 100 | 4 | UH41020015 | ○ |
| **20** | 0/-0.020 | 2.00 | 0/-0.020 | 20 | 38 | | 100 | 4 | UH41020020 | ● |
| **20** | 0/-0.020 | 3.00 | 0/-0.020 | 20 | 38 | | 100 | 4 | UH41020030 | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# UH410

| | Material Group ISO 513 | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | **D x 0.1D** | **D x 0.05D** | **D x 0.05D** | **D x 0.05D** |
| | Vc (m/min) | **90÷130** | **60÷100** | **50÷70** | **30÷50** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.010 | 0.009 | 0.008 | 0.007 |
| | **2** | 0.018 | 0.016 | 0.014 | 0.013 |
| | **3** | 0.027 | 0.024 | 0.022 | 0.019 |
| | **4** | 0.036 | 0.032 | 0.029 | 0.025 |
| | **5** | 0.041 | 0.036 | 0.032 | 0.028 |
| | **6** | 0.045 | 0.041 | 0.036 | 0.032 |
| | **8** | 0.059 | 0.053 | 0.047 | 0.041 |
| | **10** | 0.077 | 0.069 | 0.061 | 0.054 |
| | **12** | 0.090 | 0.081 | 0.072 | 0.063 |
| | **14** | 0.102 | 0.092 | 0.082 | 0.071 |
| | **16** | 0.114 | 0.103 | 0.091 | 0.080 |
| | **18** | 0.126 | 0.113 | 0.101 | 0.088 |
| | **20** | 0.138 | 0.124 | 0.110 | 0.097 |

# UH411

cylindrical shank, 4F, reduced neck, corner radius, long

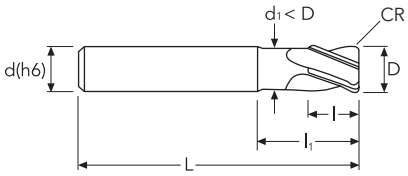
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | RADIUS | Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0/-0.012 | 0.30 | 0/-0.010 | 6 | 4 | 12 | 2.85 | 55 | 4 | UH4110300312 | ● |
| **3** | 0/-0.012 | 0.30 | 0/-0.010 | 6 | 4 | 20 | 2.85 | 60 | 4 | UH4110300320 | ● |
| **3** | 0/-0.012 | 0.50 | 0/-0.010 | 6 | 4 | 10 | 2.85 | 55 | 4 | UH4110300510 | ● |
| **3** | 0/-0.012 | 0.50 | 0/-0.010 | 6 | 4 | 20 | 2.85 | 60 | 4 | UH4110300520 | ● |
| **4** | 0/-0.012 | 0.30 | 0/-0.010 | 6 | 6 | 12 | 3.85 | 55 | 4 | UH4110400312 | ● |
| **4** | 0/-0.012 | 0.30 | 0/-0.010 | 6 | 6 | 20 | 3.85 | 60 | 4 | UH4110400320 | ● |
| **4** | 0/-0.012 | 0.50 | 0/-0.010 | 6 | 6 | 12 | 3.85 | 55 | 4 | UH4110400512 | ● |
| **4** | 0/-0.012 | 0.50 | 0/-0.010 | 6 | 6 | 20 | 3.85 | 60 | 4 | UH4110400520 | ● |
| **4** | 0/-0.012 | 1.00 | 0/-0.010 | 6 | 6 | 12 | 3.85 | 55 | 4 | UH4110401012 | ● |
| **6** | 0/-0.015 | 0.50 | 0/-0.010 | 6 | 9 | 15 | 5.85 | 60 | 4 | UH4110600520 | ● |
| **6** | 0/-0.015 | 1.00 | 0/-0.010 | 6 | 9 | 15 | 5.85 | 60 | 4 | UH4110601020 | ● |
| **8** | 0/-0.015 | 0.50 | 0/-0.015 | 8 | 12 | 20 | 7.70 | 70 | 4 | UH4110800525 | ● |
| **8** | 0/-0.015 | 1.00 | 0/-0.015 | 8 | 12 | 20 | 7.70 | 70 | 4 | UH4110801025 | ● |
| **8** | 0/-0.015 | 2.00 | 0/-0.015 | 8 | 12 | 20 | 7.70 | 70 | 4 | UH4110802025 | ● |
| **10** | 0/-0.015 | 0.50 | 0/-0.015 | 10 | 15 | 25 | 9.70 | 70 | 4 | UH4111000532 | ● |
| **10** | 0/-0.015 | 1.00 | 0/-0.015 | 10 | 15 | 25 | 9.70 | 70 | 4 | UH4111001032 | ● |
| **10** | 0/-0.015 | 2.00 | 0/-0.015 | 10 | 15 | 25 | 9.70 | 70 | 4 | UH4111002032 | ● |
| **12** | 0/-0.015 | 0.50 | 0/-0.015 | 12 | 18 | 30 | 11.70 | 80 | 4 | UH4111200538 | ● |
| **12** | 0/-0.015 | 1.00 | 0/-0.015 | 12 | 18 | 30 | 11.70 | 80 | 4 | UH4111201038 | ● |
| **12** | 0/-0.015 | 2.00 | 0/-0.015 | 12 | 18 | 30 | 11.70 | 80 | 4 | UH4111202038 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# UH411

| | Material Group ISO 513 | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | **D x 0.05D** | **D x 0.05D** | **D x 0.05D** | **D x 0.05D** |
| | Vc (m/min) | **90÷130** | **60÷100** | **50÷70** | **30÷50** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.027 | 0.024 | 0.022 | 0.019 |
| | **4** | 0.036 | 0.032 | 0.029 | 0.025 |
| | **5** | 0.041 | 0.036 | 0.032 | 0.028 |
| | **6** | 0.045 | 0.041 | 0.036 | 0.032 |
| | **8** | 0.059 | 0.053 | 0.047 | 0.041 |
| | **10** | 0.077 | 0.069 | 0.061 | 0.054 |
| | **12** | 0.090 | 0.081 | 0.072 | 0.063 |

# UH412

cylindrical shank, 4F, reduced neck, corner radius, long

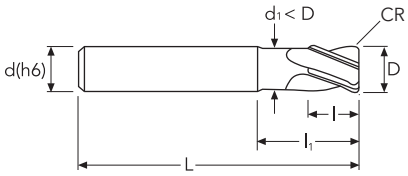
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | RADIUS | Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0/-0.020 | 0.30 | 0/-0.010 | 6 | 4 | 30 | 1.90 | 75 | 4 | UH4120200330 | ● |
| **2** | 0/-0.020 | 0.30 | 0/-0.010 | 6 | 4 | 60 | 1.90 | 100 | 4 | UH4120200360 | ● |
| **3** | 0/-0.020 | 0.30 | 0/-0.010 | 6 | 5 | 30 | 2.80 | 75 | 4 | UH4120300330 | ● |
| **3** | 0/-0.020 | 0.30 | 0/-0.010 | 6 | 5 | 60 | 2.80 | 100 | 4 | UH4120300360 | ● |
| **3** | 0/-0.020 | 0.50 | 0/-0.010 | 6 | 5 | 30 | 2.80 | 75 | 4 | UH4120300530 | ● |
| **3** | 0/-0.020 | 0.50 | 0/-0.010 | 6 | 5 | 60 | 2.80 | 100 | 4 | UH4120300560 | ● |
| **4** | 0/-0.020 | 0.30 | 0/-0.010 | 6 | 8 | 32 | 3.70 | 75 | 4 | UH4120400332 | ● |
| **4** | 0/-0.020 | 0.30 | 0/-0.010 | 6 | 8 | 60 | 3.70 | 100 | 4 | UH4120400360 | ● |
| **4** | 0/-0.020 | 0.50 | 0/-0.010 | 6 | 8 | 32 | 3.70 | 75 | 4 | UH4120400532 | ● |
| **4** | 0/-0.020 | 0.50 | 0/-0.010 | 6 | 8 | 60 | 3.70 | 100 | 4 | UH4120400560 | ● |
| **6** | 0/-0.020 | 0.50 | 0/-0.010 | 6 | 9 | 40 | 5.85 | 90 | 4 | UH4120600520 | ● |
| **6** | 0/-0.020 | 1.00 | 0/-0.010 | 6 | 9 | 40 | 5.85 | 90 | 4 | UH4120601020 | ● |
| **8** | 0/-0.020 | 0.50 | 0/-0.015 | 8 | 12 | 45 | 7.70 | 100 | 4 | UH4120800525 | ● |
| **8** | 0/-0.020 | 1.00 | 0/-0.015 | 8 | 12 | 45 | 7.70 | 100 | 4 | UH4120801025 | ● |
| **10** | 0/-0.020 | 0.50 | 0/-0.015 | 10 | 15 | 50 | 9.70 | 100 | 4 | UH4121000532 | ● |
| **10** | 0/-0.020 | 1.00 | 0/-0.015 | 10 | 15 | 50 | 9.70 | 100 | 4 | UH4121001032 | ● |
| **10** | 0/-0.020 | 2.00 | 0/-0.015 | 10 | 15 | 50 | 9.70 | 100 | 4 | UH4121002032 | ● |
| **12** | 0/-0.020 | 0.50 | 0/-0.015 | 12 | 18 | 60 | 11.70 | 110 | 4 | UH4121200538 | ● |
| **12** | 0/-0.020 | 1.00 | 0/-0.015 | 12 | 18 | 60 | 11.70 | 110 | 4 | UH4121201038 | ● |
| **12** | 0/-0.020 | 2.00 | 0/-0.015 | 12 | 18 | 60 | 11.70 | 110 | 4 | UH4121202038 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# UH412

| SIDE MILLING | Material Group ISO 513 | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | **D x 0.05D** | **D x 0.05D** | **D x 0.05D** | **D x 0.05D** |
| | Vc (m/min) | **80÷120** | **60÷100** | **50÷70** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **2** | 0.016 | 0.015 | 0.013 | 0.011 |
| | **3** | 0.024 | 0.022 | 0.019 | 0.017 |
| | **4** | 0.032 | 0.029 | 0.026 | 0.023 |
| | **5** | 0.036 | 0.033 | 0.029 | 0.026 |
| | **6** | 0.041 | 0.036 | 0.032 | 0.028 |
| | **8** | 0.053 | 0.047 | 0.042 | 0.037 |
| | **10** | 0.069 | 0.062 | 0.055 | 0.048 |
| | **12** | 0.081 | 0.073 | 0.065 | 0.057 |

# UH413

cylindrical shank, 4F, reduced neck, corner radius, long

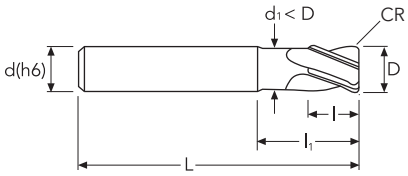
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 40° | RADIUS | Z4




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.020 | 0.30 | 0/-0.015 | 6 | 10 | 60 | 5.50 | 125 | 4 | UH4130600360 | ● |
| **6** | 0/-0.020 | 0.50 | 0/-0.015 | 6 | 10 | 60 | 5.50 | 125 | 4 | UH4130600560 | ● |
| **6** | 0/-0.020 | 1.00 | 0/-0.015 | 6 | 10 | 60 | 5.50 | 125 | 4 | UH4130601060 | ● |
| **8** | 0/-0.020 | 0.30 | 0/-0.015 | 8 | 12 | 60 | 7.40 | 125 | 4 | UH4130800360 | ● |
| **8** | 0/-0.020 | 0.50 | 0/-0.015 | 8 | 12 | 60 | 7.40 | 125 | 4 | UH4130800560 | ● |
| **8** | 0/-0.020 | 1.00 | 0/-0.015 | 8 | 12 | 60 | 7.40 | 125 | 4 | UH4130801060 | ● |
| **8** | 0/-0.020 | 2.00 | 0/-0.015 | 8 | 12 | 60 | 7.40 | 125 | 4 | UH4130802060 | ● |
| **10** | 0/-0.020 | 0.30 | 0/-0.020 | 10 | 14 | 85 | 9.20 | 125 | 4 | UH4131000385 | ● |
| **10** | 0/-0.020 | 0.50 | 0/-0.020 | 10 | 14 | 85 | 9.20 | 125 | 4 | UH4131000585 | ● |
| **10** | 0/-0.020 | 1.00 | 0/-0.020 | 10 | 14 | 85 | 9.20 | 125 | 4 | UH4131001085 | ● |
| **10** | 0/-0.020 | 2.00 | 0/-0.020 | 10 | 14 | 85 | 9.20 | 125 | 4 | UH4131002085 | ● |
| **12** | 0/-0.020 | 0.50 | 0/-0.020 | 12 | 16 | 110 | 11.00 | 150 | 4 | UH41312005110 | ● |
| **12** | 0/-0.020 | 1.00 | 0/-0.020 | 12 | 16 | 110 | 11.00 | 150 | 4 | UH41312010110 | ● |
| **12** | 0/-0.020 | 2.00 | 0/-0.020 | 12 | 16 | 110 | 11.00 | 150 | 4 | UH41312020110 | ● |
| **16** | 0/-0.020 | 0.50 | 0/-0.020 | 16 | 22 | 110 | 15.00 | 150 | 4 | UH41316005110 | ● |
| **16** | 0/-0.020 | 1.00 | 0/-0.020 | 16 | 22 | 110 | 15.00 | 150 | 4 | UH41316010110 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# UH413

| | Material Group ISO 513 | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | **D x 0.05D** | **D x 0.05D** | **D x 0.05D** | **D x 0.05D** |
| SIDE MILLING | Vc (m/min) | **70÷110** | **60÷80** | **40÷60** | **30÷50** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.041 | 0.036 | 0.032 | 0.028 |
| | **8** | 0.053 | 0.047 | 0.042 | 0.037 |
| | **10** | 0.069 | 0.062 | 0.055 | 0.048 |
| | **12** | 0.081 | 0.073 | 0.065 | 0.057 |
| | **16** | 0.095 | 0.086 | 0.076 | 0.067 |

# UH610R

cylindrical shank, multi flute, reduced neck, corner radius

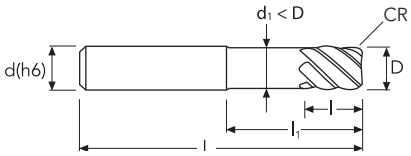
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 50° | RADIUS | Z6




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.030 | 0.50 | +/-0.015 | 6 | 6 | 15 | 5.80 | 50 | 6 | UH610R05060 | ● |
| **8** | 0/-0.030 | 0.50 | +/-0.015 | 8 | 8 | 25 | 7.80 | 60 | 6 | UH610R05080 | ● |
| **10** | 0/-0.030 | 1.00 | +/-0.015 | 10 | 10 | 30 | 9.80 | 70 | 6 | UH610R10100 | ● |
| **12** | 0/-0.030 | 1.00 | +/-0.015 | 12 | 12 | 30 | 11.80 | 75 | 6 | UH610R10120 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# UH610R

| SIDE MILLING | Material Group ISO 513 | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | **D x 0.1D** | **D x 0.05D** | **D x 0.05D** | **D x 0.05D** |
| | Vc (m/min) | **140÷180** | **100÷140** | **70÷110** | **60÷80** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.018 | 0.016 | 0.014 | 0.013 |
| | **8** | 0.028 | 0.025 | 0.022 | 0.019 |
| | **10** | 0.034 | 0.030 | 0.027 | 0.024 |
| | **12** | 0.041 | 0.037 | 0.033 | 0.029 |

# UH611R

cylindrical shank, multi flute, long, corner radius

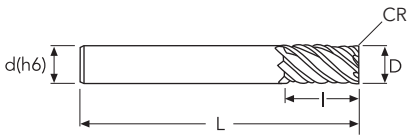
OSAWA NORM | UH | NMG / UH RED | 30÷70 HRC | 50° | RADIUS | Z6




| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

SIDE MILLING




| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 0/-0.030 | 0.50 | +/-0.015 | 6 | 15 | | 90 | 6 | UH611R05060 | ● |
| **8** | 0/-0.030 | 0.50 | +/-0.015 | 8 | 20 | | 100 | 6 | UH611R05080 | ● |
| **10** | 0/-0.030 | 0.50 | +/-0.015 | 10 | 25 | | 100 | 6 | UH611R05100 | ● |
| **10** | 0/-0.030 | 1.00 | +/-0.015 | 10 | 25 | | 100 | 6 | UH611R10100 | ● |
| **12** | 0/-0.030 | 0.50 | +/-0.015 | 12 | 30 | | 110 | 6 | UH611R05120 | ● |
| **12** | 0/-0.030 | 1.00 | +/-0.015 | 12 | 30 | | 110 | 6 | UH611R10120 | ● |
| **16** | 0/-0.030 | 1.00 | +/-0.015 | 16 | 32 | | 130 | 6 | UH611R10160 | ● |
| **20** | 0/-0.030 | 1.00 | +/-0.015 | 20 | 38 | | 140 | 6 | UH611R10200 | ● |
| **20** | 0/-0.030 | 2.00 | +/-0.015 | 20 | 38 | | 140 | 6 | UH611R20200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# UH611R

| SIDE MILLING | Material Group ISO 513 | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | **1.5D x 0.05D** | **1.5D x 0.05D** | **1.5D x 0.05D** | **1.5D x 0.05D** |
| | Vc (m/min) | **110÷150** | **90÷130** | **60÷80** | **40÷60** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.015 | 0.014 | 0.012 | 0.011 |
| | **8** | 0.023 | 0.021 | 0.019 | 0.016 |
| | **10** | 0.029 | 0.026 | 0.023 | 0.020 |
| | **12** | 0.035 | 0.031 | 0.028 | 0.024 |
| | **16** | 0.048 | 0.043 | 0.038 | 0.034 |
| | **20** | 0.066 | 0.060 | 0.053 | 0.046 |

# MHMB204

cylindrical shank, 2 flutes ball nose, miniature

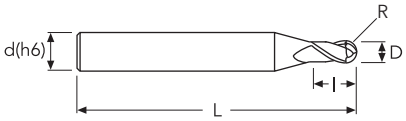
OSAWA NORM | MH | NMG MH COAT | <70 HRC | 30° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ★ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.2** | 0/-0.015 | 0.10 | 0/-0.020 | 4 | 0.2 | | | 50 | 2 | MHMB200204 | ● |
| **0.3** | 0/-0.015 | 0.15 | 0/-0.020 | 4 | 0.3 | | | 50 | 2 | MHMB200304 | ● |
| **0.4** | 0/-0.015 | 0.20 | 0/-0.020 | 4 | 0.4 | | | 50 | 2 | MHMB200404 | ● |
| **0.5** | 0/-0.015 | 0.25 | 0/-0.020 | 4 | 0.4 | | | 50 | 2 | MHMB200504 | ● |
| **0.6** | 0/-0.015 | 0.30 | 0/-0.020 | 4 | 0.5 | | | 50 | 2 | MHMB200604 | ● |
| **0.7** | 0/-0.015 | 0.35 | 0/-0.020 | 4 | 0.6 | | | 50 | 2 | MHMB200704 | ● |
| **0.8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | | | 50 | 2 | MHMB200804 | ● |
| **0.9** | 0/-0.015 | 0.45 | 0/-0.020 | 4 | 0.8 | | | 50 | 2 | MHMB200904 | ● |
| **1.0** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | | | 50 | 2 | MHMB201004 | ● |
| **1.5** | 0/-0.015 | 0.75 | 0/-0.020 | 4 | 1.35 | | | 50 | 2 | MHMB201504 | ● |
| **2** | 0/-0.015 | 1 | 0/-0.020 | 4 | 1.7 | | | 50 | 2 | MHMB202004 | ● |

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
**UH/MH**

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# MHMB204

| | Material Group ISO 513 | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | **0.05D x 0.1D** | **0.05D x 0.1D** | **0.05D x 0.1D** | **0.05D x 0.1D** |
| | Vc (m/min) | | **80÷120** | **60÷100** | **40÷80** | **20÷60** |
| COPYING | D (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **0.1** | 0.04 | 0.004 | 0.004 | 0.003 | 0.003 |
| | **0.2** | 0.09 | 0.006 | 0.005 | 0.005 | 0.004 |
| | **0.3** | 0.13 | 0.008 | 0.007 | 0.006 | 0.006 |
| | **0.4** | 0.17 | 0.010 | 0.009 | 0.008 | 0.007 |
| | **0.5** | 0.22 | 0.012 | 0.011 | 0.010 | 0.008 |
| | **0.6** | 0.26 | 0.015 | 0.014 | 0.012 | 0.011 |
| | **0.7** | 0.31 | 0.018 | 0.016 | 0.014 | 0.013 |
| | **0.8** | 0.35 | 0.020 | 0.018 | 0.016 | 0.014 |
| | **0.9** | 0.39 | 0.023 | 0.021 | 0.018 | 0.016 |
| | **1** | 0.44 | 0.026 | 0.023 | 0.020 | 0.017 |
| | **1.5** | 0.79 | 0.040 | 0.036 | 0.030 | 0.026 |
| | **2** | 1.20 | 0.055 | 0.050 | 0.041 | 0.036 |

| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 15° | x 1.1 | x 1.1 |

# MHMB206

cylindrical shank, 2 flutes ball nose, miniature, 6 mm. shank

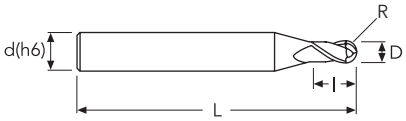
OSAWA NORM | MH | NMG MH COAT | 30÷70 HRC | 30° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ★ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.4** | 0/-0.010 | 0.20 | 0/-0.010 | 6 | 0.4 | - | 0.35 | 50 | 2 | MHMB200406 | ● |
| **0.5** | 0/-0.010 | 0.25 | 0/-0.010 | 6 | 0.5 | - | 0.45 | 50 | 2 | MHMB200506 | ● |
| **0.6** | 0/-0.010 | 0.30 | 0/-0.010 | 6 | 0.6 | - | 0.55 | 50 | 2 | MHMB200606 | ● |
| **0.8** | 0/-0.010 | 0.40 | 0/-0.010 | 6 | 0.8 | - | 0.75 | 50 | 2 | MHMB200806 | ● |



● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# MHMB206

| COPYING | Material Group ISO 513 | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** |
| | Vc (m/min) | | **80÷120** | **60÷100** | **40÷80** | **20÷60** |
| | D (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **0.4** | 0.17 | 0.010 | 0.009 | 0.008 | 0.007 |
| | **0.5** | 0.22 | 0.012 | 0.011 | 0.010 | 0.008 |
| | **0.6** | 0.26 | 0.015 | 0.014 | 0.012 | 0.011 |
| | **0.8** | 0.35 | 0.020 | 0.018 | 0.016 | 0.014 |

| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 15° | x 1.1 | x 1.1 |

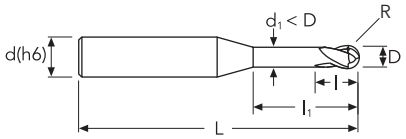
# MHLNB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck, miniature

OSAWA NORM | MH | NMG MH COAT | 30÷70 HRC | 30° | BALL NOSE | Z2 BALL



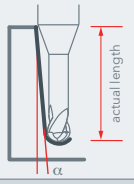





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

ROUND RIB




actual length according to α angle

| D | D Tol. | R | R Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.2** | 0/-0.015 | 0.10 | 0/-0.020 | 4 | 0.2 | 0.5 | 0.17 | 50 | 2 | 0.57 | 0.58 | 0.60 | 0.62 | 0.66 | MHLNB2002005 | ● |
| **0.2** | 0/-0.015 | 0.10 | 0/-0.020 | 4 | 0.2 | 1 | 0.17 | 50 | 2 | 1.08 | 1.12 | 1.15 | 1.19 | 1.27 | MHLNB200201 | ● |
| **0.2** | 0/-0.015 | 0.10 | 0/-0.020 | 4 | 0.2 | 1.5 | 0.17 | 50 | 2 | 1.60 | 1.65 | 1.71 | 1.76 | 1.89 | MHLNB2002015 | ● |
| **0.3** | 0/-0.015 | 0.15 | 0/-0.020 | 4 | 0.3 | 1 | 0.27 | 50 | 2 | 1.08 | 1.11 | 1.15 | 1.18 | 1.26 | MHLNB200301 | ● |
| **0.3** | 0/-0.015 | 0.15 | 0/-0.020 | 4 | 0.3 | 2 | 0.27 | 50 | 2 | 2.12 | 2.18 | 2.25 | 2.33 | 2.49 | MHLNB200302 | ● |
| **0.3** | 0/-0.015 | 0.15 | 0/-0.020 | 4 | 0.3 | 3 | 0.27 | 50 | 2 | 3.15 | 3.25 | 3.36 | 3.48 | 3.73 | MHLNB200303 | ● |
| **0.4** | 0/-0.015 | 0.20 | 0/-0.020 | 4 | 0.4 | 1 | 0.37 | 50 | 2 | 1.08 | 1.11 | 1.14 | 1.18 | 1.25 | MHLNB200401 | ● |
| **0.4** | 0/-0.015 | 0.20 | 0/-0.020 | 4 | 0.4 | 2 | 0.37 | 50 | 2 | 2.11 | 2.18 | 2.25 | 2.32 | 2.48 | MHLNB200402 | ● |
| **0.4** | 0/-0.015 | 0.20 | 0/-0.020 | 4 | 0.4 | 3 | 0.37 | 50 | 2 | 3.15 | 3.25 | 3.36 | 3.47 | 3.72 | MHLNB200403 | ● |
| **0.4** | 0/-0.015 | 0.20 | 0/-0.020 | 4 | 0.4 | 4 | 0.37 | 50 | 2 | 4.18 | 4.32 | 4.46 | 4.62 | 4.95 | MHLNB200404 | ● |
| **0.4** | 0/-0.015 | 0.20 | 0/-0.020 | 4 | 0.4 | 5 | 0.37 | 50 | 2 | 5.21 | 5.39 | 5.57 | 5.77 | 6.18 | MHLNB200405 | ● |
| **0.5** | 0/-0.015 | 0.25 | 0/-0.020 | 4 | 0.4 | 2 | 0.45 | 50 | 2 | 2.15 | 2.22 | 2.29 | 2.36 | 2.52 | MHLNB200502 | ● |
| **0.5** | 0/-0.015 | 0.25 | 0/-0.020 | 4 | 0.4 | 3 | 0.45 | 50 | 2 | 3.18 | 3.29 | 3.39 | 3.51 | 3.75 | MHLNB200503 | ● |
| **0.5** | 0/-0.015 | 0.25 | 0/-0.020 | 4 | 0.4 | 4 | 0.45 | 50 | 2 | 4.22 | 4.35 | 4.50 | 4.65 | 4.98 | MHLNB200504 | ● |
| **0.5** | 0/-0.015 | 0.25 | 0/-0.020 | 4 | 0.4 | 5 | 0.45 | 50 | 2 | 5.25 | 5.42 | 5.61 | 5.80 | 6.22 | MHLNB200505 | ● |
| **0.5** | 0/-0.015 | 0.25 | 0/-0.020 | 4 | 0.4 | 6 | 0.45 | 50 | 2 | 6.28 | 6.49 | 6.71 | 6.95 | 7.45 | MHLNB200506 | ● |
| **0.5** | 0/-0.015 | 0.25 | 0/-0.020 | 4 | 0.4 | 8 | 0.45 | 50 | 2 | 8.35 | 8.63 | 8.93 | 9.24 | 9.92 | MHLNB200508 | ● |
| **0.6** | 0/-0.015 | 0.30 | 0/-0.020 | 4 | 0.5 | 2 | 0.55 | 50 | 2 | 2.15 | 2.21 | 2.28 | 2.35 | 2.50 | MHLNB200602 | ● |
| **0.6** | 0/-0.015 | 0.30 | 0/-0.020 | 4 | 0.5 | 3 | 0.55 | 50 | 2 | 3.18 | 3.28 | 3.39 | 3.50 | 3.74 | MHLNB200603 | ● |
| **0.6** | 0/-0.015 | 0.30 | 0/-0.020 | 4 | 0.5 | 4 | 0.55 | 50 | 2 | 4.22 | 4.35 | 4.49 | 4.65 | 4.97 | MHLNB200604 | ● |
| **0.6** | 0/-0.015 | 0.30 | 0/-0.020 | 4 | 0.5 | 5 | 0.55 | 50 | 2 | 5.25 | 5.42 | 5.60 | 5.79 | 6.21 | MHLNB200605 | ● |
| **0.6** | 0/-0.015 | 0.30 | 0/-0.020 | 4 | 0.5 | 6 | 0.55 | 50 | 2 | 6.28 | 6.49 | 6.71 | 6.94 | 7.44 | MHLNB200606 | ● |
| **0.6** | 0/-0.015 | 0.30 | 0/-0.020 | 4 | 0.5 | 8 | 0.55 | 50 | 2 | 8.35 | 8.63 | 8.92 | 9.23 | 9.91 | MHLNB200608 | ● |
| **0.8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | 2 | 0.75 | 50 | 2 | 2.15 | 2.21 | 2.27 | 2.34 | 2.48 | MHLNB200802 | ● |
| **0.8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | 4 | 0.75 | 50 | 2 | 4.21 | 4.34 | 4.48 | 4.63 | 4.95 | MHLNB200804 | ● |
| **0,8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | 5 | 0.75 | 50 | 2 | 5.25 | 5.41 | 5.59 | 5.78 | 6.18 | MHLNB200805 | ● |
| **0.8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | 6 | 0.75 | 50 | 2 | 6.28 | 6.48 | 6.70 | 6.93 | 7.42 | MHLNB200806 | ● |
| **0,8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | 7 | 0.75 | 50 | 2 | 7.31 | 7.55 | 7.81 | 8.07 | 8.65 | MHLNB200807 | ● |
| **0.8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | 8 | 0.75 | 50 | 2 | 8.35 | 8.62 | 8.91 | 9.22 | 9.88 | MHLNB200808 | ● |
| **0.8** | 0/-0.015 | 0.40 | 0/-0.020 | 4 | 0.6 | 10 | 0.75 | 50 | 2 | 10.41 | 10.76 | 11.13 | 11.51 | 12.35 | MHLNB200810 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 3 | 0.9 | 50 | 2 | 3.27 | 3.37 | 3.47 | 3.57 | 3.80 | MHLNB201003 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 4 | 0.9 | 50 | 2 | 4.31 | 4.44 | 4.58 | 4.72 | 5.04 | MHLNB201004 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 5 | 0.9 | 50 | 2 | 5.34 | 5.51 | 5.68 | 5.87 | 6.27 | MHLNB201005 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 6 | 0.9 | 50 | 2 | 6.37 | 6.58 | 6.79 | 7.02 | 7.50 | MHLNB201006 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 7 | 0.9 | 50 | 2 | 7.41 | 7.64 | 7.90 | 8.16 | 8.74 | MHLNB201007 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 8 | 0.9 | 50 | 2 | 8.44 | 8.71 | 9.00 | 9.31 | 9.97 | MHLNB201008 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 9 | 0.9 | 50 | 2 | 9.47 | 9.78 | 10.11 | 10.46 | 11.21 | MHLNB201009 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 10 | 0.9 | 50 | 2 | 10.51 | 10.85 | 11.22 | 11.61 | 12.44 | MHLNB201010 | ● |
| **1** | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 12 | 0.9 | 50 | 2 | 12.57 | 12.99 | 13.43 | 13.90 | 14.91 | MHLNB201012 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
**UH/MH**

