



 **OSAWA**
D R I L L S & E N D M I L L S

CATALOGUE 2014

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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 manufacturers worldwide located (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 all are 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 da 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 Fräs Werkzeugen 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 Investitionen 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 coûts 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 cualidad 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.

Артуро Соргато
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 secure maximum useful 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. The 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 whose 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 Arbeitsstelle 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 verletzen.
- 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 entstehen. 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.



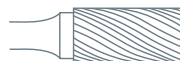
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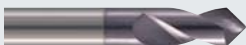











































































PARAMETERS .233

ITEM NO.		ITEM NO.		ITEM NO.	
118N	62	G2CS4R NEW	189	MEXCRB2	140
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DRILLS































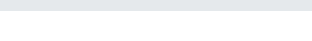


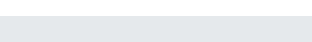
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NC STARTING		MG PV200			C-SD-TA	
		MG PV200			C-SD-TA	
EXTRA SHORT DIN1897 - DIN6539		MG PV200			343TA	
		MG BR			318N	
		HSS/CO PV10			218LFTA	
		HSSE PV10			980SUTA	
		HSS OX			118N	
		HSS/CO HT			218NVA	
		MG PV200			353TA 3xD	
SHORT DIN338 - DIN6537K DIN6537L - DIN345		MG PV200			355TA 5xD	
		MG PV200			353HTA 3xD	
		MG PV200			355HTA 5xD	
		MG PV300			355SU 5xD	
		MG PV300			353SUH 3xD	
		MG PV300			355SUH 5xD	
		MG LAPPED			353ALH 3xD	
		MG LAPPED			355ALH 5xD	
		MG PV1000			353HRC 3xD	
		MG PV1000			355HRC 5xD	
		HSS/CO PV10			238LFTA	

Ø RANGE	📄	🇮🇹 ACCIAIO	ACCIAIO	ACCIAIO		TITANIO	GHISA	ALLUMINIO	OTTONE	
		🇩🇪 STAHL	STAHL	STAHL		TITAN	GUSS	ALUMINIUM	MESSING	
		🇫🇷 ACIER	ACIER	ACIER		TITANIUM	FONTE	ALUMINIUM	LAITON	
		🇪🇸 ACERO	ACERO	ACERO		TITANIO	FUNDITÓN	ALUMINIO	LATÓN	
		🇷🇺 СТАЛЬ	СТАЛЬ	СТАЛЬ		ТИТАН	ЧУГУН	АЛЮМИНИЙ	ЛАТУНЬ	
		STEEL ~30HRC	STEEL 30~45HRC	STEEL 45HRC~	INOX	INCONEL	TITANIUM	CAST IRON	ALUMINIUM	BRASS
6~20	40	⊙	⊙		⊙	⊙	⊙	⊙	⊙	⊙
6~20	40	⊙	⊙		⊙	⊙	⊙	⊙	⊙	⊙
1~16	23	⊙	⊙		○		⊙			
1~13	23	⊙	○		○	○	⊙	○		
2~20	42	⊙	○		○		○	○		
2~13	52	⊙	○		⊙	⊙		⊙		
1~16	62	⊙	○		○	○	○	○	○	○
1~20	62	⊙	○		⊙	○	○	○	○	○
3~20	27	⊙	⊙		○		⊙			
3~20	31	⊙	⊙		○		⊙			
3~20	27	⊙	⊙		○		⊙			
3~20	31	⊙	⊙		○		⊙			
1~2.95	20	⊙	⊙		⊙		○			
3~20	27	⊙	⊙		⊙		○	○		
1~2.95	20	⊙	⊙		⊙		○	○		
3~20	31	⊙	⊙		⊙		○	○		
3~20	27							⊙		
3~20	31							⊙		
2.6~14.2	27			⊙						
2.6~14.2	31			⊙						
2~20	46	⊙	○		○		○	○		

⊙ 🇮🇹 most suitable 🇫🇷 molto adatto 🇩🇪 am besten geeignete 🇫🇷 le plus indiqué 🇪🇸 más adecuado 🇷🇺 первый выбор
 ○ 🇮🇹 suitable 🇫🇷 adatto 🇩🇪 geeignet 🇫🇷 indiqué 🇪🇸 adecuado 🇷🇺 второй выбор

SHORT
DIN338 - DIN6537K
DIN6537L - DIN345

	HSSE PV10			990SUTA	
	HSS OX			138N	
	HSS TiN			138NTI	
	HSS TiN			1386STI	
	HSS BR			138WB	
	HSS BR			138HB	
	HSS/CO HT			238NVA	
	HSS/Co TiN			2386STI	
	HSS OX			145N	
	HSS TiN			145NTI	
	HSS/CO HT			245N 8xD	

LONG
DIN340 - DIN341
OSAWA NORM

	MG PV300			358SUH 8xD	
	MG PV300			3584HTA	
	MG PV300			3512SUH 12xD	
	HSS/CO HT			234NVA	
	HSS/CO OX			234LS	
	HSS/CO PV15			234LSTH	
	HSS/Co BR			241LS	

EXTRA LONG
DIN1869/1-2-3
DIN1870/1-2

	HSS/Co BR			2691LS	
	HSS/CO PV15			2691LSTH	

Ø RANGE	📄	🇮🇹 ACCIAIO	ACCIAIO	ACCIAIO		TITANIO	GHISA	ALLUMINIO	OTTONE	
		🇩🇪 STAHL	STAHL	STAHL		TITAN	GUSS	ALUMINIUM	MESSING	
		🇫🇷 ACIER	ACIER	ACIER		TITANIUM	FONTE	ALUMINIUM	LAITON	
		🇪🇸 ACERO	ACERO	ACERO		TITANIO	FUNDITIÓN	ALUMINIO	LATÓN	
		🇷🇺 СТАЛЬ	СТАЛЬ	СТАЛЬ		ТИТАН	ЧУГУН	АЛЮМИНИЙ	ЛАТУНЬ	
		STEEL ~30HRC	STEEL 30-45HRC	STEEL 45HRC~	INOX	INCONEL	TITANIUM	CAST IRON	ALUMINIUM	BRASS
2~20	56	⊙	○		⊙		⊙		⊙	
0.2~20	67	⊙	○		○		○	○	○	○
1~16	67	⊙	○		○		○	○	○	○
1~13	67	⊙	○		○		○	○	○	○
1~13	67							⊙		
1~13	67									⊙
1~20	73	⊙	○		⊙		○	○	○	○
1~13	73	⊙	○		⊙		○	○	○	○
5~60	84	⊙	○		○		○	○	○	○
13~30	84	⊙	○		○		○	○	○	○
13~30	84	⊙	○		⊙		○	○	○	○
1~2.95	20	⊙	⊙		⊙		⊙			
3~16	35	⊙	⊙		⊙		⊙			
1~2.9	20	⊙	⊙		⊙		⊙			
0.5~12	79	⊙	○		⊙		○	○	○	○
2~13	79	⊙	○					○	○	
2~13	79	⊙	○				○	○	○	
13~30	89	⊙	○				○	○	○	
2~13	82	⊙	○				○	○	○	
2~13	82	⊙	○				○	○	○	

⊙ most suitable 🇮🇹 molto adatto 🇪🇸 am besten geeignete 🇫🇷 le plus indiqué 🇪🇸 más adecuado 🇷🇺 первый выбор
 ○ suitable 🇮🇹 adatto 🇪🇸 geeignet 🇫🇷 indiqué 🇪🇸 adecuado 🇷🇺 второй выбор

EXTRA LONG DIN1869/1-2-3 DIN1870/1-2		HSS BR			1692LS	
		HSS BR			1693LS	
SHORT DIN338 - DIN6537K DIN6537L - DIN345		HSS/Co BR			2701LS	
		HSS/Co BR			2702LS	

Ø RANGE	□	🇮🇹 ACCIAIO	ACCIAIO	ACCIAIO			TITANIO	GHISA	ALLUMINIO	OTTONE
		🇩🇪 STAHL	STAHL	STAHL			TITAN	GUSS	ALUMINIUM	MESSING
		🇫🇷 ACIER	ACIER	ACIER			TITANIUM	FONTE	ALUMINIUM	LAITON
		🇪🇸 ACERO	ACERO	ACERO			TITANIO	FUNDITÓN	ALUMINIO	LATÓN
		🇷🇺 СТАЛЬ	СТАЛЬ	СТАЛЬ			ТИТАН	ЧУГУН	АЛЮМИНИЙ	ЛАТУНЬ
		STEEL ~30HRC	STEEL 30~45HRC	STEEL 45HRC~	INOX	INCONEL	TITANIUM	CAST IRON	ALUMINIUM	BRASS
3~12	83	⊙	○				○	○	○	
3.5~12	83	⊙	○				○	○	○	
13~30	90	⊙	○				○	○	○	
13~30	90	⊙	○				○	○	○	

⊙ 🇫🇷 most suitable 🇮🇹 molto adatto 🇪🇸 am besten geeignete 🇫🇷 le plus indiqué 🇪🇸 más adecuado 🇷🇺 первый выбор
 ○ 🇫🇷 suitable 🇮🇹 adatto 🇪🇸 geeignet 🇫🇷 indiqué 🇪🇸 adecuado 🇷🇺 второй выбор

STOCK		
	<ul style="list-style-type: none"> stock standard stock standard Standard Lager 	<ul style="list-style-type: none"> stock standard stock estándar складская позиция
	<ul style="list-style-type: none"> non-standard stock stock non standard nicht Standard Lager 	<ul style="list-style-type: none"> stock non standard stock no estándar не складская позиция
	<ul style="list-style-type: none"> stock exhaustion esaurimento stock Vorraterschöpfung 	<ul style="list-style-type: none"> épuisement du stock agotamiento de stock складские остатки

SHANK ATTACCO SCHAFT QUEUE MANGO ХВОСТОВИК		
	<ul style="list-style-type: none"> cylindrical shank attacco cilindrico zylindrischer Schaft 	<ul style="list-style-type: none"> queue cylindrique mango cilíndrico цилиндрическое крепление
	<ul style="list-style-type: none"> Morse Taper shank attacco Cono Morse MK Schaft 	<ul style="list-style-type: none"> queue conique mango Cono Morse конус Морзе

GEOMETRY GEOMETRIA GEOMETRIE GÉOMÉTRIE GEOMETRÍA ГЕОМЕТРИЯ		
	<ul style="list-style-type: none"> general purpose uso generico allgemeine Anwendung 	<ul style="list-style-type: none"> applications génériques uso genérico общего назначения
	<ul style="list-style-type: none"> general purpose with inside coolant uso generico con refrigerazione interna allgemeine Anwendung mit innerer Kühlmittelzuführung 	<ul style="list-style-type: none"> applications génériques à trous d'huile uso genérico con refrigeración interna общего назначения с внутренней подачей СОЖ
	<ul style="list-style-type: none"> 4 guides chamfer with inside coolant 4 fasi con refrigerazione interna 4 Führungsfasen mit innerer Kühlmittelzuführung 	<ul style="list-style-type: none"> 4 listels à trous d'huile 4 fases con refrigeración interna 4 направляющих с внутренней подачей СОЖ
	<ul style="list-style-type: none"> stainless steel acciaio inossidabile rostfreien Stahl 	<ul style="list-style-type: none"> acier inoxydable acciaio inossidabile нержавеющей сталь
	<ul style="list-style-type: none"> stainless steel with inside coolant acciaio inossidabile con refrigerazione interna rostfreien Stahl mit innerer Kühlmittelzuführung 	<ul style="list-style-type: none"> acier inoxydable à trous d'huile acero inoxidable con refrigeración interna нержавеющей сталь с внутренней подачей СОЖ
	<ul style="list-style-type: none"> aluminium with inside coolant alluminio con refrigerazione interna Aluminium mit innerer Kühlmittelzuführung 	<ul style="list-style-type: none"> aluminium à trous d'huile aluminio con refrigeración interna алюминий с внутренней подачей СОЖ
	<ul style="list-style-type: none"> hardened steel acciaio temprato Hartstahl 	<ul style="list-style-type: none"> acier trempé acero templado закалённая сталь
	<ul style="list-style-type: none"> NC starting drill punte da centri NC NC Anbohrer mit Spitzenwinkel 	<ul style="list-style-type: none"> Forets à centreur NC Brocas de hacer punto NC центровочные свёрла для станков с ЧПУ
	<ul style="list-style-type: none"> high performance, selfcentering alto rendimento, autocentrante hochleistung, selbstzentrierende 	<ul style="list-style-type: none"> haute performance, auto centreur alto rendimiento, autocentrante высокопроизводительные, самоцентрирующиеся

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

MATERIAL MATERIALE WERKSTOFF MATIÈRE MATERIAL МАТЕРИАЛ					
	micrograin micrograna Mikrokörnung			micrograin micrograno микрозернистый твёрдый сплав	
	high speed steel acciaio super rapido Hochleistungsschnellschnittstahl			acier rapide acero súper rápido быстрорежущая сталь	
	high speed steel 5%~8% Co acciaio super rapido 5%~8% Co Hochleistungsschnellschnittstahl 5%~8% Co			acier rapide 5%~8% Co acero súper rápido 5%~8% Co быстрорежущая сталь с кобальтом 5-8%	
	HSS/Co + EV				

* SURFACE TREATMENT TRATTAMENTO SUPERFICIALE OBERFLÄCHENBEHANDLUNG
 † TREATMENT DE SURFACE TRATAMIENTO SUPERFICIAL ОБРАБОТКА ПОВЕРХНОСТИ

 ...
 OX

 * vaporization
 † vaporizzazione
 ● Dämpfung

 † traitement vapeur
 ● vaporización
 ● окисление

 ...
 HT

 * heat treatment
 † trattamento termico
 ● thermische Behandlung

 † traitement thermique
 ● tratamiento térmico
 ● термическая обработка

* COATINGS RIVESTIMENTI BESCHICHTUNGEN REVÊTEMENTS RECUBRIMIENTOS ПОКРЫТИЕ

* HARDNESS (HV) DURETÉ (HV) † DUREZZA (HV) DUREZA (HV) ● HÄRTE (HV) ТВЁРДОСТЬ (HV)	2300	3300		3500	3500	3600
* FRICTION COEFFICIENT COEFFICIENT DE FROTTEMENT † COEFFICIENTE D'ATTRITO COEFICIENTE DE ROZAMIENTO ● REIBUNGSKOEFFIZIENT КОЭФФИЦИЕНТ ТРЕНИЯ	0.4	0.35	0.2	0.5	0.5	0.25
* THICKNESS (μ) EPAISSEUR (μ) † SPESSORE (μ) ESPESOR (μ) ● DICKE (μ) ТОЛЩИНА (МКМ)	1~4	1~5	2~5	1~4	1~4	2~3
* MAX WORKING (°C) TEMPÉRATURE MAXIMALE (°C) † TEMPERATURA MAX (°C) TEMPERATURA MÁX (°C) ● HOCHSTE TEMPERATUR (°C) МАКС. ТЕМПЕРАТУРА (°C)	600	900	0~1000	800	800	1200

* PARAMETERS PARAMETRI PARAMETER PARAMÉTRÉS PARÁMETROS ПАРАМЕТРЫ

 * parameters reference
 † riferimento parametri
 ● Parameter Hinweis

 † référence des paramètres
 ● referencia parámetros
 ● ссылка на параметры



TYPHOON

Solid carbide for general and special purpose

✦ Top quality carbide substrate and latest coating technology combined with specific geometries. Here comes the Osawa Typhoon range of solid carbide drills.

🇮🇹 Un substrato di metallo duro di alta qualità e una tecnologia di rivestimento all'avanguardia combinati con geometrie specifiche. Queste le caratteristiche delle punte in metallo duro Osawa Typhoon.

🇩🇪 Hochwertige Hartmetallsubstrate, Beschichtungen und Schnittgeometrien stecken in dieser Produktpalette. Diese Produkte setzen die Osawa Typhoon VHM Bohrer Palette zusammen.

🇫🇷 Un substrat de carbure de haute qualité et une technologie de revêtement de pointe combinée avec des géométries spécifiques. Voilà les caractéristiques des forets carbure monobloc Osawa Typhoon.

🇪🇸 Sustrato de Metal Duro de altísima calidad, combinado con geometrías específicas y la última tecnología en recubrimiento. Aquí tenemos la gama Typhoon de Osawa en brocas de Metal Duro.

🇷🇺 Исходный материал наивысшего качества в комбинации с современным покрытием и специальной геометрией, представляет гамму твердосплавных сверл серии Osawa Typhoon.



PV200 COATING

GENERAL PURPOSE · USO GENERICO
ALLGEMEINE ANWENDUNGEN · APPLICATIONS GÉNÉRIQUES
UTILIZACIÓN GENERAL · ОБЩЕГО НАЗНАЧЕНИЯ



PV300 COATING

GENERAL PURPOSE · USO GENERICO
ALLGEMEINE ANWENDUNGEN · APPLICATIONS GÉNÉRIQUES
UTILIZACIÓN GENERAL · ОБЩЕГО НАЗНАЧЕНИЯ



PV300 COATING

LAPPED FLUTES · GOLE LAPPATE
GELÄPPTÉ NUTEN · GOUJOURS RODÉES
RANURAS LAPEADAS · ПОЛИРОВАННЫЕ КАНАВКИ



STAINLESS STEEL · ACCIAIO INOSSIDABILE
ROSTFREIER STAHL · ACIER INOXYDABLE
ACERO INOXIDABLE · НЕРЖАВЕЮЩАЯ СТАЛЬ



UNCOATED

LAPPED FLUTES · GOLE LAPPATE
GELÄPPTÉ NUTEN · GOUJOURS RODÉES
RANURAS LAPEADAS · ПОЛИРОВАННЫЕ КАНАВКИ

ALUMINIUM · ALLUMINIO
ALUMINIUM · ALUMINIUM
ALUMINIO · АЛЮМИНИЙ



PV1000 COATING

45-62HRC

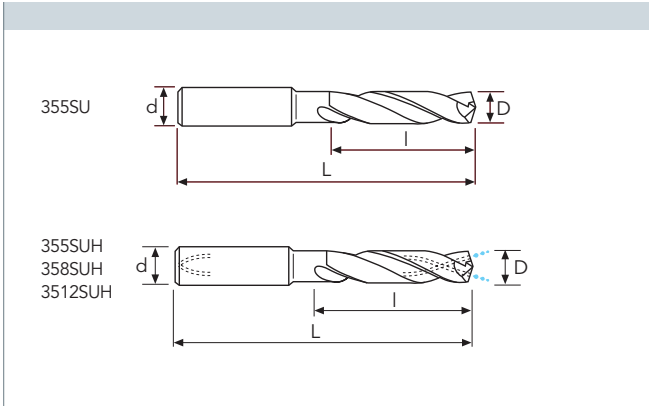
	OSAWA NORM	5XD 355SU 355SUH	8XD 358SUH	12XD 3512SUH
PAGE 246				

NEW

NEW



(m7)					
Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	+12 / +2	+16 / +4	+21 / +6	+25 / +7	+29 / +8



MG PV300	MG PV300	MG PV300	MG PV300

D(m7)	d(h6)	I	L	Stock	Stock	Stock	Stock
mm 1.00	3	6.5	50	○	○		
1.00	3	9.5	50			●	
1.00	3	13.5	55				●
1.05	3	6.5	50	○	○		
1.05	3	10	50			○	
1.10	3	7.2	50	○	○		
1.10	3	10.5	50			●	
1.10	3	14.9	55				○
1.15	3	7.5	50	○	○		
1.15	3	10.9	50			○	
1.20	3	7.8	50	○	○		
1.20	3	11.4	50			●	
1.20	3	16.2	55				●
1.25	3	8.1	50	○	○		
1.25	3	11.9	50			○	
1.28	3	12.4	50			●	
1.30	3	8.5	50	○	○		
1.30	3	12.4	50			●	
1.30	3	17.6	55				●
1.35	3	8.8	50	○	○		
1.35	3	12.8	50			○	
1.40	3	9.1	50	○	○		
1.40	3	13.3	50			●	
1.40	3	18.9	55				○
1.45	3	9.4	50	○	○		
1.45	3	13.8	50			●	
1.50	3	9.8	50	○	○		
1.50	3	14.3	50			●	
1.50	3	20.3	55				●
1.55	3	10.1	50	○	○		
1.55	3	14.7	50			○	
1.60	3	10.4	50	○	○		
1.60	3	15.2	50			●	
1.60	3	21.6	65				●
1.65	3	10.7	55	○	○		
1.65	3	15.7	60			○	

● stock standard ○ non-standard stock ■ stock exhaustion

	OSAWA NORM	5XD 355SU 355SUH	8XD 358SUH	12XD 3512SUH
PAGE 246				

(m7)

Ø mm	1-3	3.1-6	6.1-10	10.1-18	18.1-20
tol. D µ	+12 / +2	+16 / +4	+21 / +6	+25 / +7	+29 / +8



<p>355SU</p>				
<p>355SUH 358SUH 3512SUH</p>				

D(m7)	d(h6)	I	L	Stock	Stock	Stock	Stock
mm 1.70	3	11.1	55	○	○	●	○
1.70	3	16.2	60				
1.70	3	23	65				○
1.75	3	11.4	55	○	○		
1.75	3	16.6	60			○	
1.80	3	11.7	55	○	○		
1.80	3	17.1	60			●	
1.80	3	24.3	65				●
1.85	3	12	55	○	○		
1.85	3	17.6	60			●	
1.90	3	12.4	55	○	○		
1.90	3	18.1	60			●	
1.90	3	25.7	65			○	
1.95	3	12.7	55	○	○		
1.95	3	18.5	60				○
2.00	3	13	55	○	○		
2.00	3	19	60			●	
2.00	3	27	65				●
2.05	3	13.3	55	○	○		
2.05	3	19.5	60			○	
2.10	3	13.7	55	○	○		
2.10	3	20	60			●	
2.10	3	28.4	65				●
2.15	3	14	55	○	○		
2.15	3	20.4	60			○	
2.20	3	14.3	55	○	○		
2.20	3	20.9	60			●	
2.20	3	29.7	65				●
2.25	3	14.6	55	○	○		
2.25	3	21.4	60			○	
2.30	3	15	55	○	○		
2.30	3	21.9	60			●	
2.30	3	31.1	65				○
2.35	3	15.3	55	○	○		
2.35	3	22.3	60			○	
2.40	3	15.6	55	○	○		

	OSAWA NORM	5XD 355SU 355SUH	8XD 358SUH	12XD 3512SUH
PAGE 246				

NEW

NEW



(m7)					
Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	+12 / +2	+16 / +4	+21 / +6	+25 / +7	+29 / +8

355SU 	355SUH 358SUH 3512SUH 				
		MG PV300	MG PV300	MG PV300	MG PV300

D(m7)	d(h6)	I	L	Stock	Stock	Stock	Stock
mm 2.40	3	22.8	60			●	
2.40	3	32.4	75				○
2.45	3	15.9	55	○	○		
2.45	3	23.3	60			○	
2.50	3	16.3	55	○	○		
2.50	3	23.8	60			●	
2.50	3	33.8	75				●
2.55	3	16.6	55	○	○		
2.55	3	24.2	60			○	
2.60	3	16.9	55	○	○		
2.60	3	24.7	60			●	
2.60	3	35.1	75				●
2.65	3	17.2	55	○	○		
2.65	3	25.2	60			○	
2.70	3	17.4	55	○	○		
2.70	3	25.7	60			●	
2.70	3	36.5	75				○
2.75	3	17.9	55	○	○		
2.75	3	26.1	60			○	
2.80	3	18.2	55	○	○		
2.80	3	26.6	60			●	
2.80	3	37.8	75				●
2.85	3	18.5	55	○	○		
2.85	3	27.1	60			○	
2.90	3	18.9	55	○	○		
2.90	3	27.6	60			●	
2.90	3	39.2	75				○
2.95	3	19.2	55	○	○		
2.95	3	28	60			○	

● stock standard ○ non-standard stock ■ stock exhaustion

n **Vf**
PAGE
246-247

**DIN
6539**

3XD



343TA - 318N (h7)

Ø mm	1-3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -10	0 / -12	0 / -15	0 / -18	0 / -21

<D mm 2

≥D mm 2

TA

MG

PV200

TA

MG

BR

D(h7)	d(h6)	I	L	Stock	Stock
mm 1.00	2	6	40	●	●
1.10	2	7	40	●	●
1.20	2	8	40	●	●
1.30	2	8	40	●	●
1.40	2	9	40	●	●
1.50	2	9	40	●	●
1.60	2	10	40	●	●
1.70	2	10	40	●	●
1.80	2	11	40	●	●
1.90	2	11	40	●	●
2.00	2	12	40	●	●
2.10	2.1	12	40	●	●
2.20	2.2	13	40	●	●
2.30	2.3	13	46	●	●
2.40	2.4	14	46	●	●
2.50	2.5	14	46	●	●
2.60	2.6	14	46	●	●
2.70	2.7	16	46	●	●
2.80	2.8	16	49	●	●
2.90	2.9	16	49	●	●
3.00	3	16	49	●	●
3.10	3.1	18	49	●	●
3.20	3.2	18	49	●	●
3.30	3.3	18	52	●	●
3.40	3.4	20	52	●	●
3.50	3.5	20	52	●	●
3.60	3.6	20	52	●	●
3.70	3.7	20	52	●	●
3.80	3.8	22	55	●	●
3.90	3.9	22	55	●	●
4.00	4	22	55	●	●
4.10	4.1	22	55	●	●
4.20	4.2	22	55	●	●
4.30	4.3	24	58	●	●
4.40	4.4	24	58	●	○
4.50	4.5	24	58	●	●