HSS END-MILLS

CARBIDE BURRS

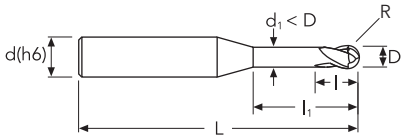
# MHLNB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck, miniature

OSAWA NORM | MH | NMG MH COAT | 30÷70 HRC | 30° | BALL NOSE | Z2 BALL



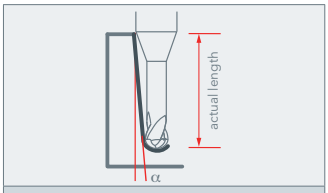





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

ROUND RIB




actual length according to α angle

| D | D Tol. | R | R Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 14 | 0.9 | 50 | 2 | 14.64 | 15.13 | 15.65 | 16.19 | 17.37 | MHLNB201014 | ● |
| 1 | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 16 | 0.9 | 50 | 2 | 16.71 | 17.27 | 17.86 | 18.49 | 19.84 | MHLNB201016 | ● |
| 1 | 0/-0.015 | 0.50 | 0/-0.020 | 4 | 0.8 | 20 | 0.9 | 60 | 2 | 20.84 | 21.55 | 22.29 | 23.08 | 24.78 | MHLNB201020 | ● |
| 1.2 | 0/-0.015 | 0.60 | 0/-0.020 | 4 | 1.0 | 6 | 1.1 | 50 | 2 | 6.37 | 6.57 | 6.78 | 7.00 | 7.48 | MHLNB201206 | ● |
| 1.2 | 0/-0.015 | 0.60 | 0/-0.020 | 4 | 1.0 | 8 | 1.1 | 50 | 2 | 8.44 | 8.71 | 8.99 | 9.30 | 9.95 | MHLNB201208 | ● |
| 1.2 | 0/-0.015 | 0.60 | 0/-0.020 | 4 | 1.0 | 10 | 1.1 | 50 | 2 | 10.50 | 10.85 | 11.21 | 11.59 | 12.42 | MHLNB201210 | ● |
| 1.2 | 0/-0.015 | 0.60 | 0/-0.020 | 4 | 1.0 | 12 | 1.1 | 50 | 2 | 12.57 | 12.98 | 13.42 | 13.89 | 14.88 | MHLNB201212 | ● |
| 1.4 | 0/-0.015 | 0.70 | 0/-0.020 | 4 | 1.1 | 8 | 1.3 | 50 | 2 | 8.43 | 8.70 | 8.98 | 9.28 | 9.93 | MHLNB201408 | ● |
| 1.4 | 0/-0.015 | 0.70 | 0/-0.020 | 4 | 1.1 | 12 | 1.3 | 50 | 2 | 12.57 | 12.98 | 13.41 | 13.87 | 14.86 | MHLNB201412 | ● |
| 1.4 | 0/-0.015 | 0.70 | 0/-0.020 | 4 | 1.1 | 16 | 1.3 | 50 | 2 | 16.70 | 17.26 | 17.84 | 18.46 | 19.80 | MHLNB201416 | ● |
| 1.5 | 0/-0.015 | 0.75 | 0/-0.020 | 4 | 1.2 | 8 | 1.4 | 50 | 2 | 8.43 | 8.70 | 8.98 | 9.27 | 9.91 | MHLNB201508 | ● |
| 1.5 | 0/-0.015 | 0.75 | 0/-0.020 | 4 | 1.2 | 12 | 1.4 | 50 | 2 | 12.57 | 12.97 | 13.41 | 13.86 | 14.85 | MHLNB201512 | ● |
| 1.5 | 0/-0.015 | 0.75 | 0/-0.020 | 4 | 1.2 | 16 | 1.4 | 50 | 2 | 16.70 | 17.25 | 17.84 | 18.45 | 19.78 | MHLNB201516 | ● |
| 1.5 | 0/-0.015 | 0.75 | 0/-0.020 | 4 | 1.2 | 18 | 1.4 | 60 | 2 | 18.77 | 19.39 | 20.05 | 20.75 | 22.25 | MHLNB201518 | ● |
| 1.5 | 0/-0.015 | 0.75 | 0/-0.020 | 6 | 2.4 | 20 | 1.4 | 50 | 2 | 20.84 | 21.53 | 22.26 | 23.04 | 24.72 | MHLNB201520 | ● |
| 1.6 | 0/-0.015 | 0.80 | 0/-0.020 | 4 | 1.3 | 8 | 1.5 | 50 | 2 | 8.43 | 8.69 | 8.97 | 9.27 | 9.90 | MHLNB201608 | ● |
| 1.6 | 0/-0.015 | 0.80 | 0/-0.020 | 4 | 1.3 | 12 | 1.5 | 50 | 2 | 12.56 | 12.97 | 13.40 | 13.86 | 14.84 | MHLNB201612 | ● |
| 1.6 | 0/-0.015 | 0.80 | 0/-0.020 | 4 | 1.3 | 16 | 1.5 | 50 | 2 | 16.70 | 17.25 | 17.83 | 18.45 | 19.77 | MHLNB201616 | ● |
| 1.6 | 0/-0.015 | 0.80 | 0/-0.020 | 4 | 1.3 | 20 | 1.5 | 60 | 2 | 20.83 | 21.53 | 22.26 | 23.03 | - | MHLNB201620 | ● |
| 1.8 | 0/-0.015 | 0.90 | 0/-0.020 | 4 | 1.4 | 8 | 1.7 | 50 | 2 | 8.43 | 8.69 | 8.96 | 9.25 | 9.88 | MHLNB201808 | ● |
| 1.8 | 0/-0.015 | 0.90 | 0/-0.020 | 4 | 1.4 | 12 | 1.7 | 50 | 2 | 12.56 | 12.96 | 13.39 | 13.84 | 14.81 | MHLNB201812 | ● |
| 1.8 | 0/-0.015 | 0.90 | 0/-0.020 | 4 | 1.4 | 16 | 1.7 | 50 | 2 | 16.70 | 17.24 | 17.82 | 18.43 | 19.75 | MHLNB201816 | ● |
| 1.8 | 0/-0.015 | 0.90 | 0/-0.020 | 4 | 1.4 | 20 | 1.7 | 60 | 2 | 20.83 | 21.52 | 22.25 | 23.02 | - | MHLNB201820 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 4 | 1.9 | 50 | 2 | 4.29 | 4.40 | 4.52 | 4.65 | 4.92 | MHLNB202004 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 6 | 1.9 | 50 | 2 | 6.36 | 6.54 | 6.74 | 6.94 | 7.39 | MHLNB202006 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 8 | 1.9 | 50 | 2 | 8.42 | 8.68 | 8.95 | 9.24 | 9.86 | MHLNB202008 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 10 | 1.9 | 50 | 2 | 10.49 | 10.82 | 11.17 | 11.53 | 12.32 | MHLNB202010 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 12 | 1.9 | 50 | 2 | 12.56 | 12.96 | 13.38 | 13.83 | 14.79 | MHLNB202012 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 14 | 1.9 | 50 | 2 | 14.62 | 15.10 | 15.59 | 16.12 | 17.26 | MHLNB202014 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 16 | 1.9 | 50 | 2 | 16.69 | 17.23 | 17.81 | 18.42 | 19.73 | MHLNB202016 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 18 | 1.9 | 60 | 2 | 18.76 | 19.37 | 20.02 | 20.71 | - | MHLNB202018 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 20 | 1.9 | 60 | 2 | 20.83 | 21.51 | 22.24 | 23.00 | - | MHLNB202020 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 22 | 1.9 | 60 | 2 | 22.89 | 23.65 | 24.45 | 25.30 | - | MHLNB202022 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 25 | 1.9 | 75 | 2 | 25.99 | 26.86 | 27.77 | 28.74 | - | MHLNB202025 | ● |
| 2 | 0/-0.015 | 1.00 | 0/-0.020 | 4 | 1.6 | 30 | 1.9 | 75 | 2 | 31.16 | 32.21 | 33.31 | - | - | MHLNB202030 | ● |
| 3 | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 8 | 2.8 | 50 | 2 | 8.60 | 8.84 | 9.10 | 9.37 | 9.96 | MHLNB203008 | ● |
| 3 | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 10 | 2.8 | 50 | 2 | 10.67 | 10.98 | 11.32 | 11.67 | 12.43 | MHLNB203010 | ● |
| 3 | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 12 | 2.8 | 50 | 2 | 12.73 | 13.12 | 13.53 | 13.96 | 14.90 | MHLNB203012 | ● |
| 3 | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 16 | 2.8 | 60 | 2 | 16.87 | 17.40 | 17.96 | 18.55 | 19.83 | MHLNB203016 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

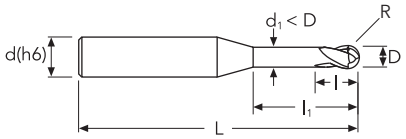
# MHLNB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck, miniature

OSAWA NORM | MH | NMG MH COAT | 30÷70 HRC | 30° | BALL NOSE | Z2 BALL



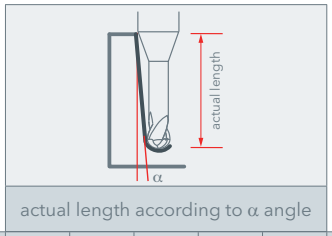





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ☆ suitable

ROUND RIB




actual length according to α angle

| D | D Tol. | R | R Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 20 | 2.8 | 60 | 2 | 21.00 | 21.68 | 22.39 | 23.14 | 24.77 | MHLNB203020 | ● |
| 3 | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 25 | 2.8 | 75 | 2 | 26.17 | 27.02 | 27.93 | 28.88 | - | MHLNB203025 | ● |
| 3 | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 30 | 2.8 | 75 | 2 | 31.34 | 32.37 | 33.46 | 34.62 | - | MHLNB203030 | ● |
| 3 | 0/-0.020 | 1.50 | 0/-0.020 | 6 | 2.4 | 35 | 2.8 | 75 | 2 | 36.51 | 37.72 | 39.00 | 40.35 | - | MHLNB203035 | ● |
| 4 | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 10 | 3.7 | 50 | 2 | 10.84 | 11.15 | 11.47 | 11.81 | 12.54 | MHLNB204010 | ● |
| 4 | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 16 | 3.7 | 60 | 2 | 17.04 | 17.56 | 18.11 | 18.69 | 19.94 | MHLNB204016 | ● |
| 4 | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 20 | 3.7 | 60 | 2 | 21.18 | 21.84 | 22.54 | 23.28 | - | MHLNB204020 | ● |
| 4 | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 25 | 3.7 | 75 | 2 | 26.35 | 27.19 | 28.08 | 29.02 | - | MHLNB204025 | ● |
| 4 | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 30 | 3.7 | 75 | 2 | 31.51 | 32.53 | 33.61 | - | - | MHLNB204030 | ● |
| 4 | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 35 | 3.7 | 75 | 2 | 36.68 | 37.88 | 39.15 | - | - | MHLNB204035 | ● |
| 4 | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 40 | 3.7 | 100 | 2 | 41.85 | 43.23 | - | - | - | MHLNB204040 | ● |
| 4 | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 45 | 3.7 | 100 | 2 | 47.02 | 48.57 | - | - | - | MHLNB204045 | ● |
| 4 | 0/-0.020 | 2.00 | 0/-0.020 | 6 | 3.2 | 50 | 3.7 | 100 | 2 | 52.19 | 53.92 | - | - | - | MHLNB204050 | ● |

● stock standard ○ non-standard stock ∇ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# MHLNB2

| | Material Group ISO 513 | | | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | | | **ap x 0.2D** | **ap x 0.2D** | **ap x 0.2D** | **ap x 0.2D** |
| | Vc (m/min) | | | | **140÷160** | **110÷130** | **80÷100** | **50÷70** |
| | D (mm) | l1 (mm) | ap (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| ROUND RIB | **0.2** | ≤ 6D | 0.01 | 0.09 | 0.008 | 0.007 | 0.006 | 0.006 |
| | | ≤ 8D | 0.01 | 0.08 | 0.007 | 0.006 | 0.005 | 0.005 |
| | | ≤ 10D | 0.01 | 0.07 | 0.006 | 0.005 | 0.004 | 0.004 |
| | **0.3** | ≤ 6D | 0.02 | 0.13 | 0.010 | 0.009 | 0.008 | 0.007 |
| | | ≤ 8D | 0.01 | 0.12 | 0.009 | 0.007 | 0.006 | 0.006 |
| | | ≤ 10D | 0.01 | 0.11 | 0.008 | 0.006 | 0.005 | 0.004 |
| | **0.4** | ≤ 6D | 0.02 | 0.17 | 0.013 | 0.012 | 0.010 | 0.009 |
| | | ≤ 8D | 0.02 | 0.16 | 0.012 | 0.009 | 0.008 | 0.007 |
| | | ≤ 10D | 0.01 | 0.15 | 0.010 | 0.007 | 0.007 | 0.006 |
| | **0.5** | ≤ 6D | 0.03 | 0.22 | 0.017 | 0.015 | 0.014 | 0.012 |
| | | ≤ 8D | 0.02 | 0.20 | 0.015 | 0.012 | 0.011 | 0.010 |
| | | ≤ 10D | 0.02 | 0.18 | 0.014 | 0.010 | 0.009 | 0.008 |
| | **0.6** | ≤ 6D | 0.03 | 0.26 | 0.021 | 0.019 | 0.017 | 0.015 |
| | | ≤ 8D | 0.03 | 0.24 | 0.019 | 0.015 | 0.014 | 0.012 |
| | | ≤ 10D | 0.02 | 0.22 | 0.017 | 0.012 | 0.011 | 0.009 |
| | **0.8** | ≤ 6D | 0.04 | 0.35 | 0.025 | 0.023 | 0.020 | 0.018 |
| | | ≤ 8D | 0.03 | 0.32 | 0.023 | 0.018 | 0.016 | 0.014 |
| | | ≤ 10D | 0.03 | 0.29 | 0.020 | 0.014 | 0.013 | 0.011 |
| | **1** | ≤ 6D | 0.05 | 0.44 | 0.030 | 0.027 | 0.024 | 0.021 |
| | | ≤ 8D | 0.04 | 0.40 | 0.027 | 0.022 | 0.019 | 0.017 |
| | | ≤ 10D | 0.04 | 0.37 | 0.024 | 0.017 | 0.015 | 0.013 |
| | | ≤ 12D | 0.03 | 0.33 | 0.021 | 0.013 | 0.012 | 0.010 |
| | | >12D | 0.02 | 0.30 | 0.018 | 0.010 | 0.009 | 0.008 |
| | **1.2** | ≤ 6D | 0.06 | 0.52 | 0.035 | 0.032 | 0.028 | 0.025 |
| | | ≤ 8D | 0.05 | 0.48 | 0.032 | 0.026 | 0.023 | 0.020 |
| | | ≤ 10D | 0.04 | 0.44 | 0.028 | 0.020 | 0.018 | 0.016 |
| | | ≤ 12D | 0.03 | 0.39 | 0.025 | 0.015 | 0.014 | 0.012 |
| | | >12D | 0.03 | 0.36 | 0.021 | 0.011 | 0.010 | 0.009 |
| | **1.5** | ≤ 6D | 0.08 | 0.65 | 0.045 | 0.041 | 0.036 | 0.032 |
| | | ≤ 8D | 0.06 | 0.61 | 0.041 | 0.033 | 0.029 | 0.026 |
| | | ≤ 10D | 0.05 | 0.55 | 0.036 | 0.026 | 0.023 | 0.020 |
| | | ≤ 12D | 0.04 | 0.49 | 0.032 | 0.020 | 0.018 | 0.015 |
| | | >12D | 0.03 | 0.44 | 0.027 | 0.015 | 0.013 | 0.011 |
| | **2** | ≤ 6D | 0.10 | 0.87 | 0.060 | 0.054 | 0.048 | 0.042 |
| | | ≤ 8D | 0.09 | 0.81 | 0.054 | 0.044 | 0.039 | 0.034 |
| | | ≤ 10D | 0.07 | 0.74 | 0.048 | 0.035 | 0.031 | 0.027 |
| | | ≤ 12D | 0.06 | 0.65 | 0.042 | 0.026 | 0.024 | 0.021 |
| | | >12D | 0.05 | 0.59 | 0.036 | 0.019 | 0.017 | 0.015 |
| | **2.5** | ≤ 6D | 0.13 | 1.09 | 0.060 | 0.054 | 0.048 | 0.042 |
| | | ≤ 8D | 0.11 | 1.01 | 0.054 | 0.044 | 0.039 | 0.034 |
| | | ≤ 10D | 0.09 | 0.92 | 0.048 | 0.035 | 0.031 | 0.027 |
| | | ≤ 12D | 0.07 | 0.82 | 0.042 | 0.026 | 0.024 | 0.021 |
| | | >12D | 0.06 | 0.74 | 0.036 | 0.019 | 0.017 | 0.015 |
| | **3** | ≤ 6D | 0.15 | 1.31 | 0.075 | 0.068 | 0.060 | 0.053 |
| | | ≤ 8D | 0.13 | 1.21 | 0.068 | 0.055 | 0.049 | 0.043 |
| | | ≤ 10D | 0.11 | 1.10 | 0.060 | 0.043 | 0.038 | 0.034 |
| | | ≤ 12D | 0.08 | 0.98 | 0.053 | 0.033 | 0.029 | 0.026 |
| | | >12D | 0.07 | 0.89 | 0.045 | 0.024 | 0.022 | 0.019 |

| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 45° | x 1.65 | x 1.65 |
| 30° | x 1.30 | x 1.30 |
| 15° | x 1.15 | x 1.15 |

CUTTING PARAMETERS

## MHLNB2

| ROUND RIB | Material Group ISO 513 | | | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | | | **ap x 0.2D** | **ap x 0.2D** | **ap x 0.2D** | **ap x 0.2D** |
| | Vc (m/min) | | | | **140÷160** | **110÷130** | **80÷100** | **50÷70** |
| | D (mm) | l1 (mm) | ap (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 4 | ≤ 6D | 0.20 | 1.74 | 0.095 | 0.086 | 0.076 | 0.067 |
| | | ≤ 8D | 0.17 | 1.61 | 0.086 | 0.069 | 0.062 | 0.054 |
| | | ≤ 10D | 0.14 | 1.47 | 0.076 | 0.055 | 0.049 | 0.043 |
| | | ≤ 12D | 0.11 | 1.31 | 0.067 | 0.042 | 0.037 | 0.033 |
| | | >12D | 0.09 | 1.19 | 0.057 | 0.031 | 0.027 | 0.024 |

| α | α | n (rpm) | Vf (mm/min) |
|---|---|---|---|
| | 45° | x 1.65 | x 1.65 |
| | 30° | x 1.30 | x 1.30 |
| | 15° | x 1.15 | x 1.15 |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
**UH/MH**

HSS END-MILLS

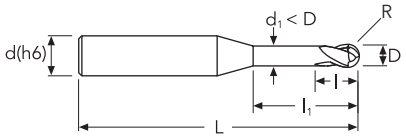
CARBIDE BURRS

# MHCRB2

cylindrical shank, 2 flutes ball nose, extended and reduced neck, miniature, 6 mm. shank

OSAWA NORM | MH | NMG MH COAT | 30÷70 HRC | 30° | BALL NOSE | Z2 BALL

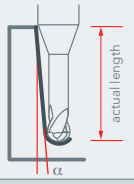





| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | | ★ | | | ★ |

★ 1st choice ★ suitable

ROUND RIB




actual length according to α angle

| D | D Tol. | R | R Tol. | d(h6) | l | l1 | d1 | L | z | 30′ | 1° | 1°30′ | 2° | 3° | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.5** | 0/-0.012 | 0.25 | +/-0.005 | 6 | 0.5 | 2 | 0.45 | 50 | 2 | 2.15 | 2.22 | 2.29 | 2.36 | 2.52 | MHCRB20050206 | ● |
| **0.5** | 0/-0.012 | 0.25 | +/-0.005 | 6 | 0.5 | 4 | 0.45 | 50 | 2 | 4.22 | 4.35 | 4.50 | 4.65 | 4.98 | MHCRB20050406 | ● |
| **0.6** | 0/-0.012 | 0.30 | +/-0.005 | 6 | 0.5 | 2 | 0.55 | 50 | 2 | 2.15 | 2.21 | 2.28 | 2.35 | 2.50 | MHCRB20060206 | ● |
| **0.6** | 0/-0.012 | 0.30 | +/-0.005 | 6 | 0.5 | 4 | 0.55 | 50 | 2 | 4.22 | 4.35 | 4.49 | 4.65 | 4.97 | MHCRB20060406 | ● |
| **0.6** | 0/-0.012 | 0.30 | +/-0.005 | 6 | 0.5 | 6 | 0.55 | 50 | 2 | 6.28 | 6.49 | 6.71 | 6.94 | 7.44 | MHCRB20060606 | ● |
| **0.8** | 0/-0.012 | 0.40 | +/-0.005 | 6 | 0.8 | 2 | 0.75 | 50 | 2 | 2.15 | 2.21 | 2.27 | 2.34 | 2.48 | MHCRB20080206 | ● |
| **0.8** | 0/-0.012 | 0.40 | +/-0.005 | 6 | 0.8 | 4 | 0.75 | 50 | 2 | 4.21 | 4.34 | 4.48 | 4.63 | 4.95 | MHCRB20080406 | ● |
| **0.8** | 0/-0.012 | 0.40 | +/-0.005 | 6 | 0.8 | 6 | 0.75 | 50 | 2 | 6.28 | 6.48 | 6.70 | 6.93 | 7.42 | MHCRB20080606 | ● |
| **1** | 0/-0.012 | 0.50 | +/-0.005 | 6 | 1 | 3 | 0.90 | 50 | 2 | 3.27 | 3.37 | 3.47 | 3.57 | 3.80 | MHCRB20100306 | ● |
| **1** | 0/-0.012 | 0.50 | +/-0.005 | 6 | 1 | 6 | 0.90 | 50 | 2 | 6.37 | 6.58 | 6.79 | 7.02 | 7.50 | MHCRB20100606 | ● |
| **1** | 0/-0.012 | 0.50 | +/-0.005 | 6 | 1 | 8 | 0.90 | 50 | 2 | 8.44 | 8.71 | 9.00 | 9.31 | 9.97 | MHCRB20100806 | ● |
| **1** | 0/-0.012 | 0.50 | +/-0.005 | 6 | 1 | 10 | 0.90 | 50 | 2 | 10.51 | 10.85 | 11.22 | 11.61 | 12.44 | MHCRB20101006 | ● |
| **1.2** | 0/-0.012 | 0.60 | +/-0.005 | 6 | 1.2 | 6 | 1.10 | 50 | 2 | 6.37 | 6.57 | 6.78 | 7.00 | 7.48 | MHCRB20120606 | ● |
| **1.2** | 0/-0.012 | 0.60 | +/-0.005 | 6 | 1.2 | 8 | 1.10 | 50 | 2 | 8.44 | 8.71 | 8.99 | 9.30 | 9.95 | MHCRB20120806 | ● |
| **1.2** | 0/-0.012 | 0.60 | +/-0.005 | 6 | 1.2 | 10 | 1.10 | 50 | 2 | 10.50 | 10.85 | 11.21 | 11.59 | 12.42 | MHCRB20121006 | ● |
| **1.5** | 0/-0.012 | 0.75 | +/-0.005 | 6 | 1.5 | 4 | 1.40 | 50 | 2 | 4.30 | 4.42 | 4.55 | 4.68 | 4.98 | MHCRB20150406 | ● |
| **1.5** | 0/-0.012 | 0.75 | +/-0.005 | 6 | 1.5 | 8 | 1.40 | 50 | 2 | 8.43 | 8.70 | 8.98 | 9.27 | 9.91 | MHCRB20150806 | ● |
| **1.5** | 0/-0.012 | 0.75 | +/-0.005 | 6 | 1.5 | 10 | 1.40 | 50 | 2 | 10.50 | 10.84 | 11.19 | 11.57 | 12.38 | MHCRB20151006 | ● |
| **1.5** | 0/-0.012 | 0.75 | +/-0.005 | 6 | 1.5 | 12 | 1.40 | 50 | 2 | 12.57 | 12.97 | 13.41 | 13.86 | 14.85 | MHCRB20151206 | ● |
| **1.5** | 0/-0.012 | 0.75 | +/-0.005 | 6 | 1.5 | 16 | 1.40 | 50 | 2 | 16.70 | 17.25 | 17.84 | 18.45 | 19.78 | MHCRB20151606 | ● |
| **2** | 0/-0.012 | 1.00 | +/-0.005 | 6 | 3 | 6 | 1.90 | 50 | 2 | 6.36 | 6.54 | 6.74 | 6.94 | 7.39 | MHCRB20200606 | ● |
| **2** | 0/-0.012 | 1.00 | +/-0.005 | 6 | 3 | 8 | 1.90 | 50 | 2 | 8.42 | 8.68 | 8.95 | 9.24 | 9.86 | MHCRB20200806 | ● |
| **2** | 0/-0.012 | 1.00 | +/-0.005 | 6 | 3 | 10 | 1.90 | 50 | 2 | 10.49 | 10.82 | 11.17 | 11.53 | 12.32 | MHCRB20201006 | ● |
| **2** | 0/-0.012 | 1.00 | +/-0.005 | 6 | 3 | 12 | 1.90 | 50 | 2 | 12.56 | 12.96 | 13.38 | 13.83 | 14.79 | MHCRB20201206 | ● |
| **2** | 0/-0.012 | 1.00 | +/-0.005 | 6 | 3 | 16 | 1.90 | 50 | 2 | 16.69 | 17.23 | 17.81 | 18.42 | 19.73 | MHCRB20201606 | ● |
| **2** | 0/-0.012 | 1.00 | +/-0.005 | 6 | 3 | 20 | 1.90 | 50 | 2 | 20.83 | 21.51 | 22.24 | 23.00 | 24.66 | MHCRB20202006 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# MHCRB2

| | Material Group ISO 513 | | | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|---|---|
| | Hardness/Rm | | | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | | | **ap x 0.2D** | **ap x 0.2D** | **ap x 0.2D** | **ap x 0.2D** |
| | Vc (m/min) | | | | **140÷160** | **110÷130** | **80÷100** | **50÷70** |
| | D (mm) | l1 (mm) | ap (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| ROUND RIB | **0.5** | ≤ 6D | 0.03 | 0.22 | 0.020 | 0.018 | 0.016 | 0.014 |
| | | ≤ 8D | 0.02 | 0.20 | 0.018 | 0.015 | 0.013 | 0.011 |
| | | ≤ 10D | 0.02 | 0.18 | 0.016 | 0.012 | 0.010 | 0.009 |
| | **0.6** | ≤ 6D | 0.03 | 0.26 | 0.022 | 0.020 | 0.018 | 0.015 |
| | | ≤ 8D | 0.03 | 0.24 | 0.020 | 0.016 | 0.014 | 0.012 |
| | | ≤ 10D | 0.02 | 0.22 | 0.018 | 0.013 | 0.011 | 0.010 |
| | **0.8** | ≤ 6D | 0.04 | 0.35 | 0.025 | 0.023 | 0.020 | 0.018 |
| | | ≤ 8D | 0.03 | 0.32 | 0.023 | 0.018 | 0.016 | 0.014 |
| | | ≤ 10D | 0.03 | 0.29 | 0.020 | 0.014 | 0.013 | 0.011 |
| | **1** | ≤ 6D | 0.05 | 0.44 | 0.030 | 0.027 | 0.024 | 0.021 |
| | | ≤ 8D | 0.04 | 0.40 | 0.027 | 0.022 | 0.019 | 0.017 |
| | | ≤ 10D | 0.04 | 0.37 | 0.024 | 0.017 | 0.015 | 0.013 |
| | | ≤ 12D | 0.03 | 0.33 | 0.021 | 0.013 | 0.012 | 0.010 |
| | | >12D | 0.02 | 0.30 | 0.018 | 0.010 | 0.009 | 0.008 |
| | **1.2** | ≤ 6D | 0.06 | 0.52 | 0.035 | 0.032 | 0.028 | 0.025 |
| | | ≤ 8D | 0.05 | 0.48 | 0.032 | 0.026 | 0.023 | 0.020 |
| | | ≤ 10D | 0.04 | 0.44 | 0.028 | 0.020 | 0.018 | 0.016 |
| | | ≤ 12D | 0.03 | 0.39 | 0.025 | 0.015 | 0.014 | 0.012 |
| | | >12D | 0.03 | 0.36 | 0.021 | 0.011 | 0.010 | 0.009 |
| | **1.5** | ≤ 6D | 0.08 | 0.65 | 0.045 | 0.041 | 0.036 | 0.032 |
| | | ≤ 8D | 0.06 | 0.61 | 0.041 | 0.033 | 0.029 | 0.026 |
| | | ≤ 10D | 0.05 | 0.55 | 0.036 | 0.026 | 0.023 | 0.020 |
| | | ≤ 12D | 0.04 | 0.49 | 0.032 | 0.020 | 0.018 | 0.015 |
| | | >12D | 0.03 | 0.44 | 0.027 | 0.015 | 0.013 | 0.011 |
| | **2** | ≤ 6D | 0.10 | 0.87 | 0.060 | 0.054 | 0.048 | 0.042 |
| | | ≤ 8D | 0.09 | 0.81 | 0.054 | 0.044 | 0.039 | 0.034 |
| | | ≤ 10D | 0.07 | 0.74 | 0.048 | 0.035 | 0.031 | 0.027 |
| | | ≤ 12D | 0.06 | 0.65 | 0.042 | 0.026 | 0.024 | 0.021 |
| | | >12D | 0.05 | 0.59 | 0.036 | 0.019 | 0.017 | 0.015 |

| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 45° | x 1.65 | x 1.65 |
| 30° | x 1.30 | x 1.30 |
| 15° | x 1.15 | x 1.15 |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
**UH/MH**

HSS END-MILLS

CARBIDE BURRS

# UHCSB2

cylindrical shank, 2 flutes ball nose

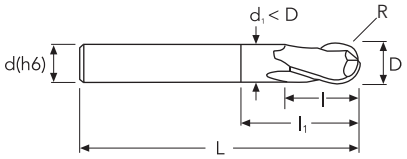
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 30° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.012 | 0.50 | 0/-0.010 | 6 | 1.5 | | 40 | 2 | UHCSB2010 | ● |
| **1.5** | 0/-0.012 | 0.75 | 0/-0.010 | 6 | 2.5 | | 40 | 2 | UHCSB2015 | ● |
| **2** | 0/-0.012 | 1.00 | 0/-0.010 | 6 | 3 | | 40 | 2 | UHCSB2020 | ● |
| **2.5** | 0/-0.012 | 1.25 | 0/-0.010 | 6 | 3 | | 50 | 2 | UHCSB2025 | ● |
| **3** | 0/-0.012 | 1.50 | 0/-0.010 | 6 | 4.5 | | 50 | 2 | UHCSB2030 | ● |
| **4** | 0/-0.012 | 2.00 | 0/-0.010 | 6 | 6 | | 50 | 2 | UHCSB2040 | ● |
| **5** | 0/-0.012 | 2.50 | 0/-0.010 | 6 | 7.5 | | 50 | 2 | UHCSB2050 | ● |
| **6** | 0/-0.015 | 3.00 | 0/-0.010 | 6 | 9 | | 50 | 2 | UHCSB2060 | ● |
| **8** | 0/-0.015 | 4.00 | 0/-0.010 | 8 | 12 | | 50 | 2 | UHCSB2080 | ● |
| **10** | 0/-0.015 | 5.00 | 0/-0.010 | 10 | 15 | | 60 | 2 | UHCSB2100 | ● |
| **12** | 0/-0.015 | 6.00 | 0/-0.010 | 12 | 18 | | 60 | 2 | UHCSB2120 | ● |
| **14** | 0/-0.020 | 7.00 | 0/-0.020 | 14 | 32 | | 90 | 2 | UHCSB2140 | ● |
| **16** | 0/-0.020 | 8.00 | 0/-0.020 | 16 | 32 | | 90 | 2 | UHCSB2160 | ● |
| **18** | 0/-0.020 | 9.00 | 0/-0.020 | 18 | 38 | | 100 | 2 | UHCSB2180 | ● |
| **20** | 0/-0.020 | 10.00 | 0/-0.020 | 20 | 38 | | 100 | 2 | UHCSB2200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# UHCSB2

| | Material Group ISO 513 | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** |
| | Vc (m/min) | | **140÷180** | **100÷140** | **80÷100** | **60÷80** |
| COPYING | D (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.44 | 0.009 | 0.008 | 0.007 | 0.006 |
| | **1.5** | 0.79 | 0.012 | 0.011 | 0.010 | 0.008 |
| | **2** | 1.20 | 0.012 | 0.011 | 0.010 | 0.008 |
| | **2.5** | 1.65 | 0.015 | 0.014 | 0.012 | 0.011 |
| | **3** | 2.14 | 0.018 | 0.016 | 0.014 | 0.013 |
| | **4** | 3.20 | 0.025 | 0.023 | 0.020 | 0.018 |
| | **5** | 4.33 | 0.032 | 0.029 | 0.026 | 0.022 |
| | **6** | 5.50 | 0.038 | 0.034 | 0.030 | 0.027 |
| | **8** | 7.84 | 0.048 | 0.043 | 0.038 | 0.034 |
| | **10** | 10.00 | 0.057 | 0.051 | 0.046 | 0.040 |
| | **12** | 11.76 | 0.067 | 0.060 | 0.054 | 0.047 |
| | **14** | 12.83 | 0.080 | 0.072 | 0.064 | 0.056 |
| | **16** | 12.80 | 0.095 | 0.086 | 0.076 | 0.067 |
| | **18** | 10.80 | 0.108 | 0.097 | 0.086 | 0.076 |
| | **20** | 12.00 | 0.108 | 0.097 | 0.086 | 0.076 |

| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 15° | x 1.1 | x 1.1 |

# UH250

cylindrical shank, 2 flutes ball nose, long reach and reduced neck

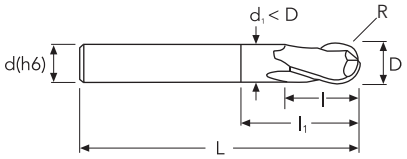
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 30° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.012 | 0.50 | 0/-0.010 | 4 | 1 | 2.2 | 0.95 | 50 | 2 | UH250010 | ● |
| **1.5** | 0/-0.012 | 0.75 | 0/-0.010 | 4 | 1.5 | 3 | 1.45 | 50 | 2 | UH250015 | ● |
| **2** | 0/-0.012 | 1.00 | 0/-0.010 | 6 | 2 | 4 | 1.95 | 50 | 2 | UH250020 | ● |
| **2.5** | 0/-0.020 | 1.25 | 0/-0.015 | 6 | 4 | 10 | 2.40 | 50 | 2 | UH250025 | ● |
| **3** | 0/-0.012 | 1.50 | 0/-0.010 | 6 | 3 | 6 | 2.85 | 60 | 2 | UH250030 | ● |
| **4** | 0/-0.012 | 2.00 | 0/-0.010 | 6 | 4 | 8 | 3.85 | 70 | 2 | UH250040 | ● |
| **5** | 0/-0.012 | 2.50 | 0/-0.010 | 6 | 5 | 10 | 4.85 | 80 | 2 | UH250050 | ● |
| **6** | 0/-0.015 | 3.00 | 0/-0.010 | 6 | 6 | 12 | 5.85 | 90 | 2 | UH250060 | ● |
| **8** | 0/-0.015 | 4.00 | 0/-0.010 | 8 | 8 | 16 | 7.70 | 100 | 2 | UH250080 | ● |
| **10** | 0/-0.015 | 5.00 | 0/-0.010 | 10 | 10 | 20 | 9.70 | 100 | 2 | UH250100 | ● |
| **12** | 0/-0.015 | 6.00 | 0/-0.010 | 12 | 12 | 24 | 11.70 | 110 | 2 | UH250120 | ● |
| **14** | 0/-0.020 | 7.00 | 0/-0.020 | 14 | 32 | 80 | 13.00 | 125 | 2 | UH250140 | ● |
| **16** | 0/-0.020 | 8.00 | 0/-0.020 | 16 | 32 | 80 | 15.00 | 125 | 2 | UH250160 | ● |
| **18** | 0/-0.020 | 9.00 | 0/-0.020 | 18 | 38 | 80 | 17.00 | 125 | 2 | UH250180 | ● |
| **20** | 0/-0.020 | 10.00 | 0/-0.020 | 20 | 38 | 80 | 19.00 | 125 | 2 | UH250200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# UH250

| | Material Group ISO 513 | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** |
| | Vc (m/min) | | **120÷160** | **100÷130** | **70÷90** | **50÷70** |
| | D (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| α 45° | **1** | 0.44 | 0.015 | 0.014 | 0.012 | 0.011 |
| | **2** | 0.87 | 0.021 | 0.019 | 0.017 | 0.015 |
| | **3** | 1.31 | 0.027 | 0.024 | 0.022 | 0.019 |
| | **4** | 1.74 | 0.037 | 0.033 | 0.029 | 0.026 |
| | **5** | 2.18 | 0.045 | 0.041 | 0.036 | 0.032 |
| | **6** | 2.62 | 0.051 | 0.046 | 0.041 | 0.036 |
| | **8** | 3.49 | 0.060 | 0.054 | 0.048 | 0.042 |
| | **10** | 4.36 | 0.068 | 0.061 | 0.054 | 0.048 |
| | **12** | 5.23 | 0.077 | 0.069 | 0.061 | 0.054 |
| | **14** | 6.10 | 0.089 | 0.080 | 0.071 | 0.062 |
| | **16** | 6.97 | 0.102 | 0.092 | 0.082 | 0.071 |
| | **18** | 7.85 | 0.115 | 0.103 | 0.092 | 0.080 |
| | **20** | 8.72 | 0.132 | 0.119 | 0.106 | 0.092 |

| | α | n (rpm) | Vf (mm/min) |
|---|---|---|---|
| ap ae COPYING | 30° | x 0.8 | x 0.8 |
| | 15° | x 0.7 | x 0.7 |
| | 0° | x 0.6 | x 0.6 |

# UH253

cylindrical shank, 2 flutes ball nose, extra-long reach and reduced neck

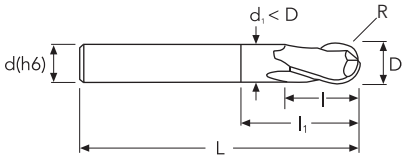
OSAWA NORM | UH | NMG / UH RED | <70 HRC | 30° | BALL NOSE | Z2 BALL



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ☆ | | ☆ | | | ★ |

★ 1st choice ☆ suitable

COPYING




| D | D Tol. | R | R Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0/-0.020 | 0.50 | 0/-0.010 | 6 | 3 | 7 | 0.90 | 75 | 2 | UH25301075 | ● |
| **1** | 0/-0.020 | 0.50 | 0/-0.010 | 6 | 3 | 10 | 0.90 | 100 | 2 | UH253010100 | ● |
| **1.5** | 0/-0.020 | 0.75 | 0/-0.010 | 6 | 3 | 10 | 1.40 | 75 | 2 | UH25301575 | ● |
| **1.5** | 0/-0.020 | 0.75 | 0/-0.010 | 6 | 3 | 15 | 1.40 | 100 | 2 | UH253015100 | ● |
| **2** | 0/-0.020 | 1.00 | 0/-0.010 | 6 | 4 | 14 | 1.90 | 75 | 2 | UH25302075 | ● |
| **2** | 0/-0.020 | 1.00 | 0/-0.010 | 6 | 4 | 20 | 1.90 | 100 | 2 | UH253020100 | ● |
| **2.5** | 0/-0.020 | 1.25 | 0/-0.015 | 6 | 4 | 18 | 2.40 | 75 | 2 | UH25302575 | ● |
| **3** | 0/-0.025 | 1.50 | 0/-0.015 | 6 | 5 | 21 | 2.80 | 75 | 2 | UH25303075 | ● |
| **3** | 0/-0.025 | 1.50 | 0/-0.015 | 6 | 5 | 30 | 2.80 | 100 | 2 | UH253030100 | ● |
| **4** | 0/-0.025 | 2.00 | 0/-0.015 | 6 | 8 | 28 | 3.70 | 75 | 2 | UH25304075 | ● |
| **4** | 0/-0.025 | 2.00 | 0/-0.015 | 6 | 8 | 40 | 3.70 | 100 | 2 | UH253040100 | ● |
| **5** | 0/-0.025 | 2.50 | 0/-0.015 | 6 | 9 | 50 | 4.60 | 100 | 2 | UH253050100 | ● |
| **6** | 0/-0.025 | 3.00 | 0/-0.015 | 6 | 10 | 60 | 5.50 | 100 | 2 | UH253060100 | ● |
| **6** | 0/-0.025 | 3.00 | 0/-0.015 | 6 | 10 | 60 | 5.50 | 150 | 2 | UH253060150 | ● |
| **8** | 0/-0.030 | 4.00 | 0/-0.015 | 8 | 12 | 60 | 7.40 | 100 | 2 | UH253080100 | ● |
| **8** | 0/-0.030 | 4.00 | 0/-0.015 | 8 | 12 | 80 | 7.40 | 150 | 2 | UH253080150 | ● |
| **10** | 0/-0.035 | 5.00 | 0/-0.020 | 10 | 14 | 85 | 9.20 | 125 | 2 | UH253100125 | ● |
| **10** | 0/-0.035 | 5.00 | 0/-0.020 | 10 | 14 | 100 | 9.20 | 150 | 2 | UH253100150 | ● |
| **12** | 0/-0.035 | 6.00 | 0/-0.020 | 12 | 16 | 85 | 11.00 | 125 | 2 | UH253120125 | ● |
| **12** | 0/-0.035 | 6.00 | 0/-0.020 | 12 | 16 | 110 | 11.00 | 150 | 2 | UH253120150 | ● |
| **14** | 0/-0.035 | 7.00 | 0/-0.020 | 14 | 32 | 110 | 13.00 | 150 | 2 | UH253140150 | ● |
| **14** | 0/-0.035 | 7.00 | 0/-0.020 | 14 | 32 | 150 | 13.00 | 200 | 2 | UH253140200 | ● |
| **16** | 0/-0.035 | 8.00 | 0/-0.020 | 16 | 32 | 110 | 15.00 | 150 | 2 | UH253160150 | ● |
| **16** | 0/-0.035 | 8.00 | 0/-0.020 | 16 | 32 | 150 | 15.00 | 200 | 2 | UH253160200 | ● |
| **20** | 0/-0.035 | 10.00 | 0/-0.020 | 20 | 38 | 110 | 19.00 | 150 | 2 | UH253200150 | ● |
| **20** | 0/-0.035 | 10.00 | 0/-0.020 | 20 | 38 | 150 | 19.00 | 200 | 2 | UH253200200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

# UH253

| | Material Group ISO 513 | | P3 P4 P5 K2 K3 | P6 K4 H1 H4 H5 | H2 | H3 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤45 HRC | 45÷55 HRC | 55÷60 HRC | 60÷65 HRC |
| | ap x ae | | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** | **0.05D x 0.2D** |
| | Vc (m/min) | | **110÷150** | **80÷120** | **50÷90** | **40÷60** |
| α 45° | D (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.44 | 0.015 | 0.014 | 0.012 | 0.011 |
| | **2** | 0.87 | 0.021 | 0.019 | 0.017 | 0.015 |
| | **3** | 1.31 | 0.027 | 0.024 | 0.022 | 0.019 |
| | **4** | 1.74 | 0.037 | 0.033 | 0.029 | 0.026 |
| | **5** | 2.18 | 0.045 | 0.041 | 0.036 | 0.032 |
| | **6** | 2.62 | 0.051 | 0.046 | 0.041 | 0.036 |
| | **8** | 3.49 | 0.060 | 0.054 | 0.048 | 0.042 |
| | **10** | 4.36 | 0.068 | 0.061 | 0.054 | 0.048 |
| | **12** | 5.23 | 0.077 | 0.069 | 0.061 | 0.054 |
| | **14** | 6.10 | 0.089 | 0.080 | 0.071 | 0.062 |
| | **16** | 6.97 | 0.102 | 0.092 | 0.082 | 0.071 |
| | **18** | 7.85 | 0.115 | 0.103 | 0.092 | 0.080 |
| | **20** | 8.72 | 0.132 | 0.119 | 0.106 | 0.092 |

| | α | n (rpm) | Vf (mm/min) |
|---|---|---|---|
| ap ae COPYING | 30° | x 0.8 | x 0.8 |
| | 15° | x 0.7 | x 0.7 |
| | 0° | x 0.6 | x 0.6 |

# HSS END MILLS

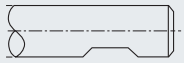



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2 FLUTES . 640
2 FLUTE ALU . 645
3 FLUTES . 647
3 FLUTES 50° HELIX . 651
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T-SLOT . 677
WOODRUFF . 679

Legenda Verzeichnis Légende Leyenda Условные обозначения

| STOCK | | |
|---|---|---|
| ● | stock standard<br>stock standard<br>Standard Lager | stock standard<br>stock estándar<br>складская позиция |
| ○ | non-standard stock<br>stock non standard<br>nicht Standard Lager | stock non standard<br>stock no estándar<br>не складская позиция |
| ▽ | stock exhaustion<br>esaurimento stock<br>Vorraterschöpfung | épuisement du stock<br>agotamiento de stock<br>складские остатки |

| APPLICATION GUIDELINES INDICAZIONI PER L'APPLICAZIONE LEITFADEN ZUR ANWENDUNG<br>INDICATIONS POUR L'APPLICATION INDICACIONES PARA SU APLICACIÓN УКАЗАНИЯ ПО ПРИМЕНЕНИЮ | | |
|---|---|---|
| ★ | 1st choice<br>1° scelta<br>1. Wahl | 1er choix<br>1ª elección<br>1-й выбор |
| ☆ | suitable<br>adatto<br>geeignet | adapté<br>adecuado<br>пригоден |

| SHANK ATTACCO SCHAFT QUEUE MANGO ХВОСТОВИК | | |
|---|---|---|
|  | cylindrical shank<br>attacco cilindrico<br>zylindrischer Schaft | queue cylindrique<br>mango cilíndrico<br>цилиндрическое крепление |
|  | Weldon | |

| MILLING STRATEGY STRATEGIA DI FRESATURA FRÄSSTRATEGIE<br>STRATÉGIES DE FRAISAGE ESTRATEGIA DE FRESADO СТРАТЕГИЯ ФРЕЗЕРОВАНИЯ | | |
|---|---|---|
|  | slotting<br>fresatura di cave<br>Nutfräsen | fraisage de pièce taillée dans la masse<br>fresado de una sola pieza<br>фрезерование пазов |
|  | side milling<br>contornatura<br>Konturfräsen | contournage<br>perfiladura<br>фрезерование по контуру |
|  | copying<br>copiatura<br>Kopieren | copiage<br>copia<br>копирование |
|  | drilling<br>foratura<br>Bohren | perçage<br>perforación<br>сверление |

Legenda Verzeichnis Légende Leyenda Условные обозначения

| MILLING STRATEGY STRATEGIA DI FRESATURA FRÄSSTRATEGIE<br>STRATÉGIES DE FRAISAGE ESTRATEGIA DE FRESADO СТРАТЕГИЯ ФРЕЗЕРОВАНИЯ | | |
|---|---|---|
|  | rounding<br>raggiatura concava<br>Konkavradius | rayon concave<br>redondeo cóncavo<br>кругление |
|  | dovetail A | |
|  | dovetail B | |
|  | T slot<br>cave a T<br>T Nut | rainure en T<br>ranurado en T<br>обработка Т-образного паза |
|  | Woodruff | |

| APPLICATION RANGE GAMMA DI APPLICAZIONE ANWENDUNGSBEREICH<br>GAMME D'APPLICATION RANGO DE APLICACIÓN ОБЛАСТЬ ПРИМЕНЕНИЯ | | |
|---|---|---|
| N | general purpose<br>uso generico<br>allgemeine Anwendung | applications génériques<br>uso genérico<br>общего назначения |
| UM | HSSP high performance<br>HSSP alto rendimento<br>HSSP hochleistung | HSSP haute performance<br>HSSP alto rendimiento<br>Высокопроизводительная быстрорежущая сталь |
| ALU | for aluminium<br>per alluminio<br>für Aluminium | pour aluminium<br>para aluminio<br>для алюминия |

| TYPE TIPO TYP TYPE TIPO ТИП | | |
|---|---|---|
|  | sharp corner<br>spigolo vivo<br>scharfe Kante | arête vive<br>arista viva<br>острая кромка |
|  | ball nose<br>raggiata<br>runder Stirn | bout hémisphérique<br>fresa de bola<br>сферическая |

Legenda Verzeichnis Légende Leyenda Условные обозначения

| NR. OF FLUTES · N. DI TAGLIENTI · ANZAHL DER SCHNEIDEN · NOMBRE DE DENTS · N. DE LABIOS · КОЛИЧЕСТВО РЕЖУЩИХ КРОМОК | | |
|---|---|---|
|  | 2 flutes<br>2 taglienti<br>2 Schneiden | 2 arêtes de coupe<br>2 filos<br>2 зуба |
|  | 3 flutes<br>3 taglienti<br>3 Schneiden | 3 arêtes de coupe<br>3 filos<br>3 зуба |
|  | 4 flutes<br>4 taglienti<br>4 Schneiden | 4 arêtes de coupe<br>4 filos<br>4 зуба |
|  | 6 flutes<br>6 taglienti<br>6 Schneiden | 6 arêtes de coupe<br>6 filos<br>6 зубьев |
|  | >6 flutes<br>>6 taglienti<br>>6 Schneiden | >6 arêtes de coupe<br>>6 filos<br>>6 зубьев |

| CHIPBREAKER STYLE · TIPO DI ROMPITRUCIOLO · SPÄNEBRECHER TYP · TYPE DE BRISE-COPEAUX · TIPO DE ROMPEVIRUTAS · ТИП СТРУЖКОЛОМА | | |
|---|---|---|
|  | roughing coarse pitch<br>sgrossare passo grosso<br>Schruppfräser Regelgewinde | ébauche pas gros<br>desbaste paso grueso<br>черновая с крупным шагом |
|  | roughing fine pitch<br>sgrossare passo fine<br>Schruppfräser Feingewinde | ébauche pas fin<br>desbaste paso fino<br>черновая с мелким шагом |

| MATERIAL · MATERIALE · WERKSTOFF · MATIÈRE · MATERIAL · МАТЕРИАЛ | | |
|---|---|---|
|  | high speed steel 5%÷8% Co<br>acciaio super rapido 5%÷8% Co<br>Hochleistungsschnellschnittstahl 5%÷8% Co | acier rapide 5%÷8% Co<br>acero súper rápido 5%÷8% Co<br>быстрорежущая сталь с кобальтом 5÷8% |
|  | powder steel<br>acciaio sinterizzato<br>Sinterstahl | acier fritté<br>acero sinterizado<br>порошковая сталь |

| SURFACE TREATMENT · TRATTAMENTO SUPERFICIALE · OBERFLÄCHENBEHANDLUNG · TRAITMENT DE SURFACE · TRATAMIENTO SUPERFICIAL · ОБРАБОТКА ПОВЕРХНОСТИ | | |
|---|---|---|
|  | uncoated<br>non rivestito<br>unbeschichtet | non revêtu<br>no revestido<br>без покрытия |

Legenda Verzeichnis Légende Leyenda Условные обозначения

| COATINGS RIVESTIMENTI BESCHICHTUNGEN REVÊTEMENTS RECUBRIMIENTOS ПОКРЫТИЕ | | |
|---|---|---|
| | | PV200 |
| hardness (HV)<br>durezza (HV)<br>Härte (HV) | dureté (HV)<br>dureza (HV)<br>твёрдость (HV) | 3300 |
| friction coefficient<br>coefficiente d'attrito<br>Reibungskoeffizient | coefficent de frottement<br>coeficiente de rozamiento<br>коэффициент трения | 0.3 |
| thickness (µ)<br>spessore (µ)<br>dicke (µ) | epaisseur (µ)<br>espesor (µ)<br>толщина (мкм) | 3 |
| max working temperature (°C)<br>temperatura max (°C)<br>hochste Temperatur (°C) | température maximale (°C)<br>temperatura máx (°C)<br>макс. температура (°C) | 950 |

| | ITEM No. | PAGE | |
|---|---|---|---|
| HSS/Co - HSSP general purpose, square | **WS2** | 640 |  |
| | **TAWS2** | 640 |  |
| | **UMWS2** | 640 |  |
| | **WL2** | 643 |  |
| | **TAWL2** | 643 |  |
| | **WSA2** | 645 |  |
| | **WS3** | 647 |  |
| | **TAWS3** | 647 |  |
| | **WL3** | 649 |  |
| | **TAWL3** | 649 |  |
| | **TAWSH3** | 651 |  |
| | **WS4(6)** | 653 |  |
| | **TAWS4(6)** | 653 |  |
| | **UMWS4** | 653 |  |
| | **WL4(6)** | 655 |  |
| | **TAWL4(6)** | 655 |  |
| HSS/Co - HSSP general purpose, roughing | **TAWSR** | 657 |  |
| | **WSFR** | 659 |  |
| | **TAWSFR** | 659 |  |
| | **UMWSFR** | 659 |  |
| | **WLFR** | 661 |  |
| | **TAWLFR** | 661 |  |
| HSS/Co general purpose, ball nose | **WSB2** | 663 |  |
| | **TAWSB2** | 663 |  |
| | **WLB2** | 665 |  |
| | **TAWLB2** | 665 |  |

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| RANGE | NORM | TYPE | MATERIAL / COATING | HELIX ANGLE | GEOMETRY | Z | ISO P | ISO M | ISO K | ISO N | ISO S | ISO H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-30 | DIN 327 | N | HSS/Co BR | 30° | SQUARE | 2 | ★ | ☆ | ★ | ☆ | | |
| 1-25 | DIN 327 | N | HSS/Co PV200 | 30° | SQUARE | 2 | ★ | ☆ | ★ | ☆ | | |
| 2-20 | DIN 327 | UM | HSSP PV200 | 30° | SQUARE | 2 | ★ | ★ | ★ | | | |
| 3-30 | DIN 844 | N | HSS/Co BR | 30° | SQUARE | 2 | ★ | ☆ | ★ | ☆ | | |
| 3-20 | DIN 844 | N | HSS/Co PV200 | 30° | SQUARE | 2 | ★ | ☆ | ★ | ☆ | | |
| 2-20 | DIN 844 | ALU | HSS/Co BR | 42° | SQUARE | 2 | | | | ★ | | |
| 1-32 | DIN 844 | N | HSS/Co BR | 30° | SQUARE | 3 | ★ | ☆ | ★ | ☆ | | |
| 1-25 | DIN 844 | N | HSS/Co PV200 | 30° | SQUARE | 3 | ★ | ☆ | ★ | ☆ | | |
| 3-25 | DIN 844 | N | HSS/Co BR | 30° | SQUARE | 3 | ★ | ☆ | ★ | ☆ | | |
| 3-20 | DIN 844 | N | HSS/Co PV200 | 30° | SQUARE | 3 | ★ | ☆ | ★ | ☆ | | |
| 6-20 | DIN 844 | N | HSS/Co PV200 | 45° | SQUARE | 3 | ★ | ☆ | ★ | ☆ | | |
| 2-30 | DIN 844 | N | HSS/Co BR | 30° | SQUARE | 4-6 | ★ | ☆ | ★ | ☆ | | |
| 2-40 | DIN 844 | N | HSS/Co PV200 | 30° | SQUARE | 4-6 | ★ | ☆ | ★ | ☆ | | |
| 3-20 | DIN 844 | UM | HSSP PV200 | 30° | SQUARE | 4 | ★ | ★ | ★ | | | |
| 3-25 | DIN 844 | N | HSS/Co BR | 30° | SQUARE | 4-6 | ★ | ☆ | ★ | ☆ | | |
| 3-40 | DIN 844 | N | HSS/Co PV200 | 30° | SQUARE | 4-6 | ★ | ☆ | ★ | ☆ | | |
| 6-20 | DIN 844 | N - NR | HSS/Co PV200 | 30° | SQUARE | 3-4 | ★ | ☆ | ★ | ☆ | | |
| 6-20 | DIN 844 | N - HR | HSS/Co BR | 30° | SQUARE | 3-4 | ★ | ☆ | ★ | ☆ | | |
| 6-40 | DIN 844 | N - HR | HSS/Co PV200 | 30° | SQUARE | 3-6 | ★ | ☆ | ★ | ☆ | | |
| 6-20 | DIN 844 | UM - HR | HSSP PV200 | 30° | SQUARE | 3-4 | ★ | ★ | ★ | | | |
| 6-20 | DIN 844 | N - HR | HSS/Co BR | 30° | SQUARE | 3-4 | ★ | ☆ | ★ | ☆ | | |
| 6-40 | DIN 844 | N - HR | HSS/Co PV200 | 30° | SQUARE | 3-6 | ★ | ☆ | ★ | ☆ | | |
| 2-30 | DIN 327 | N | HSS/Co BR | 30° | BALL NOSE | 2 | ★ | ☆ | ★ | ☆ | | |
| 2-20 | DIN 327 | N | HSS/Co PV200 | 30° | BALL NOSE | 2 | ★ | ☆ | ★ | ☆ | | |
| 3-20 | DIN 1889 | N | HSS/Co BR | 30° | BALL NOSE | 2 | ★ | ☆ | ★ | ☆ | | |
| 3-20 | DIN 1889 | N | HSS/Co PV200 | 30° | BALL NOSE | 2 | ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