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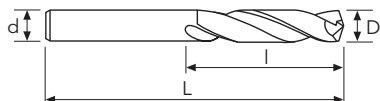
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3XD



343TA - 318N (h7)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -10	0 / -12	0 / -15	0 / -18	0 / -21



D(h7)	d(h6)	l	L	Stock	Stock
mm 4.60	4.6	24	58	●	●
4.70	4.7	24	58	●	●
4.80	4.8	26	62	●	●
4.90	4.9	26	62	●	●
5.00	5	26	62	●	●
5.10	5.1	26	62	●	●
5.20	5.2	26	62	●	●
5.30	5.3	26	66	●	●
5.40	5.4	28	66	●	●
5.50	5.5	28	66	●	●
5.60	5.6	28	66	●	●
5.70	5.7	28	66	●	●
5.80	5.8	28	70	●	●
5.90	5.9	28	70	●	●
6.00	6	28	70	●	●
6.10	6.1	31	70	●	●
6.20	6.2	31	70	●	●
6.30	6.3	31	70	●	●
6.40	6.4	31	70	●	●
6.50	6.5	31	70	●	●
6.60	6.6	31	70	●	○
6.70	6.7	31	70	●	●
6.80	6.8	34	74	●	●
6.90	6.9	34	74	●	●
7.00	7	34	74	●	●
7.10	7.1	34	74	●	○
7.20	7.2	34	74	●	○
7.30	7.3	34	79	●	○
7.40	7.4	34	79	●	○
7.50	7.5	34	79	●	●
7.60	7.6	37	79	●	○
7.70	7.7	37	79	●	○
7.80	7.8	37	79	●	○
7.90	7.9	37	79	●	○
8.00	8	37	79	●	●
8.10	8.1	37	79	●	●

● stock standard ○ non-standard stock ■ stock exhaustion

n **Vf**
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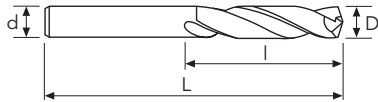
DIN
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3XD



343TA - 318N (h7)

Ø mm	1-3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -10	0 / -12	0 / -15	0 / -18	0 / -21



MG	MG
PV200	BR

D(h7)	d(h6)	I	L	Stock	Stock
mm 8.20	8.2	37	79	●	●
8.30	8.3	37	84	●	○
8.40	8.4	37	84	●	○
8.50	8.5	37	84	●	●
8.60	8.6	40	84	●	○
8.70	8.7	40	84	●	●
8.80	8.8	40	84	●	●
8.90	8.9	40	84	●	○
9.00	9	40	84	●	●
9.10	9.1	40	84	●	○
9.20	9.2	40	84	●	●
9.30	9.3	40	89	●	●
9.40	9.4	40	89	●	○
9.50	9.5	40	89	●	●
9.60	9.6	43	89	●	○
9.70	9.7	43	89	●	○
9.80	9.8	43	89	●	●
9.90	9.9	43	89	●	○
10.00	10	43	89	●	●
10.20	10.2	43	89	●	●
10.50	10.5	43	95	●	●
10.80	10.8	47	95	○	
11.00	11	47	95	●	●
11.20	11.2	47	102	○	
11.30	11.3	47	102	○	
11.50	11.5	47	102	●	●
11.80	11.8	47	102	○	
12.00	12	51	102	●	●
12.20	12.2	51	102	○	
12.50	12.5	51	103	●	●
12.80	12.8	51	103	○	
13.00	13	51	103	●	●
13.50	13.5	54	107	●	
13.80	13.8	54	107	○	
14.00	14	54	107	●	
14.50	14.5	56	111	●	

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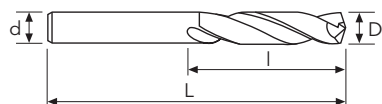
**DIN
6539**

3XD



343TA - 318N (h7)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D μ	0 / -10	0 / -12	0 / -15	0 / -18	0 / -21



D(h7)	d(h6)	l	L	Stock	Stock
mm 15.00	15	56	111	●	
15.30	15.3	58	115	○	
15.50	15.5	58	115	●	
15.80	15.8	58	115	○	
16.00	16	58	115	●	

● stock standard ○ non-standard stock ■ stock exhaustion

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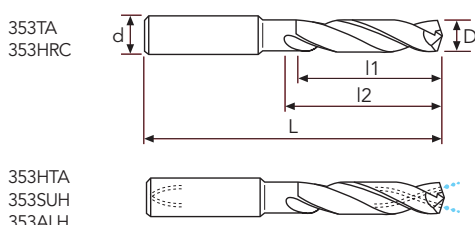















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353TA - 353HTA - 353SUH - 353ALH - 353HRC (m7)

Ø mm	1-3	3.1-6	6.1-10	10.1-18	18.1-20
tol. D µ	+12 / +2	+16 / +4	+21 / +6	+25 / +7	+29 / +8



						353TA	353HTA	353SUH	353ALH	353HRC
										
						MG PV200	MG PV200	MG PV300	MG LAPPED	MG PV1000
										
										
D(m7)	d(h6)	l1	l2	L		Stock	Stock	Stock	Stock	Stock
mm										
2.60	6	14	20	62						●
3.00	6	14	20	62		●	●	●	●	●
3.10	6	14	20	62		●	●	●	○	
3.20	6	14	20	62		●	●	●	○	
3.30	6	14	20	62		●	●	●	●	●
3.40	6	14	20	62		●	●	●	●	●
3.50	6	14	20	62		●	●	●	●	●
3.60	6	14	20	62		●	●	●	○	
3.70	6	14	20	62		●	●	●	○	●
3.80	6	17	24	66		●	●	●	●	●
3.90	6	17	24	66		●	●	●	○	
4.00	6	17	24	66		●	●	●	●	●
4.10	6	17	24	66		●	●	●	○	●
4.20	6	17	24	66		●	●	●	●	●
4.30	6	17	24	66		●	●	●	●	●
4.40	6	17	24	66		●	●	●	○	
4.50	6	17	24	66		●	●	●	●	●
4.60	6	17	24	66		●	●	●	○	●
4.70	6	17	24	66		●	●	●	○	
4.80	6	20	28	66		●	●	●	●	●
4.90	6	20	28	66		●	●	●	○	
5.00	6	20	28	66		●	●	●	●	●
5.10	6	20	28	66		●	●	●	●	●
5.20	6	20	28	66		●	●	●	●	●
5.30	6	20	28	66		●	●	●	○	●
5.40	6	20	28	66		●	●	●	○	
5.50	6	20	28	66		●	●	●	●	●
5.60	6	20	28	66		●	●	●	○	●
5.70	6	20	28	66		●	●	●	○	
5.80	6	20	28	66		●	●	●	●	●
5.90	6	20	28	66		●	●	●	○	
6.00	6	20	28	66		●	●	●	●	●
6.10	8	24	34	79		●	●	●	○	●
6.20	8	24	34	79		●	●	●	●	●
6.30	8	24	34	79		●	●	●	○	
6.40	8	24	34	79		●	●	●	○	

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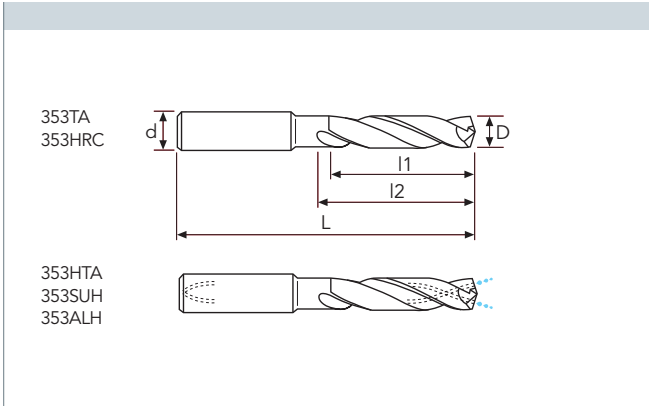
**DIN
6537K**

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353TA - 353HTA - 353SUH - 353ALH - 353HRC (m7)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	+12 / +2	+16 / +4	+21 / +6	+25 / +7	+29 / +8



MG PV200	MG PV200	MG PV300	MG LAPPED	MG PV1000

D(m7)	d(h6)	l1	l2	L	Stock	Stock	Stock	Stock	Stock
mm 6.50	8	24	34	79	●	●	●	●	●
6.60	8	24	34	79	●	●	●	○	●
6.70	8	24	34	79	●	●	●	○	●
6.80	8	24	34	79	●	●	●	○	●
6.90	8	24	34	79	●	●	●	○	●
7.00	8	24	34	79	●	●	●	●	●
7.10	8	29	41	79	●	●	●	○	●
7.20	8	29	41	79	●	●	●	○	●
7.30	8	29	41	79	●	●	●	○	●
7.40	8	29	41	79	●	●	●	○	●
7.50	8	29	41	79	●	●	●	●	●
7.60	8	29	41	79	●	●	●	○	●
7.70	8	29	41	79	●	●	●	○	●
7.80	8	29	41	79	●	●	●	●	●
7.90	8	29	41	79	●	●	●	○	●
8.00	8	29	41	79	●	●	●	●	●
8.10	10	35	47	89	●	●	●	○	●
8.20	10	35	47	89	●	●	●	●	●
8.30	10	35	47	89	●	●	●	○	●
8.40	10	35	47	89	●	●	●	○	●
8.50	10	35	47	89	●	●	●	●	●
8.60	10	35	47	89	●	●	●	○	●
8.70	10	35	47	89	●	●	●	○	●
8.80	10	35	47	89	●	●	●	●	●
8.90	10	35	47	89	●	●	●	○	●
9.00	10	35	47	89	●	●	●	●	●
9.10	10	35	47	89	●	●	●	○	●
9.20	10	35	47	89	●	●	●	○	●
9.30	10	35	47	89	●	●	●	○	●
9.40	10	35	47	89	●	●	●	○	●
9.50	10	35	47	89	●	●	●	●	●
9.60	10	35	47	89	●	●	●	○	●
9.70	10	35	47	89	●	●	●	○	●
9.80	10	35	47	89	●	●	●	○	●
9.90	10	35	47	89	●	●	●	○	●
10.00	10	35	47	89	●	●	●	●	●

● stock standard ○ non-standard stock ■ stock exhaustion

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353TA - 353HTA - 353SUH - 353ALH - 353HRC (m7)

Ø mm	1-3	3.1-6	6.1-10	10.1-18	18.1-20
tol. D µ	+12 / +2	+16 / +4	+21 / +6	+25 / +7	+29 / +8



<p>353TA 353HRC</p> <p>353HTA 353SUH 353ALH</p>									
	PV200	PV200	PV300	LAPPED	PV1000				
D(m7)	d(h6)	l1	l2	L	Stock	Stock	Stock	Stock	Stock
mm 10.10	12	40	55	102	●	●			
10.20	12	40	55	102	●	●	●	●	●
10.30	12	40	55	102	●	●	●	●	●
10.40	12	40	55	102	○	●	●	●	●
10.50	12	40	55	102	●	●	●	●	●
10.60	12	40	55	102	●	●	●		
10.70	12	40	55	102	○	○			
10.80	12	40	55	102	●	●	●	○	●
10.90	12	40	55	102	○	○			
11.00	12	40	55	102	●	●	●	●	●
11.10	12	40	55	102	○	●			
11.20	12	40	55	102	●	●	○	○	●
11.30	12	40	55	102	●	●	○	○	
11.40	12	40	55	102	○	○			
11.50	12	40	55	102	●	●	●	●	●
11.60	12	40	55	102	●	●			
11.70	12	40	55	102	●	●			
11.80	12	40	55	102	●	●	●	○	●
11.90	12	40	55	102	●	○			
12.00	12	40	55	102	●	●	●	●	●
12.20	14	43	60	107	●	●	●	○	●
12.50	14	43	60	107	●	●	●	○	
12.60	14	43	60	107	●	●			
12.80	14	43	60	107	○	●	●	○	
13.00	14	43	60	107	●	●	●	○	
13.30	14	43	60	107	○	●	●	○	
13.50	14	43	60	107	●	●	●	○	
13.80	14	43	60	107	○	●	●	○	
14.00	14	43	60	107	●	●	●	○	
14.20	16	45	65	115			●		●
14.50	16	45	65	115	●	●	●	○	
14.60	16	45	65	115					
15.00	16	65	65	115	●	●	●	○	
15.30	16	65	65	115	○	●	●	○	
15.50	16	65	65	115	●	●	●	○	
15.80	16	65	73	115	○	●	●	○	

● stock standard ○ non-standard stock ■ stock exhaustion

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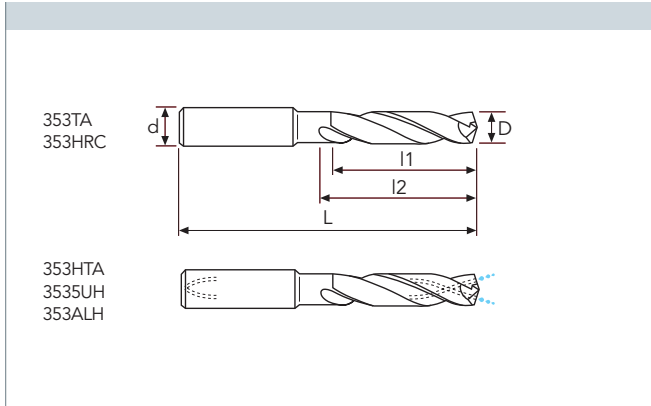
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353TA - 353HTA - 353SUH - 353ALH - 353HRC (m7)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D μ	+12 / +2	+16 / +4	+21 / +6	+25 / +7	+29 / +8



MG PV200	MG PV200	MG PV300	MG LAPPED	MG PV1000

D(m7)	d(h6)	I1	I2	L	Stock	Stock	Stock	Stock	Stock
mm 16.00	16	65	73	115	●	●	●	○	
16.50	18	73	73	123	○	●	●	○	
17.00	18	73	73	123	○	●	●	○	
17.50	18	73	73	123	○	●	●	○	
18.00	18	73	73	123	○	●	●	○	
18.50	20	79	79	131	○	●	●	○	
19.00	20	79	79	131	○	●	●	○	
19.50	20	79	79	131	○	●	●	○	
20.00	20	79	79	131	○	●	●	○	

● stock standard ○ non-standard stock ■ stock exhaustion

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**DIN
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5XD

355TA - 355HTA - 355SUH - 355ALH - 355HRC (m7)

Ø mm	1-3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	+12 / +2	+16 / +4	+21 / +6	+25 / +7	+29 / +8

385UH (h7)

Ø mm	1-3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -10	0 / -12	0 / -15	0 / -18	0 / -21



355TA
355HRC

355HTA
355SUH
355ALH

MG PV200	MG PV200	MG PV300	MG LAPPED	MG PV1000

D	d(h6)	l1	l2	L	Stock	Stock	Stock	Stock	Stock
mm 2.60	6	23	28	66					○
3.00	6	23	28	66	●	●	●	●	○
3.10	6	23	28	66	●	●	●	○	
3.20	6	23	28	66	●	●	●	●	
3.25 NEW	6	23	28	66		●			
3.30	6	23	28	66	●	●	●	●	○
3.40	6	23	28	66	●	●	●	●	○
3.50	6	23	28	66	●	●	●	●	○
3.60	6	23	28	66	●	●	●	○	
3.70	6	23	28	66	●	●	●	●	○
3.80	6	29	36	74	●	●	●	●	○
3.90	6	29	36	74	●	●	●	●	○
4.00	6	29	36	74	●	●	●	●	○
4.10	6	29	36	74	●	●	●	○	○
4.20	6	29	36	74	●	●	●	●	○
4.30	6	29	36	74	●	●	●	●	○
4.40	6	29	36	74	●	●	●	○	
4.50	6	29	36	74	●	●	●	●	○
4.60	6	29	36	74	●	●	●	○	○
4.65 NEW	6	29	36	74		●			
4.70	6	29	36	74	●	●	●	○	
4.80	6	35	44	82	●	●	●	●	○
4.90	6	35	44	82	●	●	●	○	
5.00	6	35	44	82	●	●	●	●	○
5.10	6	35	44	82	●	●	●	●	○
5.20	6	35	44	82	●	●	●	●	○
5.30	6	35	44	82	●	●	●	○	○
5.40	6	35	44	82	●	●	●	○	
5.50	6	35	44	82	●	●	●	●	○
5.55 NEW	6	35	44	82		●			
5.60	6	35	44	82	●	●	●	○	○
5.70	6	35	44	82	●	●	●	○	
5.80	6	35	44	82	●	●	●	●	○
5.90	6	35	44	82	●	●	●	○	
6.00	6	35	44	82	●	●	●	●	○
6.10	8	43	53	91	●	●	●	○	○

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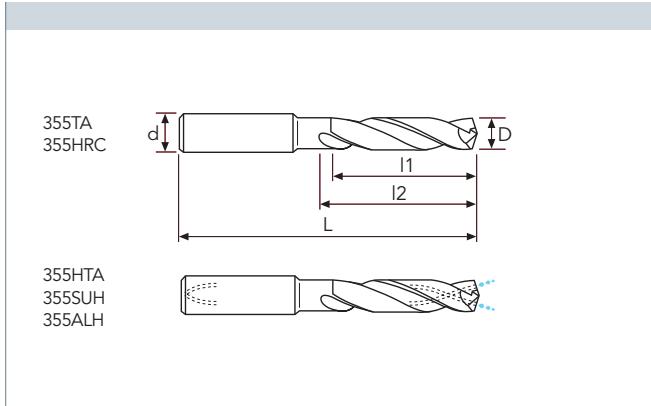


355TA - 355HTA - 355SUH - 355ALH - 355HRC (m7)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	+12 / +2	+16 / +4	+21 / +6	+25 / +7	+29 / +8

385UH (h7)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -10	0 / -12	0 / -15	0 / -18	0 / -21



MG PV200	MG PV200	MG PV300	MG LAPPED	MG PV1000

D	d(h6)	l1	l2	L	Stock	Stock	Stock	Stock	Stock
mm 6.20	8	43	53	91	●	●	●	●	○
6.30	8	43	53	91	●	●	●	○	○
6.40	8	43	53	91	●	●	●	○	○
6.50	8	43	53	91	●	●	●	●	○
6.60	8	43	53	91	●	●	●	○	○
6.70	8	43	53	91	●	●	●	○	○
6.80	8	43	53	91	●	●	●	●	○
6.90	8	43	53	91	●	●	●	○	○
7.00	8	43	53	91	●	●	●	●	○
7.10	8	43	53	91	●	●	●	○	○
7.20	8	43	53	91	●	●	●	○	○
7.30	8	43	53	91	●	●	●	○	○
7.40	8	43	53	91	●	●	●	○	○
7.45 NEW	8	43	53	91	●	●	●	○	○
7.50	8	43	53	91	●	●	●	●	○
7.60	8	43	53	91	●	●	●	○	○
7.70	8	43	53	91	●	●	●	○	○
7.80	8	43	53	91	●	●	●	●	○
7.90	8	43	53	91	●	●	●	○	○
8.00	8	43	53	91	●	●	●	●	○
8.10	10	49	61	103	●	●	●	○	○
8.20	10	49	61	103	●	●	●	●	○
8.30	10	49	61	103	●	●	●	○	○
8.40	10	49	61	103	●	●	●	○	○
8.50	10	49	61	103	●	●	●	●	○
8.60	10	49	61	103	●	●	●	○	○
8.70	10	49	61	103	●	●	●	○	○
8.80	10	49	61	103	●	●	●	●	○
8.90	10	49	61	103	●	●	●	○	○
9.00	10	49	61	103	●	●	●	●	○
9.10	10	49	61	103	●	●	●	○	○
9.20	10	49	61	103	●	●	●	○	○
9.25 NEW	10	49	61	103	●	●	●	○	○
9.30	10	49	61	103	●	●	●	○	○
9.35 NEW	10	49	61	103	●	○	●	○	○
9.40	10	49	61	103	●	●	●	○	○

● stock standard ○ non-standard stock ■ stock exhaustion

NEW

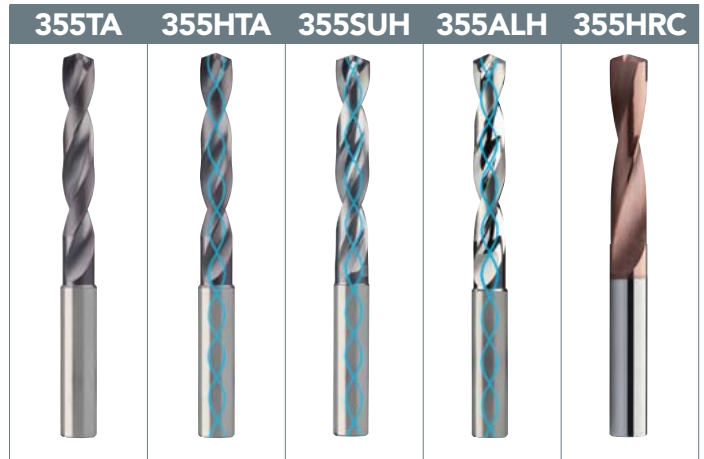
	DIN 6537L	5XD
PAGE 246-247		

355TA - 355HTA - 355SUH - 355ALH - 355HRC (m7)

Ø mm	1-3	3.1-6	6.1-10	10.1-18	18.1-20
tol. D µ	+12 / +2	+16 / +4	+21 / +6	+25 / +7	+29 / +8

385UH (h7)

Ø mm	1-3	3.1-6	6.1-10	10.1-18	18.1-20
tol. D µ	0 / -10	0 / -12	0 / -15	0 / -18	0 / -21



<p>355TA 355HRC</p> <p>355HTA 355SUH 355ALH</p>					
	MG	MG	MG	MG	MG
	PV200	PV200	PV300	LAPPED	PV1000

D	d(h6)	l1	l2	L	Stock	Stock	Stock	Stock	Stock	
mm 9.45	NEW	10	49	61	103		●			
9.50		10	61	61	103	●	●	●	●	○
9.60		10	61	61	103	●	●	●	○	
9.70		10	61	61	103	●	●	●	○	
9.80		10	61	61	103	●	●	●	○	○
9.90		10	61	61	103	●	●	●	○	
10.00		10	61	61	103	●	●	●	●	○
10.10		12	71	71	118	●	●			
10.20		12	71	71	118	●	●	●	●	○
10.30		12	71	71	118	●	●	●		○
10.40		12	71	71	118	○	●			○
10.50		12	71	71	118	●	●	●	●	○
10.60		12	71	71	118	●	●	●		
10.70		12	71	71	118	●	●			
10.80		12	71	71	118	●	●	●	○	○
10.90		12	71	71	118	○	○			
11.00		12	71	71	118	●	●	●	●	○
11.10		12	71	71	118	○	●			
11.20		12	71	71	118	●	●	●	○	○
11.25	NEW	12	71	71	118	●	●	●	○	
11.30		12	71	71	118		●			
11.40		12	71	71	118	○	●			
11.50		12	71	71	118	●	●	●	●	○
11.60		12	71	71	118	○	●			
11.70		12	71	71	118	○	●			
11.80		12	71	71	118	●	●	●	○	○
11.90		12	71	71	118	○	○			
12.00		12	71	71	118	●	●	●	●	○
12.20		14	77	77	124	○	●	●	○	○
12.50		14	77	77	124	●	●	●	○	
12.60		14	77	77	124		●	●		
12.80		14	77	77	124	○	●	●	○	
13.00		14	77	77	124	●	●	●	○	
13.30		14	77	77	124	○	●	●	○	
13.50		14	77	77	124	●	●	●	○	
13.80		14	77	77	124	○	●	●	○	

NEW

n **Vf**
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DIN
6537L

5XD

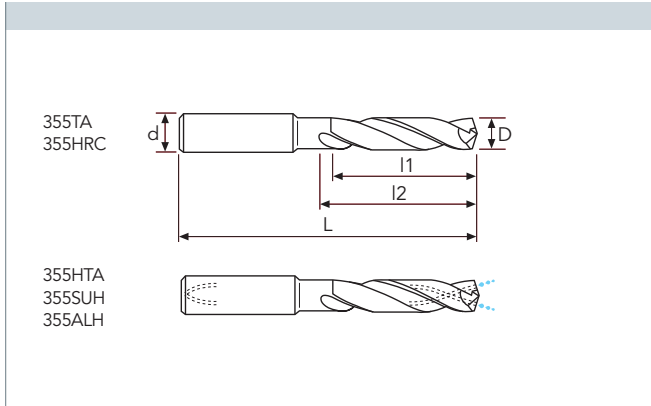


355TA - 355HTA - 355SUH - 355ALH - 355HRC (m7)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	+12 / +2	+16 / +4	+21 / +6	+25 / +7	+29 / +8

385UH (h7)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -10	0 / -12	0 / -15	0 / -18	0 / -21