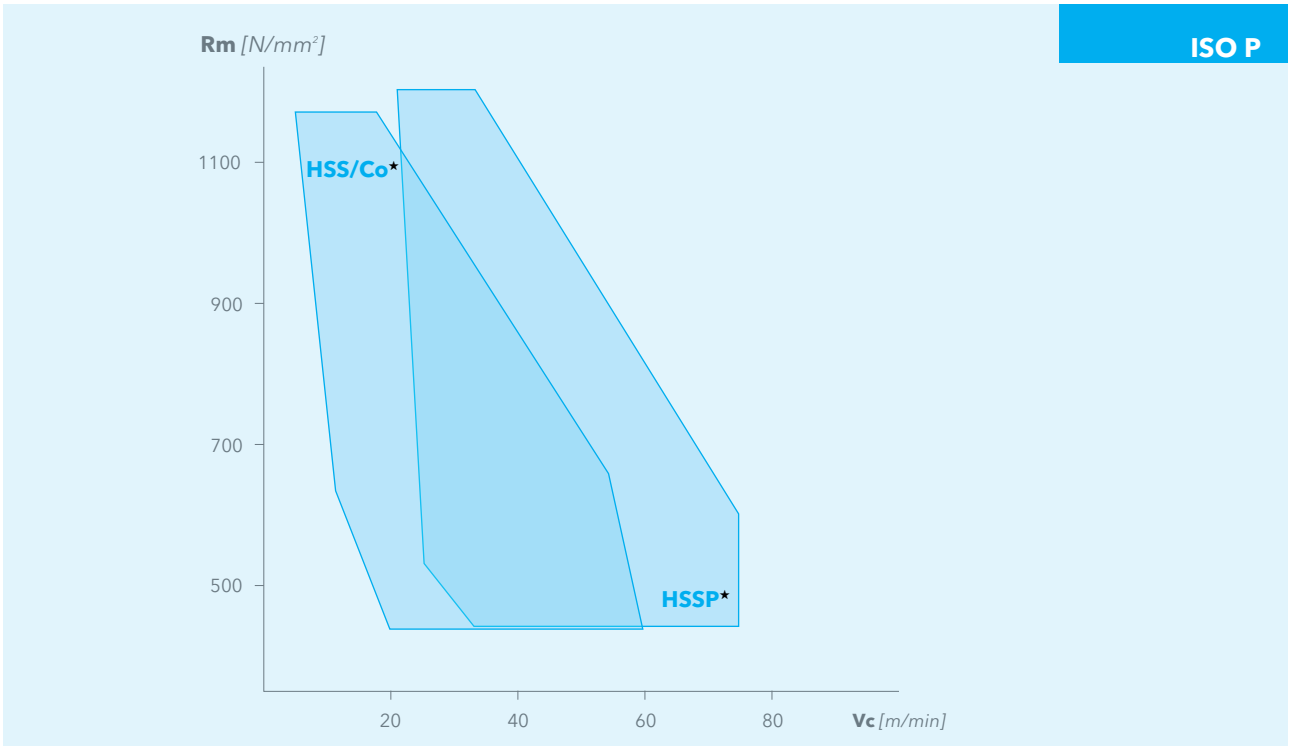
| | ITEM No. | PAGE | |
|---|---|---|---|
| HSS/Co general purpose, shell | **FM** | 667 |  |
| | **TAFM** | 667 |  |
| | **FFR** | 669 |  |
| HSS/Co general purpose, shell | **TAFFR** | 669 |  |
| HSS/Co general purpose, corner rounding | **WCR** | 671 |  |
| HSS/Co general purpose, dovetail | **WDC** | 673 |  |
| | **WDD** | 675 |  |
| HSS/Co general purpose, T-slot | **WTM** | 677 |  |
| HSS/Co general purpose, woodruff | **WWK** | 679 |  |

Indice grafico Auswahlhilfe Indice graphique Índice gráfico Руководство по выбору

| RANGE | NORM | TYPE | MATERIAL / COATING | HELIX ANGLE | GEOMETRY | Z | ISO P | ISO M | ISO K | ISO N | ISO S | ISO H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40-100 | DIN 1880 | N | HSS/Co BR | 30° | SQUARE | 8-10 | ★ | ☆ | ★ | ☆ | | |
| 40-100 | DIN 1880 | N | HSS/Co PV200 | 30° | SQUARE | 8-10 | ★ | ☆ | ★ | ☆ | | |
| 40-100 | DIN 1880 | N - HR | HSS/Co BR | 30° | SQUARE | 6-10 | ★ | ☆ | ★ | ☆ | | |
| 40-100 | DIN 1880 | N - HR | HSS/Co PV200 | 30° | SQUARE | 6-10 | ★ | ☆ | ★ | ☆ | | |
| R1-R11 | DIN 6518 | N | HSS/Co BR | 0° | RADIUS | 4 | ★ | ☆ | ★ | ☆ | | |
| 16-38 | DIN 1833 | N | HSS/Co BR | 45°-60° | SQUARE | 6-12 | ★ | ☆ | ★ | ☆ | | |
| 16-38 | DIN 1833 | N | HSS/Co BR | 45°-60° | SQUARE | 6-12 | ★ | ☆ | ★ | ☆ | | |
| 12.5-36 | DIN 851 | N | HSS/Co BR | 15° | SQUARE | 6-8 | ★ | ☆ | ★ | ☆ | | |
| 10.5-32.5 | DIN850 | N | HSS/Co BR | 10° | SQUARE | 8-12 | ★ | ☆ | ★ | ☆ | | |

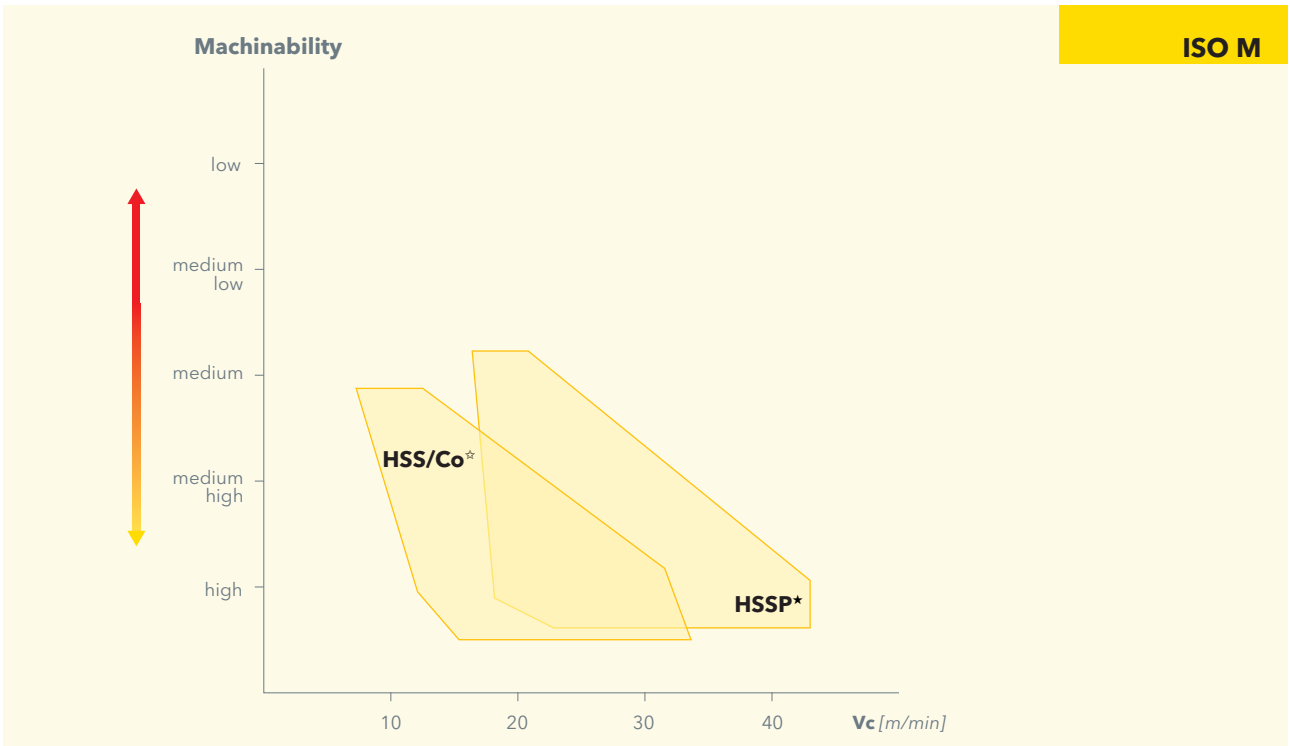
★ 1st choice ☆ suitable

## STEEL APPLICATION




★ 1st choice ☆ suitable

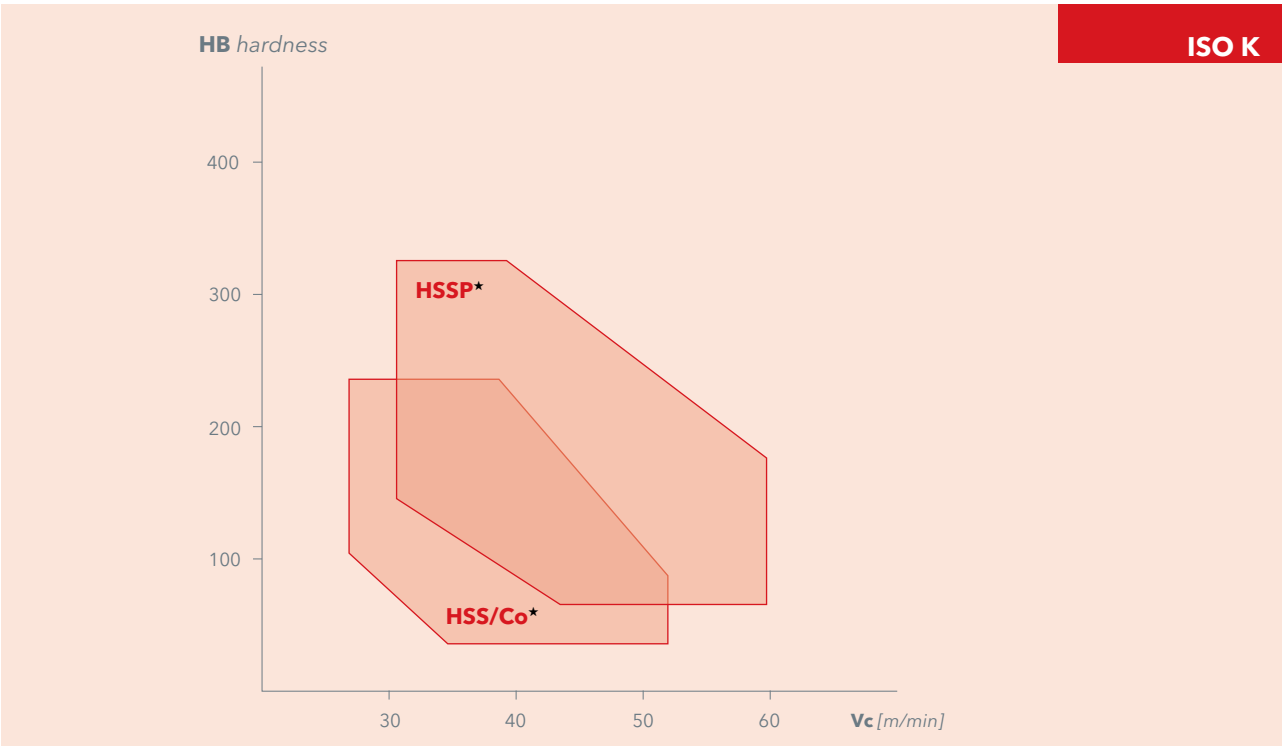
## STAINLESS STEEL APPLICATION




★ 1st choice ☆ suitable

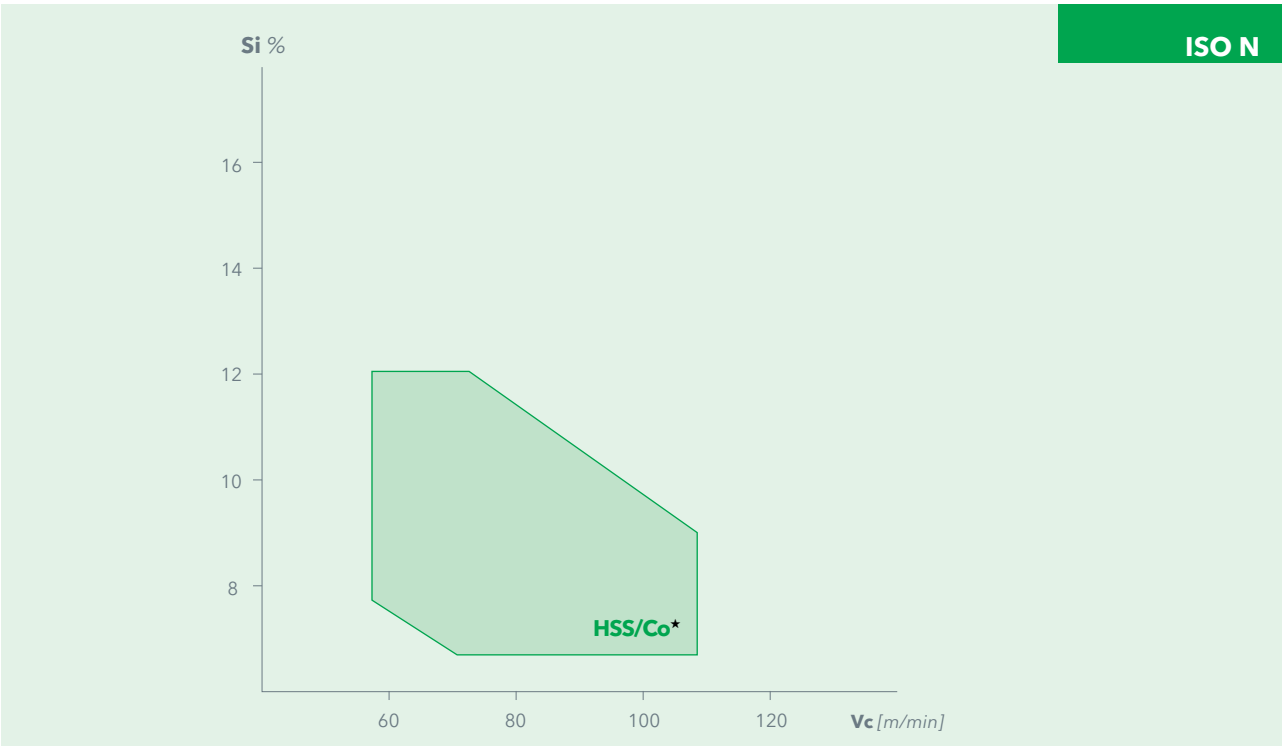
HSS/Co : general purpose (page 640)
HSSP : high performance (page 640)

## CAST IRON APPLICATION




★ 1st choice ☆ suitable

## NON-FERROUS MATERIALS APPLICATION




★ 1st choice ☆ suitable

HSS/Co : general purpose (page 640)
HSSP : high performance (page 640)




INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
**UH/MH**

HSS END-MILLS

CARBIDE BURRS


# HSS/CO - HSSP

## GENERAL PURPOSE

The Osawa catalogue includes a wide range of HSS/Co - HSSP end mills, both coated and uncoated.

Il catalogo Osawa include un'ampia scelta di frese in HSS/Co - HSSP nudo e rivestito.

Der Osawa Katalog umfasst eine große Auswahl an beschichteten und unbeschichteten Fräsern aus HSS/Co - HSSP.

Le catalogue Osawa inclut une large gamme de fraises en HSS/Co - HSSP, soit revêtues, soit non revêtues.

El catálogo Osawa incluye una amplia variedad de fresas de HSS/Co - HSSP con o sin recubrimiento.

В каталоге Osawa также представлена широкая гамма концевых фрез изготовленных из HSS/Co - HSSP с покрытием и без покрытия.

# WS2-TAWS2-UMWS2

weldon shank, 2 flutes

DIN 327 | 30° | SQUARE | Z2



WS2 — N — HSS/Co / BR



TAWS2 — N — HSS/Co / PV200



UMWS2 — UM — HSS-P / PV200

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |
| ★ | ★ | ★ | | | |

WS2-TAWS2
UMWS2

SLOTTING | SIDE MILLING | DRILLING

★ 1st choice ☆ suitable




| | | | | | | | WS2 | | TAWS2 | | UMWS2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D(e8) | D Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock | EDP No. | Stock | EDP No. | Stock |
| **1** | -0.014/-0.028 | 6 | 2.5 | | 47 | 2 | WS2010 | ● | TAWS2010 | ● | | |
| **1.5** | -0.014/-0.028 | 6 | 3 | | 47 | 2 | WS2015 | ● | TAWS2015 | ● | | |
| **2** | -0.014/-0.028 | 6 | 4 | | 48 | 2 | WS2020 | ● | TAWS2020 | ● | UMWS2020 | ● |
| **2.5** | -0.014/-0.028 | 6 | 5 | | 49 | 2 | WS2025 | ● | TAWS2025 | ● | | |
| **3** | -0.014/-0.028 | 6 | 5 | | 49 | 2 | WS2030 | ● | TAWS2030 | ● | UMWS2030 | ● |
| **3.5** | -0.020/-0.038 | 6 | 6 | | 50 | 2 | WS2035 | ● | TAWS2035 | ● | | |
| **4** | -0.020/-0.038 | 6 | 7 | | 51 | 2 | WS2040 | ● | TAWS2040 | ● | UMWS2040 | ● |
| **4.5** | -0.020/-0.038 | 6 | 7 | | 51 | 2 | WS2045 | ● | TAWS2045 | ● | | |
| **5** | -0.020/-0.038 | 6 | 8 | | 52 | 2 | WS2050 | ● | TAWS2050 | ● | UMWS2050 | ● |
| **5.5** | -0.020/-0.038 | 6 | 8 | | 52 | 2 | WS2055 | ● | TAWS2055 | ● | | |
| **6** | -0.020/-0.038 | 6 | 8 | | 52 | 2 | WS2060 | ● | TAWS2060 | ● | UMWS2060 | ● |
| **6.5** | -0.025/-0.047 | 10 | 10 | | 60 | 2 | WS2065 | ● | TAWS2065 | ● | | |
| **7** | -0.025/-0.047 | 10 | 10 | | 60 | 2 | WS2070 | ● | TAWS2070 | ● | | |
| **7.5** | -0.025/-0.047 | 10 | 10 | | 60 | 2 | WS2075 | ● | TAWS2075 | ● | | |
| **8** | -0.025/-0.047 | 10 | 11 | | 61 | 2 | WS2080 | ● | TAWS2080 | ● | UMWS2080 | ● |
| **8.5** | -0.025/-0.047 | 10 | 11 | | 61 | 2 | WS2085 | ● | TAWS2085 | ● | | |
| **9** | -0.025/-0.047 | 10 | 11 | | 61 | 2 | WS2090 | ● | TAWS2090 | ● | | |
| **9.5** | -0.025/-0.047 | 10 | 11 | | 61 | 2 | WS2095 | ● | TAWS2095 | ● | | |
| **10** | -0.025/-0.047 | 10 | 13 | | 63 | 2 | WS2100 | ● | TAWS2100 | ● | UMWS2100 | ● |
| **10.5** | -0.032/-0.059 | 12 | 13 | | 70 | 2 | WS2105 | ● | TAWS2105 | ● | | |
| **11** | -0.032/-0.059 | 12 | 13 | | 70 | 2 | WS2110 | ● | TAWS2110 | ● | | |
| **11.5** | -0.032/-0.059 | 12 | 13 | | 70 | 2 | WS2115 | ● | TAWS2115 | ● | | |
| **12** | -0.032/-0.059 | 12 | 16 | | 73 | 2 | WS2120 | ● | TAWS2120 | ● | UMWS2120 | ● |
| **12.5** | -0.032/-0.059 | 12 | 16 | | 73 | 2 | WS2125 | ● | TAWS2125 | ● | | |
| **13** | -0.032/-0.059 | 12 | 16 | | 73 | 2 | WS2130 | ● | TAWS2130 | ● | | |
| **13.5** | -0.032/-0.059 | 12 | 16 | | 73 | 2 | WS2135 | ● | TAWS2135 | ● | | |
| **14** | -0.032/-0.059 | 12 | 16 | | 73 | 2 | WS2140 | ● | TAWS2140 | ● | UMWS2140 | ● |
| **15** | -0.032/-0.059 | 12 | 16 | | 73 | 2 | WS2150 | ● | TAWS2150 | ● | | |
| **16** | -0.032/-0.059 | 16 | 19 | | 79 | 2 | WS2160 | ● | TAWS2160 | ● | UMWS2160 | ● |
| **17** | -0.032/-0.059 | 16 | 19 | | 79 | 2 | WS2170 | ● | TAWS2170 | ● | | |
| **18** | -0.032/-0.059 | 16 | 19 | | 79 | 2 | WS2180 | ● | TAWS2180 | ● | UMWS2180 | ● |
| **19** | -0.040/-0.073 | 16 | 19 | | 79 | 2 | WS2190 | ● | TAWS2190 | ● | | |
| **20** | -0.040/-0.073 | 20 | 22 | | 88 | 2 | WS2200 | ● | TAWS2200 | ● | UMWS2200 | ● |
| **22** | -0.040/-0.073 | 20 | 22 | | 88 | 2 | WS2220 | ● | TAWS2220 | ● | | |
| **24** | -0.040/-0.073 | 25 | 26 | | 102 | 2 | WS2240 | ● | | | | |
| **25** | -0.040/-0.073 | 25 | 26 | | 102 | 2 | WS2250 | ● | TAWS2250 | ● | | |
| **26** | -0.040/-0.073 | 25 | 26 | | 102 | 2 | WS2260 | ● | | | | |
| **28** | -0.040/-0.073 | 25 | 26 | | 102 | 2 | WS2280 | ● | | | | |
| **30** | -0.040/-0.073 | 25 | 26 | | 102 | 2 | WS2300 | ● | | | | |

● stock standard ○ non-standard stock ▽ stock exhaustion

# TAWS2

**UMWS2 (Vc = +20%) - WS2 (Vc = -20% ÷ -30%)**

| | Material Group ISO 513 | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **40÷60** | **30÷50** | **25÷35** | **15÷25** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.003 | 0.003 | 0.002 | 0.002 |
| | **2** | 0.006 | 0.005 | 0.005 | 0.004 |
| | **3** | 0.009 | 0.008 | 0.007 | 0.006 |
| | **4** | 0.013 | 0.012 | 0.010 | 0.009 |
| | **5** | 0.017 | 0.015 | 0.013 | 0.012 |
| | **6** | 0.022 | 0.020 | 0.017 | 0.015 |
| | **8** | 0.032 | 0.029 | 0.024 | 0.022 |
| | **10** | 0.040 | 0.036 | 0.030 | 0.028 |
| | **12** | 0.048 | 0.043 | 0.036 | 0.034 |
| | **14** | 0.057 | 0.051 | 0.043 | 0.040 |
| | **16** | 0.067 | 0.060 | 0.050 | 0.047 |
| | **18** | 0.077 | 0.069 | 0.058 | 0.054 |
| | **20** | 0.088 | 0.079 | 0.066 | 0.062 |
| | **22** | 0.098 | 0.088 | 0.074 | 0.069 |
| | **24** | 0.105 | 0.095 | 0.079 | 0.074 |
| | **25** | 0.110 | 0.099 | 0.083 | 0.077 |
| | **26** | 0.116 | 0.104 | 0.087 | 0.081 |
| | **28** | 0.122 | 0.110 | 0.092 | 0.085 |
| | **30** | 0.128 | 0.115 | 0.096 | 0.090 |
| **ap x ae** | **≤ D3** | 0.25D x D | | | |

| | Material Group ISO 513 | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.3D** | **1.5D x 0.3D** |
| | Vc (m/min) | **50÷70** | **40÷60** | **30÷40** | **20÷30** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.003 | 0.003 | 0.003 | 0.003 |
| | **2** | 0.007 | 0.006 | 0.006 | 0.004 |
| | **3** | 0.007 | 0.006 | 0.006 | 0.005 |
| | **4** | 0.011 | 0.010 | 0.009 | 0.008 |
| | **5** | 0.016 | 0.014 | 0.012 | 0.011 |
| | **6** | 0.020 | 0.018 | 0.016 | 0.014 |
| | **8** | 0.026 | 0.024 | 0.021 | 0.018 |
| | **10** | 0.038 | 0.035 | 0.031 | 0.027 |
| | **12** | 0.048 | 0.043 | 0.038 | 0.034 |
| | **14** | 0.058 | 0.052 | 0.046 | 0.040 |
| | **16** | 0.068 | 0.062 | 0.055 | 0.048 |
| | **18** | 0.080 | 0.072 | 0.064 | 0.056 |
| | **20** | 0.092 | 0.083 | 0.074 | 0.065 |
| | **22** | 0.106 | 0.095 | 0.084 | 0.074 |
| | **24** | 0.118 | 0.106 | 0.094 | 0.082 |
| | **25** | 0.126 | 0.113 | 0.101 | 0.088 |
| | **26** | 0.132 | 0.119 | 0.106 | 0.092 |
| | **28** | 0.139 | 0.125 | 0.111 | 0.097 |
| | **30** | 0.146 | 0.132 | 0.117 | 0.102 |
| **ap x ae** | **≤ D3** | 1.5D x 0.25D | 1.5D x 0.25D | 1.2D x 0.1D | 1.2D x 0.1D |

CUTTING PARAMETERS

# TAWS2

**UMWS2 (Vc= +20%) - WS2 (Vc = -20% ÷ -30%)**

| | Material Group ISO 513 | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.5D x D** |
| | Vc (m/min) | **30÷50** | **25÷35** | **20÷30** | **12÷18** |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.005 | 0.003 | 0.002 | 0.002 |
| | **4** | 0.007 | 0.004 | 0.003 | 0.003 |
| | **5** | 0.009 | 0.006 | 0.005 | 0.005 |
| | **6** | 0.011 | 0.008 | 0.006 | 0.006 |
| | **8** | 0.016 | 0.010 | 0.008 | 0.008 |
| | **10** | 0.020 | 0.014 | 0.012 | 0.011 |
| | **12** | 0.024 | 0.018 | 0.015 | 0.014 |
| | **14** | 0.029 | 0.022 | 0.018 | 0.017 |
| | **16** | 0.034 | 0.026 | 0.021 | 0.020 |
| | **18** | 0.039 | 0.030 | 0.025 | 0.023 |
| | **20** | 0.044 | 0.035 | 0.029 | 0.027 |
| | **22** | 0.049 | 0.040 | 0.033 | 0.031 |
| | **24** | 0.053 | 0.044 | 0.037 | 0.034 |
| | **25** | 0.055 | 0.047 | 0.039 | 0.037 |
| | **26** | 0.058 | 0.050 | 0.041 | 0.039 |
| | **28** | 0.061 | 0.052 | 0.044 | 0.041 |
| | **30** | 0.064 | 0.055 | 0.046 | 0.043 |

# WL2-TAWL2

weldon shank, 2 flutes, long

DIN 844 | N | HSS/Co BR | HSS/Co PV200 | 30° | SQUARE | Z2

WL2 TAWL2



WL2

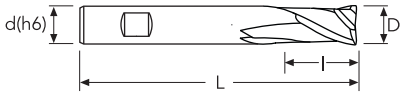


TAWL2

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| | | | | | | | WL2 | | TAWL2 | |
|---|---|---|---|---|---|---|---|---|---|---|
| D(e8) | D Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock | EDP No. | Stock |
| **3** | -0.014/-0.028 | 6 | 8 | | 56 | 2 | WL2030 | ● | TAWL2030 | ● |
| **4** | -0.020/-0.038 | 6 | 11 | | 63 | 2 | WL2040 | ● | TAWL2040 | ● |
| **5** | -0.020/-0.038 | 6 | 13 | | 68 | 2 | WL2050 | ● | TAWL2050 | ● |
| **6** | -0.020/-0.038 | 6 | 13 | | 68 | 2 | WL2060 | ● | TAWL2060 | ● |
| **7** | -0.025/-0.047 | 10 | 16 | | 80 | 2 | WL2070 | ● | | |
| **8** | -0.025/-0.047 | 10 | 19 | | 88 | 2 | WL2080 | ● | TAWL2080 | ● |
| **9** | -0.025/-0.047 | 10 | 19 | | 88 | 2 | WL2090 | ● | | |
| **10** | -0.025/-0.047 | 10 | 22 | | 95 | 2 | WL2100 | ● | TAWL2100 | ● |
| **11** | -0.032/-0.059 | 12 | 22 | | 102 | 2 | WL2110 | ● | | |
| **12** | -0.032/-0.059 | 12 | 26 | | 110 | 2 | WL2120 | ● | TAWL2120 | ● |
| **13** | -0.032/-0.059 | 12 | 26 | | 110 | 2 | WL2130 | ● | | |
| **14** | -0.032/-0.059 | 12 | 26 | | 110 | 2 | WL2140 | ● | TAWL2140 | ● |
| **15** | -0.032/-0.059 | 12 | 26 | | 110 | 2 | WL2150 | ● | | |
| **16** | -0.032/-0.059 | 16 | 32 | | 123 | 2 | WL2160 | ● | TAWL2160 | ● |
| **18** | -0.032/-0.059 | 16 | 32 | | 123 | 2 | WL2180 | ● | TAWL2180 | ● |
| **20** | -0.040/-0.073 | 20 | 38 | | 141 | 2 | WL2200 | ● | TAWL2200 | ● |
| **22** | -0.040/-0.073 | 20 | 38 | | 141 | 2 | WL2220 | ● | | |
| **24** | -0.040/-0.073 | 25 | 45 | | 166 | 2 | WL2240 | ○ | | |
| **25** | -0.040/-0.073 | 25 | 45 | | 166 | 2 | WL2250 | ● | | |
| **28** | -0.040/-0.073 | 25 | 45 | | 166 | 2 | WL2280 | ● | | |
| **30** | -0.040/-0.073 | 25 | 45 | | 166 | 2 | WL2300 | ● | | |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# TAWL2