MG PV200	MG PV200	MG PV300	MG LAPPED	MG PV1000

D	d(h6)	l1	l2	L	Stock	Stock	Stock	Stock	Stock
mm 14.00	14	77	77	124	●	●	●	○	
14.20	16	83	83	133		●	●		○
14.50	16	83	83	133	●	●	●	○	
14.60	16	83	83	133		●	●		
15.00	16	83	83	133	●	●	●	○	
15.30	16	83	83	133	○	●	●	○	
15.50	16	83	83	133	●	●	●	○	
15.80	16	83	83	133	○	●	●	○	
16.00	16	83	83	133	●	●	●	○	
16.50	18	93	93	143	○	●	●	○	
17.00	18	93	93	143	○	●	●	○	
17.50	18	93	93	143	○	●	●	○	
18.00	18	93	93	143	○	●	●	○	
18.50	20	101	101	153	○	●	●	○	
19.00	20	101	101	153	○	●	●	○	
19.50	20	101	101	153	○	○	●	○	
20.00	20	101	101	153	○	●	●	○	

● stock standard ○ non-standard stock ■ stock exhaustion

n **Vf**
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246-247

**OSAWA
NORM**

8XD



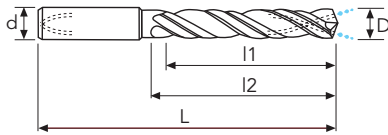
4 guide chamfers
4 fasi
4 Führungsfasen
4 listels
4 márgenes
4 фазы

3584HTA



3584HTA (m7)

Ø mm	1-3	3.1-6	6.1-10	10.1-18	18.1-20
tol. D µ	+12 / +2	+16 / +4	+21 / +6	+25 / +7	+29 / +8



D(m7)	d(h6)	l1	l2	L	Stock
mm 3.00	6	32	40	85	●
3.10	6	32	40	85	○
3.20	6	32	40	85	●
3.30	6	32	40	85	●
3.40	6	32	40	85	○
3.50	6	32	40	85	●
3.60	6	36	40	85	○
3.70	6	36	40	85	●
3.80	6	36	40	85	●
3.90	6	36	40	85	○
4.00	6	38	46	85	●
4.10	6	38	46	85	●
4.20	6	38	46	85	●
4.30	6	40	46	97	●
4.40	6	40	46	97	○
4.50	6	44	46	97	●
4.60	6	44	46	97	●
4.70	6	44	46	97	○
4.80	6	44	46	97	●
4.90	6	44	46	97	○
5.00	6	48	57	97	●
5.10	6	48	57	97	●
5.20	6	48	57	97	●
5.30	6	48	57	97	○
5.40	6	48	57	97	○
5.50	6	48	57	97	●
5.60	6	48	57	97	●
5.70	6	48	57	97	○
5.80	6	48	57	97	●
5.90	6	48	57	97	●
6.00	6	48	57	97	●
6.10	8	64	76	116	●
6.20	8	64	76	116	●
6.30	8	64	76	116	●
6.40	8	64	76	116	○
6.50	8	64	76	116	●

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 246-247

**OSAWA
NORM**

8XD



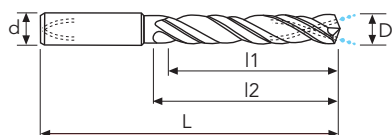
4 guide chamfers
 4 fasi
 4 Führungsfasen
 4 listels
 4 мэргенес
 4 фазы

3584HTA



3584HTA (m7)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	+12 / +2	+16 / +4	+21 / +6	+25 / +7	+29 / +8



D(m7)	d(h6)	l1	l2	L	Stock
mm 6.60	8	64	76	116	○
6.70	8	64	76	116	○
6.80	8	64	76	116	●
6.90	8	64	76	116	○
7.00	8	64	76	116	●
7.10	8	64	76	116	●
7.20	8	64	76	116	●
7.30	8	64	76	116	○
7.40	8	64	76	116	○
7.50	8	64	76	116	●
7.60	8	64	76	116	○
7.70	8	64	76	116	○
7.80	8	64	76	116	●
7.90	8	64	76	116	○
8.00	8	64	76	116	●
8.10	10	80	95	142	●
8.20	10	80	95	142	●
8.30	10	80	95	142	●
8.40	10	80	95	142	○
8.50	10	80	95	142	●
8.60	10	80	95	142	●
8.70	10	80	95	142	○
8.80	10	80	95	142	●
8.90	10	80	95	142	○
9.00	10	80	95	142	●
9.10	10	80	95	142	●
9.20	10	80	95	142	●
9.30	10	80	95	142	○
9.40	10	80	95	142	○
9.50	10	80	95	142	●
9.60	10	80	95	142	○
9.70	10	80	95	142	○
9.80	10	80	95	142	●
9.90	10	80	95	142	○
10.00	10	80	95	142	●
10.20	12	96	114	163	●



OSAWA
NORM

8XD



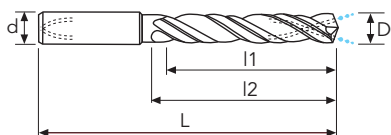
4 guide chamfers
4 fasi
4 Führungsfasen
4 listels
4 márgenes
4 фазы

3584HTA



3584HTA (m7)

Ø mm	1-3	3.1-6	6.1-10	10.1-18	18.1-20
tol. D µ	+12 / +2	+16 / +4	+21 / +6	+25 / +7	+29 / +8



D(m7)	d(h6)	l1	l2	L	Stock
mm 10.50	12	96	114	163	●
10.80	12	96	114	163	●
11.00	12	96	114	163	●
11.20	12	96	114	163	●
11.30	12	96	114	163	○
11.50	12	96	114	163	●
11.80	12	96	114	163	●
12.00	12	96	114	163	●
12.20	14	112	133	182	●
12.50	14	112	133	182	●
12.80	14	112	133	182	●
13.00	14	112	133	182	●
13.50	14	112	133	182	●
14.00	14	112	133	182	●
14.50	16	128	152	204	●
15.00	16	128	152	204	●
15.50	16	128	152	204	●
16.00	16	128	152	204	●

● stock standard ○ non-standard stock ■ stock exhaustion



C-SD-TA

Solid carbide NC starting 90°-120°

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

🇮🇹 Punte da centri a 90° e 120° per NC. Centatura 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 hacer punto y escariar 90° - 120° en una grande variedad de materiales.

🇷🇺 Центровочные свёрла с углами при вершине 90°-120° для сверления центровых отверстий и зенкования, для обработки широкой гаммы материалов на станках с ЧПУ.

n **Vf**
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**OSW
NORM**

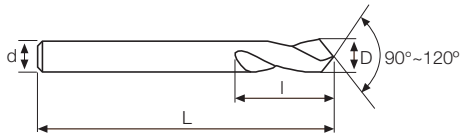
3XD

C-SD-TA 90° C-SD-TA 120°



C-SD-TA (h6)

∅ mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D μ	0 / -6	0 / -8	0 / -9	0 / -11	0 / -13



D(h6)	d(h6)	l	L	Stock	Stock
mm 6.00	6	16	50	●	●
8.00	8	20	64	●	●
10.00	10	25	70	●	●
12.00	12	25	75	●	●
16.00	16	26	90	●	●
20.00	20	35	100	○	○

● stock standard ○ non-standard stock ■ stock exhaustion



LFTA

Hss/Co multi-purpose

✚ 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 affutage autocentrante. Fabriquée en HSS/Co+PV10 de la plus haute qualité et caractérisée par une géométrie de coupe très polyvalente, 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 larga de materiales.

🇷🇺 Высокопроизводительная и самоцентрирующаяся геометрия. Использование HSS/Co+ покрытия PV10 высочайшего качества и универсальная геометрия, позволяет получить повышенную производительность на широком спектре обрабатываемых материалов.



PV10 COATING

GENERAL PURPOSE · USO GENERICO
ALLGEMEINE ANWENDUNGEN · APPLICATIONS GÉNÉRIQUES
UTILIZACIÓN GENERAL · ОБЩЕГО НАЗНАЧЕНИЯ

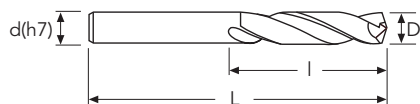
	DIN 1897
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218LFTA



218LFTA (h8)

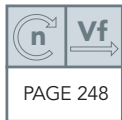
Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D



D(h8)	l	L	Stock
mm 2.00	12	38	●
2.10	12	38	●
2.20	13	40	●
2.30	13	40	●
2.40	14	43	●
2.50	14	43	●
2.60	14	43	●
2.70	16	46	●
2.80	16	46	●
2.90	16	46	●
3.00	16	46	●
3.10	18	49	●
3.20	18	49	●
3.30	18	49	●
3.40	20	52	●
3.50	20	52	●
3.60	20	52	●
3.70	20	52	●
3.80	22	55	●
3.90	22	55	●
4.00	22	55	●
4.10	22	55	●
4.20	22	55	●
4.30	24	58	●
4.40	24	58	●
4.50	24	58	●
4.60	24	58	●
4.70	24	58	●
4.80	26	62	●
4.90	26	62	●
5.00	26	62	●
5.10	26	62	●
5.20	26	62	●
5.30	26	62	●
5.40	28	66	●
5.50	28	66	●

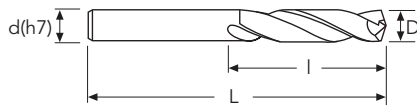


218LFTA



218LFTA (h8)

Ø mm	1-3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D



HSS/CO

PV10



D(h8)	I	L	Stock
mm 5.60	28	66	●
5.70	28	66	●
5.80	28	66	●
5.90	28	66	●
6.00	28	66	●
6.10	31	70	●
6.20	31	70	●
6.30	31	70	●
6.40	31	70	●
6.50	31	70	●
6.60	31	70	●
6.70	31	70	●
6.80	34	74	●
6.90	34	74	●
7.00	34	74	●
7.10	34	74	●
7.20	34	74	●
7.30	34	74	●
7.40	34	74	●
7.50	34	74	●
7.60	37	79	●
7.70	37	79	●
7.80	37	79	●
7.90	37	79	●
8.00	37	79	●
8.10	37	79	●
8.20	37	79	●
8.30	37	79	●
8.40	37	79	●
8.50	37	79	●
8.60	40	84	●
8.70	40	84	●
8.80	40	84	●
8.90	40	84	●
9.00	40	84	●
9.10	40	84	●

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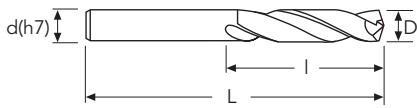
DIN
1897

218LFTA



218LFTA (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D



D(h8)	I	L	Stock
mm 9.20	40	84	●
9.30	40	84	●
9.40	40	84	●
9.50	40	84	●
9.60	43	89	●
9.70	43	89	●
9.80	43	89	●
9.90	43	89	●
10.00	43	89	●
10.20	43	89	●
10.30	43	89	●
10.50	43	89	●
10.80	47	95	●
11.00	47	95	●
11.20	47	95	●
11.30	47	95	●
11.50	47	95	●
11.80	47	95	●
12.00	51	102	●
12.20	51	102	●
12.50	51	102	●
12.80	51	102	●
13.00	51	102	●
13.30	54	107	●
13.50	54	107	●
13.80	54	107	●
14.00	54	107	●
14.50	56	111	●
14.80	56	111	●
15.00	56	111	●
15.30	56	111	●
15.50	58	115	●
15.80	58	115	●
16.00	58	115	●
16.50	60	119	●
17.00	60	119	●

n **Vf**
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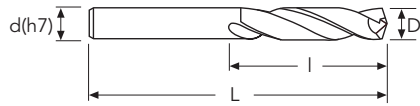
DIN
1897

218LFTA



218LFTA (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



HSS/CO

PV10



D(h8)	l	L	Stock
mm 17.50	62	123	●
18.00	62	123	●
18.50	64	127	●
19.00	64	127	●
19.50	66	131	●
20.00	66	131	●

● stock standard ○ non-standard stock ■ stock exhaustion

n Vf
PAGE 249

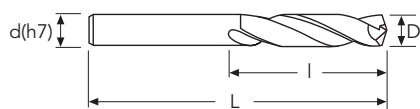
DIN
338

238LFTA



238LFTA (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D μ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D



D(h8)	I	L	Stock
mm 2.00	24	49	●
2.10	24	49	●
2.20	27	53	●
2.30	27	53	●
2.40	30	57	●
2.50	30	57	●
2.60	30	57	●
2.70	33	61	●
2.80	33	61	●
2.90	33	61	●
3.00	33	61	●
3.10	36	65	●
3.20	36	65	●
3.30	36	65	●
3.40	39	70	●
3.50	39	70	●
3.60	39	70	●
3.70	39	70	●
3.80	43	75	●
3.90	43	75	●
4.00	43	75	●
4.10	43	75	●
4.20	43	75	●
4.30	47	80	●
4.40	47	80	●
4.50	47	80	●
4.60	47	80	●
4.70	47	80	●
4.80	52	86	●
4.90	52	86	●
5.00	52	86	●
5.10	52	86	●
5.20	52	86	●
5.30	52	86	●
5.40	57	93	●
5.50	57	93	●

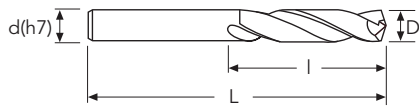
n **Vf**
PAGE 249

DIN
338

238LFTA (h8)

Ø mm	1-3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33

238LFTA



d = D



HSS/CO

PV10



D(h8)	I	L	Stock
mm 5.60	57	93	●
5.70	57	93	●
5.80	57	93	●
5.90	57	93	●
6.00	57	93	●
6.10	63	101	●
6.20	63	101	●
6.30	63	101	●
6.40	63	101	●
6.50	63	101	●
6.60	63	101	●
6.70	63	101	●
6.80	69	109	●
6.90	69	109	●
7.00	69	109	●
7.10	69	109	●
7.20	69	109	●
7.30	69	109	●
7.40	69	109	●
7.50	69	109	●
7.60	75	117	●
7.70	75	117	●
7.80	75	117	●
7.90	75	117	●
8.00	75	117	●
8.10	75	117	●
8.20	75	117	●
8.30	75	117	●
8.40	75	117	●
8.50	75	117	●
8.60	81	125	●
8.70	81	125	●
8.80	81	125	●
8.90	81	125	●
9.00	81	125	●
9.10	81	125	●

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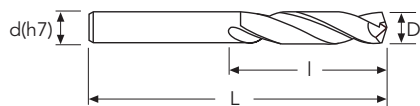
DIN 338

238LFTA



238LFTA (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D μ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D



D(h8)	l	L	Stock	
mm 9.20	81	125	●	
9.30	81	125	●	
9.40	81	125	●	
9.50	81	125	●	
9.60	87	133	●	
9.70	87	133	●	
9.80	87	133	●	
9.90	87	133	●	
10.00	87	133	●	
10.20	87	133	●	
10.30	87	133	●	
10.50	87	133	●	
10.80	94	142	●	
11.00	94	142	●	
11.20	94	142	●	
11.30	94	142	●	
11.50	94	142	●	
11.80	94	142	●	
12.00	101	151	●	
12.20	101	151	●	
12.50	101	151	●	
12.80	101	151	●	
13.00	101	151	●	
13.30	108	160	●	
13.50	108	160	●	
13.80	108	160	●	
14.00	108	160	●	
14.50	114	169	●	
14.80	114	169	●	
15.00	114	169	●	
15.30	120	178	●	
15.50	120	178	●	
15.80	120	178	●	
16.00	120	178	●	
16.50	125	184	●	
17.00	125	184	●	

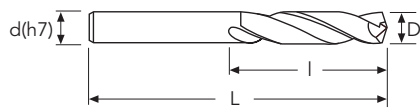


**DIN
338**

238LFTA (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33

238LFTA



HSS/CO

PV10



D(h8)	I	L	Stock
mm 17.50	130	191	●
18.00	130	191	●
18.50	135	198	●
19.00	135	198	●
19.50	140	205	●
20.00	140	205	●

● stock standard ○ non-standard stock ■ stock exhaustion



SUTA

HSSE for stainless steel

✚ 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 drilling.

🇮🇹 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.

🇩🇪 Hohe Leistungen und selbstzentrierende Schnittgeometrie. Aus hervorragendem HSS/Co mit PV10 Beschichtung. Dank des sehr geringen Schneiddrucks, sind unschlagbare Leistungen auf rostfreien Stählen möglich.

🇫🇷 Haute performance et affutage autocentrante. Fabriquée avec les meilleurs HSSE+PV10 et une arête spécifique, permet de minimiser les efforts de coupe en garantissant des performances exceptionnelles dans le perçage des aciers inoxydables.

🇪🇸 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 inoxidable.

🇷🇺 Высокопроизводительная и самоцентрирующаяся геометрия. При обработке нержавеющей сталей использование первоклассного HSSE+покрытия PV10 и специальной формы режущей кромки, позволяет работать при низком режущем усилии и отличной производительности.



PV10 COATING

STAINLESS STEEL · ACCIAIO INOSSIDABILE
ROSTFREIER STAHL · ACIER INOXYDABLE
ACERO INOXIDABLE · НЕРЖАВЕЮЩАЯ СТАЛЬ

PAGE 249

**OSAWA
NORM**

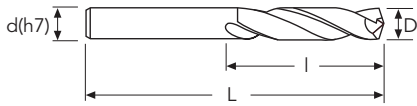
3XD

980SUTA



980SUTA (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D



**HSSE
PV10**



D(h8)	l	L	Stock
mm 2.00	12	44	●
2.10	12	44	●
2.20	13	45	●
2.30	13	45	●
2.40	14	46	●
2.50	14	46	●
2.60	14	46	●
2.70	16	48	●
2.80	16	48	●
2.90	16	48	●
3.00	16	48	●
3.10	18	50	●
3.20	18	50	●
3.30	18	50	●
3.40	20	52	●
3.50	20	52	●
3.60	20	52	●
3.70	20	52	●
3.80	22	54	●
3.90	22	54	●
4.00	22	54	●
4.10	22	66	●
4.20	22	66	●
4.30	24	68	●
4.40	24	68	●
4.50	24	68	●
4.60	24	68	●
4.70	24	68	●
4.80	26	70	●
4.90	26	70	●
5.00	26	70	●
5.10	26	70	●
5.20	26	70	●
5.30	26	70	●
5.40	28	72	●
5.50	28	72	●

* ≤ mm 4 = 130°

● stock standard ○ non-standard stock ■ stock exhaustion

n **Vf**
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**OSAWA
NORM**

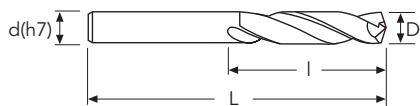
3XD

980SUTA



980SUTA (h8)

Ø mm	1-3	3.1-6	6.1-10	10.1-18	18.1-20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D



D(h8)	I	L	Stock
mm 5.60	28	72	●
5.70	28	72	●
5.80	28	72	●
5.90	28	72	●
6.00	28	72	●
6.10	31	75	●
6.20	31	75	●
6.30	31	75	●
6.40	31	75	●
6.50	31	75	●
6.60	31	75	●
6.70	31	75	●
6.80	34	78	●
6.90	34	78	●
7.00	34	78	●
7.10	34	78	●
7.20	34	78	●
7.30	34	78	●
7.40	34	78	●
7.50	34	78	●
7.60	37	81	●
7.70	37	81	●
7.80	37	81	●
7.90	37	81	●
8.00	37	81	●
8.10	37	87	●
8.20	37	87	●
8.30	37	87	●
8.40	37	87	●
8.50	37	87	●
8.60	40	90	●
8.70	40	90	●
8.80	40	90	●
8.90	40	90	●
9.00	40	90	●
9.10	40	90	●

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**OSAWA
NORM**

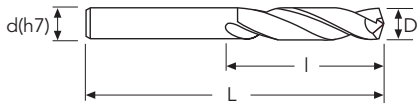
3XD

980SUTA



980SUTA (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D



D(h8)	I	L	Stock
mm 9.20	40	90	●
9.30	40	90	●
9.40	40	90	●
9.50	40	90	●
9.60	43	93	●
9.70	43	93	●
9.80	43	93	●
9.90	43	93	●
10.00	43	93	●
10.10	43	100	●
10.20	43	100	●
10.30	43	100	●
10.40	43	100	●
10.50	43	100	●
10.60	43	100	●
10.70	47	104	●
10.80	47	104	●
10.90	47	104	●
11.00	47	104	●
11.10	47	104	●
11.20	47	104	●
11.30	47	104	●
11.40	47	104	●
11.50	47	104	●
11.60	47	104	●
11.70	47	104	●
11.80	47	104	●
11.90	51	108	●
12.00	51	108	●
12.10	51	108	●
12.20	51	108	●
12.30	51	108	●
12.40	51	108	●
12.50	51	108	●
12.60	51	108	●
12.70	51	108	●

n **Vf**
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OSAWA
NORM

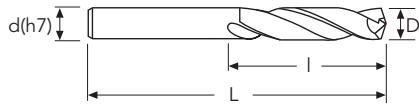
3XD

980SUTA



980SUTA (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D



D(h8)	l	L	Stock
mm 12.80	51	108	●
12.90	51	108	●
13.00	51	108	●

● stock standard ○ non-standard stock ■ stock exhaustion

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OSAWA
NORM

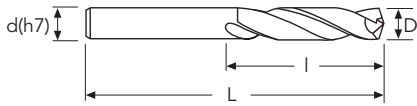
5XD

990SUTA



990SUTA (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D



D(h8)	I	L	Stock
mm 2.00	24	56	●
2.10	24	56	●
2.20	27	59	●
2.30	27	59	●
2.40	30	62	●
2.50	30	62	●
2.60	30	62	●
2.70	33	65	●
2.80	33	65	●
2.90	33	65	●
3.00	33	65	●
3.10	36	68	●
3.20	36	68	●
3.30	36	68	●
3.40	39	71	●
3.50	39	71	●
3.60	39	71	●
3.70	39	71	●
3.80	43	75	●
3.90	43	75	●
4.00	43	75	●
4.10	43	87	●
4.20	43	87	●
4.30	47	91	●
4.40	47	91	●
4.50	47	91	●
4.60	47	91	●
4.70	47	91	●
4.80	52	96	●
4.90	52	96	●
5.00	52	96	●
5.10	52	96	●
5.20	52	96	●
5.30	52	96	●
5.40	57	101	●
5.50	57	101	●

* ≤ mm 4 = 130°

● stock standard ○ non-standard stock ■ stock exhaustion

n **Vf**
PAGE 249

**OSAWA
NORM**

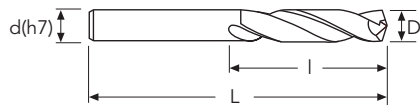
5XD

990SUTA



990SUTA (h8)

Ø mm	1-3	3.1-6	6.1-10	10.1-18	18.1-20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D



D(h8)	I	L	Stock
mm 5.60	57	101	●
5.70	57	101	●
5.80	57	101	●
5.90	57	101	●
6.00	57	101	●
6.10	63	107	●
6.20	63	107	●
6.30	63	107	●
6.40	63	107	●
6.50	63	107	●
6.60	63	107	●
6.70	63	107	●
6.80	69	113	●
6.90	69	113	●
7.00	69	113	●
7.10	69	113	●
7.20	69	113	●
7.30	69	113	●
7.40	69	113	●
7.50	69	113	●
7.60	75	119	●
7.70	75	119	●
7.80	75	119	●
7.90	75	119	●
8.00	75	119	●
8.10	75	125	●
8.20	75	125	●
8.30	75	125	●
8.40	75	125	●
8.50	75	125	●
8.60	81	131	●
8.70	81	131	●
8.80	81	131	●
8.90	81	131	●
9.00	81	131	●
9.10	81	131	●

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**OSAWA
NORM**

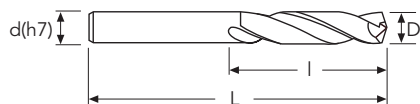
5XD

990SUTA



990SUTA (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D



D(h8)	I	L	Stock
mm 9.20	81	131	●
9.30	81	131	●
9.40	81	131	●
9.50	81	131	●
9.60	87	137	●
9.70	87	137	●
9.80	87	137	●
9.90	87	137	●
10.00	87	137	●
10.10	87	144	●
10.20	87	144	●
10.30	87	144	●
10.40	87	144	●
10.50	87	144	●
10.60	87	144	●
10.70	94	151	●
10.80	94	151	●
10.90	94	151	●
11.00	94	151	●
11.10	94	151	●
11.20	94	151	●
11.30	94	151	●
11.40	94	151	●
11.50	94	151	●
11.60	94	151	●
11.70	94	151	●
11.80	94	151	●
11.90	101	158	●
12.00	101	158	●
12.10	101	158	●
12.20	101	158	●
12.30	101	158	●
12.40	101	158	●
12.50	101	158	●
12.60	101	158	●
12.70	101	158	●


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OSAWA
NORM

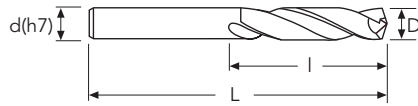
5XD

990SUTA



990SUTA (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D



D(h8)	I	L	Stock
mm 12.80	101	158	●
12.90	101	158	●
13.00	101	158	●
13.50	106	166	●
14.00	106	166	●
14.10	109	169	●
14.50	109	169	●
15.00	109	169	●
15.50	112	172	●
15.60	112	172	●
16.00	112	172	●
16.50	115	181	●
17.00	115	181	●
17.50	118	184	●
17.60	118	184	●
18.00	118	184	●
18.50	122	188	●
19.00	122	188	●
19.50	125	191	●
20.00	125	191	●

● stock standard ○ non-standard stock ■ stock exhaustion



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 ed 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 et de normes constructives, aussi que une combinaison très rentable de performance et 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 puntas de HSS y HSS/Co Osawa.

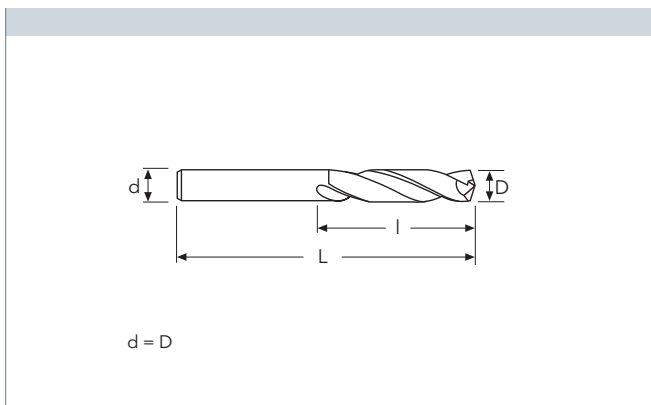
🇷🇺 Исходный материал наивысшего качества в комбинации с современным покрытием и специальной геометрией. Представляет гамму твердосплавных сверл серии Osawa Typhoon.

n Vf
PAGE 250

**DIN
1897**


118N - 218NVA (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



HSS OX *	HSS/CO HT

D(h8)	l	L		Stock	Stock
mm 1.00	6	26	10	●	●
1.10	7	28	10	●	○
1.20	8	30	10	●	●
1.25	8	30	10	●	○
1.30	8	30	10	●	○
1.40	9	32	10	●	○
1.50	9	32	10	●	●
1.60	10	34	10	●	○
1.70	10	34	10	●	○
1.75	11	36	10	●	○
1.80	11	36	10	●	○
1.90	11	36	10	●	○
2.00	12	38	10	●	●
2.10	12	38	10	●	●
2.20	13	40	10	●	○
2.25	13	40	10	●	○
2.30	13	40	10	●	○
2.40	14	43	10	●	●
2.50	14	43	10	●	●
2.60	14	43	10	●	○
2.70	16	46	10	●	○
2.75	16	46	10	●	○
2.80	16	46	10	●	○
2.90	16	46	10	●	○
3.00	16	46	10	●	●
3.10	18	49	10	●	○
3.20	18	49	10	●	●
3.25	18	49	10	●	●
3.30	18	49	10	●	●
3.40	20	52	10	●	●
3.50	20	52	10	●	●
3.60	20	52	10	●	○
3.70	20	52	10	●	○
3.75	20	52	10	●	○
3.80	22	55	10	●	●
3.90	22	55	10	●	○

* OX ≥ mm. 2 ● stock standard ○ non-standard stock ■ stock exhaustion



118N - 218NVA (h8)

Ø mm	1-3	3.1-6	6.1-10	10.1-18	18.1-20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D

N

HSS

OX

118°

25-30°

NH

HSS/CO

HT

130°

30°

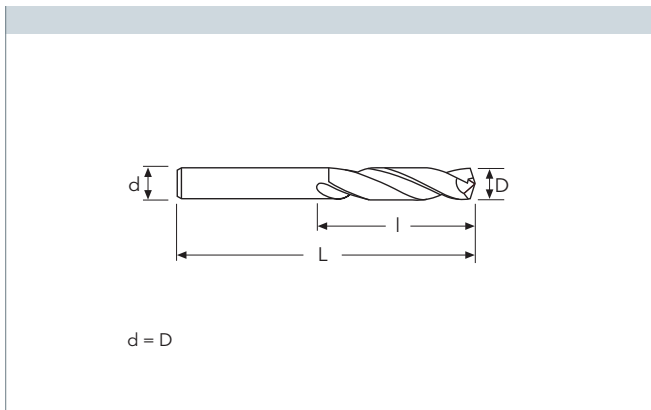
D(h8)	I	L		Stock	Stock
mm 4.00	22	55	10	●	●
4.10	22	55	10	●	●
4.20	22	55	10	●	●
4.25	22	55	10	●	●
4.30	24	58	10	●	●
4.40	24	58	10	○	○
4.50	24	58	10	●	●
4.60	24	58	10	●	●
4.70	24	58	10	●	○
4.75	24	58	10	●	○
4.80	26	62	10	●	●
4.90	26	62	10	●	○
5.00	26	62	10	●	●
5.10	26	62	10	●	●
5.20	26	62	10	●	●
5.25	26	62	10	●	○
5.30	26	62	10	●	○
5.40	28	66	10	●	○
5.50	28	66	10	●	●
5.60	28	66	10	●	○
5.70	28	66	10	●	○
5.75	28	66	10	●	○
5.80	28	66	10	●	○
5.90	28	66	10	○	○
6.00	28	66	10	●	●
6.10	31	70	10	●	○
6.20	31	70	10	●	○
6.25	31	70	10	●	○
6.30	31	70	10	●	○
6.40	31	70	10	●	○
6.50	31	70	10	●	●
6.60	31	70	5	○	○
6.70	31	70	5	●	●
6.75	34	74	5	●	●
6.80	34	74	5	●	●
6.90	34	74	5	●	○

n Vf
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118N - 218NVA (h8)

∅ mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D μ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



HSS OX	HSS/CO HT

D(h8)	l	L		Stock	Stock
mm 7.00	34	74	5	●	●
7.10	34	74	5	●	○
7.20	34	74	5	●	○
7.25	34	74	5	●	○
7.30	34	74	5	●	○
7.40	34	74	5	○	○
7.50	34	74	5	●	●
7.60	37	79	5	●	○
7.70	37	79	5	○	○
7.75	37	79	5	●	○
7.80	37	79	5	●	○
7.90	37	79	5	○	○
8.00	37	79	5	●	●
8.10	37	79	5	●	○
8.20	37	79	5	●	●
8.25	37	79	5	●	○
8.30	37	79	5	○	●
8.40	37	79	5	○	○
8.50	37	79	5	●	●
8.60	40	84	5	●	●
8.70	40	84	5	○	●
8.75	40	84	5	●	●
8.80	40	84	5	○	○
8.90	40	84	5	○	○
9.00	40	84	5	●	●
9.10	40	84	5	●	○
9.20	40	84	5	○	●
9.25	40	84	5	○	○
9.30	40	84	5	○	○
9.40	40	84	5	○	●
9.50	40	84	5	●	●
9.60	43	89	5	○	○
9.70	43	89	5	○	○
9.75	43	89	5	○	○
9.80	43	89	5	○	○
9.90	43	89	5	○	○



118N - 218NVA (h8)

Ø mm	1-3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D

N

HSS

OX

118°

25-30°

NH

HSS/CO

HT

130°

30°

D(h8)	I	L		Stock	Stock
mm 10.00	43	89	5	●	●
10.20	43	89	5	●	●
10.25	43	89	5	●	●
10.50	43	89	5	●	●
10.75	47	95	5	●	●
11.00	47	95	5	●	●
11.25	47	95	5	●	○
11.50	47	95	5	●	●
11.75	47	95	5	●	●
12.00	51	102	5	●	●
12.25	51	102	5	●	●
12.50	51	102	5	●	●
12.75	51	102	5	●	●
13.00	51	102	5	●	●
13.25	54	107	1	●	○
13.50	54	107	1	●	●
13.75	54	107	1	●	○
14.00	54	107	1	●	●
14.25	56	111	1	●	●
14.50	56	111	1	●	●
14.75	56	111	1	●	○
15.00	56	111	1	●	●
15.25	58	115	1	●	○
15.50	58	115	1	●	●
15.75	58	115	1	○	○
16.00	58	115	1	●	●
16.25	60	119	1		○
16.50	60	119	1		●
16.75	60	119	1		○
17.00	60	119	1		●
17.25	62	123	1		○
17.50	62	123	1		●
17.75	62	123	1		○
18.00	62	123	1		●
18.25	64	127	1		○
18.50	64	127	1		●

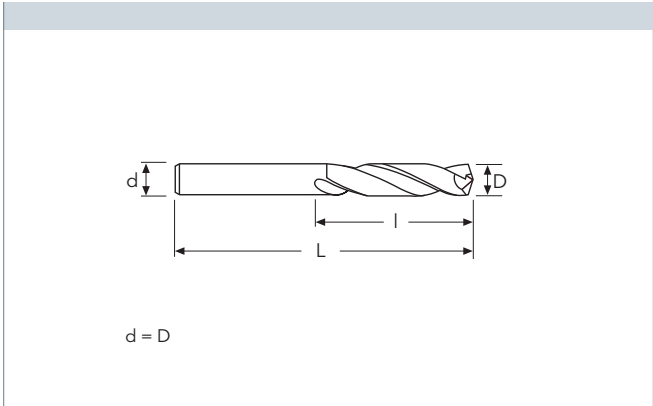
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DIN
1897



118N - 218NVA (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



HSS OX	HSS/CO HT

D(h8)	l	L		Stock	Stock
mm 18.75	64	127	1		○
19.00	64	127	1		●
19.25	66	131	1		○
19.50	66	131	1		●
19.75	66	131	1		●
20.00	66	131	1		●

● stock standard ○ non-standard stock ■ stock exhaustion

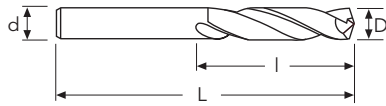


DIN 338

PAGE 250~252

138N - 1386STI - 138NTI - 138HB - 138WB (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D

HSS OX *	HSS TIN	HSS TIN	HSS BR	HSS BR
118°	118°	118°	118°	130°
25-30°	30°	25-30°	12-15°	35-40°

D(h8)	I	L		Stock	Stock	Stock	Stock	Stock
mm 0.20	2.5	19	10	●				
0.30	3	19	10	●				
0.40	5	20	10	●				
0.50	6	22	10	●				
0.60	7	24	10	●				
0.70	9	28	10	●				
0.75	9	28	10	●				
0.80	10	30	10	●				
0.90	11	32	10	●				
1.00	12	34	10	●	●**	●		
1.10	14	36	10	●	●**	●		
1.20	16	38	10	●	●**	●		
1.25	16	38	10	●				
1.30	16	38	10	●	●**	●		
1.40	18	40	10	●	●**	●		
1.50	18	40	10	●	●**	●	●	●
1.60	20	43	10	●	●	●	○	○
1.70	20	43	10	●	●	●	○	○
1.75	22	46	10	●				
1.80	22	46	10	●	●	●	○	○
1.90	22	46	10	●	●	●	○	○
2.00	24	49	10	●	●	●	●	●
2.10	24	49	10	●	●	●	○	○
2.20	27	53	10	●	●	●	●	●
2.25	27	53	10	●				
2.30	27	53	10	●	●	●	○	○
2.40	30	57	10	●	●	●	●	●
2.50	30	57	10	●	●	●	●	●
2.60	30	57	10	●	●	●	●	○
2.70	33	61	10	●	●	●	○	○
2.75	33	61	10	●				
2.80	33	61	10	●	●	●	○	○
2.90	33	61	10	●	●	●	○	○
3.00	33	61	10	●	●	●	●	●
3.10	36	65	10	●	●	●	○	○
3.20	36	65	10	●	●	●	●	●

* OX ≥ mm. 2

** N TYPE ≤ mm. 1.5 = 1385NTI

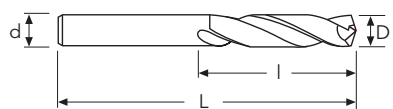
● stock standard ○ non-standard stock ■ stock exhaustion

n Vf
PAGE
250~252

DIN
338

138N - 1386STI - 138NTI - 138HB - 138WB (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D

HSS	HSS	HSS	HSS	HSS
OX	TIN	TIN	BR	BR

D(h8)	I	L		Stock	Stock	Stock	Stock	Stock
mm 3.25	36	65	10	●				
3.30	36	65	10	●	●	●	●	●
3.40	39	70	10	●	●	●	○	○
3.50	39	70	10	●	●	●	●	●
3.60	39	70	10	●	●	●	○	●
3.70	39	70	10	●	●	●	○	●
3.75	39	70	10	●		●		
3.80	43	75	10	●	●	●	●	●
3.90	43	75	10	●	●	●	○	●
4.00	43	75	10	●	●	●	●	●
4.10	43	75	10	●	●	●	○	●
4.20	43	75	10	●	●	●	●	●
4.25	43	75	10	●				
4.30	47	80	10	●	●	●	○	○
4.40	47	80	10	●	●	●	○	○
4.50	47	80	10	●	●	●	●	●
4.60	47	80	10	●	●	●	○	●
4.70	47	80	10	●	●	●	○	○
4.75	47	80	10	●				
4.80	52	86	10	●	●	●	●	●
4.90	52	86	10	●	●	●	○	○
5.00	52	86	10	●	●	●	●	●
5.10	52	86	10	●	●	●	○	○
5.20	52	86	10	●	●	●	○	●
5.25	52	86	10	●				
5.30	52	86	10	●	●	●	○	○
5.40	57	93	10	●	●	●	○	○
5.50	57	93	10	●	●	●	●	●
5.60	57	93	10	●	●	●	○	●
5.70	57	93	10	●	●	●	○	○
5.75	57	93	10	●				
5.80	57	93	10	●	●	●	○	○
5.90	57	93	10	●	●	●	○	○
6.00	57	93	10	●	●	●	●	●
6.10	63	101	10	●	●	●	○	○
6.20	63	101	10	●	●	●	○	○

● stock standard ○ non-standard stock ■ stock exhaustion

n **Vf**
PAGE
250~252

**DIN
338**

138N - 1386STI - 138NTI - 138HB - 138WB (h8)

Ø mm	1-3	3.1-6	6.1-10	10.1-18	18.1-20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D

HSS OX	HSS TIN	HSS TIN	HSS BR	HSS BR

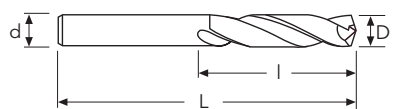
D(h8)	I	L		Stock	Stock	Stock	Stock	Stock
mm 6.25	63	101	10	●				
6.30	63	101	10	●	●	●	○	○
6.40	63	101	10	●	●	●	○	○
6.50	63	101	10	●	●	●	●	●
6.60	63	101	5	●	●	●	○	○
6.70	63	101	5	●	●	●	○	○
6.75	69	109	5	●				
6.80	69	109	5	●	●	●	○	●
6.90	69	109	5	●	●	●	○	○
7.00	69	109	5	●	●	●	●	●
7.10	69	109	5	●	●	●	○	○
7.20	69	109	5	●	●	●	○	○
7.25	69	109	5	●				
7.30	69	109	5	●	●	●	○	○
7.40	69	109	5	●	●	●	○	○
7.50	69	109	5	●	●	●	●	●
7.60	75	117	5	●	●	○	○	○
7.70	75	117	5	●	●	●	○	○
7.75	75	117	5	●				
7.80	75	117	5	●	●	●	●	○
7.90	75	117	5	●	●	●	○	○
8.00	75	117	5	●	●	●	●	●
8.10	75	117	5	●	●	●	○	○
8.20	75	117	5	●	●	●	○	○
8.25	75	117	5	●				
8.30	75	117	5	●	●	●	○	○
8.40	75	117	5	●	●	○	○	○
8.50	75	117	5	●	●	●	●	●
8.60	81	125	5	●	●	●	○	○
8.70	81	125	5	●	●	●	○	○
8.75	81	125	5	●				
8.80	81	125	5	●	●	●	○	○
8.90	81	125	5	●	●	●	○	○
9.00	81	125	5	●	●	●	●	●
9.10	81	125	5	●	●	○	○	○
9.20	81	125	5	●	●	○	○	○

n Vf
PAGE
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DIN
338

138N - 1386STI - 138NTI - 138HB - 138WB (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D

HSS OX	HSS TIN	HSS TIN	HSS BR	HSS BR

D(h8)	l	L		Stock	Stock	Stock	Stock	Stock
mm 9.25	81	125	5	●	●	○	○	○
9.30	81	125	5	●	●	○	○	○
9.40	81	125	5	●	●	○	○	○
9.50	81	125	5	●	●	●	●	●
9.60	87	133	5	●	●	○	○	○
9.70	87	133	5	●	●	○	○	○
9.75	87	133	5	●	●	○	○	○
9.80	87	133	5	●	●	○	○	○
9.90	87	133	5	●	●	○	○	○
10.00	87	133	5	●	●	●	●	●
10.10	87	133	5	●	●	○	○	○
10.20	87	133	5	●	●	●	○	○
10.25	87	133	5	●	●	○	○	○
10.30	87	133	5	●	●	○	○	○
10.40	87	133	5	●	●	○	○	○
10.50	87	133	5	●	●	●	○	○
10.60	87	133	5	●	●	○	○	○
10.70	94	142	5	●	●	○	○	○
10.75	94	142	5	●	●	○	○	○
10.80	94	142	5	●	●	○	○	○
10.90	94	142	5	●	●	○	○	○
11.00	94	142	5	●	●	●	○	○
11.10	94	142	5	●	●	○	○	○
11.20	94	142	5	●	●	○	○	○
11.25	94	142	5	●	●	○	○	○
11.30	94	142	5	●	●	○	○	○
11.40	94	142	5	●	●	○	○	○
11.50	94	142	5	●	●	●	○	○
11.60	94	142	5	●	●	○	○	○
11.70	94	142	5	●	●	○	○	○
11.75	94	142	5	●	●	○	○	○
11.80	94	142	5	●	●	○	○	○
11.90	101	151	5	●	●	○	○	○
12.00	101	151	5	●	●	●	○	○
12.10	101	151	5	●	●	○	○	○
12.20	101	151	5	●	●	○	○	○

● stock standard ○ non-standard stock ■ stock exhaustion

	DIN 338
PAGE 250~252	

138N - 1386STI - 138NTI - 138HB - 138WB (h8)

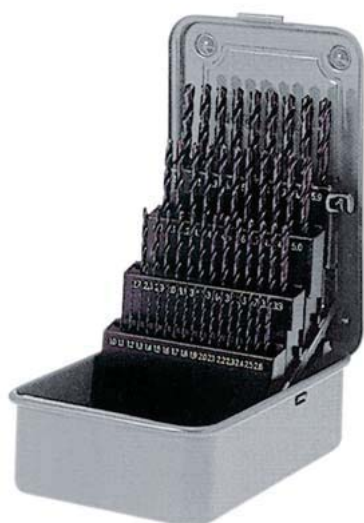
Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



<p>d = D</p>					
	HSS OX	HSS TIN	HSS TIN	HSS BR	HSS BR

D(h8)	I	L		Stock	Stock	Stock	Stock	Stock
mm 12.25	101	151	5	●				
12.30	101	151	5	●	●			
12.40	101	151	5	●	●			
12.50	101	151	5	●	●	●	○	○
12.60	101	151	5	●	●			
12.70	101	151	5	●	●			
12.75	101	151	5	●				
12.80	101	151	5	●	●			
12.90	101	151	5	●	●			
13.00	101	151	5	●	●	●	○	○
13.25	108	160	1	●				
13.50	108	160	1	●		●		
13.75	108	160	1	●				
14.00	108	160	1	●		●		
14.25	114	169	1	●				
14.50	114	169	1	●		●		
14.75	114	169	1	●				
15.00	114	169	1	●		●		
15.25	120	178	1	●				
15.50	120	178	1	●		●		
15.75	120	178	1	●				
16.00	120	178	1	●		●		
16.25	125	184	1	●				
16.50	125	184	1	●				
16.75	125	184	1	●				
17.00	125	184	1	●				
17.50	130	191	1	●				
18.00	130	191	1	●				
18.50	135	198	1	●				
19.00	135	198	1	●				
19.50	140	205	1	●				
20.00	140	205	1	●				

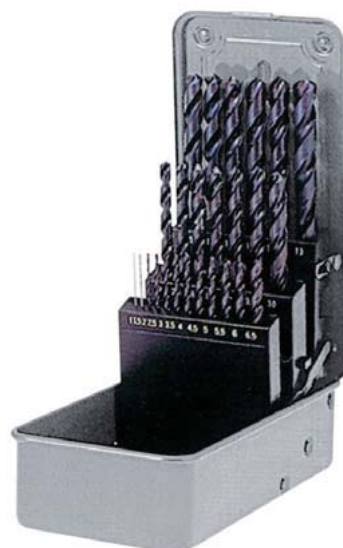
● stock standard ○ non-standard stock ■ stock exhaustion



138NA01A
Set 50pcs.
 138N DIN338 HSS
 Ø1mm~Ø5,9mm x 0,1mm



138NA01B
Set 41pcs.
 138N DIN338 HSS
 Ø6mm~Ø10mm x 0,1mm



138NA05C
Set 25pcs.
 138N DIN338 HSS
 Ø1mm~Ø13mm x 0,5mm



1386STIA01A
Set 50pcs.
 1386STI DIN338 HSS TIN POINTED
 Ø1mm~Ø5,9mm x 0,1mm



1386STIA01B
Set 41pcs.
 1386STI DIN338 HSS TIN POINTED
 Ø6mm~Ø10mm x 0,1mm



1386STIA05C
Set 25pcs.
 1386STI DIN338 HSS TIN POINTED
 Ø1mm~Ø13mm x 0,5mm

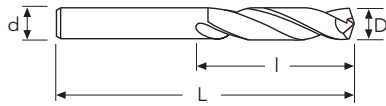


**DIN
338**

238NVA - 2386STI (h8)

Ø mm	1-3	3.1-6	6.1-10	10.1-18	18.1-20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33

238NVA 2386STI*



d = D



D(h8)	I	L		Stock	Stock
mm 1.00	12	34	10	●	●*
1.10	14	36	10	●	●*
1.20	16	38	10	●	●*
1.25	16	38	10	●	
1.30	16	38	10	●	●*
1.40	18	40	10	●	●*
1.50	18	40	10	●	●*
1.60	20	43	10	●	●
1.70	20	43	10	●	●
1.75	22	46	10	●	
1.80	22	46	10	●	●
1.90	22	46	10	●	●
2.00	24	49	10	●	●
2.10	24	49	10	●	●
2.20	27	53	10	●	●
2.25	27	53	10	●	
2.30	27	53	10	●	●
2.40	30	57	10	●	●
2.50	30	57	10	●	●
2.60	30	57	10	●	●
2.70	33	61	10	●	●
2.75	33	61	10	●	
2.80	33	61	10	●	●
2.90	33	61	10	●	●
3.00	33	61	10	●	●
3.10	36	65	10	●	●
3.20	36	65	10	●	●
3.25	36	65	10	●	
3.30	36	65	10	●	●
3.40	39	70	10	●	●
3.50	39	70	10	●	●
3.60	39	70	10	●	●
3.70	39	70	10	●	●
3.75	39	70	10	●	
3.80	43	75	10	●	●
3.90	43	75	10	●	●

* N TYPE ≤ mm. 1.5 = 2385NTI

● stock standard ○ non-standard stock ■ stock exhaustion

PAGE
 250~252

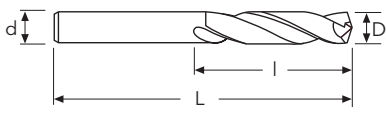
DIN
338

238NVA 2386STI



238NVA - 2386STI (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D

HSS/CO HT	HSS/Co TIN

D(h8)	I	L		Stock	Stock
mm 4.00	43	75	10	●	●
4.10	43	75	10	●	●
4.20	43	75	10	●	●
4.25	43	75	10	●	●
4.30	47	80	10	●	●
4.40	47	80	10	●	●
4.50	47	80	10	●	●
4.60	47	80	10	●	●
4.70	47	80	10	●	●
4.75	47	80	10	●	●
4.80	52	86	10	●	●
4.90	52	86	10	●	●
5.00	52	86	10	●	●
5.10	52	86	10	●	●
5.20	52	86	10	●	●
5.25	52	86	10	●	●
5.30	52	86	10	●	●
5.40	57	93	10	●	●
5.50	57	93	10	●	●
5.60	57	93	10	●	●
5.70	57	93	10	●	●
5.75	57	93	10	●	●
5.80	57	93	10	●	●
5.90	57	93	10	●	●
6.00	57	93	10	●	●
6.10	63	101	10	●	●
6.20	63	101	10	●	●
6.25	63	101	10	●	●
6.30	63	101	10	●	●
6.40	63	101	10	●	●
6.50	63	101	10	●	●
6.60	63	101	5	●	●
6.70	63	101	5	●	●
6.75	69	109	5	●	●
6.80	69	109	5	●	●
6.90	69	109	5	●	●

	DIN 338
PAGE 250~252	

238NVA - 2386STI (h8)

Ø mm	1-3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D

NH

HSS/CO

HT

130°

30°

SPLIT POINT

HSS/Co

TIN

135°

33°

D(h8)	I	L		Stock	Stock
mm 7.00	69	109	5	●	●
7.10	69	109	5	●	●
7.20	69	109	5	●	●
7.25	69	109	5	●	●
7.30	69	109	5	●	●
7.40	69	109	5	●	●
7.50	69	109	5	●	●
7.60	75	117	5	●	●
7.70	75	117	5	●	●
7.75	75	117	5	●	●
7.80	75	117	5	●	●
7.90	75	117	5	●	●
8.00	75	117	5	●	●
8.10	75	117	5	●	●
8.20	75	117	5	●	●
8.25	75	117	5	●	●
8.30	75	117	5	●	●
8.40	75	117	5	●	●
8.50	75	117	5	●	●
8.60	81	125	5	●	●
8.70	81	125	5	●	●
8.75	81	125	5	●	●
8.80	81	125	5	●	●
8.90	81	125	5	●	●
9.00	81	125	5	●	●
9.10	81	125	5	●	●
9.20	81	125	5	●	●
9.25	81	125	5	●	●
9.30	81	125	5	●	●
9.40	81	125	5	●	●
9.50	81	125	5	●	●
9.60	87	133	5	●	●
9.70	87	133	5	●	●
9.75	87	133	5	●	●
9.80	87	133	5	●	●
9.90	87	133	5	●	●

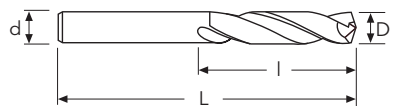
	DIN 338
PAGE 250~252	

238NVA 2386STI



238NVA - 2386STI (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D μ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D

HSS/CO HT	HSS/Co TIN

D(h8)	l	L		Stock	Stock
mm 10.00	87	133	5	●	●
10.10	87	133	5	●	●
10.20	87	133	5	●	●
10.30	87	133	5	●	●
10.40	87	133	5	●	●
10.50	87	133	5	●	●
10.60	87	133	5	●	●
10.70	87	133	5	●	●
10.80	94	142	5	●	●
10.90	94	142	5	●	●
11.00	94	142	5	●	●
11.10	94	142	5	●	●
11.20	94	142	5	●	●
11.30	94	142	5	●	●
11.40	94	142	5	●	●
11.50	94	142	5	●	●
11.60	94	142	5	●	●
11.70	94	142	5	●	●
11.80	94	142	5	●	●
11.90	101	151	5	●	●
12.00	101	151	5	●	●
12.10	101	151	5	●	●
12.20	101	151	5	●	●
12.30	101	151	5	●	●
12.40	101	151	5	●	●
12.50	101	151	5	●	●
12.60	101	151	5	●	●
12.70	101	151	5	●	●
12.80	101	151	5	●	●
12.90	101	151	5	●	●
13.00	101	151	5	●	●
13.50	108	160	1	●	●
14.00	108	160	1	●	●
14.50	114	169	1	●	●
15.00	114	169	1	●	●
15.50	120	178	1	●	●

● stock standard ○ non-standard stock ■ stock exhaustion

n **Vf**
PAGE
250~252

**DIN
338**

238NVA - 2386STI (h8)

Ø mm	1-3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



NH

HSS/CO

HT

130°

30°

SPLIT POINT

HSS/Co

TIN

135°

33°

D(h8)	I	L		Stock	Stock
mm 16.00	120	178	1	●	
16.50	125	184	1	●	
17.00	125	184	1	●	
17.50	130	191	1	●	
18.00	130	191	1	●	
18.50	135	198	1	●	
19.00	135	198	1	●	
19.50	104	205	1	○	
20.00	104	205	1	●	

● stock standard ○ non-standard stock ■ stock exhaustion



NEW
238NVAA01A

Set 50pcs.