**WL2 (Vc = -20% ÷ -30%)**

| | Material Group ISO 513 | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | **0.3D x D** | **0.3D x D** | **0.3D x D** | **0.3D x D** |
| | Vc (m/min) | **30÷50** | **25÷35** | **20÷30** | **12÷18** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.006 | 0.005 | 0.005 | 0.004 |
| | **4** | 0.008 | 0.007 | 0.007 | 0.006 |
| | **5** | 0.011 | 0.010 | 0.009 | 0.008 |
| | **6** | 0.014 | 0.012 | 0.011 | 0.010 |
| | **8** | 0.020 | 0.018 | 0.016 | 0.015 |
| | **10** | 0.025 | 0.023 | 0.020 | 0.019 |
| | **12** | 0.030 | 0.027 | 0.024 | 0.023 |
| | **14** | 0.036 | 0.032 | 0.029 | 0.027 |
| | **16** | 0.042 | 0.038 | 0.034 | 0.032 |
| | **18** | 0.048 | 0.043 | 0.038 | 0.036 |
| | **20** | 0.053 | 0.048 | 0.043 | 0.040 |
| | **22** | 0.060 | 0.054 | 0.048 | 0.045 |
| | **25** | 0.070 | 0.063 | 0.056 | 0.053 |
| | **28** | 0.077 | 0.069 | 0.062 | 0.058 |
| | **30** | 0.084 | 0.076 | 0.067 | 0.063 |
| **ap x ae** | **≤ D5** | 0.25D x D | | | |

| | Material Group ISO 513 | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | **0.2D x 0.1D** | **0.2D x 0.1D** | **0.2D x 0.1D** | **0.2D x 0.1D** |
| | Vc (m/min) | **35÷55** | **30÷40** | **25÷35** | **12÷20** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.006 | 0.006 | 0.005 | 0.005 |
| | **4** | 0.009 | 0.008 | 0.007 | 0.007 |
| | **5** | 0.012 | 0.011 | 0.009 | 0.009 |
| | **6** | 0.015 | 0.014 | 0.012 | 0.011 |
| | **8** | 0.022 | 0.020 | 0.018 | 0.017 |
| | **10** | 0.028 | 0.025 | 0.022 | 0.021 |
| | **12** | 0.033 | 0.030 | 0.027 | 0.025 |
| | **14** | 0.040 | 0.036 | 0.032 | 0.030 |
| | **16** | 0.046 | 0.042 | 0.037 | 0.035 |
| | **18** | 0.052 | 0.047 | 0.042 | 0.039 |
| | **20** | 0.059 | 0.053 | 0.047 | 0.044 |
| | **22** | 0.065 | 0.059 | 0.052 | 0.049 |
| | **25** | 0.077 | 0.069 | 0.062 | 0.058 |
| | **28** | 0.085 | 0.076 | 0.068 | 0.064 |
| | **30** | 0.092 | 0.083 | 0.074 | 0.069 |
| **ap x ae** | **≤ D5** | 1.5D x 0.05D | | | |

# WSA2

weldon shank, 2 flutes for aluminium

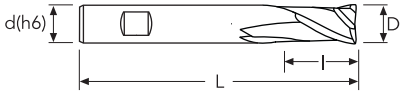
DIN 844 | ALU | HSS/Co BR | 42° | SQUARE | Z2



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| | | | ★ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING | DRILLING




| D(e8) | D Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|
| **2** | -0.014/-0.028 | 6 | 7 | | 51 | 2 | WSA2020 | ● |
| **2.5** | -0.014/-0.028 | 6 | 8 | | 52 | 2 | WSA2025 | ● |
| **3** | -0.014/-0.028 | 6 | 8 | | 52 | 2 | WSA2030 | ● |
| **4** | -0.020/-0.038 | 6 | 11 | | 55 | 2 | WSA2040 | ● |
| **5** | -0.020/-0.038 | 6 | 13 | | 57 | 2 | WSA2050 | ● |
| **6** | -0.020/-0.038 | 6 | 13 | | 57 | 2 | WSA2060 | ● |
| **8** | -0.025/-0.047 | 10 | 19 | | 69 | 2 | WSA2080 | ● |
| **10** | -0.025/-0.047 | 10 | 22 | | 72 | 2 | WSA2100 | ● |
| **12** | -0.032/-0.059 | 12 | 26 | | 83 | 2 | WSA2120 | ● |
| **14** | -0.032/-0.059 | 12 | 26 | | 83 | 2 | WSA2140 | ● |
| **16** | -0.032/-0.059 | 16 | 32 | | 92 | 2 | WSA2160 | ● |
| **18** | -0.032/-0.059 | 16 | 32 | | 92 | 2 | WSA2180 | ● |
| **20** | -0.040/-0.073 | 20 | 38 | | 104 | 2 | WSA2200 | ● |



● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# WSA2

| | Material Group ISO 513 | N1 | N2 | N3 N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| | Vc (m/min) | 90÷110 | 70÷90 | 60÷80 | 100÷140 |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 2 | 0.015 | 0.014 | 0.012 | 0.018 |
| | 3 | 0.020 | 0.018 | 0.016 | 0.024 |
| | 4 | 0.030 | 0.027 | 0.024 | 0.036 |
| | 5 | 0.035 | 0.032 | 0.028 | 0.042 |
| | 6 | 0.042 | 0.038 | 0.034 | 0.050 |
| | 8 | 0.056 | 0.050 | 0.045 | 0.067 |
| | 10 | 0.073 | 0.066 | 0.058 | 0.088 |
| | 12 | 0.090 | 0.081 | 0.072 | 0.108 |
| | 14 | 0.106 | 0.095 | 0.085 | 0.127 |
| | 16 | 0.120 | 0.108 | 0.096 | 0.144 |
| | 18 | 0.135 | 0.122 | 0.108 | 0.162 |
| | 20 | 0.150 | 0.135 | 0.120 | 0.180 |

| ap x ae | ≤ D3 | 0.2D x D |
|---|---|---|

| | Material Group ISO 513 | N1 | N2 | N3 N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 1.5D x 0.5D | 1.5D x 0.5D | 1.5D x 0.5D | 1.5D x 0.5D |
| | Vc (m/min) | 100÷140 | 90÷110 | 70÷90 | 130÷150 |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 2 | 0.018 | 0.016 | 0.014 | 0.020 |
| | 3 | 0.018 | 0.016 | 0.014 | 0.020 |
| | 4 | 0.024 | 0.022 | 0.019 | 0.027 |
| | 5 | 0.036 | 0.032 | 0.029 | 0.040 |
| | 6 | 0.042 | 0.038 | 0.034 | 0.047 |
| | 8 | 0.050 | 0.045 | 0.040 | 0.056 |
| | 10 | 0.067 | 0.060 | 0.054 | 0.075 |
| | 12 | 0.088 | 0.079 | 0.070 | 0.098 |
| | 14 | 0.108 | 0.097 | 0.086 | 0.121 |
| | 16 | 0.127 | 0.114 | 0.102 | 0.142 |
| | 18 | 0.144 | 0.130 | 0.115 | 0.161 |
| | 20 | 0.162 | 0.146 | 0.130 | 0.181 |

| ap x ae | ≤ D3 | 1.2D x 0.1D |
|---|---|---|

| | Material Group ISO 513 | N1 | N2 | N3 N4 | N5 |
|---|---|---|---|---|---|
| | Hardness/Rm | | | | |
| | ap x ae | 0.5D x 0.5D | 0.5D x 0.5D | 0.5D x 0.5D | 0.5D x 0.5D |
| | Vc (m/min) | 70÷90 | 55÷75 | 50÷60 | 90÷110 |
| DRILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.010 | 0.007 | 0.006 | 0.009 |
| | 4 | 0.015 | 0.009 | 0.008 | 0.012 |
| | 5 | 0.018 | 0.014 | 0.012 | 0.018 |
| | 6 | 0.021 | 0.016 | 0.014 | 0.021 |
| | 8 | 0.028 | 0.019 | 0.017 | 0.025 |
| | 10 | 0.037 | 0.025 | 0.022 | 0.034 |
| | 12 | 0.045 | 0.033 | 0.029 | 0.044 |
| | 14 | 0.053 | 0.041 | 0.036 | 0.054 |
| | 16 | 0.060 | 0.048 | 0.042 | 0.064 |
| | 18 | 0.068 | 0.054 | 0.048 | 0.072 |
| | 20 | 0.075 | 0.061 | 0.054 | 0.081 |

# WS3-TAWS3

weldon shank, 3 flutes

DIN 844 | N | HSS/Co BR | HSS/Co PV200 | 30° | SQUARE | Z3

WS3 TAWS3



WS3

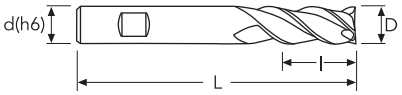


TAWS3

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| | | | | | | | WS3 | | TAWS3 | |
|---|---|---|---|---|---|---|---|---|---|---|
| D(e8) | D Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock | EDP No. | Stock |
| 1 | -0.014/-0.028 | 6 | 3 | | 47 | 3 | WS3010 | ● | TAWS3010 | ○ |
| 1.5 | -0.014/-0.028 | 6 | 7 | | 51 | 3 | WS3015 | ● | TAWS3015 | ○ |
| 2 | -0.014/-0.028 | 6 | 7 | | 51 | 3 | WS3020 | ● | TAWS3020 | ● |
| 2.5 | -0.014/-0.028 | 6 | 8 | | 52 | 3 | WS3025 | ● | TAWS3025 | ● |
| 3 | -0.014/-0.028 | 6 | 8 | | 52 | 3 | WS3030 | ● | TAWS3030 | ● |
| 3.5 | -0.020/-0.038 | 6 | 10 | | 54 | 3 | WS3035 | ● | TAWS3035 | ● |
| 4 | -0.020/-0.038 | 6 | 11 | | 55 | 3 | WS3040 | ● | TAWS3040 | ● |
| 4.5 | -0.020/-0.038 | 6 | 11 | | 55 | 3 | WS3045 | ● | TAWS3045 | ● |
| 5 | -0.020/-0.038 | 6 | 13 | | 57 | 3 | WS3050 | ● | TAWS3050 | ● |
| 5.5 | -0.020/-0.038 | 6 | 13 | | 57 | 3 | WS3055 | ● | TAWS3055 | ● |
| 6 | -0.020/-0.038 | 6 | 13 | | 57 | 3 | WS3060 | ● | TAWS3060 | ● |
| 6.5 | -0.025/-0.047 | 10 | 16 | | 66 | 3 | WS3065 | ● | TAWS3065 | ● |
| 7 | -0.025/-0.047 | 10 | 16 | | 66 | 3 | WS3070 | ● | TAWS3070 | ● |
| 8 | -0.025/-0.047 | 10 | 19 | | 69 | 3 | WS3080 | ● | TAWS3080 | ● |
| 8.5 | -0.025/-0.047 | 10 | 19 | | 69 | 3 | WS3085 | ● | TAWS3085 | ● |
| 9 | -0.025/-0.047 | 10 | 19 | | 69 | 3 | WS3090 | ● | TAWS3090 | ● |
| 10 | -0.025/-0.047 | 10 | 22 | | 72 | 3 | WS3100 | ● | TAWS3100 | ● |
| 11 | -0.032/-0.059 | 12 | 22 | | 79 | 3 | WS3110 | ● | TAWS3110 | ● |
| 12 | -0.032/-0.059 | 12 | 26 | | 83 | 3 | WS3120 | ● | TAWS3120 | ● |
| 13 | -0.032/-0.059 | 12 | 26 | | 83 | 3 | WS3130 | ● | TAWS3130 | ● |
| 14 | -0.032/-0.059 | 12 | 26 | | 83 | 3 | WS3140 | ● | TAWS3140 | ● |
| 15 | -0.032/-0.059 | 12 | 26 | | 83 | 3 | WS3150 | ● | TAWS3150 | ● |
| 16 | -0.032/-0.059 | 16 | 32 | | 92 | 3 | WS3160 | ● | TAWS3160 | ● |
| 18 | -0.032/-0.059 | 16 | 32 | | 92 | 3 | WS3180 | ● | TAWS3180 | ● |
| 20 | -0.040/-0.073 | 20 | 38 | | 104 | 3 | WS3200 | ● | TAWS3200 | ● |
| 22 | -0.040/-0.073 | 20 | 38 | | 104 | 3 | WS3220 | ● | TAWS3220 | ● |
| 25 | -0.040/-0.073 | 25 | 45 | | 121 | 3 | WS3250 | ● | TAWS3250 | ● |
| 30 | -0.040/-0.073 | 25 | 45 | | 121 | 3 | WS3300 | ● | | |
| 32 | -0.050/-0.089 | 32 | 53 | | 133 | 3 | WS3320 | ● | | |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

# TAWS3

**WS3 (Vc = -20% ÷ -30%)**

| | Material Group ISO 513 | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | **0.3D x D** | **0.3D x D** | **0.3D x D** | **0.3D x D** |
| | Vc (m/min) | **40÷60** | **30÷50** | **25÷35** | **15÷25** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.003 | 0.002 | 0.002 | 0.002 |
| | **2** | 0.005 | 0.005 | 0.004 | 0.004 |
| | **3** | 0.008 | 0.007 | 0.006 | 0.006 |
| | **4** | 0.012 | 0.011 | 0.009 | 0.008 |
| | **5** | 0.015 | 0.014 | 0.011 | 0.011 |
| | **6** | 0.020 | 0.018 | 0.015 | 0.014 |
| | **8** | 0.029 | 0.026 | 0.022 | 0.020 |
| | **10** | 0.036 | 0.032 | 0.027 | 0.025 |
| | **12** | 0.043 | 0.039 | 0.032 | 0.030 |
| | **14** | 0.051 | 0.046 | 0.038 | 0.036 |
| | **16** | 0.060 | 0.054 | 0.045 | 0.042 |
| | **18** | 0.069 | 0.062 | 0.052 | 0.049 |
| | **20** | 0.079 | 0.071 | 0.059 | 0.055 |
| | **22** | 0.088 | 0.079 | 0.066 | 0.062 |
| | **25** | 0.099 | 0.089 | 0.074 | 0.069 |
| | **28** | 0.122 | 0.110 | 0.090 | 0.085 |
| | **30** | 0.128 | 0.115 | 0.093 | 0.090 |
| | **32** | 0.136 | 0.116 | 0.095 | 0.093 |
| **ap x ae** | **≤ D3** | 0.25D x D | | | |

| | Material Group ISO 513 | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.3D** | **1.5D x 0.3D** |
| | Vc (m/min) | **50÷70** | **40÷60** | **30÷40** | **20÷30** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **1** | 0.003 | 0.003 | 0.002 | 0.002 |
| | **2** | 0.006 | 0.006 | 0.005 | 0.005 |
| | **3** | 0.006 | 0.006 | 0.005 | 0.005 |
| | **4** | 0.010 | 0.009 | 0.008 | 0.007 |
| | **5** | 0.014 | 0.013 | 0.011 | 0.010 |
| | **6** | 0.018 | 0.017 | 0.015 | 0.013 |
| | **8** | 0.024 | 0.021 | 0.019 | 0.017 |
| | **10** | 0.035 | 0.031 | 0.028 | 0.024 |
| | **12** | 0.043 | 0.039 | 0.035 | 0.030 |
| | **14** | 0.052 | 0.047 | 0.041 | 0.036 |
| | **16** | 0.062 | 0.055 | 0.049 | 0.043 |
| | **18** | 0.072 | 0.065 | 0.058 | 0.051 |
| | **20** | 0.083 | 0.075 | 0.067 | 0.058 |
| | **22** | 0.095 | 0.086 | 0.076 | 0.067 |
| | **25** | 0.113 | 0.102 | 0.091 | 0.079 |
| | **28** | 0.139 | 0.125 | 0.111 | 0.097 |
| | **30** | 0.143 | 0.130 | 0.115 | 0.100 |
| | **32** | 0.146 | 0.132 | 0.117 | 0.102 |
| **ap x ae** | **≤ D3** | 1.5D x 0.25D | 1.5D x 0.25D | 1.2D x 0.1D | 1.2D x 0.1D |

# WL3-TAWL3

weldon shank, 3 flutes, long

DIN 844 | N | HSS/Co BR WL3 | HSS/Co PV200 TAWL3 | 30° | SQUARE | Z3



WL3

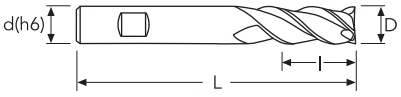


TAWL3

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| | | | | | | | WL3 | | TAWL3 | |
|---|---|---|---|---|---|---|---|---|---|---|
| D(e8) | D(e8) Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock | EDP No. | Stock |
| **3** | -0.014/-0.028 | 6 | 12 | | 56 | 3 | WL3030 | ● | TAWL3030 | ● |
| **4** | -0.020/-0.038 | 6 | 19 | | 63 | 3 | WL3040 | ● | TAWL3040 | ● |
| **5** | -0.020/-0.038 | 6 | 24 | | 68 | 3 | WL3050 | ● | TAWL3050 | ● |
| **6** | -0.020/-0.038 | 6 | 24 | | 68 | 3 | WL3060 | ● | TAWL3060 | ● |
| **8** | -0.025/-0.047 | 10 | 38 | | 88 | 3 | WL3080 | ● | TAWL3080 | ● |
| **10** | -0.025/-0.047 | 10 | 45 | | 95 | 3 | WL3100 | ● | TAWL3100 | ● |
| **12** | -0.032/-0.059 | 12 | 53 | | 110 | 3 | WL3120 | ● | TAWL3120 | ● |
| **14** | -0.032/-0.059 | 12 | 53 | | 110 | 3 | WL3140 | ● | TAWL3140 | ● |
| **16** | -0.032/-0.059 | 16 | 63 | | 123 | 3 | WL3160 | ● | TAWL3160 | ● |
| **18** | -0.032/-0.059 | 16 | 63 | | 123 | 3 | WL3180 | ● | TAWL3180 | ● |
| **20** | -0.040/-0.073 | 20 | 75 | | 141 | 3 | WL3200 | ● | TAWL3200 | ● |
| **22** | -0.040/-0.073 | 20 | 75 | | 141 | 3 | WL3220 | ● | | |
| **25** | -0.040/-0.073 | 25 | 90 | | 166 | 3 | WL3250 | ● | | |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# TAWL3

**WL3 (Vc = -20% ÷ -30%)**

| | Material Group ISO 513 | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | **0.3D x D** | **0.3D x D** | **0.3D x D** | **0.2D x D** |
| | Vc (m/min) | **30÷50** | **25÷35** | **20÷30** | **12÷18** |
| SLOTTING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.006 | 0.005 | 0.005 | 0.004 |
| | **4** | 0.008 | 0.007 | 0.007 | 0.006 |
| | **5** | 0.011 | 0.010 | 0.009 | 0.008 |
| | **6** | 0.014 | 0.012 | 0.011 | 0.010 |
| | **8** | 0.020 | 0.018 | 0.016 | 0.015 |
| | **10** | 0.025 | 0.023 | 0.020 | 0.019 |
| | **12** | 0.030 | 0.027 | 0.024 | 0.023 |
| | **14** | 0.036 | 0.032 | 0.029 | 0.027 |
| | **16** | 0.042 | 0.038 | 0.034 | 0.032 |
| | **18** | 0.048 | 0.043 | 0.038 | 0.036 |
| | **20** | 0.053 | 0.048 | 0.043 | 0.040 |
| | **22** | 0.060 | 0.054 | 0.048 | 0.045 |
| | **25** | 0.070 | 0.063 | 0.056 | 0.053 |
| **ap x ae** | **≤ D5** | 0.25D x D | | | |

| | Material Group ISO 513 | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | **2D x 0.1D** | **2D x 0.1D** | **2D x 0.1D** | **2D x 0.1D** |
| | Vc (m/min) | **40÷50** | **30÷40** | **25÷35** | **10÷20** |
| SIDE MILLING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 0.006 | 0.006 | 0.005 | 0.005 |
| | **4** | 0.009 | 0.008 | 0.007 | 0.007 |
| | **5** | 0.012 | 0.011 | 0.009 | 0.009 |
| | **6** | 0.015 | 0.014 | 0.012 | 0.011 |
| | **8** | 0.022 | 0.020 | 0.018 | 0.017 |
| | **10** | 0.028 | 0.025 | 0.022 | 0.021 |
| | **12** | 0.033 | 0.030 | 0.027 | 0.025 |
| | **14** | 0.040 | 0.036 | 0.032 | 0.030 |
| | **16** | 0.046 | 0.042 | 0.037 | 0.035 |
| | **18** | 0.052 | 0.047 | 0.042 | 0.039 |
| | **20** | 0.059 | 0.053 | 0.047 | 0.044 |
| | **22** | 0.065 | 0.059 | 0.052 | 0.049 |
| | **25** | 0.077 | 0.069 | 0.062 | 0.058 |
| **ap x ae** | **≤ D5** | 1.5D x 0.05D | 1.5D x 0.05D | 1.5D x 0.05D | 1.5D x 0.05D |

# TAWSH3

weldon shank 3 flutes

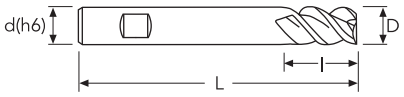
DIN 844 | N | HSS/Co PV200 | 50° | SQUARE | Z3



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| D | D Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|
| **6** | 0/+0.048 | 6 | 13 | | 57 | 3 | TAWSH3060 | ● |
| **8** | 0/+0.058 | 10 | 19 | | 69 | 3 | TAWSH3080 | ● |
| **10** | 0/+0.058 | 10 | 22 | | 72 | 3 | TAWSH3100 | ● |
| **12** | 0/+0.070 | 12 | 26 | | 83 | 3 | TAWSH3120 | ● |
| **14** | 0/+0.070 | 12 | 26 | | 83 | 3 | TAWSH3140 | ● |
| **16** | 0/+0.070 | 16 | 32 | | 92 | 3 | TAWSH3160 | ● |
| **18** | 0/+0.070 | 16 | 32 | | 92 | 3 | TAWSH3180 | ● |
| **20** | 0/+0.084 | 20 | 38 | | 104 | 3 | TAWSH3200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# TAWSH3

SLOTTING

| Material Group ISO 513 | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| ap x ae | **0.3D x D** | **0.3D x D** | **0.3D x D** | **0.3D x D** |
| Vc (m/min) | **40÷60** | **30÷50** | **25÷35** | **15÷25** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **6** | 0.020 | 0.018 | 0.015 | 0.014 |
| **8** | 0.029 | 0.026 | 0.022 | 0.020 |
| **10** | 0.036 | 0.032 | 0.027 | 0.025 |
| **12** | 0.043 | 0.039 | 0.032 | 0.030 |
| **14** | 0.051 | 0.046 | 0.038 | 0.036 |
| **16** | 0.060 | 0.054 | 0.045 | 0.042 |
| **18** | 0.069 | 0.062 | 0.052 | 0.049 |
| **20** | 0.079 | 0.071 | 0.059 | 0.055 |

SIDE MILLING

| Material Group ISO 513 | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|
| Hardness/Rm | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.3D** | **1.5D x 0.3D** |
| Vc (m/min) | **50÷70** | **40÷60** | **30÷40** | **20÷30** |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **6** | 0.018 | 0.017 | 0.015 | 0.013 |
| **8** | 0.024 | 0.021 | 0.019 | 0.017 |
| **10** | 0.035 | 0.031 | 0.028 | 0.024 |
| **12** | 0.043 | 0.039 | 0.035 | 0.030 |
| **14** | 0.052 | 0.047 | 0.041 | 0.036 |
| **16** | 0.062 | 0.055 | 0.049 | 0.043 |
| **18** | 0.072 | 0.065 | 0.058 | 0.051 |
| **20** | 0.083 | 0.075 | 0.067 | 0.058 |

# WS4(6)-TAWS4(6)-UMWS4

weldon shank, 4 flutes-6 flutes

DIN 844 | 30° | SQUARE | Z4~Z6



WS4(6)

N | HSS/Co | BR



TAWS4(6)

N | HSS/Co | PV200



UMWS4

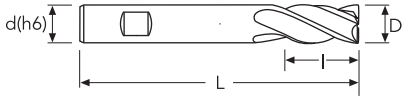
UM | HSS-P | PV200

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |
| ★ | ★ | ★ | | | |

WS4(6)-TAWS4(6)
UMWS4

L | SIDE MILLING

★ 1st choice ☆ suitable




| | | | | | | | WS4(6) | | TAWS4(6) | | UMWS4 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D | D Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock | EDP No. | Stock | EDP No. | Stock |
| **2** | 0/+0.040 | 6 | 7 | | 51 | 4 | WS4020 | ● | TAWS4020 | ● | | |
| **3** | 0/+0.040 | 6 | 8 | | 52 | 4 | WS4030 | ● | TAWS4030 | ● | UMWS4030 | ● |
| **4** | 0/+0.040 | 6 | 11 | | 55 | 4 | WS4040 | ● | TAWS4040 | ● | UMWS4040 | ● |
| **5** | 0/+0.040 | 6 | 13 | | 57 | 4 | WS4050 | ● | TAWS4050 | ● | UMWS4050 | ● |
| **6** | 0/+0.040 | 6 | 13 | | 57 | 4 | WS4060 | ● | TAWS4060 | ● | UMWS4060 | ● |
| **7** | 0/+0.040 | 10 | 16 | | 66 | 4 | WS4070 | ● | TAWS4070 | ● | | |
| **8** | 0/+0.040 | 10 | 19 | | 69 | 4 | WS4080 | ● | TAWS4080 | ● | UMWS4080 | ● |
| **9** | 0/+0.040 | 10 | 19 | | 69 | 4 | WS4090 | ● | TAWS4090 | ● | | |
| **10** | 0/+0.040 | 10 | 22 | | 72 | 4 | WS4100 | ● | TAWS4100 | ● | UMWS4100 | ● |
| **11** | 0/+0.040 | 12 | 22 | | 79 | 4 | WS4110 | ● | TAWS4110 | ● | | |
| **12** | 0/+0.040 | 12 | 26 | | 83 | 4 | WS4120 | ● | TAWS4120 | ● | UMWS4120 | ● |
| **13** | 0/+0.040 | 12 | 26 | | 83 | 4 | WS4130 | ● | TAWS4130 | ● | | |
| **14** | 0/+0.040 | 12 | 26 | | 83 | 4 | WS4140 | ● | TAWS4140 | ● | UMWS4140 | ● |
| **15** | 0/+0.040 | 12 | 26 | | 83 | 4 | WS4150 | ● | TAWS4150 | ● | | |
| **16** | 0/+0.040 | 16 | 32 | | 92 | 4 | WS4160 | ● | TAWS4160 | ● | UMWS4160 | ● |
| **17** | 0/+0.040 | 16 | 32 | | 92 | 4 | | | TAWS4170 | ● | | |
| **18** | 0/+0.040 | 16 | 32 | | 92 | 4 | WS4180 | ● | TAWS4180 | ● | UMWS4180 | ● |
| **19** | 0/+0.040 | 16 | 32 | | 92 | 4 | | | TAWS4190 | ● | | |
| **20** | 0/+0.040 | 20 | 38 | | 104 | 4 | WS4200 | ● | TAWS4200 | ● | UMWS4200 | ● |
| **22** | 0/+0.040 | 20 | 38 | | 104 | 4 | WS4220 | ● | TAWS4220 | ● | | |
| **24** | 0/+0.040 | 25 | 45 | | 121 | 6 | WS6240 | ● | | | | |
| **25** | 0/+0.040 | 25 | 45 | | 121 | 4 | WS4250 | ● | TAWS4250 | ● | | |
| **28** | 0/+0.040 | 25 | 45 | | 121 | 6 | WS6280 | ● | TAWS6280 | ● | | |
| **30** | 0/+0.040 | 25 | 45 | | 121 | 6 | WS6300 | ● | TAWS6300 | ● | | |
| **32** | 0/+0.040 | 32 | 53 | | 133 | 6 | | | TAWS6320 | ● | | |
| **36** | 0/+0.040 | 32 | 53 | | 133 | 6 | | | TAWS6360 | ● | | |
| **40** | 0/+0.040 | 40 | 63 | | 155 | 6 | | | TAWS6400 | ● | | |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# TAWS4