238NVA DIN338 HSS/Co
Ø1mm~Ø5,9mm x 0,1mm



NEW
238NVAA01B

Set 41pcs.

238NVA DIN338 HSS/Co
Ø6mm~Ø10mm x 0,1mm



NEW
238NVAA05C

Set 25pcs.

238NVA DIN338 HSS/Co
Ø1mm~Ø13mm x 0,5mm



NEW
2386STIA01A

Set 50pcs.

2386STI DIN338 HSS/Co TIN POINTED
Ø1mm~Ø5,9mm x 0,1mm



NEW
2386STIA01B

Set 41pcs.

2386STI DIN338 HSS/Co TIN POINTED
Ø6mm~Ø10mm x 0,1mm



NEW
2386STIA05C

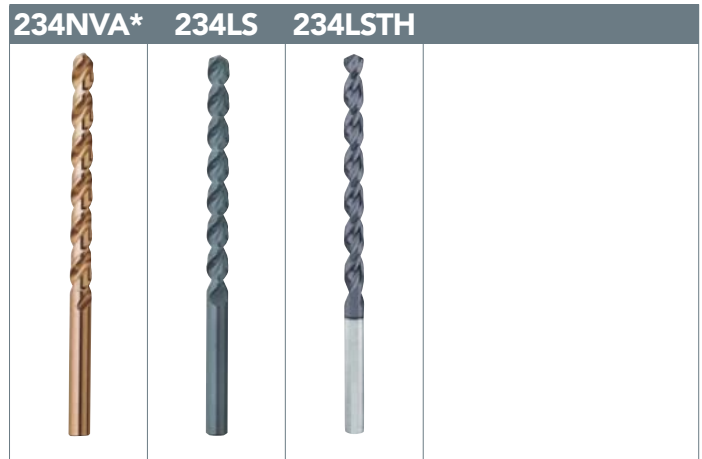
Set 25pcs.

2386STI DIN338 HSS/Co TIN POINTED
Ø1mm~Ø13mm x 0,5mm

	DIN 340
PAGE 250-251	

234NVA - 234LS - 234LSTH (h8)

Ø mm	1-3	3.1-6	6.1-10	10.1-18	18.1-20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D

HSS/CO
HT

HSS/CO
OX

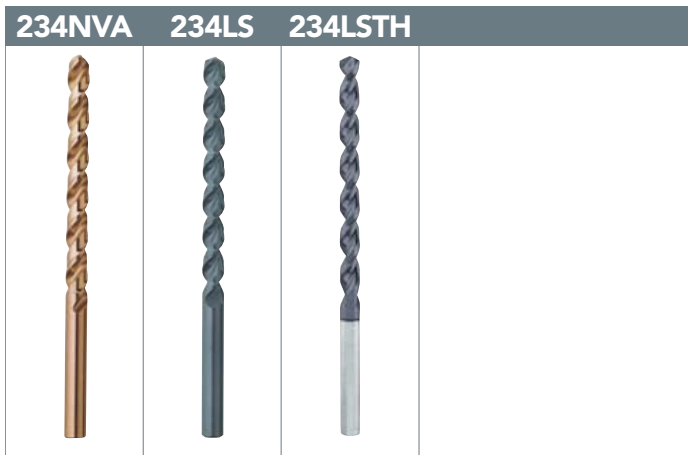
HSS/CO
PV15

D(h8)	I	L		Stock	Stock	Stock
mm 0.50	12	32	10	●*		
0.60	15	35	10	●*		
0.70	21	42	10	●*		
0.80	25	46	10	●*		
0.90	29	51	10	●*		
1.00	33	56	10	●*		
1.10	37	60	10	●*		
1.20	41	65	10	●*		
1.30	41	65	10	●*		
1.40	45	70	10	●*		
1.50	45	70	10	●*		
1.60	50	76	10	●*		
1.70	50	76	10	●*		
1.80	53	80	10	●*		
1.90	53	80	10	●*		
2.00	56	85	10	●	●	●
2.10	56	85	10	●	●	●
2.20	59	90	10	●	●	●
2.30	59	90	10	●	●	●
2.40	62	95	10	●	●	●
2.50	62	95	10	●	●	●
2.60	62	95	10	●	●	●
2.70	66	100	10	●	●	●
2.80	66	100	10	●	●	●
2.90	66	100	10	●	●	●
3.00	66	100	10	●	●	●
3.10	69	106	10	●	●	●
3.20	69	106	10	●	●	●
3.30	69	106	10	●	●	●
3.40	73	112	10	●	●	●
3.50	73	112	10	●	●	●
3.60	73	112	10	●	●	●
3.70	73	112	10	●	●	●
3.80	78	119	10	●	●	●
3.90	78	119	10	●	●	●
4.00	78	119	10	●	●	●

* ≤ mm. 1.9 = 134N HSS

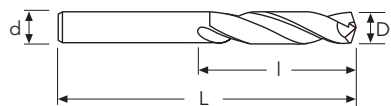
● stock standard ○ non-standard stock ■ stock exhaustion

	DIN 340
PAGE 250-251	



234NVA - 234LS - 234LSTH (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D

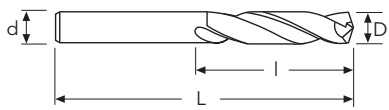
HSS/CO HT	HSS/CO OX	HSS/CO PV15

D(h8)	I	L		Stock	Stock	Stock
mm 4.10	78	119	10	●		
4.20	78	119	10	●	●	●
4.30	82	126	10	●		
4.40	82	126	10	●		
4.50	82	126	10	●	●	●
4.60	82	126	10	●		
4.70	82	126	10	●		
4.80	87	132	10	●	●	●
4.90	87	132	10	●		
5.00	87	132	10	●	●	●
5.10	87	132	10	●		
5.20	87	132	10	●	●	●
5.30	87	132	10	●		
5.40	91	139	10	●		
5.50	91	139	10	●	●	●
5.60	91	139	10	●		
5.70	91	139	10	●		
5.80	91	139	10	●	●	●
5.90	91	139	10	●		
6.00	91	139	10	●	●	●
6.10	97	148	5	●		
6.20	97	148	5	●	●	●
6.30	97	148	5	●		
6.40	97	148	5	○		
6.50	97	148	5	●	●	●
6.60	97	148	5	●		
6.70	97	148	5	●		
6.80	102	156	5	●	●	●
6.90	102	156	5	●		
7.00	102	156	5	●	●	●
7.10	102	156	5	●		
7.20	102	156	5	●	●	○
7.30	102	156	5	○		
7.40	102	156	5	●		
7.50	102	156	5	●	●	●
7.60	109	165	5	●		

	DIN 340
PAGE 250-251	

234NVA - 234LS - 234LSTH (h8)

Ø mm	1-3	3.1-6	6.1-10	10.1-18	18.1-20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



$d = D$

HSS/CO HT	HSS/CO OX	HSS/CO PV15

D(h8)	I	L		Stock	Stock	Stock
mm 7.70	109	165	5	●		
7.80	109	165	5	●	●	○
7.90	109	165	5	●		
8.00	109	165	5	●	●	●
8.10	109	165	5	●		
8.20	109	165	5	●	●	○
8.30	109	165	5	●		
8.40	109	165	5	○		
8.50	109	165	5	●	●	●
8.60	115	175	5	●		
8.70	115	175	5	●		
8.80	115	175	5	●		
8.90	115	175	5	●		
9.00	115	175	5	●	●	●
9.10	115	175	5	●		
9.20	115	175	5	●		
9.30	115	175	5	●		
9.40	115	175	5	●		
9.50	115	175	5	●	●	●
9.60	121	184	5	●		
9.70	121	184	5	●		
9.80	121	184	5	●	●	○
9.90	121	184	5	●		
10.00	121	184	5	●	●	●
10.20	121	184	5	●		
10.50	121	184	5	●	●	●
10.80	128	195	5	●		
11.00	128	195	5	●	●	●
11.20	128	195	5	●		
11.50	128	195	5	●	●	●
11.80	128	195	5	●		
12.00	134	205	5	●	●	●
12.50	134	205	5		●	●
13.00	134	205	5		●	●

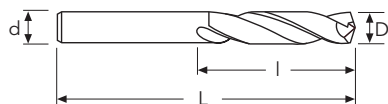
● stock standard ○ non-standard stock ■ stock exhaustion

	DIN 1869 1
PAGE 250-251	



2691LS - 2691LSTH (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



d = D

HSS/Co BR	HSS/CO PV15

D(h8)	I	L	Stock	Stock
mm 2.00	85	125	●	●
2.25	90	135	○	●
2.50	95	140	●	●
3.00	100	150	●	●
3.25	105	155	●	●
3.50	115	165	●	●
3.75	115	165	○	●
4.00	120	175	●	●
4.25	120	175	○	●
4.50	125	185	●	●
4.75	125	185	○	●
5.00	135	195	●	●
5.25	135	195	●	●
5.50	140	205	●	●
5.75	140	205	○	●
6.00	140	205	●	●
6.25	150	215	○	●
6.50	150	215	●	●
6.75	155	225	●	●
7.00	155	225	●	●
7.50	155	225	●	●
8.00	165	240	●	●
8.25	165	240	○	●
8.50	165	240	●	●
9.00	175	250	●	●
9.25	175	250	○	●
9.50	175	250	●	●
10.00	185	265	●	●
10.50	185	265	●	●
11.00	195	280	●	●
11.50	195	280	●	●
12.00	205	295	●	●
12.50	205	295	●	●
13.00	205	295	●	●

● stock standard ○ non-standard stock ■ stock exhaustion



**DIN
1869
2-3**

1692LS - 1693LS (h8)

Ø mm	1-3	3.1~6	6.1~10	10.1~18	18.1~20
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



LS

HSS

BR

130°

35-40°

LS

HSS

BR

130°

35-40°

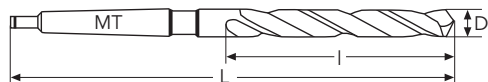
D	I	L	Stock	Stock
mm 3.00	130	190	●	
3.50	145	210	●	
3.50	180	265		●
4.00	150	220	●	
4.00	190	280		●
4.50	160	235	●	
4.50	200	295		●
5.00	170	245	●	
5.00	210	315		●
5.50	180	260	●	
5.50	225	330		●
6.00	180	260	●	
6.00	225	330		●
6.50	190	275	●	
6.50	235	350		●
7.00	200	290	●	
7.00	250	370		●
7.50	200	290	●	
7.50	250	370		●
8.00	210	305	●	
8.00	265	390		●
8.50	210	305	●	
8.50	265	390		●
9.00	220	320	●	
9.00	280	410		●
9.50	220	320	●	
9.50	280	410		●
10.00	235	340	●	
10.00	295	430		●
10.50	235	340	●	
10.50	295	430		●
11.00	250	365	●	
11.00	310	455		●
12.00	260	375	●	
12.00	330	480		●

n Vf
PAGE
250-251

DIN
345

145N - 145NTI - 245N (h8)

Ø mm	3.1~6	6.1~10	10.1~18	18.1~30	30.1~50	50.1~80
tol. D µ	0 / -18	0 / -22	0 / -27	0 / -33	0 / -39	0 / -46



HSS	HSS	HSS/CO
OX	TIN	HT

D(h8)	I	L	MT	Stock	Stock	Stock
5.00	52	133	1	●		
5.25	52	133	1	○		
5.50	57	138	1	●		
5.75	57	138	1	○		
6.00	57	138	1	●		
6.25	63	144	1	○		
6.50	63	144	1	●		
6.75	69	150	1	●		
7.00	69	150	1	●		
7.25	69	150	1	○		
7.50	69	150	1	●		
7.75	75	156	1	○		
8.00	75	156	1	●		
8.25	75	156	1	○		
8.50	75	156	1	●		
8.75	81	162	1	○		
9.00	81	162	1	●		
9.25	81	162	1	○		
9.50	81	162	1	●		
9.75	87	168	1	○		
10.00	87	168	1	●		
10.25	87	168	1	●		
10.50	87	168	1	●		
10.75	94	175	1	○		
11.00	94	175	1	●		
11.25	94	175	1	○		
11.50	94	175	1	●		
11.75	94	175	1	○		
12.00	101	182	1	●		
12.25	101	182	1	○		
12.50	101	182	1	●		
12.75	101	182	1	○		
13.00	101	182	1	●	●	●
13.25	108	189	1	●		
13.50	108	189	1	●	●	●
13.75	108	189	1	●		



DIN 345

145N - 145NTI - 245N (h8)

Ø mm	3.1~6	6.1~10	10.1~18	18.1~30	30.1~50	50.1~80
tol. D µ	0 / -18	0 / -22	0 / -27	0 / -33	0 / -39	0 / -46



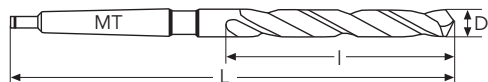
HSS	HSS	HSS/CO
OX	TIN	HT

D(h8)	I	L	MT	Stock	Stock	Stock
mm 14.00	108	189	1	●	●	●
14.25	114	212	2	●	●	●
14.50	114	212	2	●	●	●
14.75	114	212	2	●	●	●
15.00	114	212	2	●	●	●
15.25	120	218	2	●	●	●
15.50	120	218	2	●	●	●
15.75	120	218	2	●	●	●
16.00	120	218	2	●	●	●
16.25	125	223	2	●	●	●
16.50	125	223	2	●	●	●
16.75	125	223	2	●	●	●
17.00	125	223	2	●	●	●
17.25	130	228	2	●	●	●
17.50	130	228	2	●	●	●
17.75	130	228	2	●	●	●
18.00	130	228	2	●	●	●
18.25	135	233	2	●	●	●
18.50	135	233	2	●	●	●
18.75	135	233	2	●	●	●
19.00	135	233	2	●	●	●
19.25	140	238	2	●	●	●
19.50	140	238	2	●	●	●
19.75	140	238	2	●	●	●
20.00	140	238	2	●	●	●
20.25	145	243	2	●	●	●
20.50	145	243	2	●	●	●
20.75	145	243	2	●	●	●
21.00	145	243	2	●	●	●
21.25	150	248	2	●	●	●
21.50	150	248	2	●	●	●
21.75	150	248	2	●	●	●
22.00	150	248	2	●	●	●
22.25	150	248	2	●	●	●
22.50	155	253	2	●	●	●
22.75	155	253	2	●	●	●

	DIN 345
PAGE 250-251	

145N - 145NTI - 245N (h8)

Ø mm	3.1~6	6.1~10	10.1~18	18.1~30	30.1~50	50.1~80
tol. D µ	0 / -18	0 / -22	0 / -27	0 / -33	0 / -39	0 / -46



HSS OX	HSS TIN	HSS/CO HT

D(h8)	I	L	MT	Stock	Stock	Stock
mm 23.00	155	253	2	●	●	●
23.25	155	276	3	●		
23.50	155	276	3	●	●	●
23.75	160	281	3	●		
24.00	160	281	3	●	●	●
24.25	160	281	3	●		
24.50	160	281	3	●	●	●
24.75	160	281	3	●		
25.00	160	281	3	●	●	●
25.25	165	286	3	○		
25.50	165	286	3	●	○	●
25.75	165	286	3	○		
26.00	165	286	3	●	●	●
26.25	165	286	3	○		
26.50	165	286	3	●	○	●
26.75	170	291	3	○		
27.00	170	291	3	●	●	●
27.25	170	291	3	○		
27.50	170	291	3	●	○	●
27.75	170	291	3	○		
28.00	170	291	3	●	●	●
28.25	175	296	3	○		
28.50	175	296	3	●	○	●
28.75	175	296	3	○		
29.00	175	296	3	●	●	●
29.25	175	296	3	○		
29.50	175	296	3	●	○	●
29.75	175	296	3	○		
30.00	175	296	3	●	●	●
30.25	180	301	3	○		
30.50	180	301	3	●		
30.75	180	301	3	○		
31.00	180	301	3	●		
31.25	180	301	3	○		
31.50	180	301	3	●		
31.75	185	306	3	○		

n **Vf**
PAGE
250-251

**DIN
345**

145N - 145NTI - 245N (h8)

Ø mm	3.1~6	6.1~10	10.1~18	18.1~30	30.1~50	50.1~80
tol. D µ	0 / -18	0 / -22	0 / -27	0 / -33	0 / -39	0 / -46



	HSS OX	HSS TIN	HSS/CO HT

D(h8)	I	L	MT	Stock	Stock	Stock
mm 32.00	185	334	4	●		
32.50	185	334	4	●		
33.00	185	334	4	●		
33.50	185	334	4	●		
34.00	190	339	4	●		
34.50	190	339	4	●		
35.00	190	339	4	●		
35.50	190	339	4	●		
36.00	195	344	4	●		
36.50	195	344	4	●		
37.00	195	344	4	●		
37.50	195	344	4	●		
38.00	200	349	4	●		
38.50	200	349	4	●		
39.00	200	349	4	●		
39.50	200	349	4	●		
40.00	200	349	4	●		
40.50	205	354	4	○		
41.00	205	354	4	●		
41.50	205	354	4	○		
42.00	205	354	4	●		
42.50	205	354	4	○		
43.00	210	359	4	●		
43.50	210	359	4	○		
44.00	210	359	4	●		
44.50	210	359	4	○		
45.00	210	359	4	●		
45.50	215	364	4	○		
46.00	215	364	4	●		
46.50	215	364	4	○		
47.00	215	364	4	●		
47.50	215	364	4	○		
48.00	220	369	4	●		
48.50	220	369	4	○		
49.00	220	369	4	●		
49.50	220	369	4	○		

	DIN 345
PAGE 250-251	



145N - 145NTI - 245N (h8)

Ø mm	3.1~6	6.1~10	10.1~18	18.1~30	30.1~50	50.1~80
tol. D µ	0 / -18	0 / -22	0 / -27	0 / -33	0 / -39	0 / -46

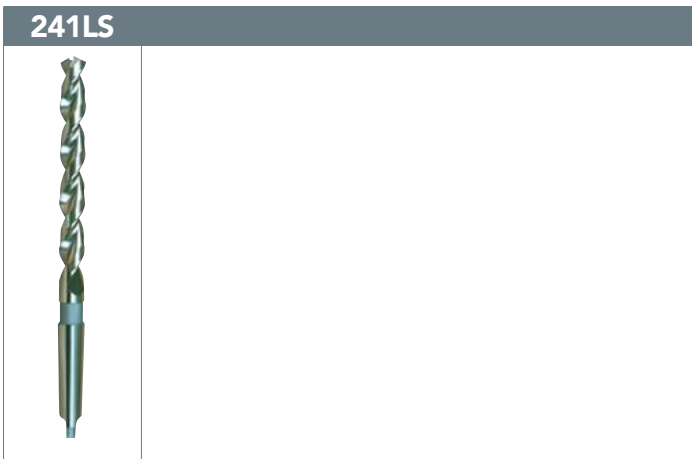
	HSS OX	HSS TIN	HSS/CO HT

D(h8)	I	L	MT	Stock	Stock	Stock
mm 50.00	220	369	4	●		
51.00	225	412	5	○		
52.00	225	412	5	○		
53.00	225	412	5	○		
54.00	230	417	5	○		
55.00	230	417	5	●		
56.00	230	417	5	○		
57.00	235	422	5	○		
58.00	235	422	5	○		
59.00	235	422	5	○		
60.00	235	422	5	●		

● stock standard ○ non-standard stock ■ stock exhaustion

n **Vf**
PAGE
250-251

**DIN
341**



241LS (h8)

Ø mm	1-3	3.1~6	6.1~10	10.1~18	18.1~30
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33

LS

HSS/Co
BR

130°

35-40°

D(h8)	I	L	MT	Stock
mm 13.00	134	215	1	●
13.50	142	223	1	●
14.00	142	223	1	●
14.50	147	245	2	●
15.00	147	245	2	●
15.50	153	251	2	●
16.00	153	251	2	●
16.50	159	257	2	●
17.00	159	257	2	●
17.50	165	263	2	●
18.00	165	263	2	●
18.50	171	269	2	●
19.00	171	269	2	●
19.50	177	275	2	●
20.00	177	275	2	●
21.00	184	282	2	●
22.00	191	289	2	●
23.00	198	296	2	●
24.00	206	327	3	●
25.00	206	327	3	●
26.00	214	335	3	●
27.00	222	343	3	●
28.00	222	343	3	●
29.00	230	351	3	●
30.00	230	351	3	●

● stock standard ○ non-standard stock ■ stock exhaustion

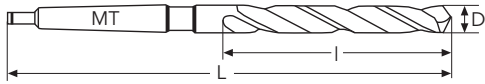
PAGE
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DIN
1870
1-2



2701LS - 2702LS (h8)

Ø mm	1~3	3.1~6	6.1~10	10.1~18	18.1~30
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33



D(h8)	I	L	MT	Stock	Stock
mm 13.00	205	310	1	●	●
13.00	260	395	1	●	●
13.50	220	325	1	●	●
13.50	275	410	1	●	●
14.00	220	325	1	●	●
14.00	275	410	1	●	●
14.50	220	340	2	●	●
14.50	275	425	2	●	●
15.00	220	340	2	●	●
15.00	275	425	2	●	●
15.50	230	355	2	●	●
15.50	295	445	2	●	●
16.00	230	355	2	●	●
16.00	295	445	2	●	●
16.50	230	355	2	●	●
16.50	295	445	2	●	●
17.00	230	355	2	●	●
17.00	295	445	2	●	●
17.50	245	370	2	●	●
17.50	310	465	2	●	●
18.00	245	370	2	●	●
18.00	310	465	2	●	●
18.50	245	370	2	●	●
18.50	310	465	2	●	●
19.00	245	370	2	●	●
19.00	310	465	2	●	●
19.50	260	385	2	●	●
19.50	325	490	2	●	●
20.00	260	385	2	●	●
20.00	325	490	2	●	●
21.00	260	385	2	●	●
21.00	325	490	2	●	●
22.00	270	405	2	●	●
22.00	345	515	2	●	●
23.00	270	405	2	●	●
23.00	345	515	2	●	●

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DIN 1870 1-2

2701LS - 2702LS (h8)

Ø mm	1-3	3.1~6	6.1~10	10.1~18	18.1~30
tol. D µ	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33





























































	<table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td>HSS/Co BR</td> <td>HSS/Co BR</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>				HSS/Co BR	HSS/Co BR				
HSS/Co BR	HSS/Co BR									
D(h8)	I	L	MT	Stock	Stock					
mm 24.00	290	440	3	●						
24.00	365	555	3		●					
25.00	290	440	3	●						
25.00	365	555	3		●					
26.00	290	440	3	●						
26.00	365	555	3		●					
27.00	305	460	3	●						
27.00	385	580	3		●					
28.00	305	460	3	●						
28.00	385	580	3		●					
29.00	305	460	3	●						
29.00	385	580	3		●					
30.00	305	460	3	●						
30.00	385	580	3		●					

● stock standard ○ non-standard stock ■ stock exhaustion



END MILLS

DRILL SELECTION GUIDE .	94
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1FL		MG LAPPED	ALU		MDCSA1	
2FL		NMG UH RED	UH RADIUS		UHCS2	
		UMG ENDLESS ORANGE	MEX		MEXCS2	
		UMG ENDLESS ORANGE	MEX		MEXCL2	
		UMG ENDLESS ORANGE	MEX RADIUS		MEXCL2R	
		UMG ENDLESS ORANGE	MEX RADIUS		MEXLS2R	
		UMG ENDLESS ORANGE	VA		MEFCS2	
		MG LAPPED	ALU		MDCSA2	
		MG TiCN	ALU RADIUS		MCA212R	
		MG Diamond	MDC		MDC2202	
		MG BR	N		GB205	
		MG PV200	N		G2CS2	
		MG PV200	N		G2WS2	
		MG PV200	N RADIUS		G2CS2R	
		MG PV200	N		G2210	
		MG PV200	N		G2211	
		MG PV200	N		G2212	
		MG PV200	N		G2213	
		MG PV200	N		MDTACS2	
	MG PV200	N		MDTA210		

Ø RANGE	📄	🇮🇹 ACCIAIO	🇦🇹 ACCIAIO	🇩🇪 ACCIAIO	INOX	INCONEL	TITANIO	GHISA	ALLUMINIO	GRAFITE
		🇩🇪 STAHL	🇫🇷 ACIER	🇪🇸 ACERO			🇷🇺 СТАЛЬ	TITAN	GUSS	ALUMINIUM
		🇫🇷 ACIER	🇦🇹 ACCIAIO	🇩🇪 ACCIAIO			TITANIUM	FONTE	ALUMINIUM	GRAPHITE
		🇪🇸 ACERO	🇷🇺 СТАЛЬ	🇪🇸 ACERO			TITANIO	FUNDITION	ALUMINIO	GRAFITO
		🇷🇺 СТАЛЬ	🇪🇸 ACERO	🇷🇺 СТАЛЬ			ТИТАН	ЧУГУН	АЛЮМИНИЙ	ГРАФИТ
		STEEL ~30HRC	STEEL 30-45HRC	STEEL 45HRC~			TITANIUM	CAST IRON	ALUMINIUM	GRAPHITE
2~12	168								⊙	
1~12	123			⊙						
1~25	144	○	⊙	⊙	○			○		
1~12	144	○	⊙	⊙	○			○		
3~12	155	○	⊙	⊙	○			○		
2~16	155	○	⊙	⊙	○			○		
1~16	164	○	⊙		⊙	○	⊙			
3~20	169								⊙	
2~12	170								⊙	
0.5~12	177									⊙
1~12	180	⊙	⊙		○			⊙	○	
1~20	180	⊙	⊙		○	○	○	⊙	○	
3~20	186	⊙	⊙		○	○	○	⊙	○	
1~12	189	⊙	⊙		○	○	○	⊙	○	
2~6	180	⊙	⊙		○	○	○	⊙	○	
5~12	180	⊙	⊙		○	○	○	⊙	○	
8~20	180	⊙	⊙		○	○	○	⊙	○	
16~20	180	⊙	⊙		○	○	○	⊙	○	
1~20	192	⊙	⊙		○	○	○	⊙	○	
3~16	192	⊙	⊙		○	○	○	⊙	○	

⊙ 🇮🇹 most suitable 🇫🇷 molto adatto 🇪🇸 am besten geeignete 🇷🇺 le plus indiqué 🇪🇸 más adecuado 🇷🇺 первый выбор
 ○ 🇮🇹 suitable 🇫🇷 adatto 🇪🇸 geeignet 🇷🇺 indiqué 🇪🇸 adecuado 🇷🇺 второй выбор

2FL		MG BR	N		MDCL2	
		HSS-P PV200	UM		UMWS2	
		HSS/Co BR	N		WS2	
		HSS/Co PV200	N		TAWS2	
		HSS/Co BR	ALU		WSA2	
		HSS/Co BR	N		WL2	
		HSS/Co PV200	N		TAWL2	
2FL MICRO		NMG UH RED	UH RADIUS		UHM2	
		NMG UH RED	UH		UHM2-N	
		UMG ENDLESS ORANGE	MEX		MEXM2	
2FL RIB PROCESSING		NMG UH RED	UH		UHCR2	
		NMG UH RED	UH		UHLN2	
		NMG UH RED	UH RADIUS		UH211	
		NMG UH RED	UH RADIUS		UH212	
		UMG ENDLESS ORANGE	MEX		MEXCR2	
		UMG ENDLESS ORANGE	MEX		MEXLN2	
2FL BALL		NMG UH RED	UH BALL NOSE		UHCSB2	
		NMG UH RED	UH BALL NOSE		UH250	
		NMG UH RED	UH BALL NOSE		UH253	
		UMG ENDLESS ORANGE	MEX BALL NOSE		MEXCSB2	





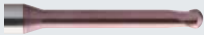









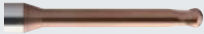






















































































Ø RANGE	📄	🇮🇹 ACCIAIO	ACCIAIO	ACCIAIO		TITANIO	GHISA	ALLUMINIO	GRAFITE
		🇩🇪 STAHL	STAHL	STAHL	INOX	TITAN	GUSS	ALUMINIUM	GRAPHIT
		🇫🇷 ACIER	ACIER	ACIER		TITANIUM	FONTE	ALUMINIUM	GRAPHITE
		🇪🇸 ACERO	ACERO	ACERO		TITANIO	FUNDITIÓN	ALUMINIO	GRAFITO
		🇷🇺 СТАЛЬ	СТАЛЬ	СТАЛЬ		ТИТАН	ЧУГУН	АЛЮМИНИЙ	ГРАФИТ
		STEEL ~30HRC	STEEL 30~45HRC	STEEL 45HRC~		TITANIUM	CAST IRON	ALUMINIUM	GRAPHITE
3~20	192	⊙	⊙		○		⊙	○	
2~20	198	⊙	○		○		⊙		
1~32	202	⊙	○		○		○		
1~25	202	⊙	○		○		○		
2~20	204							⊙	
3~40	208	⊙	○		○		○		
3~20	208	⊙	○		○		○		
0.3~2	123			⊙					
0.1~9	123			⊙					
0.1~2	144	○	⊙	⊙	○		○		
0.1~4	124			⊙					
0.2~4	124			⊙					
0.5~12	128			⊙					
0.2~4	128			⊙					
0.4~6	146	○	⊙	⊙	○		○		
0.2~4	146	○	⊙	⊙	○		○		
0.2~12	116			⊙					
1~12	116			⊙					
1~12	116			⊙					
1~25	138	○	⊙	⊙	○		○		

⊙ 🇮🇹 most suitable 🇮🇹 molto adatto 🇩🇪 am besten geeignet 🇫🇷 le plus indiqué 🇪🇸 más adecuado 🇷🇺 первый выбор
 ○ 🇮🇹 suitable 🇮🇹 adatto 🇩🇪 geeignet 🇫🇷 indiqué 🇪🇸 adecuado 🇷🇺 второй выбор

2FL BALL		UMG ENDLESS ORANGE			MEXCLSB2 
		UMG ENDLESS ORANGE			MEX253 
		MG LAPPED			MDCAB2 
		MG 			MDC2254 
		MG 			MDC2250 
		MG 			MDC2251 
		MG BR			GB255 
		MG PV200			G2CSB2 
		MG PV200			G2250 
		MG PV200			G2251 
		MG PV200			MDTACSB2 
		MG PV200			MDTA250 
		HSS/Co BR			WSB2 
		HSS/Co PV200			TAWSB2 
		HSS/Co BR			WLB2 
		HSS/Co PV200			TAWLB2 
2FL BALL MICRO		NMG UH RED			UHMB2 
		UMG ENDLESS ORANGE			MEXMB2 
2FL BALL RIB PROCESSING		NMG UH RED			UHCRB2 

























































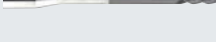













Ø RANGE	📄	🇮🇹 ACCIAIO	ACCIAIO	ACCIAIO		TITANIO	GHISA	ALLUMINIO	GRAFITE
		🇩🇪 STAHL	STAHL	STAHL	INOX	TITAN	GUSS	ALUMINIUM	GRAPHIT
		🇫🇷 ACIER	ACIER	ACIER		TITANIUM	FONTE	ALUMINIUM	GRAPHITE
		🇪🇸 ACERO	ACERO	ACERO		TITANIO	FUNDITIÓN	ALUMINIO	GRAFITO
		🇷🇺 СТАЛЬ	СТАЛЬ	СТАЛЬ		ТИТАН	ЧУГУН	АЛЮМИНИЙ	ГРАФИТ
		STEEL ~30HRC	STEEL 30-45HRC	STEEL 45HRC~		TITANIUM	CAST IRON	ALUMINIUM	GRAPHITE
1~20	138	○	●	●	○		○		
1~20	138	○	●	●	○		○		
1~12	173							●	
1~6	176								●
0.5~12	176								●
2~6	176							○	●
1~12	190	●	●		○		●	○	
1~20	190		●		○	○	●	○	
1~12	190		●		○	○	●	○	
8~20	190		●		○	○	●	○	
1~12	196		●		○	○	●	○	
3~12	196		●		○	○	●	○	
2~30	202	●	○		○		○		
2~20	202	●	○		○		○		
3~20	208	●	○		○		○		
3~20	208	●	○		○		○		
0.2~0.9	116			●					
0.2~2	138	○	●	●	○		○		
0.1~4	118			●					

● most suitable 🇮🇹 molto adatto 🇪🇸 am besten geeignete 🇫🇷 le plus indiqué 🇪🇸 más adecuado 🇷🇺 первый выбор
 ○ suitable 🇮🇹 adatto 🇪🇸 geeignet 🇫🇷 indiqué 🇪🇸 adecuado 🇷🇺 второй выбор

2FL BALL RIB PROCESSING		 UH RED	 UH BALL NOSE	 30°	UHLNB2	
		 ENDLESS ORANGE	 MEX BALL NOSE	 30°	MEXCRB2	
		 ENDLESS ORANGE	 MEX BALL NOSE	 30°	MEXLNB2	
3FL		 ENDLESS	 VA	 50°	MEFCSH3	
		 LAPPED	 ALU	 55°	MDCSA3	
		 LAPPED	 ALU	 55°	MDA310	
		 LAPPED	 ALU	 55°	MDA311	
		 LAPPED	 ALU	 55°	MDA312	
		 	 MDC RADIUS	 30°	MDC3311	
		 BR	 N	 45°	GB305	
		 PV200	 N	 45°	G2CSH3	
		 PV200	 N	 45°	G2WSH3	
		 PV200	 N	 45°	G2310	
		 PV200	 N	 45°	G2311	
		 PV200	 N	 45°	G2312	
		 PV200	 N	 30°	MDTACS3	
		 PV200	 N	 50°	MDTAWSH3	
		 PV200	 UM	 30°	UMWS3	
		 BR	 N	 30°	WS3	
		 PV200	 N	 30°	TAWS3	

































Ø RANGE	📄	🇮🇹 ACCIAIO	ACCIAIO	ACCIAIO			TITANIO	GHISA	ALLUMINIO	GRAFITE
		🇩🇪 STAHL	STAHL	STAHL			TITANIO	GUSS	ALUMINIUM	GRAPHIT
		🇫🇷 ACIER	ACIER	ACIER			TITANIO	FONTE	ALUMINIUM	GRAPHITE
		🇪🇸 ACERO	ACERO	ACERO			TITANIO	FUNDITIÓN	ALUMINIO	GRAFITO
		🇷🇺 СТАЛЬ	СТАЛЬ	СТАЛЬ			ТИТАН	ЧУГУН	АЛЮМИНИЙ	ГРАФИТ
		STEEL ~30HRC	STEEL 30-45HRC	STEEL 45HRC~	INOX	INCONEL	TITANIUM	CAST IRON	ALUMINIUM	GRAPHITE
0.2~4	118			⊙						
0.4~6	140	○	⊙	⊙	○			○		
0.2~4	140	○	⊙	⊙	○			○		
6~20	164	○	⊙		⊙	○	⊙			
1~20	171								⊙	
3~6	171								⊙	
3~12	171								⊙	
8~20	171								⊙	
2~12	178								○	⊙
1~12	182	⊙	⊙		○			⊙	○	
1~20	182	⊙	⊙		○	○	○	⊙	○	
3~20	186	⊙	⊙		○	○	○	⊙	○	
2~6	180	⊙	⊙		○	○	○	⊙	○	
5~12	180	⊙	⊙		○	○	○	⊙	○	
8~20	180	⊙	⊙		○	○	○	⊙	○	
2~20	193	⊙	⊙		○	○	○	⊙	○	
3~20	193	⊙	⊙		○	○	○	⊙	○	
3~20	198	⊙	○		○			⊙		
1~32	205	⊙	○		○			○		
1~32	205	⊙	○		○			○		

⊙ 🇮🇹 molto adatto 🇩🇪 am besten geeignete 🇫🇷 le plus indiqué 🇪🇸 más adecuado 🇷🇺 первый выбор
 ○ 🇮🇹 adatto 🇩🇪 geeignet 🇫🇷 indiqué 🇪🇸 adecuado 🇷🇺 второй выбор

3FL		HSS/Co PV200	N		TAWSH3	
		HSS/Co BR	N		WL3	
		HSS/Co PV200	N		TAWL3	
4FL		NMG UH RED			UHCS4	
		NMG UH RED			UH411	
		NMG UH RED			UH412	
		NMG UH RED			UHF430	
		NMG UH RED			UHF4	
		UMG ENDLESS ORANGE			MEXCS4	
		UMG ENDLESS ORANGE			MEX410R	
		UMG ENDLESS ORANGE			MEXCL4	
		UMG ENDLESS ORANGE			MEXCL4R	
		UMG ENDLESS ORANGE			MEXLS4R	
		UMG ENDLESS			MEFCS4	
		MG DIAMOND			MDC2204	
		MG BR	N		GB405	
		MG PV200	N		G2CS4	
		MG PV200	N		G2WS4	
	MG PV200			G2CS4R		

Ø RANGE	📄	🇮🇹 ACCIAIO	ACCIAIO	ACCIAIO		TITANIO	GHISA	ALLUMINIO	GRAFITE	
		🇩🇪 STAHL	STAHL	STAHL		TITAN	GUSS	ALUMINIUM	GRAPHIT	
		🇫🇷 ACIER	ACIER	ACIER		TITANIUM	FONTE	ALUMINIUM	GRAPHITE	
		🇪🇸 ACERO	ACERO	ACERO		TITANIO	FUNDITIÓN	ALUMINIO	GRAFITO	
		🇷🇺 СТАЛЬ	СТАЛЬ	СТАЛЬ		ТИТАН	ЧУГУН	АЛЮМИНИЙ	ГРАФИТ	
		STEEL ~30HRC	STEEL 30-45HRC	STEEL 45HRC~	INOX	INCONEL	TITANIUM	CAST IRON	ALUMINIUM	GRAPHITE
6~20	205	⊙	○		○			○		
3~25	209	⊙	○		○			○		
3~25	209	⊙	○		○			○		
1~20	133			⊙						
3~12	134			⊙						
2~12	134			⊙						
5~10	122			⊙						
2~12	122			⊙						
1~25	150	○	⊙	⊙	○			○		
2~12	154	○	⊙	⊙	○			○		
2~25	150	○	⊙	⊙	○			○		
3~16	155	○	⊙	⊙	○			○		
2~16	155	○	⊙	⊙	○			○		
2~20	164	○	⊙		⊙	○	⊙			
0.5~12	177								⊙	
1~12	184	⊙	⊙		○			⊙	○	
1~20	184	⊙	⊙		○	○	○	⊙	○	
3~20	186	⊙	⊙		○	○	○	⊙	○	
1~12	189	⊙	⊙		○	○	○	⊙	○	

⊙ most suitable 🇮🇹 molto adatto 🇪🇸 am besten geeignete 🇫🇷 le plus indiqué 🇷🇺 más adecuado 🇷🇺 первый выбор
 ○ suitable 🇮🇹 adatto 🇪🇸 geeignet 🇫🇷 indiqué 🇷🇺 adecuado 🇷🇺 второй выбор

4FL		MG PV200	N		G2410	
		MG PV200	N		G2411	
		MG PV200	N		G2412	
		MG PV200	N		G2413	
		MG PV200	N		MDTACS4	
		MG PV200	N		MDTA410	
		MG BR	N		MDCL4	
		HSS-P PV200	UM		UMWS4	
		HSS/Co BR	N		WS4/6	
		HSS/Co PV200	N		TAWS4/6	
		HSS/Co BR	N		WL4/6	
		HSS/Co PV200	N		TAWL4/6	
4FL VARIABLE HELIX AND UNEQUAL PITCH		MG PV300	HF UNI		HF440	
		MG PV300	HF UNI		HF840	
		MG PV300	HF UNI		HF441	
		MG PV300	HF UNI RADIUS		HF442	
		MG PV300	HF UNI RADIUS		HF842	
		MG PV300	HF UNI RADIUS		HF443	
4FL UNEQUAL PITCH		MG PV300	HF HARD		HF450	
		MG PV300	HF HARD		HF850	

























































Ø RANGE	184	ACCIAIO STAHL ACIER ACERO СТАЛЬ STEEL ~30HRC	ACCIAIO STAHL ACIER ACERO СТАЛЬ STEEL 30-45HRC	ACCIAIO STAHL ACIER ACERO СТАЛЬ STEEL 45HRC-	INOX	INCONEL	TITANIO TITAN TITANIUM TITANIO ТИТАН TITANIUM	GHISA GUSS FONTE FUNDITION ЧУГУН CAST IRON	ALLUMINIO ALUMINIUM ALUMINIO ALUMINIO АЛЮМИНИЙ ALUMINIUM	GRAFITE GRAPHIT GRAPHITE GRAFITO ГРАФИТ GRAPHITE
		2~6	184	⊙	⊙		○	○	○	⊙
5~12	184	⊙	⊙		○	○	○	⊙	○	
8~20	184	⊙	⊙		○	○	○	⊙	○	
16~20	184	⊙	⊙		○	○	○	⊙	○	
2~20	194	⊙	⊙		○	○	○	⊙	○	
3~16	194	⊙	⊙		○	○	○	⊙	○	
3~20	194	⊙	⊙		○			⊙	○	
3~20	199	⊙	○		○			⊙		
2~30	206	⊙	○		○			○		
2~40	206	⊙	○		○			○		
3~25	209	⊙	○		○			○		
3~40	209	⊙	○		○			○		
3~20	159	⊙	⊙ <40HRC		⊙	⊙	⊙	⊙		
3~20	159	⊙	⊙ <40HRC		⊙	⊙	⊙	⊙		
3~20	159	⊙	⊙ <40HRC		⊙	⊙	⊙	⊙		
3~20	160	⊙	⊙ <40HRC		⊙	⊙	⊙	⊙		
3~20	160	⊙	⊙ <40HRC		⊙	⊙	⊙	⊙		
3~20	160	⊙	⊙ <40HRC		⊙	⊙	⊙	⊙		
3~20	159		⊙ 35~55HRC	⊙ 35~55HRC	⊙ 35~55HRC	⊙ 35~55HRC	⊙ 35~55HRC			
3~20	159		⊙ 35~55HRC	⊙ 35~55HRC	⊙ 35~55HRC	⊙ 35~55HRC	⊙ 35~55HRC			

⊙ most suitable molto adatto am besten geeignete le plus indiqué más adecuado первый выбор
○ suitable adatto geeignet indiqué adecuado второй выбор

4FL VARIABLE HELIX		MG PV300	HF HARD		HF451	
		MG PV300	HF HARD RADIUS		HF452	
		MG PV300	HF HARD RADIUS		HF852	
		MG PV300	HF UNI HR		HF444	
		MG PV300	HF UNI HR		HF844	
		MG PV300	HF UNI HR		HF445	
4FL BALL		MG PV200	N BALL NOSE		G2CSB4	
MULTI FLUTES		NMG UH RED	UH		UH600	
		NMG UH RED	UH		UH612	
		NMG UH RED	UH RADIUS		UH610R	
		NMG UH RED	UH RADIUS		UH611R	
		UMG ENDLESS ORANGE	MEX		MEXCSHM	
		UMG ENDLESS ORANGE	MEX		MEXCLHM	
		UMG ENDLESS ORANGE	MEX RADIUS		MEX610R	
		UMG ENDLESS ORANGE	MEX RADIUS		MEX611R	
		UMG ENDLESS	VA		MEF600	
		MG LAPPED	ALU		MDCSAM	
		MG PV200	N		G2CSHM	
ROUGHING		UMG ENDLESS	MEX HR FINE		MEXCSFR	
		UMG ENDLESS	VA HR FINE		MEF901	

Ø RANGE	📄	🇮🇹 ACCIAIO	🇦🇹 ACCIAIO	🇦🇹 ACCIAIO			TITANIO	GHISA	ALLUMINIO	GRAFITE
		🇩🇪 STAHL	🇦🇹 STAHL	🇦🇹 STAHL	INOX	INCONEL	TITAN	GUSS	ALUMINIUM	GRAPHIT
		🇫🇷 ACIER	🇫🇷 ACIER	🇫🇷 ACIER			TITANIUM	FONTE	ALUMINIUM	GRAPHITE
		🇪🇸 ACERO	🇪🇸 ACERO	🇪🇸 ACERO			TITANIO	FUNDITIÓN	ALUMINIO	GRAFITO
		🇷🇺 СТАЛЬ	🇷🇺 СТАЛЬ	🇷🇺 СТАЛЬ			ТИТАН	ЧУГУН	АЛЮМИНИЙ	ГРАФИТ
		🇺🇸 STEEL ~30HRC	🇺🇸 STEEL 30-45HRC	🇺🇸 STEEL 45HRC~			TITANIUM	CAST IRON	ALUMINIUM	GRAPHITE
3~20	159		☉ 35~55HRC	☉ 35~55HRC	☉ 35~55HRC	☉ 35~55HRC	☉ 35~55HRC			
3~20	160		☉ 35~55HRC	☉ 35~55HRC	☉ 35~55HRC	☉ 35~55HRC	☉ 35~55HRC			
3~20	160		☉ 35~55HRC	☉ 35~55HRC	☉ 35~55HRC	☉ 35~55HRC	☉ 35~55HRC			
6~20	162		☉ <40HRC		☉	☉	☉	☉		
6~20	162		☉ <40HRC		☉	☉	☉	☉		
6~20	162		☉ <40HRC		☉	☉	☉	☉		
1~20	190	☉	☉		○	○	○	☉	○	
3~20	135			☉						
3~16	135			☉						
6~12	136			☉						
6~20	136			☉						
6~20	152	○	☉	☉	○			○		
6~25	152	○	☉	☉	○			○		
6~12	153	○	☉	☉	○			○		
6~12	153	○	☉	☉	○			○		
6~20	165	○	☉		☉	○	☉			
6~20	172								☉	
6~20	188	☉	☉		○	○	○	☉	○	
6~20	156	○	☉	☉	○			○		
4~20	166	○	☉		☉	○	☉			

☉ 🇺🇸 most suitable 🇮🇹 molto adatto 🇦🇹 am besten geeignete 🇫🇷 le plus indiqué 🇪🇸 más adecuado 🇷🇺 первый выбор
○ 🇺🇸 suitable 🇮🇹 adatto 🇦🇹 geeignet 🇫🇷 indiqué 🇪🇸 adecuado 🇷🇺 второй выбор

ROUGHING		UMG ENDLESS	VA HR FINE		MEF902	
		HSS/Co BR	ALU WR COARSE		WSAR	
		MG PV200	HR FINE		G2CSFR	
		MG PV200	HR FINE		G2WSFR	
		MG PV200	NR COARSE		MDTAWSR	
		HSS-P PV200	UM HR FINE		UMWSFR	
		HSS/Co PV200	NR COARSE		TAWSR	
		HSS/Co BR	HR FINE		WSFR	
		HSS/Co PV200	HR FINE		TAWSFR	
		HSS/Co BR	HR FINE		WLFR	
		HSS/Co PV200	HR FINE		TAWLFR	
	VARIOUS		HSS/Co BR	N		FM
		HSS/Co PV200	N		TAFM	
		HSS/Co BR	HR FINE		FFR	
		HSS/Co PV200	HR FINE		TAFFR	
		HSS/Co BR	N		WCR	
		HSS/Co BR	N		WDC	
		HSS/Co BR	N		WDD	
		HSS/Co BR	N		WTM	