**UMWS4 (Vc = +20%) - WS4 (Vc = -20% ÷ -30%)**

| | Material Group ISO 513 | | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.3D** | **1.5D x 0.3D** |
| | Vc (m/min) | | **50÷70** | **40÷60** | **30÷40** | **20÷30** |
| | D (mm) | z | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| SIDE MILLING | **2** | 4 | 0.006 | 0.005 | 0.005 | 0.004 |
| | **3** | 4 | 0.006 | 0.005 | 0.005 | 0.004 |
| | **4** | 4 | 0.009 | 0.008 | 0.007 | 0.006 |
| | **5** | 4 | 0.012 | 0.011 | 0.010 | 0.009 |
| | **6** | 4 | 0.016 | 0.015 | 0.013 | 0.012 |
| | **8** | 4 | 0.021 | 0.019 | 0.017 | 0.016 |
| | **10** | 4 | 0.031 | 0.028 | 0.025 | 0.023 |
| | **12** | 4 | 0.038 | 0.035 | 0.031 | 0.029 |
| | **14** | 4 | 0.046 | 0.041 | 0.037 | 0.035 |
| | **16** | 4 | 0.055 | 0.049 | 0.044 | 0.041 |
| | **18** | 4 | 0.064 | 0.058 | 0.051 | 0.048 |
| | **20** | 4 | 0.074 | 0.067 | 0.059 | 0.055 |
| | **22** | 4 | 0.084 | 0.076 | 0.068 | 0.063 |
| | **24** | 6 | 0.088 | 0.079 | 0.071 | 0.066 |
| | **25** | 4 | 0.106 | 0.095 | 0.084 | 0.079 |
| | **28** | 6 | 0.102 | 0.092 | 0.082 | 0.077 |
| | **30** | 6 | 0.108 | 0.097 | 0.086 | 0.081 |
| | **32** | 6 | 0.113 | 0.102 | 0.091 | 0.085 |
| | **36** | 6 | 0.127 | 0.114 | 0.101 | 0.095 |
| | **40** | 6 | 0.139 | 0.125 | 0.111 | 0.104 |
| **ap x ae** | **≤ D3** | | 1.5D x 0.25D | 1.5D x 0.25D | 1.2D x 0.1D | 1.2D x 0.1D |

# WL4(6)-TAWL4(6)

weldon shank, 4 flutes-6 flutes, long

DIN 844 | N | HSS/Co BR | HSS/Co PV200 | 30° | SQUARE | Z4~Z6

WL4(6) TAWL4(6)



WL4(6)

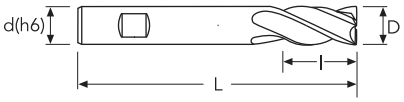


TAWL4(6)

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| | | | | | | | WL4(6) | | TAWL4(6) | |
|---|---|---|---|---|---|---|---|---|---|---|
| D | D Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock | EDP No. | Stock |
| 3 | 0/+0.040 | 6 | 12 | | 56 | 4 | WL4030 | ● | TAWL4030 | ● |
| 4 | 0/+0.040 | 6 | 19 | | 63 | 4 | WL4040 | ● | TAWL4040 | ● |
| 5 | 0/+0.040 | 6 | 24 | | 68 | 4 | WL4050 | ● | TAWL4050 | ● |
| 6 | 0/+0.040 | 6 | 24 | | 68 | 4 | WL4060 | ● | TAWL4060 | ● |
| 7 | 0/+0.050 | 10 | 30 | | 80 | 4 | WL4070 | ● | TAWL4070 | ● |
| 8 | 0/+0.050 | 10 | 38 | | 88 | 4 | WL4080 | ● | TAWL4080 | ● |
| 9 | 0/+0.050 | 10 | 38 | | 88 | 4 | WL4090 | ● | TAWL4090 | ● |
| 10 | 0/+0.050 | 10 | 45 | | 95 | 4 | WL4100 | ● | TAWL4100 | ● |
| 11 | 0/+0.050 | 12 | 45 | | 102 | 4 | WL4110 | ● | TAWL4110 | ● |
| 12 | 0/+0.050 | 12 | 53 | | 110 | 4 | WL4120 | ● | TAWL4120 | ● |
| 13 | 0/+0.050 | 12 | 53 | | 110 | 4 | WL4130 | ● | TAWL4130 | ● |
| 14 | 0/+0.050 | 12 | 53 | | 110 | 4 | WL4140 | ● | TAWL4140 | ● |
| 15 | 0/+0.050 | 12 | 53 | | 110 | 4 | WL4150 | ● | TAWL4150 | ● |
| 16 | 0/+0.050 | 16 | 63 | | 123 | 4 | WL4160 | ● | TAWL4160 | ● |
| 17 | 0/+0.050 | 16 | 63 | | 123 | 4 | WL4170 | ● | TAWL4170 | ● |
| 18 | 0/+0.050 | 16 | 63 | | 123 | 4 | WL4180 | ● | TAWL4180 | ● |
| 19 | 0/+0.050 | 16 | 63 | | 123 | 4 | WL4190 | ● | TAWL4190 | ● |
| 20 | 0/+0.050 | 20 | 75 | | 141 | 4 | WL4200 | ● | TAWL4200 | ● |
| 22 | 0/+0.050 | 20 | 75 | | 141 | 6 | WL6220 | ● | TAWL6220 | ● |
| 25 | 0/+0.050 | 25 | 90 | | 166 | 6 | WL6250 | ● | TAWL6250 | ● |
| 30 | 0/+0.050 | 25 | 90 | | 166 | 6 | | | TAWL6300 | ● |
| 32 | 0/+0.050 | 32 | 106 | | 186 | 6 | | | TAWL6320 | ● |
| 36 | 0/+0.050 | 32 | 106 | | 186 | 6 | | | TAWL6360 | ● |
| 40 | 0/+0.050 | 40 | 125 | | 217 | 6 | | | TAWL6400 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# TAWL4

**WL4 (Vc = -20% ÷ -30%)**

| | Material Group ISO 513 | | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | | **2D x 0.1D** | **2D x 0.1D** | **2D x 0.1D** | **2D x 0.1D** |
| | Vc (m/min) | | **40÷50** | **30÷40** | **25÷35** | **10÷20** |
| SIDE MILLING | D (mm) | z | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 4 | 0.004 | 0.004 | 0.003 | 0.003 |
| | **4** | 4 | 0.006 | 0.005 | 0.005 | 0.004 |
| | **5** | 4 | 0.009 | 0.008 | 0.007 | 0.006 |
| | **6** | 4 | 0.012 | 0.011 | 0.010 | 0.009 |
| | **8** | 4 | 0.015 | 0.013 | 0.012 | 0.011 |
| | **10** | 4 | 0.021 | 0.019 | 0.017 | 0.016 |
| | **12** | 4 | 0.027 | 0.024 | 0.021 | 0.020 |
| | **14** | 4 | 0.032 | 0.029 | 0.026 | 0.024 |
| | **16** | 4 | 0.038 | 0.034 | 0.030 | 0.028 |
| | **18** | 4 | 0.045 | 0.040 | 0.036 | 0.033 |
| | **20** | 4 | 0.050 | 0.045 | 0.040 | 0.038 |
| | **22** | 6 | 0.056 | 0.051 | 0.045 | 0.042 |
| | **25** | 6 | 0.068 | 0.061 | 0.054 | 0.051 |
| | **30** | 6 | 0.074 | 0.066 | 0.059 | 0.053 |
| | **32** | 6 | 0.077 | 0.069 | 0.062 | 0.054 |
| | **36** | 6 | 0.085 | 0.077 | 0.068 | 0.060 |
| | **40** | 6 | 0.095 | 0.086 | 0.076 | 0.067 |
| **ap x ae** | **≤ D5** | | 1.5D x 0.05D | 1.5D x 0.05D | 1.2D x 0.05D | 1.2D x 0.05D |

# TAWSR

weldon shank, roughing NR

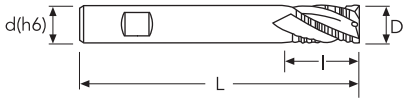
DIN 844 | N | HSS/Co PV200 | 30° | SQUARE | NR COARSE | Z3~Z4



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| D(js12) | D Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|
| **6** | +/-0.060 | 6 | 13 | | 57 | 3 | TAWSR060 | ● |
| **7** | +/-0.075 | 10 | 16 | | 66 | 3 | TAWSR070 | ● |
| **8** | +/-0.075 | 10 | 19 | | 69 | 3 | TAWSR080 | ● |
| **9** | +/-0.075 | 10 | 19 | | 69 | 3 | TAWSR090 | ● |
| **10** | +/-0.075 | 10 | 22 | | 72 | 4 | TAWSR100 | ● |
| **11** | +/-0.090 | 12 | 22 | | 79 | 4 | TAWSR110 | ● |
| **12** | +/-0.090 | 12 | 26 | | 83 | 4 | TAWSR120 | ● |
| **13** | +/-0.090 | 12 | 26 | | 83 | 4 | TAWSR130 | ● |
| **14** | +/-0.090 | 12 | 26 | | 83 | 4 | TAWSR140 | ● |
| **15** | +/-0.090 | 12 | 26 | | 83 | 4 | TAWSR150 | ● |
| **16** | +/-0.090 | 16 | 32 | | 92 | 4 | TAWSR160 | ● |
| **17** | +/-0.090 | 16 | 32 | | 92 | 4 | TAWSR170 | ● |
| **18** | +/-0.090 | 16 | 32 | | 92 | 4 | TAWSR180 | ● |
| **20** | +/-0.105 | 20 | 38 | | 104 | 4 | TAWSR200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# TAWSR

| SLOTTING | Material Group ISO 513 | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | **D x D** | **D x D** | **D x D** | **0.5D x D** |
| | Vc (m/min) | **40÷60** | **30÷50** | **25÷35** | **15÷25** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.022 | 0.020 | 0.018 | 0.017 |
| | **8** | 0.028 | 0.025 | 0.022 | 0.019 |
| | **10** | 0.035 | 0.032 | 0.028 | 0.025 |
| | **12** | 0.045 | 0.041 | 0.036 | 0.032 |
| | **14** | 0.055 | 0.050 | 0.044 | 0.039 |
| | **16** | 0.065 | 0.059 | 0.052 | 0.046 |
| | **18** | 0.075 | 0.068 | 0.060 | 0.053 |
| | **20** | 0.085 | 0.077 | 0.068 | 0.060 |

| SIDE MILLING | Material Group ISO 513 | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.3D** | **1.5D x 0.3D** |
| | Vc (m/min) | **50÷70** | **40÷60** | **30÷40** | **20÷30** |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **6** | 0.026 | 0.024 | 0.021 | 0.018 |
| | **8** | 0.033 | 0.030 | 0.026 | 0.023 |
| | **10** | 0.042 | 0.038 | 0.034 | 0.029 |
| | **12** | 0.054 | 0.049 | 0.043 | 0.038 |
| | **14** | 0.066 | 0.059 | 0.053 | 0.046 |
| | **16** | 0.078 | 0.070 | 0.062 | 0.055 |
| | **18** | 0.090 | 0.081 | 0.072 | 0.063 |
| | **20** | 0.102 | 0.092 | 0.082 | 0.071 |

# WSFR-TAWSFR-UMWSFR

weldon shank, roughing HR

DIN 844 | 30° | SQUARE | HR FINE | Z3~Z6



WSFR

N | HSS/Co BR



TAWSFR

N | HSS/Co PV200



UMWSFR

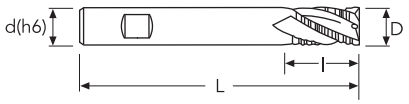
UM | HSS-P PV200

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |
| ★ | ★ | ★ | | | |

WSFR-TAWSFR
UMWSFR

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| | | | | | | | WSFR | | TAWSFR | | UMWSFR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D(js12) | D Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock | EDP No. | Stock | EDP No. | Stock |
| **6** | +/-0.060 | 6 | 13 | | 57 | 3 | WSFR060 | ● | TAWSFR060 | ● | UMWSFR060 | ● |
| **7** | +/-0.075 | 10 | 16 | | 66 | 3 | | | TAWSFR070 | ● | UMWSFR070 | ● |
| **8** | +/-0.075 | 10 | 19 | | 69 | 3 | WSFR080 | ● | TAWSFR080 | ● | UMWSFR080 | ● |
| **9** | +/-0.075 | 10 | 19 | | 69 | 3 | | | TAWSFR090 | ● | UMWSFR090 | ● |
| **10** | +/-0.075 | 10 | 22 | | 72 | 4 | WSFR100 | ● | TAWSFR100 | ● | UMWSFR100 | ● |
| **11** | +/-0.090 | 12 | 22 | | 79 | 4 | | | TAWSFR110 | ● | | |
| **12** | +/-0.090 | 12 | 26 | | 83 | 4 | WSFR120 | ● | TAWSFR120 | ● | UMWSFR120 | ● |
| **13** | +/-0.090 | 12 | 26 | | 83 | 4 | | | TAWSFR130 | ● | | |
| **14** | +/-0.090 | 12 | 26 | | 83 | 4 | WSFR140 | ● | TAWSFR140 | ● | UMWSFR140 | ● |
| **15** | +/-0.090 | 12 | 26 | | 83 | 4 | | | TAWSFR150 | ● | | |
| **16** | +/-0.090 | 16 | 32 | | 92 | 4 | WSFR160 | ● | TAWSFR160 | ● | UMWSFR160 | ● |
| **17** | +/-0.090 | 16 | 32 | | 92 | 4 | | | TAWSFR170 | ● | | |
| **18** | +/-0.090 | 16 | 32 | | 92 | 4 | WSFR180 | ● | TAWSFR180 | ● | UMWSFR180 | ● |
| **20** | +/-0.105 | 20 | 38 | | 104 | 4 | WSFR200 | ● | TAWSFR200 | ● | UMWSFR200 | ● |
| **22** | +/-0.105 | 20 | 38 | | 104 | 5 | | | TAWSFR220 | ● | | |
| **25** | +/-0.105 | 25 | 45 | | 121 | 5 | | | TAWSFR250 | ● | | |
| **28** | +/-0.105 | 25 | 45 | | 121 | 6 CH | | | TAWSFR280 | ● | | |
| **30** | +/-0.105 | 25 | 45 | | 121 | 6 | | | TAWSFR300 | ● | | |
| **32** | +/-0.125 | 32 | 53 | | 133 | 6 | | | TAWSFR320 | ● | | |
| **36** | +/-0.125 | 32 | 53 | | 133 | 6 | | | TAWSFR360 | ● | | |
| **40** | +/-0.125 | 32 | 63 | | 155 | 6 | | | TAWSFR400 | ● | | |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# TAWSFR

**UMWSFR (Vc = +20%) - WSFR (Vc = -20% ÷ -30%)**

SLOTTING

| Material Group ISO 513 | | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| Hardness/Rm | | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| ap x ae | | **D x D** | **D x D** | **D x D** | **0.5D x D** |
| Vc (m/min) | | **40÷60** | **30÷50** | **25÷35** | **15÷25** |
| **D (mm)** | **z** | **fz (mm/z)** | **fz (mm/z)** | **fz (mm/z)** | **fz (mm/z)** |
| **6** | 3 | 0.022 | 0.020 | 0.018 | 0.017 |
| **8** | 3 | 0.028 | 0.025 | 0.022 | 0.019 |
| **10** | 4 | 0.035 | 0.032 | 0.028 | 0.025 |
| **12** | 4 | 0.045 | 0.041 | 0.036 | 0.032 |
| **14** | 4 | 0.055 | 0.050 | 0.044 | 0.039 |
| **16** | 4 | 0.065 | 0.059 | 0.052 | 0.046 |
| **18** | 4 | 0.075 | 0.068 | 0.060 | 0.053 |
| **20** | 4 | 0.085 | 0.077 | 0.068 | 0.060 |
| **22** | 5 | 0.086 | 0.077 | 0.068 | 0.060 |
| **25** | 5 | 0.099 | 0.089 | 0.079 | 0.069 |
| **28** | 6 | 0.100 | 0.090 | 0.080 | 0.070 |
| **30** | 6 | 0.108 | 0.097 | 0.086 | 0.076 |
| **32** | 6 | 0.116 | 0.104 | 0.093 | 0.081 |
| **36** | 6 | 0.130 | 0.111 | 0.104 | 0.091 |
| **40** | 6 | 0.145 | 0.123 | 0.116 | 0.102 |

SIDE MILLING

| Material Group ISO 513 | | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| Hardness/Rm | | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| ap x ae | | **1.5D x 0.5D** | **1.5D x 0.5D** | **1.5D x 0.3D** | **1.5D x 0.3D** |
| Vc (m/min) | | **50÷70** | **40÷60** | **30÷40** | **20÷30** |
| **D (mm)** | **z** | **fz (mm/z)** | **fz (mm/z)** | **fz (mm/z)** | **fz (mm/z)** |
| **6** | 3 | 0.026 | 0.024 | 0.021 | 0.018 |
| **8** | 3 | 0.033 | 0.030 | 0.026 | 0.023 |
| **10** | 4 | 0.042 | 0.038 | 0.034 | 0.029 |
| **12** | 4 | 0.054 | 0.049 | 0.043 | 0.038 |
| **14** | 4 | 0.066 | 0.059 | 0.053 | 0.046 |
| **16** | 4 | 0.078 | 0.070 | 0.062 | 0.055 |
| **18** | 4 | 0.090 | 0.081 | 0.072 | 0.063 |
| **20** | 4 | 0.102 | 0.092 | 0.082 | 0.071 |
| **22** | 5 | 0.103 | 0.092 | 0.082 | 0.072 |
| **25** | 5 | 0.119 | 0.107 | 0.095 | 0.083 |
| **28** | 6 | 0.120 | 0.108 | 0.096 | 0.084 |
| **30** | 6 | 0.130 | 0.117 | 0.104 | 0.091 |
| **32** | 6 | 0.139 | 0.125 | 0.111 | 0.097 |
| **36** | 6 | 0.156 | 0.140 | 0.125 | 0.109 |
| **40** | 6 | 0.174 | 0.157 | 0.139 | 0.122 |

# WLFR-TAWLFR

weldon shank, roughing HR, long

DIN 844 | N | HSS/Co BR | HSS/Co PV200 | 30° | SQUARE | HR FINE | Z3~Z6

WLFR TAWLFR



WLFR

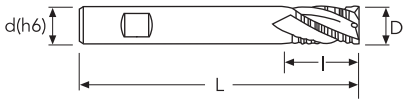


TAWLFR

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SLOTTING | SIDE MILLING




| | | | | | | | WLFR | | TAWLFR | |
|---|---|---|---|---|---|---|---|---|---|---|
| D(js12) | D Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock | EDP No. | Stock |
| **6** | +/-0.060 | 6 | 24 | | 68 | 3 | WLFR060 | ● | TAWLFR060 | ● |
| **8** | +/-0.075 | 10 | 38 | | 88 | 3 | WLFR080 | ● | TAWLFR080 | ● |
| **10** | +/-0.075 | 10 | 45 | | 95 | 4 | WLFR100 | ● | TAWLFR100 | ● |
| **12** | +/-0.090 | 12 | 53 | | 110 | 4 | WLFR120 | ● | TAWLFR120 | ● |
| **14** | +/-0.090 | 12 | 53 | | 110 | 4 | WLFR140 | ● | TAWLFR140 | ● |
| **16** | +/-0.090 | 16 | 63 | | 123 | 4 | WLFR160 | ● | TAWLFR160 | ● |
| **18** | +/-0.090 | 16 | 63 | | 123 | 4 | WLFR180 | ● | TAWLFR180 | ● |
| **20** | +/-0.105 | 20 | 75 | | 141 | 4 | WLFR200 | ● | TAWLFR200 | ● |
| **22** | +/-0.105 | 20 | 75 | | 141 | 5 | | | TAWLFR220 | ● |
| **25** | +/-0.105 | 25 | 90 | | 166 | 5 | | | TAWLFR250 | ● |
| **30** | +/-0.105 | 25 | 90 | | 166 | 6 | | | TAWLFR300 | ● |
| **32** | +/-0.105 | 32 | 106 | | 186 | 6 | | | TAWLFR320 | ● |
| **36** | +/-0.125 | 32 | 106 | | 186 | 6 | | | TAWLFR360 | ● |
| **40** | +/-0.125 | 32 | 125 | | 217 | 6 | | | TAWLFR400 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

CUTTING PARAMETERS

# TAWLFR

**WLFR (Vc = -20% ÷ -30%)**

SLOTTING

| Material Group ISO 513 | | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| Hardness/Rm | | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| ap x ae | | **0.5D x D** | **0.5D x D** | **0.5D x D** | **0.3D x D** |
| Vc (m/min) | | **35÷45** | **25÷35** | **20÷30** | **10÷20** |
| D (mm) | z | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **6** | 3 | 0.014 | 0.013 | 0.011 | 0.011 |
| **8** | 3 | 0.020 | 0.018 | 0.016 | 0.014 |
| **10** | 4 | 0.025 | 0.022 | 0.020 | 0.017 |
| **12** | 4 | 0.032 | 0.028 | 0.025 | 0.022 |
| **14** | 4 | 0.039 | 0.035 | 0.031 | 0.027 |
| **16** | 4 | 0.046 | 0.041 | 0.036 | 0.032 |
| **18** | 4 | 0.053 | 0.047 | 0.042 | 0.037 |
| **20** | 4 | 0.060 | 0.054 | 0.048 | 0.042 |
| **22** | 5 | 0.060 | 0.054 | 0.048 | 0.042 |
| **25** | 5 | 0.069 | 0.062 | 0.055 | 0.049 |
| **28** | 6 | 0.070 | 0.063 | 0.056 | 0.049 |
| **30** | 6 | 0.076 | 0.068 | 0.060 | 0.053 |
| **32** | 6 | 0.081 | 0.073 | 0.065 | 0.057 |
| **36** | 6 | 0.091 | 0.077 | 0.073 | 0.064 |
| **40** | 6 | 0.102 | 0.086 | 0.081 | 0.071 |

SIDE MILLING

| Material Group ISO 513 | | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|
| Hardness/Rm | | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| ap x ae | | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.3D** | **1.5D x 0.2D** |
| Vc (m/min) | | **35÷45** | **25÷35** | **20÷30** | **10÷20** |
| D (mm) | z | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| **6** | 3 | 0.017 | 0.015 | 0.013 | 0.012 |
| **8** | 3 | 0.024 | 0.022 | 0.019 | 0.017 |
| **10** | 4 | 0.029 | 0.026 | 0.024 | 0.021 |
| **12** | 4 | 0.038 | 0.034 | 0.030 | 0.026 |
| **14** | 4 | 0.046 | 0.042 | 0.037 | 0.032 |
| **16** | 4 | 0.055 | 0.049 | 0.044 | 0.038 |
| **18** | 4 | 0.063 | 0.057 | 0.050 | 0.044 |
| **20** | 4 | 0.071 | 0.064 | 0.057 | 0.050 |
| **22** | 5 | 0.072 | 0.065 | 0.057 | 0.050 |
| **25** | 5 | 0.083 | 0.075 | 0.067 | 0.058 |
| **28** | 6 | 0.084 | 0.076 | 0.067 | 0.059 |
| **30** | 6 | 0.091 | 0.082 | 0.073 | 0.064 |
| **32** | 6 | 0.097 | 0.088 | 0.078 | 0.068 |
| **36** | 6 | 0.109 | 0.098 | 0.087 | 0.076 |
| **40** | 6 | 0.122 | 0.110 | 0.097 | 0.085 |

# WSB2-TAWSB2

weldon shank, 2 flutes ball nose

DIN 327 | N | HSS/Co BR | HSS/Co PV200 | 30° | BALL NOSE | Z2 BALL

WSB2 TAWSB2



WSB2

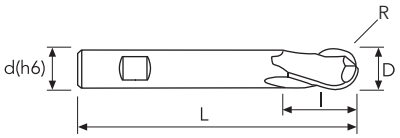


TAWSB2

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

COPYING




| | | | | | | | | | WSB2 | | TAWSB2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D(e8) | D(e8) Tol. | R | R Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock | EDP No. | Stock |
| 2 | -0.014/-0.028 | 1.00 | +0.020/-0.020 | 6 | 4 | | 48 | 2 | WSB2020 | ● | TAWSB2020 | ○ |
| 3 | -0.014/-0.028 | 1.50 | +0.020/-0.020 | 6 | 5 | | 49 | 2 | WSB2030 | ● | TAWSB2030 | ● |
| 4 | -0.020/-0.038 | 2.00 | +0.020/-0.020 | 6 | 7 | | 51 | 2 | WSB2040 | ● | TAWSB2040 | ● |
| 5 | -0.020/-0.038 | 2.50 | +0.020/-0.020 | 6 | 8 | | 52 | 2 | WSB2050 | ● | TAWSB2050 | ● |
| 6 | -0.020/-0.038 | 3.00 | +0.020/-0.020 | 6 | 8 | | 52 | 2 | WSB2060 | ● | TAWSB2060 | ● |
| 8 | -0.025/-0.047 | 4.00 | +0.020/-0.020 | 10 | 11 | | 61 | 2 | WSB2080 | ● | TAWSB2080 | ● |
| 10 | -0.025/-0.047 | 5.00 | +0.020/-0.020 | 10 | 13 | | 63 | 2 | WSB2100 | ● | TAWSB2100 | ● |
| 12 | -0.032/-0.059 | 6.00 | +0.020/-0.020 | 12 | 16 | | 73 | 2 | WSB2120 | ● | TAWSB2120 | ● |
| 14 | -0.032/-0.059 | 7.00 | +0.020/-0.020 | 12 | 16 | | 73 | 2 | WSB2140 | ● | TAWSB2140 | ● |
| 16 | -0.032/-0.059 | 8.00 | +0.020/-0.020 | 16 | 19 | | 79 | 2 | WSB2160 | ● | TAWSB2160 | ● |
| 18 | -0.032/-0.059 | 9.00 | +0.020/-0.020 | 16 | 19 | | 79 | 2 | WSB2180 | ● | TAWSB2180 | ● |
| 20 | -0.040/-0.073 | 10.00 | +0.020/-0.020 | 20 | 22 | | 88 | 2 | WSB2200 | ● | TAWSB2200 | ● |
| 25 | -0.040/-0.073 | 12.50 | +0.020/-0.020 | 25 | 26 | | 102 | 2 | WSB2250 | ● | | |
| 28 | -0.040/-0.073 | 14.00 | +0.020/-0.020 | 25 | 26 | | 102 | 2 | WSB2280 | ○ | | |
| 30 | -0.040/-0.073 | 15.00 | +0.020/-0.020 | 25 | 26 | | 102 | 2 | WSB2300 | ○ | | |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# TAWSB2

**WSB2 (Vc = -20% ÷ -30%)**

| | Material Group ISO 513 | | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | | **0.1D x 0.2D** | **0.1D x 0.2D** | **0.1D x 0.2D** | **0.1D x 0.2D** |
| | Vc (m/min) | | **40÷60** | **30÷50** | **25÷35** | **15÷25** |
| COPYING | D (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **2** | 1.20 | 0.020 | 0.018 | 0.016 | 0.015 |
| | **3** | 1.80 | 0.040 | 0.036 | 0.032 | 0.030 |
| | **4** | 2.40 | 0.060 | 0.054 | 0.048 | 0.045 |
| | **5** | 3.00 | 0.070 | 0.063 | 0.056 | 0.053 |
| | **6** | 3.60 | 0.082 | 0.074 | 0.066 | 0.062 |
| | **8** | 4.80 | 0.094 | 0.085 | 0.075 | 0.071 |
| | **10** | 6.00 | 0.110 | 0.099 | 0.088 | 0.083 |
| | **12** | 7.20 | 0.130 | 0.117 | 0.104 | 0.098 |
| | **14** | 8.40 | 0.150 | 0.135 | 0.120 | 0.113 |
| | **16** | 9.60 | 0.170 | 0.153 | 0.136 | 0.128 |
| | **18** | 10.80 | 0.190 | 0.171 | 0.152 | 0.143 |
| | **20** | 12.00 | 0.210 | 0.189 | 0.168 | 0.158 |
| | **22** | 13.20 | 0.232 | 0.209 | 0.186 | 0.174 |
| | **25** | 15.00 | 0.262 | 0.236 | 0.210 | 0.197 |
| | **28** | 16.80 | 0.285 | 0.257 | 0.228 | 0.214 |
| | **30** | 18.00 | 0.292 | 0.263 | 0.233 | 0.219 |

| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 15° | x 1.1 | x 1.1 |

# WLB2-TAWLB2

weldon shank, 2 flutes ball nose, long

DIN 1889 | N | HSS/Co BR | HSS/Co PV200 | 30° | BALL NOSE | Z2 BALL

WLB2 TAWLB2



WLB2

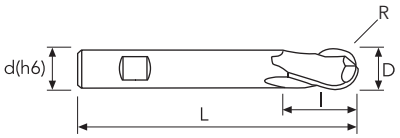


TAWLB2

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

COPYING




| | | | | | | | | | WLB2 | | TAWLB2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D(e8) | D(e8) Tol. | R | R Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock | EDP No. | Stock |
| 3 | -0.014/-0.028 | 1.50 | +0.020/-0.020 | 6 | 8 | | 56 | 2 | WLB2030 | ● | TAWLB2030 | ○ |
| 4 | -0.020/-0.038 | 2.00 | +0.020/-0.020 | 6 | 11 | | 63 | 2 | WLB2040 | ● | TAWLB2040 | ○ |
| 5 | -0.020/-0.038 | 2.50 | +0.020/-0.020 | 6 | 13 | | 68 | 2 | WLB2050 | ● | TAWLB2050 | ○ |
| 6 | -0.020/-0.038 | 3.00 | +0.020/-0.020 | 6 | 13 | | 68 | 2 | WLB2060 | ● | TAWLB2060 | ○ |
| 8 | -0.025/-0.047 | 4.00 | +0.020/-0.020 | 10 | 19 | | 88 | 2 | WLB2080 | ● | TAWLB2080 | ○ |
| 10 | -0.025/-0.047 | 5.00 | +0.020/-0.020 | 10 | 22 | | 95 | 2 | WLB2100 | ● | TAWLB2100 | ○ |
| 12 | -0.032/-0.059 | 6.00 | +0.020/-0.020 | 12 | 26 | | 110 | 2 | WLB2120 | ● | TAWLB2120 | ○ |
| 14 | -0.032/-0.059 | 7.00 | +0.020/-0.020 | 12 | 26 | | 110 | 2 | WLB2140 | ● | TAWLB2140 | ○ |
| 16 | -0.032/-0.059 | 8.00 | +0.020/-0.020 | 16 | 32 | | 123 | 2 | WLB2160 | ● | TAWLB2160 | ○ |
| 18 | -0.032/-0.059 | 9.00 | +0.020/-0.020 | 16 | 32 | | 123 | 2 | WLB2180 | ● | TAWLB2180 | ○ |
| 20 | -0.040/-0.073 | 10.00 | +0.020/-0.020 | 20 | 38 | | 141 | 2 | WLB2200 | ● | TAWLB2200 | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# TAWLB2