Ø RANGE	📄	🇮🇹 ACCIAIO	ACCIAIO	ACCIAIO	TITANIO	GHISA	ALLUMINIO	GRAFITE		
		🇩🇪 STAHL	STAHL	STAHL	TITAN	GUSS	ALUMINIUM	GRAPHIT		
		🇫🇷 ACIER	ACIER	ACIER	TITANIUM	FONTE	ALUMINIUM	GRAPHITE		
		🇪🇸 ACERO	ACERO	ACERO	TITANIO	FUNDITIÓN	ALUMINIO	GRAFITO		
		🇷🇺 СТАЛЬ	СТАЛЬ	СТАЛЬ	ТИТАН	ЧУГУН	АЛЮМИНИЙ	ГРАФИТ		
		STEEL ~30HRC	STEEL 30-45HRC	STEEL 45HRC~	INOX	INCONEL	TITANIUM	CAST IRON	ALUMINIUM	GRAPHITE
6~20	166	○	●		●	○	●			
6~25	207							●		
6~20	187	●	●		○	○	○	●	○	
6~20	187	●	●		○	○	○	●	○	
6~20	195	●	●		○	○	○	●	○	
6~20	200	●	○		○			●		
6~20	207	●	○		○			○		
6~20	207	●	○		○			○		
6~40	207	●	○		○			○		
6~20	210	●	○		○			○		
6~40	210	●	○		○			○		
40~160	211	●	○		○			○		
40~160	211	●	○		○			○		
40~160	211	●	○		○			○		
40~160	211	●	○		○			○		
R1~R20	212	●	○		○			○		
16~38	213	●	○		○			○		
16~38	213	●	○		○			○		
12.5~40	214	●	○		○			○		

● most suitable 🇮🇹 molto adatto ● am besten geeignete 🇫🇷 le plus indiqué ● más adecuado 🇷🇺 первый выбор
 ○ suitable 🇮🇹 adatto ● geeignet 🇫🇷 indiqué ● adecuado 🇷🇺 второй выбор

VARIOUS



HSS/Co
BR

N



WWK



Ø RANGE	215	ACIAIO	ACIAIO	ACIAIO	TITANIO	GHISA	ALLUMINIO	GRAFITE		
		STAHL	STAHL	STAHL	TITAN	GUSS	ALUMINIUM	GRAPHIT		
		ACIER	ACIER	ACIER	TITANIUM	FONTE	ALUMINIUM	GRAPHITE		
		ACERO	ACERO	ACERO	TITANIO	FUNDITIÓN	ALUMINIO	GRAFITO		
		СТАЛЬ	СТАЛЬ	СТАЛЬ	ТИТАН	ЧУГУН	АЛЮМИНИЙ	ГРАФИТ		
		STEEL ~30HRC	STEEL 30~45HRC	STEEL 45HRC~	INOX	INCONEL	TITANIUM	CAST IRON	ALUMINIUM	GRAPHITE
10.5~45.5	215	⊙	○		○			○		

⊙ 🇮🇹 most suitable 🇮🇹 molto adatto 🇩🇪 am besten geeignete 🇫🇷 le plus indiqué 🇪🇸 más adecuado 🇷🇺 первый выбор
 ○ 🇮🇹 suitable 🇮🇹 adatto 🇩🇪 geeignet 🇫🇷 indiqué 🇪🇸 adecuado 🇷🇺 второй выбор

STOCK		
	<ul style="list-style-type: none"> stock standard stock standard Standard Lager 	<ul style="list-style-type: none"> stock standard stock estándar складская позиция
	<ul style="list-style-type: none"> non-standard stock stock non standard nicht Standard Lager 	<ul style="list-style-type: none"> stock non standard stock no estándar не складская позиция
	<ul style="list-style-type: none"> stock exhaustion esaurimento stock Vorraterschöpfung 	<ul style="list-style-type: none"> épuisement du stock agotamiento de stock складские остатки

SHANK ATTACCO SCHAFT QUEUE MANGO ХВОСТОВИК		
	<ul style="list-style-type: none"> cylindrical shank attacco cilindrico zylindrischer Schaft 	<ul style="list-style-type: none"> queue cylindrique mango cilíndrico цилиндрическое крепление
	weldon	
	<ul style="list-style-type: none"> Morse Taper shank attacco Cono Morse MK Schaft 	<ul style="list-style-type: none"> queue conique mango Cono Morse конус Морзе

TYPE TIPO TYP TYPE TIPO ТИП		
	<ul style="list-style-type: none"> flutes number numero di taglienti Schneidenanzahl 	<ul style="list-style-type: none"> nombre de dents número de cortes количество режущих кромок
	<ul style="list-style-type: none"> ball nose raggata runder Stirn 	<ul style="list-style-type: none"> bout hémisphérique fresa de bola сферическая
	<ul style="list-style-type: none"> corner radius torica Eckradius 	<ul style="list-style-type: none"> torique radio angular с радиусом при вершине

GEOMETRY GEOMETRIA GEOMETRIE GÉOMÉTRIE GEOMETRÍA ГЕОМЕТРИЯ		
	<ul style="list-style-type: none"> 50~70HRC for hardened steel 50~70HRC per acciai temprati 50~70HRC für Hartstahl 	<ul style="list-style-type: none"> 50~70HRC pour acier trempé 50~70HRC para aceros templados 50~70HRC для закалённых сталей
	<ul style="list-style-type: none"> 30~55HRC general purpose and hardened steel 30~55HRC uso generico e acciaio temprato 30~55HRC allgemeine Anwendung und gehärtete Stähle 	<ul style="list-style-type: none"> 30~55HRC utilisation générale et aciers trempés 30~55HRC Mecanizado genérico y acero templado 30~55HRC общее назначение и для закалённых сталей
	<ul style="list-style-type: none"> ~40HRC variable helix and unequal pitch ~40HRC elica variabile e passo differenziato ~40HRC ungleicher Teilung und Winkel 	<ul style="list-style-type: none"> ~40HRC hélice et pas variables ~40HRC helice variable y paso alterno ~40HRC переменный завиток и дифференциальная кромка
	<ul style="list-style-type: none"> 35~55HRC unequal pitch 35~55HRC passo differenziato 35~55HRC ungleicher Teilung 	<ul style="list-style-type: none"> 35~55HRC pas variable 35~55HRC paso alterno 35~55HRC неодинаковый шаг режущих кромок

GEOMETRY GEOMETRIA GEOMETRIE GÉOMÉTRIE GEOMETRÍA ГЕОМЕТРИЯ		
MEF	<ul style="list-style-type: none"> for stainless steel per acciaio inossidabile für rostfreien Stahl 	<ul style="list-style-type: none"> pour acier inoxydable para acero inoxidable для нержавеющей сталей
ALU	<ul style="list-style-type: none"> for aluminium per alluminio für Aluminium 	<ul style="list-style-type: none"> pour aluminium para aluminio для алюминия
MDC	<ul style="list-style-type: none"> for graphite per grafite für Graphit 	<ul style="list-style-type: none"> pour graphite para grafito для графита
UM	<ul style="list-style-type: none"> high performance (HSS-P) alto rendimento (HSS-P) hochleistung (HSS-P) 	<ul style="list-style-type: none"> haute performance (HSS-P) alto rendimiento (HSS-P) высокопроизводительная (HSS-P)
N	standard	
NR COARSE	<ul style="list-style-type: none"> roughing coarse pitch sgrossare passo grosso Schruffräser Regelgewinde 	<ul style="list-style-type: none"> ébauche pas gros desbaste paso grueso черновая с крупным шагом
HR FINE	<ul style="list-style-type: none"> roughing fine pitch sgrossare passo fine Schruffräser Feingewinde 	<ul style="list-style-type: none"> ébauche pas fin desbaste paso fino черновая с мелким шагом
WR ALU	<ul style="list-style-type: none"> roughing for light alloy sgrossare per leghe leggere Schruffräser für weiche Werkstoffe 	<ul style="list-style-type: none"> ébauche pour alliages légers desbaste para aleaciones livianas черновая для легких сплавов

MATERIAL MATERIALE WERKSTOFF MATIÈRE MATERIAL МАТЕРИАЛ		
NMG ...	<ul style="list-style-type: none"> nano micrograin nano micrograna nano Mikrokörnung 	<ul style="list-style-type: none"> nano micrograin nano micrograno нано микрoзернистый твёрдый сплав
UMG ...	<ul style="list-style-type: none"> ultra fine micrograin micrograna ultra fine ultrafeine Mikrokörnung 	<ul style="list-style-type: none"> micrograin ultra-fin micrograno ultra fino ультра микрoзернистый твёрдый сплав
MG ...	<ul style="list-style-type: none"> micrograin micrograna Mikrokörnung 	<ul style="list-style-type: none"> micrograin micrograno микрoзернистый твёрдый сплав
HSS-P ...	<ul style="list-style-type: none"> powder steel acciaio sinterizzato Sinterstahl 	<ul style="list-style-type: none"> acier fritté acero sinterizado порошковая сталь
HSS/Co ...	<ul style="list-style-type: none"> high speed steel 5%~8% Co acciaio super rapido 5%~8% Co Hochleistungsschnellschnittstahl 5%~8% Co 	<ul style="list-style-type: none"> acier rapide 5%~8% Co acero súper rápido 5%~8% Co быстрорежущая сталь с кобальтом 5-8%

Legenda
 Verzeichnis
 Légende
 Leyenda
 Условные обозначения

COATINGS
 RIVESTIMENTI
 BESCHICHTUNGEN
 REVÊTEMENTS
 RECUBRIMIENTOS
 ПОКРЫТИЕ

	TIGN	PV200	PV100	ENDLESS ORANGE	UH RED	DIAMOND
HARDNESS (HV) DURETÉ (HV) DUREZZA (HV) DUREZA (HV) HÄRTE (HV) ТВЁРДОСТЬ (HV)	3000	3500	3500	3300	4500	5000 - 8000
FRICTION COEFFICIENT COEFFICIENT DE FROTTEMENT COEFFICIENTE D'ATTRITO COEFICIENTE DE ROZAMIENTO REIBUNGSKOEFFIZIENT КОЭФФИЦИЕНТ ТРЕНИЯ	0.4	0.5	0.5	0.4	0.45	
THICKNESS (μ) EPAISSEUR (μ) SPESSORE (μ) ESPESOR (μ) DICKE (μ) ТОЛЩИНА (МКМ)	1~4	1~4	1~4	1~4	1~4	
MAX WORKING (°C) TEMPÉRATURE MAXIMALE (°C) TEMPERATURA MAX (°C) TEMPERATURA MÁX (°C) HOCHSTE TEMPERATUR (°C) МАКС. ТЕМПЕРАТУРА (°C)	400	800	800	900	1200	

PARAMETERS
 PARAMETRI
 PARAMETER
 PARAMÈTRES
 PARÁMETROS
 ПАРАМЕТРЫ



parameters reference
 riferimento parametri
 Parameter Hinweis

référence des paramètres
 referencia parámetros
 ссылка на параметры



UH RED

Nano micrograin for 50~70HRC

🇺🇸 UH nano micrograin: for high-speed dry machining on hardened steel, up to 70 HRC.

🇮🇹 UH nano micrograna: per lavorazione a secco ad alta velocità su acciaio temprato, fino a 70 HRC.

🇩🇪 UH nano Mikrokörnung: für trockene Hochgeschwindigkeitsbearbeitungen von gehärteten Stählen bis 70 HRC.

🇫🇷 UH nano micrograin: pour une grande vitesse d'usinage à sec de l'acier traité à 70 HRC.

🇪🇸 UH nano micrograno para alta velocidad de corte, mecanizado en seco, y aceros con durezas por encima de 70 HRC.

🇷🇺 UH нано –зернистый твёрдый сплав: предназначен для обработки закалённых сталей до 70 HRC без СОЖ.



UH RED COATING
NANO MICROGRAIN

50~70HRC

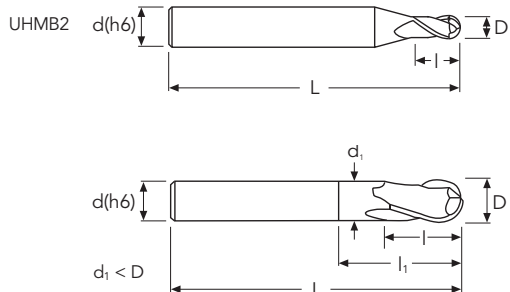
	OSAWA NORM
PAGE 253-254	

UHMB2 - UH253

Ø mm	~0.8	≥0.8
tol. D μ	0 / -12	0 / -20
tol. R μ	0 / -20	0 / -20

UHCSB2 - UH250

Ø mm	~6	>6
tol. D μ	0 / -12	0 / -15
tol. R μ	±5	±10



D	d	l	l1	L	UHMB2	UHCSB2	UH250	UH253
mm 0.2	4	0.4		40	●			
0.2	6	0.2		40		■		
0.3	4	0.6		40	●			
0.4	4	0.8		40	●			
0.4	6	0.4		40		■		
0.5	4	1.2		40	●			
0.5	6	1.2		50		●		
0.6	4	1.4		40	●			
0.6	6	0.6		40		■		
0.6	6	1.4		50		●		
0.7	4	1.6		40	●			
0.8	4	1.8		40	●			
0.8	6	0.8		40		■		
0.8	6	1.8		50		●		
0.9	4	2		40	●			
0.9	6	0.9		40		■		
1	6	1.5		40		●		
1	4	1	2.2	50			●	
1	6	3	7	75				●
1	6	3	10	100				●
1.5	6	2.5		40		●		
1.5	4	1.5	3	50			●	
1.5	6	3	10	75				●
1.5	6	3	15	100				●
2	6	3		40		●		
2	6	2	4	50			●	
2	6	4	14	75				●
2	6	4	20	100				●
2.5	6	3		50		●		
2.5	6	4	18	75				●
2.5	6	4	25	100				○
3	6	4.5		50		●		
3	6	3	6	60			●	
3	6	5	21	75				●
3	6	5	30	100				●
4	6	6		50		●		

● stock standard ○ non-standard stock ■ stock exhaustion

	OSAWA NORM
PAGE 253-254	

UHMB2 - UH253

Ø mm	~0.8	≥0.8
tol. D μ	0 / -12	0 / -20
tol. R μ	0 / -20	0 / -20

UHCSB2 - UH250

Ø mm	~6	>6
tol. D μ	0 / -12	0 / -15
tol. R μ	±5	±10



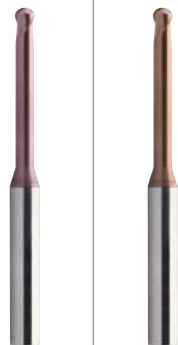
					 Z2 BALL	 Z2 BALL	 Z2 BALL	 Z2 BALL
					 NMG UH RED	 NMG UH RED	 NMG UH RED	 NMG UH RED
					 UH BALL NOSE	 UH BALL NOSE	 UH BALL NOSE	 UH BALL NOSE
					 30°	 30°	 30°	 30°
D	d	l	l1	L	Stock	Stock	Stock	Stock
mm								
4	6	4	8	70			●	
4	6	4	40	100				●
5	6	7.5		50		●		
5	6	5	10	80			●	
5	6	5	50	100				●
6	6	9		50		●		
6	6	6	12	90			●	
6	6	10	60	100				●
6	6	10	60	150				●
8	8	12		50		●		
8	8	8	16	100			●	
8	8	12	60	100				●
8	8	12	80	150				●
10	10	15		60		●		
10	10	10	20	100			●	
10	10	14	85	125				●
10	10	14	100	150				●
12	12	18		60		●		
12	12	12	24	110			●	
12	12	16	85	125				●
12	12	16	110	150				●

● stock standard ○ non-standard stock ■ stock exhaustion

NEW

	OSAWA NORM
PAGE 255~257	

UHCRB2 UHLNB2

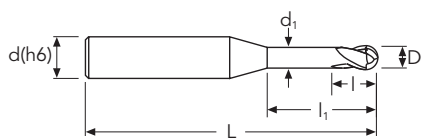


UHCRB2

Ø mm	~6
tol. D µ	0 / -12
tol. R µ	±5

UHLNB2

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	0 / -20	0 / -20



$d_1 < D$

D	d	l	l1	L	UHCRB2 Stock	UHLNB2 Stock
mm 0.1	4	0.1	0.3	45	■	●
0.2	4	0.2	0.5	50	■	●
0.2	4	0.2	1	45	■	●
0.2	4	0.2	1.5	50		●
0.3	4	0.3	1	50		●
0.3	4	0.3	2	45	■	●
0.3	4	0.3	2	50		●
0.3	4	0.3	3	50		●
0.4	4	0.4	1	45	■	●
0.4	4	0.4	1	50		●
0.4	4	0.4	2	50		●
0.4	4	0.4	3	50		●
0.4	4	0.4	4	50		●
0.5	6	0.5	2	45	●	
0.5	4	0.4	2	50		●
0.5	4	0.4	3	50		●
0.5	6	0.5	4	45	●	
0.5	4	0.4	4	50		●
0.5	4	0.4	5	50		●
0.5	4	0.4	6	45	■	●
0.5	4	0.4	6	50		●
0.5	4	0.4	8	50		●
0.6	4	0.5	2	50		●
0.6	4	0.5	3	50		●
0.6	6	0.6	4	45	●	
0.6	4	0.5	4	50		●
0.6	4	0.5	5	50		●
0.6	4	0.6	6	45	■	●
0.6	4	0.5	6	50		●
0.6	4	0.5	8	50		●
0.8	4	0.6	2	50		●
0.8	6	0.8	2	45	●	
0.8	4	0.6	4	50		●
0.8	4	0.6	6	50		●
0.8	6	0.8	6	45	●	

● stock standard ○ non-standard stock ■ stock exhaustion


 PAGE
 255~257

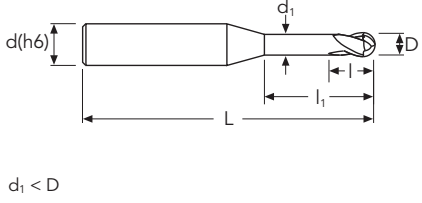
OSAWA
NORM


NEW


UHCRB2	
Ø mm	~6
tol. D µ	0 / -12
tol. R µ	±5


UHLNB2		
Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	0 / -20	0 / -20









Z2 BALL



Z2 BALL



NMG
UH RED


NMG
UH RED


UH BALL NOSE


UH BALL NOSE


30°

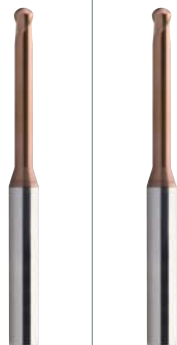

30°

D	d	l	l1	L	UHCRB2 Stock	UHLNB2 Stock
mm 0.8	4	0.6	8	50		●
0.8	4	0.8	10	45	■	
0.8	4	0.6	10	50		●
1	4	0.8	3	50		●
1	6	1	3	50	●	
1	4	0.8	4	50		●
1	4	0.8	5	50		●
1	4	0.8	6	50		●
1	6	1	6	50	●	
1	4	0.8	7	50		○
1	4	0.8	8	50		●
1	4	0.8	9	50		○
1	4	0.8	10	50	■	●
1	6	1	10	50	●	
1	4	0.8	12	50		●
1	4	0.8	14	50		●
1	4	0.8	16	50	■	●
1	4	0.8	20	50	■	●
1.2	4	1	6	50		●
1.2	4	1	8	50		●
1.2	6	1.2	8	50	●	
1.2	4	1	10	50		●
1.2	4	1	12	50		●
1.4	4	1.1	8	50		●
1.4	4	1.1	12	50		●
1.4	4	1.1	16	50		●
1.5	6	1.5	4	50	●	
1.5	4	1.2	8	50		●
1.5	6	1.5	10	50	●	
1.5	4	1.2	12	50	■	●
1.5	6	1.5	12	50	●	
1.5	4	1.2	16	50		●
1.5	4	1.2	18	60		●
1.5	4	1.5	20	55	■	
1.5	4	1.2	20	60		●
1.6	4	1.3	8	50		●

NEW

	OSAWA NORM
PAGE 255~257	

UHCRB2 UHLNB2

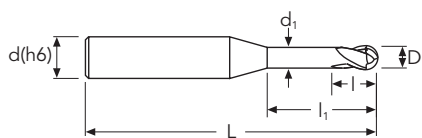


UHCRB2

Ø mm	~6
tol. D µ	0 / -12
tol. R µ	±5

UHLNB2

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	0 / -20	0 / -20



D	d	l	l1	L	UHCRB2 Stock	UHLNB2 Stock
mm 1.6	4	1.3	12	50		●
1.6	4	1.3	16	50		●
1.6	4	1.3	20	60		○
1.8	4	1.4	8	50		●
1.8	4	1.4	12	50		●
1.8	4	1.4	16	50		●
1.8	4	1.4	20	60		○
2	4	1.6	4	50		●
2	4	1.6	6	50		●
2	6	3	6	50	●	
2	4	1.6	8	50		●
2	4	1.6	10	50		●
2	4	3	10	50	■	
2	4	1.6	12	50		●
2	6	3	12	50	●	
2	4	1.6	14	50		●
2	4	3	16	50	■	
2	4	1.6	16	50		●
2	4	1.6	18	60		●
2	6	3	20	50	●	
2	4	1.6	20	60		●
2	4	1.6	22	60		●
2	4	3	25	60	■	
2	4	1.6	25	75		●
2	4	3	30	70	■	
2	4	1.6	30	75		●
3	6	2.4	8	50		●
3	6	2.4	10	50		●
3	6	2.4	12	50		●
3	6	4	12	55	■	
3	6	2.4	16	50		●
3	6	4	16	55	■	
3	6	2.4	20	60		●
3	6	4	20	60	■	
3	6	2.4	25	75		●
3	6	4	30	70	■	

n **Vf**
PAGE
255~257

**OSAWA
NORM**

UHCRB2

Ø mm	~6
tol. D µ	0 / -12
tol. R µ	±5

UHLNB2

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	0 / -20	0 / -20

NEW



$d_1 < D$

Z2 BALL

NMG

UH RED

UH BALL NOSE

30°

Z2 BALL

NMG

UH RED

UH BALL NOSE

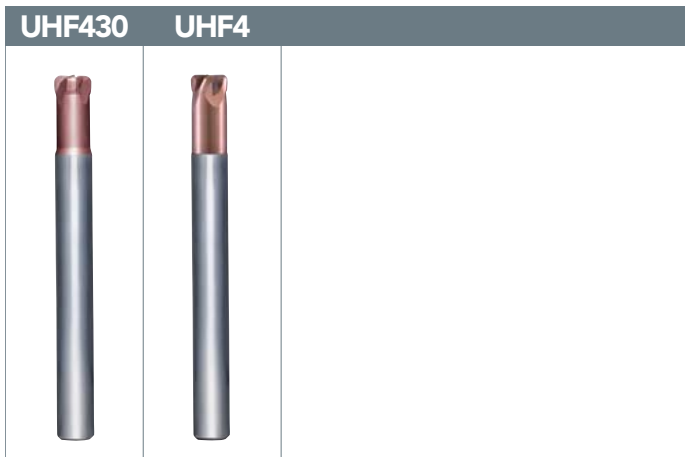
30°

D	d	l	l1	L	UHCRB2 Stock	UHLNB2 Stock
mm 3	6	2.4	30	75		●
3	6	2.4	35	75		●
4	6	3.2	10	50		●
4	6	5	16	55	■	
4	6	3.2	16	60		●
4	6	3.2	20	60		●
4	6	3.2	25	75		●
4	6	5	30	70	■	
4	6	3.2	30	75		●
4	6	3.2	35	75		●
4	6	5	40	80	■	
4	6	3.2	40	100		●
4	6	3.2	45	100		○
4	6	3.2	50	100		○

● stock standard ○ non-standard stock ■ stock exhaustion

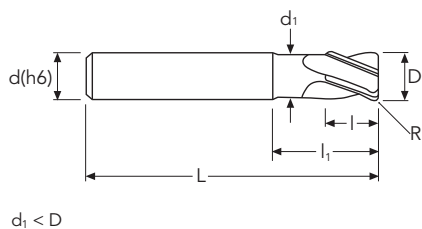
	OSAWA NORM
PAGE 258	

NEW



UHF430	
Ø mm	-12
tol. D µ	0 / -20
tol. R µ	±5

UHF4	
Ø mm	-12
tol. D µ	0 / -30
tol. R µ	0 / -20



NMG	NMG
UH RED	UH RED

D	d	l	l1	L	Stock	Stock
mm 2 R0.5	6	1	6	70		●
3 R0.5	6	1.2	8	70		●
4 R0.5	6	1.5	10	70		●
5 R0.5	6	2	10	70	■	●
6 R0.5	6	2.5	12	90	■	●
6 R1	6	2.5	12	90	■	●
8 R1	8	3.5	16	100	■	●
8 R2	8	3.5	16	100	■	●
10 R1	10	4	20	100	■	●
10 R2	10	4	20	100	■	●
12 R2	12	5	25	110		●
12 R3	12	5	25	110		●