**WLB2 (Vc = -20% ÷ -30%)**

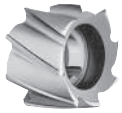
| | Material Group ISO 513 | | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | | **0.1D x 0.2D** | **0.1D x 0.2D** | **0.1D x 0.2D** | **0.1D x 0.2D** |
| | Vc (m/min) | | **30÷40** | **25÷35** | **20÷30** | **12÷18** |
| ap ae COPYING | D (mm) | D(eff.) (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **3** | 1.80 | 0.034 | 0.031 | 0.027 | 0.026 |
| | **4** | 2.40 | 0.051 | 0.046 | 0.041 | 0.038 |
| | **5** | 3.00 | 0.060 | 0.054 | 0.048 | 0.045 |
| | **6** | 3.60 | 0.070 | 0.063 | 0.056 | 0.052 |
| | **8** | 4.80 | 0.080 | 0.072 | 0.064 | 0.060 |
| | **10** | 6.00 | 0.094 | 0.084 | 0.075 | 0.070 |
| | **12** | 7.20 | 0.111 | 0.099 | 0.088 | 0.083 |
| | **14** | 8.40 | 0.128 | 0.115 | 0.102 | 0.096 |
| | **16** | 9.60 | 0.145 | 0.130 | 0.116 | 0.108 |
| | **18** | 10.80 | 0.162 | 0.145 | 0.129 | 0.121 |
| | **20** | 12.00 | 0.179 | 0.161 | 0.143 | 0.134 |

| α | n (rpm) | Vf (mm/min) |
|---|---|---|
| 15° | x 1.1 | x 1.1 |

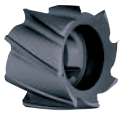
# FM-TAFM

shell mill, multi flute

DIN 1880 | N | HSS/Co BR FM | HSS/Co PV200 TAFM | 30° | SQUARE | Z8~Z14



FM

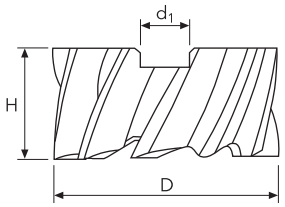


TAFM

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| | | | | | | | FM | | TAFM | |
|---|---|---|---|---|---|---|---|---|---|---|
| D | D Tol. | d1 | d1 Tol. | H | H Tol. | z | EDP No. | Stock | EDP No. | Stock |
| **40** | +0.250/-0.150 | 16 | +0.020/0 | 32 | +0.50/0 | 8 | FM40 | ● | TAFM40 | ● |
| **50** | +0.250/-0.150 | 22 | +0.020/0 | 36 | +0.50/0 | 8 | FM50 | ● | TAFM50 | ● |
| **63** | +0.250/-0.150 | 27 | +0.020/0 | 40 | +0.50/0 | 8 | FM63 | ● | TAFM63 | ● |
| **80** | +0.250/-0.150 | 27 | +0.020/0 | 45 | +0.50/0 | 10 | FM80 | ○ | TAFM80 | ○ |
| **100** | +0.250/-0.150 | 32 | +0.020/0 | 50 | +0.50/0 | 10 | FM100 | ○ | TAFM100 | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

CUTTING PARAMETERS

# TAFFM

**FM (Vc = -20% ÷ -30%)**

| | Material Group ISO 513 | | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | | **0.25D x 0.75D** | **0.25D x 0.75D** | **0.25D x 0.75D** | **0.25D x 0.75D** |
| SIDE MILLING | Vc (m/min) | | **40÷60** | **30÷50** | **25÷35** | **15÷25** |
| | D (mm) | z | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **40** | 8 | 0.060 | 0.054 | 0.048 | 0.045 |
| | **50** | 8 | 0.070 | 0.063 | 0.056 | 0.053 |
| | **63** | 8 | 0.080 | 0.072 | 0.064 | 0.060 |
| | **80** | 10 | 0.100 | 0.090 | 0.080 | 0.075 |
| | **100** | 10 | 0.120 | 0.108 | 0.096 | 0.090 |

# FFR-TAFFR

shell mill, multi flute, roughing HR

DIN 1880 | N | HSS/Co BR (FFR) | HSS/Co PV200 (TAFFR) | 30° | SQUARE | HR FINE | Z6~Z10



FFR

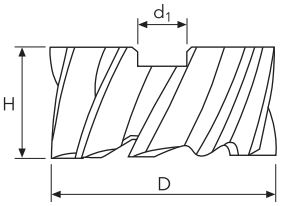


TAFFR

| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

SIDE MILLING




| | | | | | | | FFR | | TAFFR | |
|---|---|---|---|---|---|---|---|---|---|---|
| D | D Tol. | d1 | d1 Tol. | H | H Tol. | z | EDP No. | Stock | EDP No. | Stock |
| **40** | +0.250/-0.150 | 16 | +0.020/0 | 32 | +0.50/0 | 6 | FFR40 | ● | TAFFR40 | ● |
| **50** | +0.250/-0.150 | 22 | +0.020/0 | 36 | +0.50/0 | 8 | FFR50 | ● | TAFFR50 | ● |
| **63** | +0.250/-0.150 | 27 | +0.020/0 | 40 | +0.50/0 | 8 | FFR63 | ● | TAFFR50 | ● |
| **80** | +0.250/-0.150 | 27 | +0.020/0 | 45 | +0.50/0 | 10 | FFR80 | ○ | TAFFR63 | ○ |
| **100** | +0.250/-0.150 | 32 | +0.020/0 | 50 | +0.50/0 | 10 | FFR100 | ○ | TAFFR100 | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# TAFFR

**FFR (Vc = -20% ÷ -30%)**

| | Material Group ISO 513 | | P1 P2 | P3 P7 K1 | P4 M1 K2 | P5 M2 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤700 N/mm² | 600÷800 N/mm² | 800÷1000 N/mm² | 900÷1200 N/mm² |
| | ap x ae | | **0.25D x 0.75D** | **0.25D x 0.75D** | **0.25D x 0.75D** | **0.25D x 0.75D** |
| SIDE MILLING | Vc (m/min) | | **40÷60** | **30÷50** | **25÷35** | **15÷25** |
| | D (mm) | z | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **40** | 8 | 0.080 | 0.072 | 0.064 | 0.060 |
| | **50** | 8 | 0.100 | 0.090 | 0.080 | 0.075 |
| | **63** | 8 | 0.120 | 0.108 | 0.096 | 0.090 |
| | **80** | 10 | 0.120 | 0.108 | 0.096 | 0.090 |
| | **100** | 10 | 0.140 | 0.126 | 0.112 | 0.105 |

# WCR

corner rounding

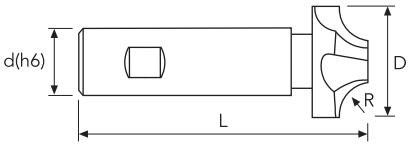
DIN 6518 | N | HSS/Co BR | 0° | Z4



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

ROUNDING




| D | R | R(H11) Tol. | d(h6) | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|
| **8** | 1.00 | +0.060/0 | 10 | 60 | 4 | WCR080 | ● |
| **9** | 1.50 | +0.060/0 | 10 | 60 | 4 | WCR090 | ● |
| **10** | 2.00 | +0.060/0 | 10 | 60 | 4 | WCR100 | ● |
| **11** | 2.50 | +0.060/0 | 10 | 60 | 4 | WCR110 | ● |
| **12** | 3.00 | +0.060/0 | 12 | 60 | 4 | WCR120 | ● |
| **13** | 3.50 | +0.075/0 | 12 | 60 | 4 | WCR130 | ● |
| **14** | 4.00 | +0.075/0 | 12 | 60 | 4 | WCR140 | ● |
| **15** | 4.50 | +0.075/0 | 12 | 60 | 4 | WCR150 | ● |
| **16** | 5.00 | +0.075/0 | 12 | 60 | 4 | WCR160 | ● |
| **19** | 5.50 | +0.075/0 | 16 | 67 | 4 | WCR190 | ● |
| **20** | 6.00 | +0.075/0 | 16 | 67 | 4 | WCR200 | ● |
| **21** | 6.50 | +0.090/0 | 16 | 71 | 4 | WCR210 | ● |
| **22** | 7.00 | +0.090/0 | 16 | 71 | 4 | WCR220 | ● |
| **23** | 7.50 | +0.090/0 | 16 | 71 | 4 | WCR230 | ● |
| **24** | 8.00 | +0.090/0 | 16 | 71 | 4 | WCR240 | ● |
| **25** | 8.50 | +0.090/0 | 25 | 85 | 4 | WCR250 | ● |
| **26** | 9.00 | +0.090/0 | 25 | 85 | 4 | WCR260 | ● |
| **27** | 9.50 | +0.090/0 | 25 | 85 | 4 | WCR270 | ● |
| **28** | 10.00 | +0.090/0 | 25 | 85 | 4 | WCR280 | ● |
| **32** | 11.00 | +0.110/0 | 25 | 90 | 4 | WCR320 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

## WCR

| | Material Group ISO 513 | P1 P2 P3 P4 | P7 M1 | K1 K2 | N1 N2 N3 N4 |
|---|---|---|---|---|---|
| | Hardness/Rm | ≤800 N/mm² | ≤750 N/mm² | ≤350 HB | |
| | ap x ae | **0.2D x 0.2D** | **0.2D x 0.2D** | **0.2D x 0.2D** | **0.2D x 0.2D** |
| | Vc (m/min) | **30÷50** | **15÷25** | **30÷40** | **60÷80** |
| ROUNDING | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **8** | 0.006 | 0.004 | 0.005 | 0.007 |
| | **9** | 0.008 | 0.006 | 0.007 | 0.009 |
| | **10** | 0.010 | 0.007 | 0.009 | 0.011 |
| | **11** | 0.012 | 0.008 | 0.010 | 0.013 |
| | **12** | 0.015 | 0.010 | 0.012 | 0.016 |
| | **13** | 0.017 | 0.012 | 0.014 | 0.019 |
| | **14** | 0.020 | 0.014 | 0.017 | 0.021 |
| | **15** | 0.023 | 0.016 | 0.019 | 0.025 |
| | **16** | 0.025 | 0.018 | 0.021 | 0.028 |
| | **17** | 0.026 | 0.018 | 0.022 | 0.029 |
| | **18** | 0.027 | 0.019 | 0.023 | 0.030 |
| | **19** | 0.029 | 0.020 | 0.024 | 0.031 |
| | **20** | 0.030 | 0.021 | 0.026 | 0.033 |
| | **21** | 0.033 | 0.023 | 0.028 | 0.036 |
| | **22** | 0.035 | 0.025 | 0.030 | 0.039 |
| | **23** | 0.038 | 0.026 | 0.032 | 0.041 |
| | **24** | 0.040 | 0.028 | 0.034 | 0.044 |
| | **25** | 0.042 | 0.029 | 0.035 | 0.046 |
| | **26** | 0.043 | 0.030 | 0.037 | 0.047 |
| | **27** | 0.045 | 0.031 | 0.038 | 0.049 |
| | **28** | 0.046 | 0.032 | 0.039 | 0.051 |
| | **32** | 0.050 | 0.035 | 0.043 | 0.055 |

# WDC

Dovetail cutter

DIN 1833 | N | HSS/Co BR | α 45° | α 60° | Z6~Z12

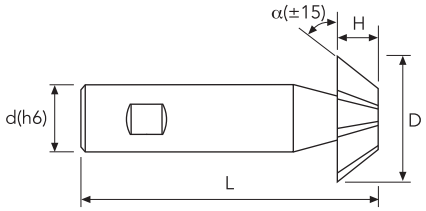
WDC 45 WDC 60



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

DOVETAIL B 45°-60°




| D | D Tol. | d(h6) | H | L | alfa | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|
| **16** | +/-0.065 | 12 | 4 | 60 | 45° | 6 | WDC45160 | ● |
| **20** | +/-0.065 | 12 | 5 | 63 | 45° | 6 | WDC45200 | ● |
| **22** | +/-0.065 | 12 | 6 | 67 | 45° | 6 | WDC45220 | ● |
| **25** | +/-0.065 | 16 | 6.3 | 67 | 45° | 8 | WDC45250 | ● |
| **28** | +/-0.065 | 16 | 7.5 | 67 | 45° | 8 | WDC45280 | ● |
| **32** | +/-0.080 | 16 | 8 | 71 | 45° | 10 | WDC45320 | ● |
| **38** | +/-0.080 | 16 | 10 | 80 | 45° | 12 | WDC45380 | ○ |
| | | | | | | | | |
| **16** | +/-0.065 | 12 | 6.3 | 60 | 60° | 6 | WDC60160 | ● |
| **20** | +/-0.065 | 12 | 8 | 63 | 60° | 6 | WDC60200 | ● |
| **22** | +/-0.065 | 12 | 9 | 67 | 60° | 6 | WDC60220 | ● |
| **25** | +/-0.065 | 16 | 10 | 67 | 60° | 8 | WDC60250 | ● |
| **28** | +/-0.065 | 16 | 11 | 67 | 60° | 8 | WDC60280 | ● |
| **32** | +/-0.080 | 16 | 12.5 | 71 | 60° | 10 | WDC60320 | ● |
| **38** | +/-0.080 | 16 | 16 | 80 | 60° | 12 | WDC60380 | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# WDC 45° - 60°

| | Material Group ISO 513 | | P1 P2 P3 P4 | P7 M1 | K1 K2 | N1 N2 N3 N4 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤800 N/mm² | ≤750 N/mm² | ≤350 HB | |
| | ap x ae | | **0.2D x 0.15D** | **0.2D x 0.15D** | **0.2D x 0.15D** | **0.2D x 0.15D** |
| | Vc (m/min) | | **30÷50** | **15÷25** | **30÷40** | **50÷70** |
| DOVETAIL B 45°-60° | D (mm) | z | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **16** | 6 | 0.015 | 0.011 | 0.013 | 0.017 |
| | **20** | 6 | 0.017 | 0.012 | 0.014 | 0.018 |
| | **22** | 6 | 0.018 | 0.013 | 0.015 | 0.020 |
| | **25** | 8 | 0.020 | 0.014 | 0.017 | 0.022 |
| | **28** | 8 | 0.023 | 0.016 | 0.019 | 0.025 |
| | **32** | 10 | 0.025 | 0.018 | 0.021 | 0.028 |
| | **38** | 12 | 0.028 | 0.020 | 0.024 | 0.031 |

# WDD

Dovetail cutter

DIN 1833 | N | HSS/Co BR | α 45° | α 60° | Z6~Z12

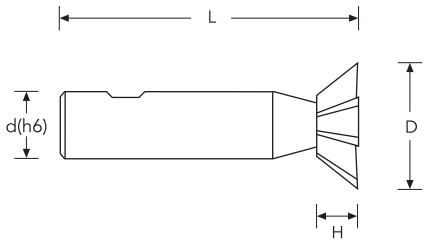
WDD 45 WDD 60



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

DOVETAIL A 45°-60°




| D | D Tol. | d(h6) | H | L | alfa | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|
| **16** | +/-0.065 | 12 | 4 | 60 | 45° | 6 | WDD45160 | ● |
| **20** | +/-0.065 | 12 | 5 | 63 | 45° | 6 | WDD45200 | ● |
| **22** | +/-0.065 | 12 | 6 | 67 | 45° | 6 | WDD45220 | ● |
| **25** | +/-0.065 | 16 | 6.3 | 67 | 45° | 8 | WDD45250 | ● |
| **28** | +/-0.065 | 16 | 7.5 | 67 | 45° | 8 | WDD45280 | ● |
| **32** | +/-0.080 | 16 | 8 | 71 | 45° | 10 | WDD45320 | ● |
| **38** | +/-0.080 | 16 | 10 | 80 | 45° | 12 | WDD45380 | ○ |
| | | | | | | | | |
| **16** | +/-0.065 | 12 | 6.3 | 60 | 60° | 6 | WDD60160 | ● |
| **20** | +/-0.065 | 12 | 8 | 63 | 60° | 6 | WDD60200 | ● |
| **22** | +/-0.065 | 12 | 9 | 67 | 60° | 6 | WDD60220 | ● |
| **25** | +/-0.065 | 16 | 10 | 67 | 60° | 8 | WDD60250 | ● |
| **28** | +/-0.065 | 16 | 11 | 67 | 60° | 8 | WDD60280 | ● |
| **32** | +/-0.080 | 16 | 12.5 | 71 | 60° | 10 | WDD60320 | ● |
| **38** | +/-0.080 | 16 | 16 | 80 | 60° | 12 | WDD60380 | ○ |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

CUTTING PARAMETERS

# WDD 45° - 60°

| DOVETAIL A 45°-60° | Material Group ISO 513 | | P1 P2 P3 P4 | P7 M1 | K1 K2 | N1 N2 N3 N4 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤800 N/mm² | ≤750 N/mm² | ≤350 HB | |
| | ap x ae | | **0.2D x 0.15D** | **0.2D x 0.15D** | **0.2D x 0.15D** | **0.2D x 0.15D** |
| | Vc (m/min) | | **30÷50** | **15÷25** | **30÷40** | **50÷70** |
| | D (mm) | z | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | **16** | 6 | 0.015 | 0.011 | 0.013 | 0.017 |
| | **20** | 6 | 0.017 | 0.012 | 0.014 | 0.018 |
| | **22** | 6 | 0.018 | 0.013 | 0.015 | 0.020 |
| | **25** | 8 | 0.020 | 0.014 | 0.017 | 0.022 |
| | **28** | 8 | 0.023 | 0.016 | 0.019 | 0.025 |
| | **32** | 10 | 0.025 | 0.018 | 0.021 | 0.028 |
| | **38** | 12 | 0.028 | 0.020 | 0.024 | 0.031 |

# WTM

T-slot

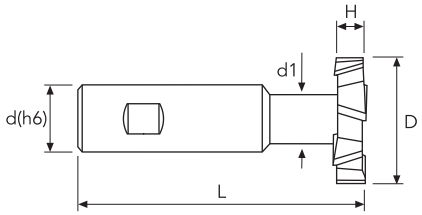
DIN 851 | N | HSS/Co BR | 15° | SQUARE | Z6~Z8



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

T SLOT




| D(d11) | D(d11) Tol. | d(h6) | d1(h12) | d1 Tol. | H(d11) | H Tol. | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|---|---|
| **12.5** | -0.050/-0.160 | 10 | 5 | 0/-0.012 | 6 | -0-030/-0.105 | 57 | 6 | WTM125 | ● |
| **16** | -0.050/-0.160 | 10 | 6.5 | 0/-0.015 | 8 | -0-040/-0.130 | 62 | 6 | WTM160 | ● |
| **18** | -0.050/-0.160 | 12 | 8 | 0/-0.015 | 8 | -0-040/-0.130 | 70 | 6 | WTM180 | ● |
| **19** | -0.065/-0.195 | 12 | 8 | 0/-0.015 | 9 | -0-040/-0.130 | 71 | 6 | WTM190 | ● |
| **21** | -0.065/-0.195 | 12 | 10 | 0/-0.015 | 9 | -0-040/-0.130 | 74 | 6 | WTM210 | ● |
| **22** | -0.065/-0.195 | 12 | 10 | 0/-0.015 | 10 | -0-040/-0.130 | 75 | 6 | WTM220 | ● |
| **25** | -0.065/-0.195 | 16 | 12 | 0/-0.018 | 11 | -0-050/-0.160 | 82 | 6 | WTM250 | ● |
| **28** | -0.065/-0.195 | 16 | 13 | 0/-0.018 | 12 | -0-050/-0.160 | 83 | 6 | WTM280 | ● |
| **32** | -0.080/-0.240 | 16 | 15 | 0/-0.018 | 14 | -0-050/-0.160 | 90 | 8 | WTM320 | ● |
| **36** | -0.080/-0.240 | 25 | 17 | 0/-0.018 | 16 | -0-050/-0.160 | 103 | 8 | WTM360 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

CUTTING PARAMETERS

# WTM

| | Material Group ISO 513 | | P1 P2 P3 P4 | P7 M1 | K1 K2 | N1 N2 N3 N4 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤800 N/mm² | ≤750 N/mm² | ≤350 HB | |
| | ap x ae | | DIN Norm 650 | DIN Norm 650 | DIN Norm 650 | DIN Norm 650 |
| | Vc (m/min) | | 25÷35 | 12÷18 | 20÷30 | 40÷60 |
| T SLOT | D (mm) | z | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 12.5 | 6 | 0.010 | 0.007 | 0.009 | 0.011 |
| | 16 | 6 | 0.025 | 0.018 | 0.021 | 0.028 |
| | 18 | 6 | 0.030 | 0.021 | 0.026 | 0.033 |
| | 19 | 6 | 0.035 | 0.025 | 0.030 | 0.039 |
| | 21 | 6 | 0.040 | 0.028 | 0.034 | 0.044 |
| | 22 | 6 | 0.043 | 0.030 | 0.036 | 0.047 |
| | 25 | 6 | 0.045 | 0.032 | 0.038 | 0.050 |
| | 28 | 6 | 0.050 | 0.035 | 0.043 | 0.055 |
| | 32 | 8 | 0.057 | 0.040 | 0.048 | 0.063 |
| | 36 | 8 | 0.065 | 0.046 | 0.055 | 0.072 |

# WWK

Woodruff

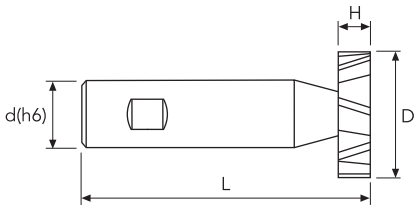
DIN 850 | N | HSS/Co BR | 10° | SQUARE | Z8~Z14



| P | M | K | N | S | H |
|---|---|---|---|---|---|
| ★ | ☆ | ★ | ☆ | | |

★ 1st choice ☆ suitable

WOODRUFF




| D(h11) | D Tol. | d(h6) | H(e8) | H Tol. | L | z | EDP No. | Stock |
|---|---|---|---|---|---|---|---|---|
| **10.5** | 0/-0.110 | 6 | 2 | -0.032/-0.059 | 50 | 8 | WWK105A | ● |
| **10.5** | 0/-0.110 | 6 | 2.5 | -0.032/-0.059 | 50 | 8 | WWK105B | ● |
| **10.5** | 0/-0.110 | 6 | 3 | -0.032/-0.059 | 50 | 8 | WWK105C | ● |
| **13.5** | 0/-0.110 | 10 | 2 | -0.032/-0.059 | 56 | 8 | WWK135A | ● |
| **13.5** | 0/-0.110 | 10 | 2.5 | -0.032/-0.059 | 56 | 8 | WWK135B | ● |
| **13.5** | 0/-0.110 | 10 | 3 | -0.032/-0.059 | 56 | 8 | WWK135C | ● |
| **13.5** | 0/-0.110 | 10 | 4 | -0.032/-0.059 | 56 | 8 | WWK135D | ● |
| **16.5** | 0/-0.110 | 10 | 2.5 | -0.032/-0.059 | 56 | 8 | WWK165B | ● |
| **16.5** | 0/-0.110 | 10 | 3 | -0.032/-0.059 | 56 | 8 | WWK165C | ● |
| **16.5** | 0/-0.110 | 10 | 4 | -0.032/-0.059 | 56 | 8 | WWK165D | ● |
| **16.5** | 0/-0.110 | 10 | 5 | -0.032/-0.059 | 56 | 8 | WWK165E | ● |
| **19.5** | 0/-0.130 | 10 | 3 | -0.040/-0.073 | 63 | 8 | WWK195C | ● |
| **19.5** | 0/-0.130 | 10 | 4 | -0.040/-0.073 | 63 | 8 | WWK195D | ● |
| **19.5** | 0/-0.130 | 10 | 5 | -0.040/-0.073 | 63 | 8 | WWK195E | ● |
| **19.5** | 0/-0.130 | 10 | 6 | -0.040/-0.073 | 63 | 8 | WWK195F | ● |
| **22.5** | 0/-0.130 | 10 | 4 | -0.040/-0.073 | 63 | 10 | WWK225D | ● |
| **22.5** | 0/-0.130 | 10 | 5 | -0.040/-0.073 | 63 | 10 | WWK225E | ● |
| **22.5** | 0/-0.130 | 10 | 6 | -0.040/-0.073 | 63 | 10 | WWK225F | ● |
| **22.5** | 0/-0.130 | 10 | 8 | -0.040/-0.073 | 63 | 10 | WWK225H | ● |
| **25.5** | 0/-0.130 | 10 | 5 | -0.040/-0.073 | 63 | 10 | WWK255E | ● |
| **25.5** | 0/-0.130 | 10 | 6 | -0.040/-0.073 | 63 | 10 | WWK255F | ● |
| **25.5** | 0/-0.130 | 10 | 7 | -0.040/-0.073 | 63 | 10 | WWK255G | ● |
| **25.5** | 0/-0.130 | 10 | 8 | -0.040/-0.073 | 63 | 10 | WWK255H | ● |
| **28.5** | 0/-0.130 | 10 | 5 | -0.040/-0.073 | 63 | 10 | WWK285E | ● |
| **28.5** | 0/-0.130 | 10 | 6 | -0.040/-0.073 | 63 | 10 | WWK285F | ● |
| **28.5** | 0/-0.130 | 10 | 7 | -0.040/-0.073 | 63 | 10 | WWK285G | ● |
| **28.5** | 0/-0.130 | 10 | 8 | -0.040/-0.073 | 63 | 10 | WWK285H | ● |
| **32.5** | 0/-0.160 | 12 | 5 | -0.050/-0.089 | 71 | 12 | WWK325E | ● |
| **32.5** | 0/-0.160 | 12 | 6 | -0.050/-0.089 | 71 | 12 | WWK325F | ● |
| **32.5** | 0/-0.160 | 12 | 7 | -0.050/-0.089 | 71 | 12 | WWK325G | ● |
| **32.5** | 0/-0.160 | 12 | 8 | -0.050/-0.089 | 71 | 12 | WWK325H | ● |
| **32.5** | 0/-0.160 | 12 | 10 | -0.050/-0.089 | 71 | 12 | WWK325L | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

# WWK

| | Material Group ISO 513 | | P1 P2 P3 P4 | P7 M1 | K1 K2 | N1 N2 N3 N4 |
|---|---|---|---|---|---|---|
| | Hardness/Rm | | ≤800 N/mm² | ≤750 N/mm² | ≤350 HB | |
| | ap x ae | | DIN Norm 6888 | DIN Norm 6888 | DIN Norm 6888 | DIN Norm 6888 |
| | Vc (m/min) | | 25÷35 | 12÷18 | 20÷30 | 40÷60 |
| WOODRUFF | D (mm) | z | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 10.5 | 8 | 0.010 | 0.007 | 0.009 | 0.011 |
| | 13.5 | 8 | 0.018 | 0.012 | 0.015 | 0.019 |
| | 16.5 | 8 | 0.025 | 0.018 | 0.021 | 0.028 |
| | 19.5 | 8 | 0.033 | 0.023 | 0.028 | 0.036 |
| | 22.5 | 10 | 0.040 | 0.028 | 0.034 | 0.044 |
| | 25.5 | 10 | 0.045 | 0.032 | 0.038 | 0.050 |
| | 28.5 | 10 | 0.050 | 0.035 | 0.043 | 0.055 |
| | 32.5 | 12 | 0.055 | 0.039 | 0.047 | 0.061 |

# CARBIDE BURRS



Indice grafico Auswahlhilfe Indice graphique Índice gráfico Руководство по выбору

| ITEM No. | PAGE | Ø3 mm | Ø6 mm |
|---|---|---|---|
| **SA** | 685 |  |  |
| **SB** | 686 |  |  |
| **SC** | 687 |  |  |
| **SD** | 688 |  |  |
| **SE** | 689 |  |  |
| **SF** | 690 |  |  |
| **SG** | 691 |  |  |
| **SH** | 692 |  |  |
| **SJ** | 693 |  |  |
| **SK** | 694 |  |  |
| **SL** | 695 |  |  |
| **SM** | 696 |  |  |
| **SN** | 697 |  |  |



# CARBIDE BURRS

Don’t miss the Osawa quality on carbide rotary burrs, available in a wide variety of shapes and geometries.

Ritrovate tutta la qualità Osawa anche nella gamma di lime rotative in metallo duro, disponibili in un’ampia scelta di forme e geometrie.

Die Osawa- Qualität steht auch für Hartmetall-Rotierfräser. Diese sind in einer breiten Auswahl an Formen und Geometrien erhältlich.

Retrouvez toute la qualité Osawa dans la gamme de limes rotatives carbure, disponibles dans une grande variété de formes et géométries.

Toda la calidad Osawa también se propone en la gama de limas rotativas de metal duro, disponibles con una amplia variedad de formas y geometrías.

Широкий выбор форм и геометрии в сочетании с высочайшим качеством характеризует линию твёрдосплавных борфрез Osawa.


INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

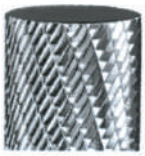
HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

## CARBIDE BURRS



**M**

### M

Double cut
Doppio taglio
2 Schneiden

Coupe double
Doble corte
Двойная заточка



**MPC**

### MPC

Plain cut
Taglio piano
Flachschneide

Coupe plane
Corte plano
Обычная заточка



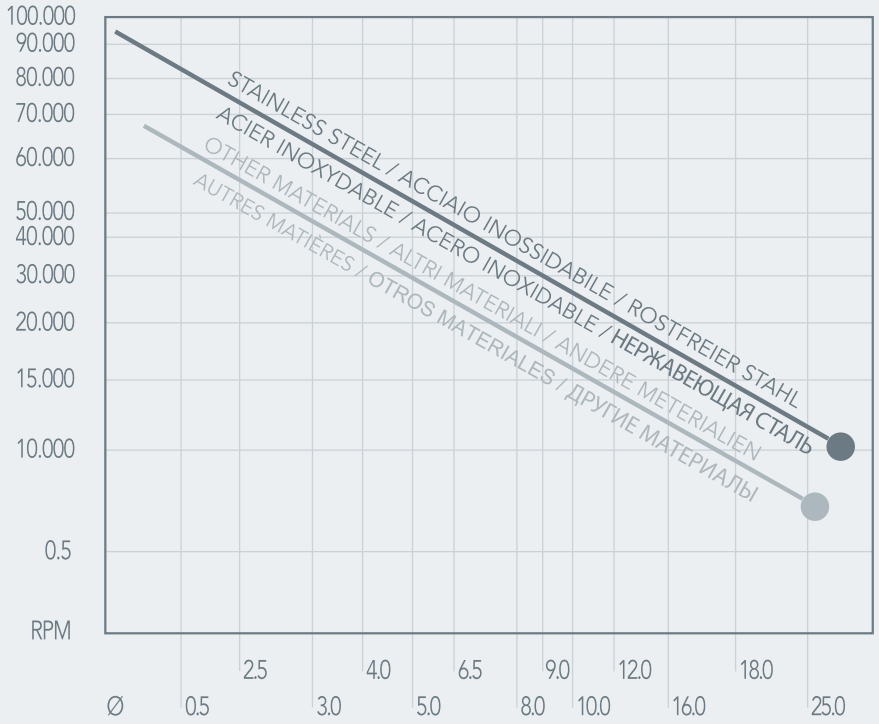
**MNF**

### MFN

Alucut

**SPEED TABLE**
**TABELLA VELOCITÀ**
**GESCHWINDIGKEITSTABELLE**

**TABLEAU DE VITESSE**
**TABLA DE VELOCIDAD**
**ТАБЛИЦА СКОРОСТЕЙ**

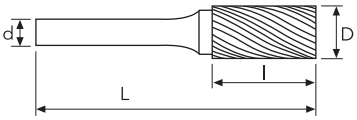


# SA

OSAWA NORM








Always wear goggles when using the rotary burrs
Per l'uso delle lime rotative è obbligatorio indossare occhiali protettivi
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| | | | | | | | M | | MPC | | MNF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D | d (3) | d (6) | l | L | ANGLE | PACKAGING | EDP No. | Stock | EDP No. | Stock | EDP No. | Stock |
| **1.5** | 3 | | 6 | 38 | | 5 | SA41M | ● | SA41MPC | ● | | |
| **2.5** | 3 | | 11 | 38 | | 5 | SA42M | ● | SA42MPC | ● | | |
| **3.0** | 3 | | 14 | 38 | | 5 | SA43M | ● | SA43MPC | ● | | |
| **3.0** | | 6 | 12 | 50 | | 5 | SA11M | ● | SA11MPC | ○ | | |
| **4.0** | 3 | | 12 | 38 | | 5 | SA52M | ● | SA52MPC | ● | | |
| **4.0** | | 6 | 13 | 50 | | 5 | SA13M | ● | SA13MPC | ○ | | |
| **5.0** | 3 | | 12.7 | 38 | | 5 | SA53M | ● | SA53MPC | ● | | |
| **5.0** | | 6 | 16 | 50 | | 5 | SA14M | ● | SA14MPC | ○ | | |
| **6.0** | | 6 | 18 | 50 | | 5 | SA1M | ● | SA1MPC | ○ | SA1MNF | ○ |
| **6.3** | 3 | | 12.7 | 45 | | 5 | SA51M | ● | SA51MPC | ● | | |
| **8.0** | | 6 | 19 | 64 | | 5 | SA2M | ● | SA2MPC | ○ | | |
| **9.5** | | 6 | 19 | 64 | | 5 | SA3M | ● | SA3MPC | ○ | SA3MNF | ○ |
| **11.0** | | 6 | 25 | 70 | | 5 | SA4M | ● | SA4MPC | ○ | | |
| **12.7** | | 6 | 25 | 70 | | 5 | SA5M | ● | SA5MPC | ○ | SA5MNF | ○ |
| **16.0** | | 6 | 25 | 70 | | 5 | SA6M | ● | SA6MPC | ○ | SA6MNF | ○ |
| **19.0** | | 6 | 25 | 70 | | 5 | SA7M | ● | SA7MPC | ○ | SA7MNF | ○ |
| **25.0** | | 6 | 25 | 70 | | 5 | SA9M | ● | SA9MPC | ○ | | |

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ∇ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
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SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

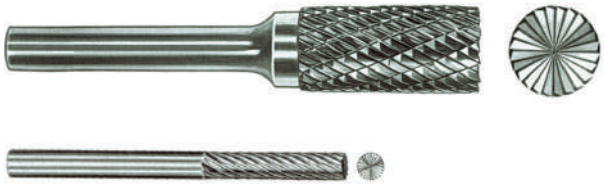
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

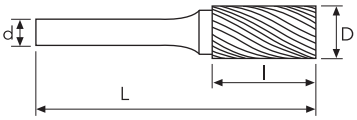
HSS END-MILLS

CARBIDE BURRS

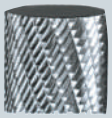
# SB

OSAWA NORM






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| | | | | | | | M | | MPC | | MNF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | |  | |  | | | | | | | |
| **D** | **d (3)** | **d (6)** | **l** | **L** | **ANGLE** | **PACKAGING** | **EDP No.** | **Stock** | **EDP No.** | **Stock** | **EDP No.** | **Stock** |
| **1.5** | 3 | | 6 | 38 | | 5 | SB41M | ● | SB41MPC | ● | | |
| **2.5** | 3 | | 11 | 38 | | 5 | SB42M | ● | SB42MPC | ● | | |
| **3.0** | 3 | | 14 | 38 | | 5 | SB43M | ● | SB43MPC | ● | | |
| **3.0** | | 6 | 12 | 50 | | 5 | SB11M | ● | SB11MPC | ○ | | |
| **4.0** | | 6 | 13 | 50 | | 5 | SB13M | ● | SB13MPC | ○ | | |
| **5.0** | | 6 | 16 | 50 | | 5 | SB14M | ● | SB14MPC | ○ | | |
| **6.0** | | 6 | 18 | 50 | | 5 | SB1M | ● | SB1MPC | ○ | SB1MNF | ○ |
| **6.3** | 3 | | 4.7 | 37 | | 5 | SB51M | ● | SB51MPC | ● | | |
| **8.0** | | 6 | 19 | 64 | | 5 | SB2M | ● | SB2MPC | ○ | | |
| **9.5** | | 6 | 19 | 64 | | 5 | SB3M | ● | SB3MPC | ○ | SB3MNF | ○ |
| **11.0** | | 6 | 25 | 70 | | 5 | SB4M | ● | SB4MPC | ○ | | |
| **12.7** | | 6 | 25 | 70 | | 5 | SB5M | ● | SB5MPC | ○ | SB5MNF | ○ |
| **16.0** | | 6 | 25 | 70 | | 5 | SB6M | ● | SB6MPC | ○ | SB6MNF | ○ |
| **19.0** | | 6 | 25 | 70 | | 5 | SB7M | ○ | SB7MPC | ○ | SB7MNF | ○ |
| **25.0** | | 6 | 25 | 70 | | 5 | SB9M | ○ | SB9MPC | ○ | | |

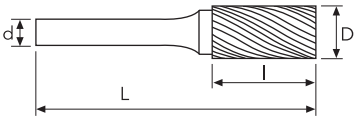
● stock standard ○ non-standard stock ∇ stock exhaustion

# SC

OSAWA NORM








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| | | | | | | | M | | MPC | | MNF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D | d (3) | d (6) | l | L | ANGLE | PACKAGING | EDP No. | Stock | EDP No. | Stock | EDP No. | Stock |
| **2.5** | 3 | | 11 | 38 | | 5 | SC41M | ● | SC41MPC | ● | | |
| **3.0** | 3 | | 14 | 38 | | 5 | SC42M | ● | SC42MPC | ● | | |
| **3.0** | | 6 | 12 | 50 | | 5 | SC11M | ● | SC11MPC | ○ | | |
| **4.0** | | 6 | 13 | 50 | | 5 | SC13M | ● | SC13MPC | ○ | | |
| **5.0** | 3 | | 12.7 | 38 | | 5 | SC53M | ● | SC53MPC | ● | | |
| **5.0** | | 6 | 16 | 50 | | 5 | SC14M | ● | SC14MPC | ○ | | |
| **6.0** | | 6 | 18 | 50 | | 5 | SC1M | ● | SC1MPC | ○ | SC1MNF | ○ |
| **6.3** | 3 | | 12.7 | 45 | | 5 | SC51M | ● | SC51MPC | ● | | |
| **8.0** | | 6 | 19 | 63 | | 5 | SC2M | ● | SC2MPC | ○ | | |
| **9.5** | | 6 | 19 | 63 | | 5 | SC3M | ● | SC3MPC | ○ | SC3MNF | ○ |
| **11.0** | | 6 | 25 | 70 | | 5 | SC4M | ● | SC4MPC | ○ | | |
| **12.7** | | 6 | 25 | 70 | | 5 | SC5M | ● | SC5MPC | ○ | SC5MNF | ○ |
| **16.0** | | 6 | 25 | 70 | | 5 | SC6M | ● | SC6MPC | ○ | SC6MNF | ○ |
| **19.0** | | 6 | 25 | 70 | | 5 | SC7M | ○ | SC7MPC | ○ | SC7MNF | ○ |
| **25.0** | | 6 | 25 | 70 | | 5 | SC9M | ○ | SC9MPC | ○ | | |

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CARBIDE BURRS

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C-SD-TA

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LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

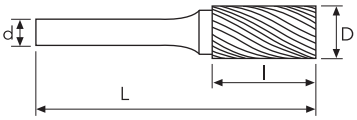
CARBIDE BURRS

# SD

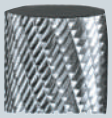
OSAWA NORM








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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | |  | |  | | | | | | | |
| **D** | **d (3)** | **d (6)** | **l** | **L** | **ANGLE** | **PACKAGING** | **EDP No.** | **Stock** | **EDP No.** | **Stock** | **EDP No.** | **Stock** |
| **2.5** | 3 | | 2.3 | 38 | | 5 | SD41M | ● | SD41MPC | ● | | |
| **3.0** | 3 | | 2.5 | 38 | | 5 | SD42M | ● | SD42MPC | ● | | |
| **3.0** | | 6 | 2.5 | 50 | | 5 | SD11M | ● | SD11MPC | ○ | | |
| **5.0** | 3 | | 4.7 | 38 | | 5 | SD53M | ● | SD53MPC | ● | | |
| **5.0** | | 6 | 4 | 50 | | 5 | SD14M | ● | SD14MPC | ○ | | |
| **6.0** | | 6 | 4.7 | 50 | | 5 | SD1M | ● | SD1MPC | ○ | SD1MNF | ○ |
| **6.3** | 3 | | 5 | 38 | | 5 | SD51M | ● | SD51MPC | ● | | |
| **8.0** | | 6 | 6 | 52 | | 5 | SD2M | ● | SD2MPC | ○ | | |
| **9.5** | | 6 | 8 | 54 | | 5 | SD3M | ● | SD3MPC | ○ | SD3MNF | ○ |
| **11.0** | | 6 | 9.5 | 55 | | 5 | SD4M | ● | SD4MPC | ○ | | |
| **12.7** | | 6 | 11 | 56 | | 5 | SD5M | ● | SD5MPC | ○ | SD5MNF | ○ |
| **16.0** | | 6 | 14 | 60 | | 5 | SD6M | ● | SD6MPC | ○ | SD6MNF | ○ |
| **19.0** | | 6 | 16.5 | 62 | | 5 | SD7M | ● | SD7MPC | ○ | SD7MNF | ○ |
| **25.0** | | 6 | 22 | 68 | | 5 | SD9M | ● | SD9MPC | ○ | | |

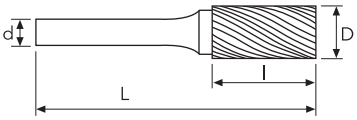
● stock standard ○ non-standard stock ▽ stock exhaustion

# SE

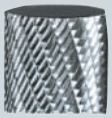
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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | |  | |  | | | | | | | |
| D | d (3) | d (6) | l | L | ANGLE | PACKAGING | EDP No. | Stock | EDP No. | Stock | EDP No. | Stock |
| **3.0** | 3 | | 5.5 | 38 | | 5 | SE41M | ● | SE41MPC | ● | | |
| **6.0** | | 6 | 10 | 50 | | 5 | SE1M | ● | SE1MPC | ○ | | |
| **5.0** | 3 | | 7.1 | 38 | | 5 | SE53M | ● | SE53MPC | ● | | |
| **6.3** | 3 | | 9.5 | 42 | | 5 | SE51M | ● | SE51MPC | ● | | |
| **9.5** | | 6 | 16 | 60 | | 5 | SE3M | ● | SE3MPC | ○ | SE3MNF | ○ |
| **12.7** | | 6 | 22 | 67 | | 5 | SE5M | ● | SE5MPC | ○ | SE5MNF | ○ |
| **16.0** | | 6 | 25 | 70 | | 5 | SE6M | ● | SE6MPC | ○ | SE6MNF | ○ |
| **19.0** | | 6 | 25 | 70 | | 5 | SE7M | ○ | SE7MPC | ○ | SE7MNF | ○ |

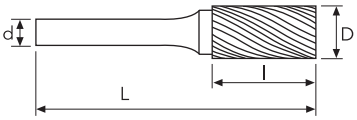
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# SF

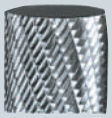
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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | |  | |  | | | | | | | |
| **D** | **d (3)** | **d (6)** | **l** | **L** | **ANGLE** | **PACKAGING** | **EDP No.** | **Stock** | **EDP No.** | **Stock** | **EDP No.** | **Stock** |
| **3.0** | 3 | | 6 | 38 | | 5 | SF41M | ● | SF41MPC | ● | | |
| **3.0** | 3 | | 14 | 38 | | 5 | SF42M | ● | SF42MPC | ● | | |
| **3.0** | | 6 | 12 | 50 | | 5 | SF11M | ● | SF11MPC | ○ | | |
| **5.0** | 3 | | 12.7 | 38 | | 5 | SF53M | ● | SF53MPC | ● | | |
| **6.0** | | 6 | 18 | 50 | | 5 | SF1M | ● | SF1MPC | ○ | SF1MNF | ○ |
| **6.3** | 3 | | 12.7 | 45 | | 5 | SF51M | ● | SF51MPC | ● | | |
| **9.6** | | 6 | 19 | 64 | | 5 | SF3M | ● | SF3MPC | ○ | SF3MNF | ○ |
| **11.0** | | 6 | 25 | 70 | | 5 | SF4M | ● | SF4MPC | ○ | | |
| **12.7** | | 6 | 19 | 65 | | 5 | SF13M | ○ | SF13MPC | ○ | | |
| **12.7** | | 6 | 25 | 70 | | 5 | SF5M | ● | SF5MPC | ○ | SF5MNF | ○ |
| **16.0** | | 6 | 25 | 70 | | 5 | SF6M | ● | SF6MPC | ○ | SF6MNF | ○ |
| **19.0** | | 6 | 25 | 70 | | 5 | SF7M | ○ | SF7MPC | ○ | | |

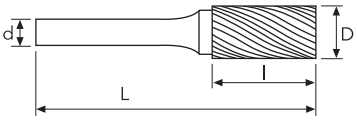
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# SG

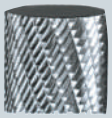
OSAWA NORM








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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | |  | |  | | | | | | | |
| D | d (3) | d (6) | l | L | ANGLE | PACKAGING | EDP No. | Stock | EDP No. | Stock | EDP No. | Stock |
| **3.0** | 3 | | 6 | 38 | | 5 | SG41M | ● | SG41MPC | ● | | |
| **3.0** | 3 | | 10 | 38 | | 5 | SG43M | ● | SG43MPC | ● | | |
| **3.0** | 3 | | 14 | 38 | | 5 | SG44M | ● | SG44MPC | ● | | |
| **5.0** | 3 | | 12.7 | 38 | | 5 | SG53M | ● | SG53MPC | ● | | |
| **6.0** | | 6 | 18 | 50 | | 5 | SG1M | ● | SG1MPC | ○ | | |
| **6.3** | 3 | | 12.7 | 45 | | 5 | SG51M | ● | SG51MPC | ● | | |
| **8.0** | | 6 | 19 | 64 | | 5 | SG2M | ● | SG2MPC | ○ | | |
| **9.5** | | 6 | 19 | 64 | | 5 | SG3M | ● | SG3MPC | ○ | | |
| **12.7** | | 6 | 19 | 64 | | 5 | SG13M | ○ | SG13MPC | ○ | | |
| **12.7** | | 6 | 25 | 70 | | 5 | SG5M | ● | SG5MPC | ○ | | |
| **16.0** | | 6 | 25 | 70 | | 5 | SG6M | ● | SG6MPC | ○ | | |
| **19.0** | | 6 | 25 | 70 | | 5 | SG7M | ● | SG7MPC | ○ | | |
| **19.0** | | 6 | 38 | 83 | | 5 | SG15M | ○ | SG15MPC | ○ | | |



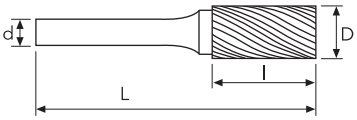
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# SH

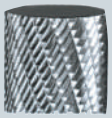
OSAWA NORM








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- Toujours porter les lunettes de securité en utilisant les limes rotatives
- Para usar las limas rotativas es obligatorio usar gafas de protección
- При работе с борфрезами всегда используйте защитные очки

| | | | | | | | M | | MPC | | MNF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | |  | |  | |  | |
| D | d (3) | d (6) | l | L | ANGLE | PACKAGING | EDP No. | Stock | EDP No. | Stock | EDP No. | Stock |
| **3.0** | 3 | | 6 | 38 | | 5 | SH41M | ● | SH41MPC | ● | | |
| **5.0** | 3 | | 9.5 | 38 | | 5 | SH53M | ● | SH53MPC | ● | | |
| **8.0** | | 6 | 19 | 64 | | 5 | SH2M | ● | SH2MPC | ○ | | |
| **12.7** | | 6 | 32 | 77 | | 5 | SH5M | ● | SH5MPC | ○ | | |
| **16.0** | | 6 | 36 | 80 | | 5 | SH6M | ○ | SH6MPC | ○ | | |

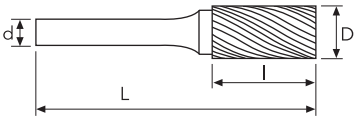
● stock standard ○ non-standard stock ∇ stock exhaustion

# SJ

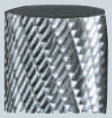
OSAWA NORM








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| | | | | | | | M | | MPC | | MNF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | |  | |  | | | | | | | |
| D | d (3) | d (6) | l | L | ANGLE | PACKAGING | EDP No. | Stock | EDP No. | Stock | EDP No. | Stock |
| **3.0** | 3 | | 2.5 | 38 | 60° | 5 | SJ42M | ● | SJ42MPC | ● | | |
| **6.0** | | 6 | 4 | 50 | 60° | 5 | SJ1M | ○ | SJ1MPC | ○ | | |
| **9.5** | | 6 | 8 | 56 | 60° | 5 | SJ3M | ● | SJ3MPC | ○ | | |
| **12.7** | | 6 | 11 | 59 | 60° | 5 | SJ5M | ● | SJ5MPC | ○ | | |
| **16.0** | | 6 | 14.5 | 63 | 60° | 5 | SJ6M | ○ | SJ6MPC | ○ | | |
| **19.0** | | 6 | 17.5 | 65 | 60° | 5 | SJ7M | ○ | SJ7MPC | ○ | | |
| **25.0** | | 6 | 24.5 | 70 | 60° | 5 | SJ9M | ○ | SJ9MPC | ○ | | |

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ∇ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

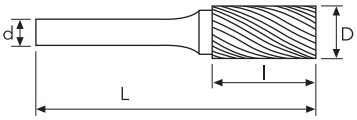
CARBIDE BURRS

# SK

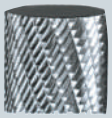
OSAWA NORM








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| | | | | | | | M | | MPC | | MNF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | |  | |  | | | | | | | |
| **D** | **d (3)** | **d (6)** | **l** | **L** | **ANGLE** | **PACKAGING** | **EDP No.** | **Stock** | **EDP No.** | **Stock** | **EDP No.** | **Stock** |
| **3.0** | 3 | | 1.5 | 38 | 90° | 5 | SK42M | ● | SK42MPC | ● | | |
| **6.0** | | 6 | 3 | 50 | 90° | 5 | SK1M | ● | SK1MPC | ○ | | |
| **9.5** | | 6 | 4.7 | 53 | 90° | 5 | SK3M | ● | SK3MPC | ○ | | |
| **12.7** | | 6 | 6.3 | 55 | 90° | 5 | SK5M | ● | SK5MPC | ○ | | |
| **16.0** | | 6 | 8 | 57 | 90° | 5 | SK6M | ● | SK6MPC | ○ | | |
| **19.0** | | 6 | 9.5 | 59 | 90° | 5 | SK7M | ○ | SK7MPC | ○ | | |
| **25.0** | | 6 | 12.7 | 60 | 90° | 5 | SK9M | ○ | SK9MPC | ○ | | |

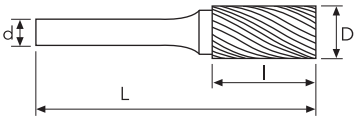
● stock standard ○ non-standard stock ∇ stock exhaustion

# SL

OSAWA NORM

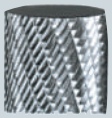









- Always wear goggles when using the rotary burrs
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| D | d (3) | d (6) | l | L | ANGLE | PACKAGING | M EDP No. | M Stock | MPC EDP No. | MPC Stock | MNF EDP No. | MNF Stock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3.0** | 3 | | 10 | 38 | 10° | 5 | SL41M | ● | SL41MPC | ● | | |
| **3.0** | 3 | | 14 | 38 | 8° | 5 | SL42M | ● | SL42MPC | ● | | |
| **5.0** | 3 | | 12.7 | 38 | 14° | 5 | SL53M | ● | SL53MPC | ● | | |
| **6.0** | | 6 | 18 | 50 | 14° | 5 | SL1M | ● | SL1MPC | ○ | | |
| **8.0** | | 6 | 25.4 | 70 | 14° | 5 | SL2M | ● | SL2MPC | ○ | | |
| **9.6** | | 6 | 30.2 | 76 | 14° | 5 | SL3M | ● | SL3MPC | ○ | SL3MNF | ○ |
| **12.7** | | 6 | 32 | 77 | 14° | 5 | SL4M | ● | SL4MPC | ○ | SL4MNF | ○ |
| **16.0** | | 6 | 33.3 | 78 | 14° | 5 | SL5M | ● | SL5MPC | ○ | SL5MNF | ○ |
| **19.0** | | 6 | 41.3 | 86 | 14° | 5 | SL7M | ○ | SL7MPC | ○ | | |

INFO

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
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MEX/MH
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CARBIDE BURRS

● stock standard ○ non-standard stock ∇ stock exhaustion

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

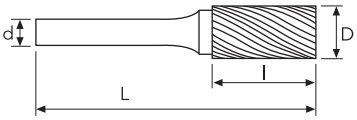
CARBIDE BURRS

# SM

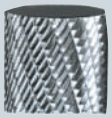
OSAWA NORM








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| | | | | | | | M | | MPC | | MNF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | |  | |  | | | | | | | |
| **D** | **d (3)** | **d (6)** | **l** | **L** | **ANGLE** | **PACKAGING** | **EDP No.** | **Stock** | **EDP No.** | **Stock** | **EDP No.** | **Stock** |
| **3.0** | 3 | | 8 | 38 | 18° | 5 | SM41M | ● | SM41MPC | ● | | |
| **3.0** | 3 | | 11 | 38 | 14° | 5 | SM42M | ● | SM42MPC | ● | | |
| **3.0** | 3 | | 15 | 38 | 10° | 5 | SM43M | ● | SM43MPC | ● | | |
| **6.0** | | 6 | 12.7 | 50 | 22° | 5 | SM1M | ● | SM1MPC | ○ | | |
| **6.0** | | 6 | 20 | 50 | 14° | 5 | SM2M | ● | SM2MPC | ○ | | |
| **6.0** | | 6 | 25 | 50 | 10° | 5 | SM3M | ● | SM3MPC | ○ | | |
| **6.3** | 3 | | 12.7 | 51 | 22° | 5 | SM51M | ● | SM51MPC | ● | | |
| **9.5** | | 6 | 16 | 64 | 28° | 5 | SM4M | ● | SM4MPC | ○ | | |
| **12.7** | | 6 | 22 | 71 | 28° | 5 | SM5M | ● | SM5MPC | ○ | | |
| **16.0** | | 6 | 25 | 74 | 31° | 5 | SM6M | ● | SM6MPC | ○ | | |

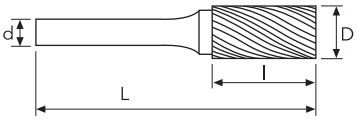
● stock standard ○ non-standard stock ∇ stock exhaustion

# SN

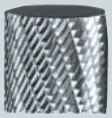
OSAWA NORM








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| | | | | | | | M | | MPC | | MNF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | |  | |  | | | | | | | |
| D | d (3) | d (6) | l | L | ANGLE | PACKAGING | EDP No. | Stock | EDP No. | Stock | EDP No. | Stock |
| **3.0** | 3 | | 4 | 38 | 10° | 5 | SN42M | ● | SN42MPC | ● | | |
| **6.0** | | 6 | 8 | 50 | 10° | 5 | SN1M | ● | SN1MPC | ○ | | |
| **6.3** | 3 | | 6 | 39 | 12° | 5 | SN51M | ○ | SN51MPC | ○ | | |
| **9.5** | | 6 | 9.5 | 55 | 13° | 5 | SN2M | ● | SN2MPC | ○ | | |
| **12.7** | | 6 | 12.7 | 58 | 28° | 5 | SN4M | ● | SN4MPC | ○ | | |
| **16.0** | | 6 | 19 | 64 | 18° | 5 | SN6M | ○ | SN6MPC | ○ | | |
| **19.0** | | 6 | 16 | 61 | 30° | 5 | SN7M | ○ | SN7MPC | ○ | | |



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INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

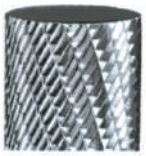
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS



**M**



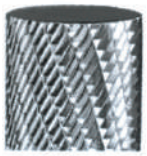
**BUR10 M TYPE**
Set 10pcs. - shank Ø6 mm
SA1 - SB1 - SC1 - SD1 - SE1 - SF1 - SG1 - SL1 - SM1 - SN1



**MPC**




**A15FW MPC TYPE**
Set 15pcs. - shank Ø3 mm
SA41 - SA42 - SA43 - SA52 - SB43 -
SC42 - SD41 - SD42 - SD53 - SE41 -
SG43 - SL42 - SM42 - SM43 - SN42



**M**

**A16FW M TYPE**
Set 15pcs. - shank Ø3 mm
SA41 - SA42 - SA43 - SA52 - SB43 - SC42 - SD41
SD42 - SD53 - SE41 - SG43 - SL42 - SM42 - SM43 - SN42

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**www.osawa.it**

$OC

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DIAMOND & CUTTING TOOLS

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