● stock standard ○ non-standard stock ■ stock exhaustion

	OSAWA NORM
PAGE 258-259	

UHM2 - UHCS2

Ø mm	~6	>6
tol. D µ	0 / -12	0 / -15
tol. R µ	±10	±15

UHM2-N

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20

NEW



UHM2-N							
UHM2							
UHCS2							
D	d	I	I1	L	Stock	Stock	Stock
mm							
0.1	4	0.2		40	●		
0.2	4	0.4		40	●		
0.3	4	0.6		40	●		
0.3	6	0.45		50		●	
0.4	4	0.8		40	●		
0.4	6	0.6		50		●	
0.5	4	1		40	●		
0.5 R0.05	6	0.7		50		●	
0.6	4	1.2		40	●		
0.6 R0.05	6	0.9		50		●	
0.7	4	1.4		40	●		
0.8	4	1.6		40	●		
0.8 R0.05	6	1.2		50		●	
0.9	4	1.8		40	●		
1 R0.1	4	2	3	50			●
1 R0.1	6	1.5		50		●	
1.5 R0.1	4	2.5	4	50			●
1.5 R0.15	6	2.2		50		●	
2 R0.15	6	2.2		50		●	
3 R0.1	6	4.5	8	55			●
4 R0.1	6	6	10	55			●
5 R0.2	6	6	11	50			●
6 R0.2	6	9	15	60			●
8 R0.2	8	12	20	65			●
10 R0.2	10	15	25	70			●
12 R0.3	12	18	30	80			●

● stock standard ○ non-standard stock ■ stock exhaustion

n Vf
PAGE
260~262

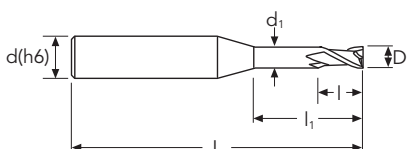
**OSAWA
NORM**

NEW



UHCR2	
Ø mm	~4
tol. D µ	0 / -12

UHLN2	
Ø mm	~0.8 ≥0.8
tol. D µ	0 / -12 0 / -20



NMG	NMG
UH RED	UH RED
UH	UH

D	d	l	l1	L	Stock	Stock
mm 0.1	4	0.15	0.3	45	■	●
0.2	4	0.3	0.5	50	■	●
0.2	4	0.3	1	45	■	●
0.2	4	0.3	1	50	■	●
0.2	4	0.3	1.5	50	■	●
0.3	4	0.4	1	50	■	●
0.3	4	0.45	1.5	45	■	●
0.3	4	0.4	2	50	■	●
0.3	4	0.45	3	45	■	●
0.3	4	0.4	3	50	■	●
0.4	4	0.6	2	50	■	●
0.4	4	0.6	3	50	■	●
0.4	4	0.6	4	50	■	●
0.4	4	0.6	5	45	■	●
0.4	4	0.6	5	50	■	●
0.5	4	0.7	2	45	■	●
0.5	4	0.7	2	50	■	●
0.5	4	0.7	4	45	■	●
0.5	4	0.7	4	50	■	●
0.5	4	0.7	6	50	■	●
0.5	4	0.7	8	50	■	●
0.6	4	0.9	2	50	■	●
0.6	4	0.9	4	45	■	●
0.6	4	0.9	4	50	■	●
0.6	4	0.9	6	45	■	●
0.6	4	0.9	6	50	■	●
0.6	4	0.9	8	50	■	●
0.6	4	0.9	10	50	■	●
0.7	4	1	2	50	■	●
0.7	4	1	4	50	■	●
0.7	4	1	6	50	■	●
0.7	4	1	8	50	■	●
0.7	4	1	10	50	■	●
0.8	4	1.2	4	50	■	●
0.8	4	1.2	6	50	■	●
0.8	4	1.2	8	45	■	●

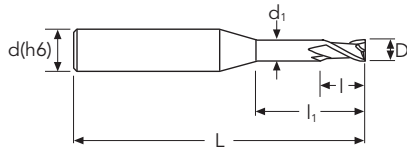
● stock standard ○ non-standard stock ■ stock exhaustion

	OSAWA NORM
PAGE 260~262	

UHCR2	
Ø mm	~4
tol. D µ	0 / -12

UHLN2		
Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20

NEW



$d_1 < D$

NMG UH RED	NMG UH RED
UH	UH

D	d	l	l1	L	Stock	Stock
mm 0.8	4	1.2	8	50		●
0.8	4	1.2	10	50		●
0.8	4	1.2	12	50		●
0.9	4	1.4	6	50		●
0.9	4	1.4	8	50		●
0.9	4	1.4	10	50		●
0.9	4	1.4	15	50		●
1	4	1.5	4	50	■	
1	4	1.5	6	50		●
1	4	1.5	8	50	■	●
1	4	1.5	10	50	■	●
1	4	1.5	12	50		●
1	4	1.5	14	50		○
1	4	1.5	16	50	■	●
1	4	1.5	20	55	■	
1.2	4	1.8	4	50	■	
1.2	4	1.8	6	50		●
1.2	4	1.8	8	50		●
1.2	4	1.8	10	50	■	●
1.2	4	1.8	12	50		●
1.4	4	2.1	6	50		●
1.4	4	2.1	8	50		●
1.4	4	2.1	10	50		●
1.4	4	2.1	12	50		●
1.4	4	2.1	14	50		○
1.4	4	2.1	16	50		●
1.5	4	2.3	6	50	■	●
1.5	4	2.3	8	50		●
1.5	4	2.3	10	50	■	●
1.5	4	2.3	12	50		●
1.5	4	2.3	14	50		○
1.5	4	2.3	16	50	■	●
1.5	4	2.3	18	60		○
1.5	4	2.3	20	55	■	
1.5	4	2.3	20	60		●
1.6	4	2.4	6	50		●

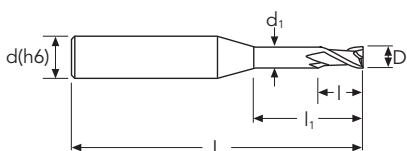
n	V_f	OSAWA NORM
PAGE 260~262		

NEW







UHCR2	
Ø mm	~4
tol. D µ	0 / -12

UHLN2	
Ø mm	~0.8 ≥0.8
tol. D µ	0 / -12 0 / -20



$d_1 < D$

	
NMG	NMG
UH RED	UH RED
UH	UH
	

D	d	l	l1	L	Stock	Stock
mm 1.6	4	2.4	8	50		●
1.6	4	2.4	10	50		●
1.6	4	2.4	12	50		●
1.6	4	2.4	14	50		○
1.6	4	2.4	16	50		●
1.6	4	2.4	18	60		○
1.6	4	2.4	20	60		●
1.8	4	2.7	6	50		●
1.8	4	2.7	8	50		●
1.8	4	2.7	10	50		●
1.8	4	2.7	12	50		●
1.8	4	2.7	14	50		○
1.8	4	2.7	16	50		●
1.8	4	2.7	18	60		●
1.8	4	2.7	20	60		●
2	4	3	6	50	■	●
2	4	3	8	50		●
2	4	3	10	50		●
2	4	3	12	50	■	●
2	4	3	14	50		○
2	4	3	16	50	■	●
2	4	3	18	60		○
2	4	3	20	55	■	
2	4	3	20	60		●
2	4	3	25	75		●
2	4	3	30	75		●
2.5	4	3.7	8	50		●
2.5	4	3.7	10	50		●
2.5	4	3.7	12	50		●
2.5	4	3.7	14	50		○
2.5	4	3.7	16	50		●
2.5	4	3.7	18	60		○
2.5	4	3.7	20	60		●
2.5	4	3.7	25	75		●
2.5	4	3.7	30	75		●
3	6	4.5	8	50		●

● stock standard ○ non-standard stock ■ stock exhaustion

n **Vf**
PAGE
260~262

**OSAWA
NORM**

UHCR2

Ø mm	~4
tol. D µ	0 / -12

UHLN2

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20

NEW



$d_1 < D$

NMG
UH RED

UH

NMG
UH RED

UH

D	d	l	l1	L	UHCR2 Stock	UHLN2 Stock
mm 3	6	4.5	10	50	●	●
3	6	4.5	12	50	■	●
3	6	4.5	12	55	■	○
3	6	4.5	14	50	■	●
3	6	4.5	16	55	■	●
3	6	4.5	16	60	■	○
3	6	4.5	18	60	■	●
3	6	4.5	20	60	■	●
3	6	4.5	25	75	■	●
3	6	4.5	30	70	■	●
4	6	6	10	60	■	●
4	6	6	15	60	■	●
4	6	6	20	60	■	●
4	6	6	25	75	■	●
4	6	6	30	75	■	●
4	6	6	40	75	■	●
4	6	6	40	80	■	●

● stock standard ○ non-standard stock ■ stock exhaustion

NEW

n

Vf

PAGE
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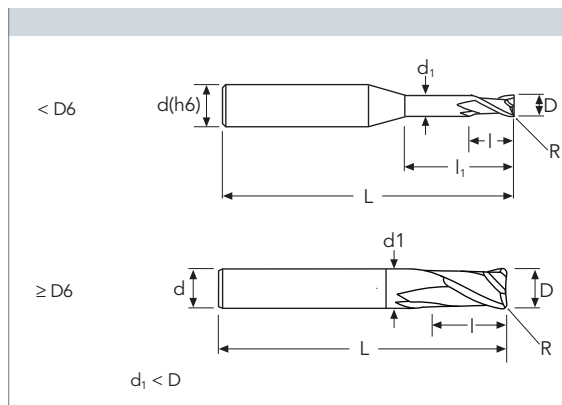
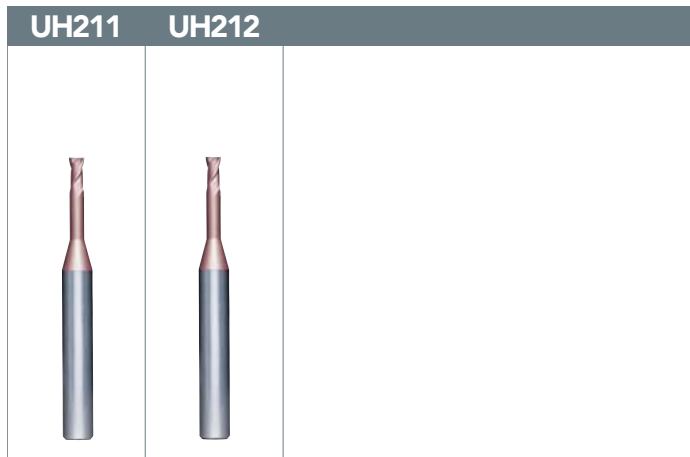
**OSAWA
NORM**

UH211

Ø mm	~6	>6
tol. D µ	0 / -12	0 / -15
tol. R µ	±10	±15

UH212

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	±10	±10



D	d	I	I1	L	Stock	Stock
mm 0.2 R0.02	4	0.3	0.5	50		●
0.2 R0.02	4	0.3	1	50		●
0.2 R0.02	4	0.3	1.5	50		●
0.3 R0.03	4	0.4	1	50		●
0.3 R0.03	4	0.4	2	50		●
0.3 R0.03	4	0.4	3	50		●
0.4 R0.03	4	0.6	2	50		●
0.4 R0.03	4	0.6	3	50		●
0.4 R0.03	4	0.6	4	50		●
0.4 R0.03	4	0.6	5	50		●
0.5 R0.05	4	0.7	1.5	45	■	
0.5 R0.05	4	0.7	2	50		●
0.5 R0.05	4	0.7	4	45	■	
0.5 R0.05	4	0.7	4	50		●
0.5 R0.05	4	0.7	6	50		●
0.5 R0.05	4	0.7	8	50		●
0.6 R0.05	4	0.9	2	45	■	
0.6 R0.05	4	0.9	2	50		●
0.6 R0.05	4	0.9	4	45	■	
0.6 R0.05	4	0.9	4	50		●
0.6 R0.05	4	0.9	6	50		●
0.6 R0.05	4	0.9	8	50		●
0.6 R0.05	4	0.9	10	50		●
0.7 R0.08	4	1	2	50		●
0.7 R0.08	4	1	4	50		●
0.7 R0.08	4	1	6	50		●
0.7 R0.08	4	1	8	50		●
0.7 R0.08	4	1	10	50		●
0.8 R0.05	4	1.2	2	45	■	
0.8 R0.08	4	1.2	4	50		●
0.8 R0.05	4	1.2	6	45	■	
0.8 R0.08	4	1.2	6	50		●
0.8 R0.08	4	1.2	8	50		●
0.8 R0.08	4	1.2	10	50		●
0.8 R0.08	4	1.2	12	50		●
0.9 R0.08	4	1.4	6	50		●

● stock standard ○ non-standard stock ■ stock exhaustion

NEW

n **Vf**
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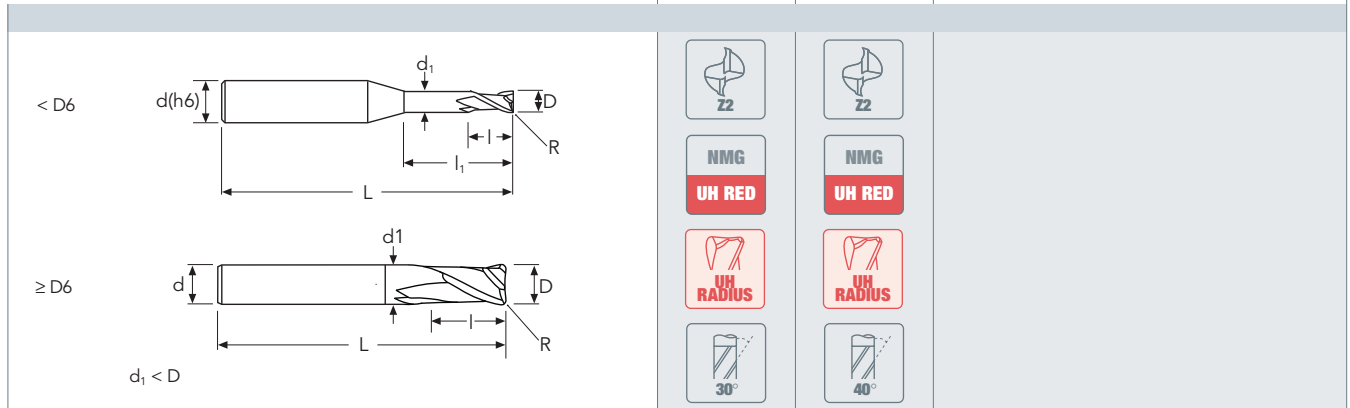
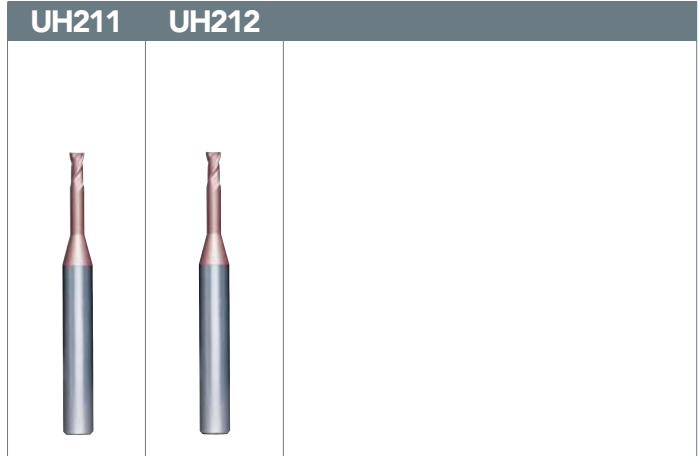
**OSAWA
NORM**

UH211

Ø mm	~6	>6
tol. D µ	0 / -12	0 / -15
tol. R µ	±10	±15

UH212

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	±10	±10

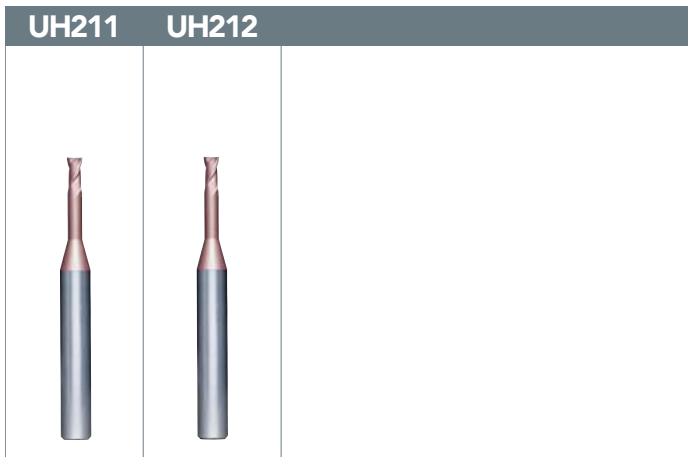


NMG UH RED	NMG UH RED

D	d	l	l1	L	Stock	Stock
mm 0.9 R0.08	4	1.4	8	50		●
0.9 R0.08	4	1.4	10	50		●
0.9 R0.08	4	1.4	15	50		●
1 R0.1	4	2	4	50	●	
1 R0.1	4	2	6	50	●	
1 R0.1	4	2	8	50	●	
1 R0.1	4	1.5	10	50		●
1 R0.1	4	1.5	12	50		●
1 R0.1	4	1.5	14	50		○
1 R0.1	4	1.5	16	50		●
1 R0.2	4	2	4	50	●	
1 R0.2	4	2	8	50	●	
1 R0.3	4	2	4	50	●	
1 R0.3	4	2	8	50	●	
1.2 R0.1	4	1.8	6	50		●
1.2 R0.1	4	1.8	8	50		●
1.2 R0.1	4	1.8	10	50		●
1.2 R0.1	4	1.8	12	50		●
1.4 R0.15	4	2.1	6	50		●
1.4 R0.15	4	2.1	8	50		●
1.4 R0.15	4	2.1	10	50		●
1.4 R0.15	4	2.1	12	50		●
1.4 R0.15	4	2.1	14	50		○
1.4 R0.15	4	2.1	16	50		●
1.5 R0.1	4	2.5	6	50	●	
1.5 R0.1	4	2.5	10	50	●	
1.5 R0.15	4	2.3	6	50		●
1.5 R0.15	4	2.3	8	50		●
1.5 R0.15	4	2.3	10	50		●
1.5 R0.15	4	2.3	12	50		●
1.5 R0.15	4	2.3	14	50		○
1.5 R0.15	4	2.3	16	50		●
1.5 R0.15	4	2.3	18	60		○
1.5 R0.15	4	2.3	20	60		●
1.5 R0.2	4	2.5	4	50	■	
1.5 R0.2	4	2.5	8	50	●	

NEW

	OSAWA NORM
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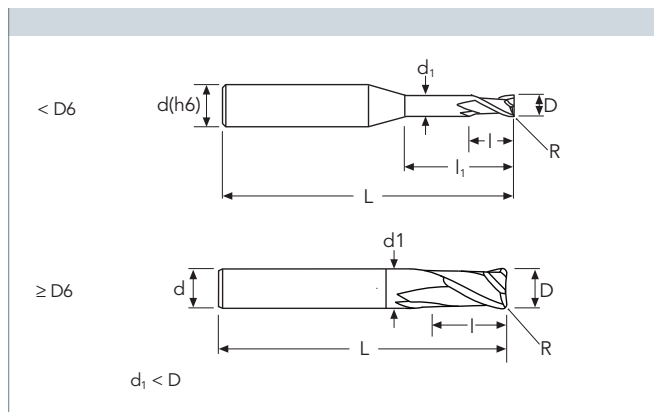


UH211

Ø mm	~6	>6
tol. D µ	0 / -12	0 / -15
tol. R µ	±10	±15

UH212

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	±10	±10



D	d	l	l1	L	Stock	Stock
mm 1.5 R0.2	4	2.5	12	50	●	
1.5 R0.3	4	2.5	4	50	■	
1.5 R0.3	4	2.5	8	50	■	
1.6 R0.15	4	2.4	6	50		●
1.6 R0.15	4	2.4	8	50		●
1.6 R0.15	4	2.4	10	50		●
1.6 R0.15	4	2.4	12	50		●
1.6 R0.15	4	2.4	14	50		○
1.6 R0.15	4	2.4	16	50		●
1.6 R0.15	4	2.4	18	60		○
1.6 R0.15	4	2.4	20	60		●
1.8 R0.2	4	2.7	6	50		●
1.8 R0.2	4	2.7	8	50		●
1.8 R0.2	4	2.7	10	50		●
1.8 R0.2	4	2.7	12	50		●
1.8 R0.2	4	2.7	14	50		○
1.8 R0.2	4	2.7	16	50		●
1.8 R0.2	4	2.7	18	60		○
1.8 R0.2	4	2.7	20	60		●
2 R0.1	4	3	6	50	●	
2 R0.1	4	3	12	50	●	
2 R0.2	4	3	6	50	●	
2 R0.2	4	3	8	50		●
2 R0.2	4	3	10	50		●
2 R0.2	4	3	12	50	●	●
2 R0.2	4	3	14	50		○
2 R0.2	4	3	16	50		●
2 R0.2	4	3	18	60		○
2 R0.2	4	3	20	60		●
2 R0.2	4	3	25	75		●
2 R0.2	4	3	30	75		●
2 R0.3	4	3	8	50	●	
2 R0.3	4	3	12	50	●	
2 R0.3	4	3	16	50	●	
2 R0.5	4	3	6	50	●	
2 R0.5	4	3	12	50	●	

NEW

n **Vf**
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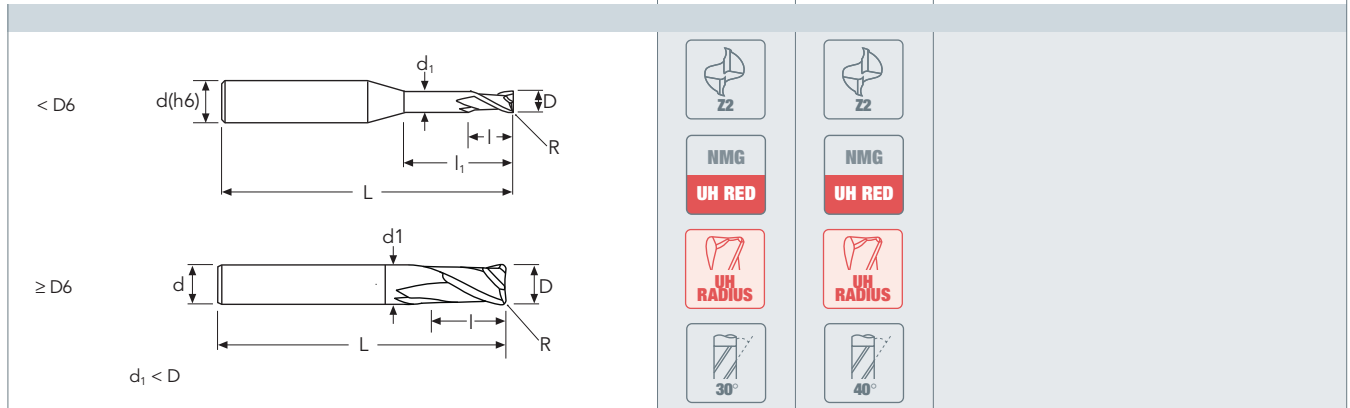
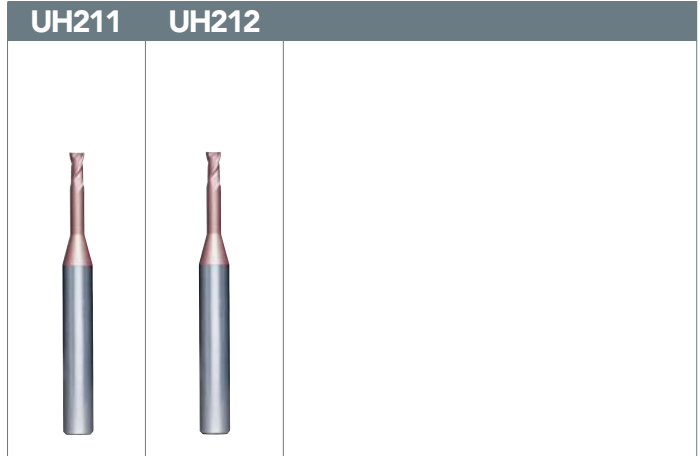
**OSAWA
NORM**

UH211

Ø mm	~6	>6
tol. D µ	0 / -12	0 / -15
tol. R µ	±10	±15

UH212

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	±10	±10

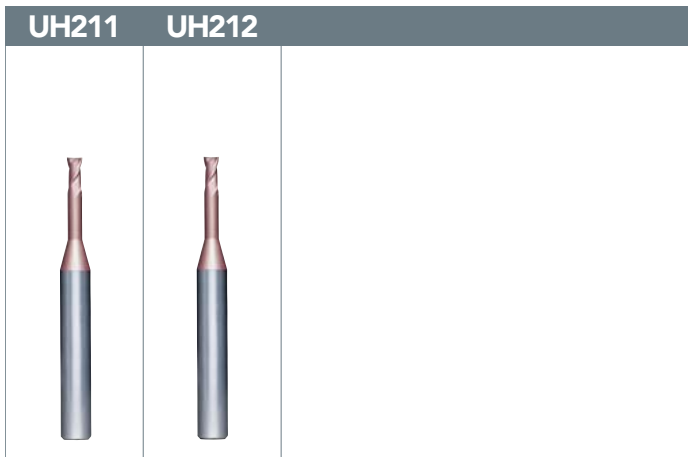


NMG UH RED	NMG UH RED

D	d	l	l1	L	Stock	Stock
mm 2.5 R0.2	4	3.5	8	55	■	
2.5 R0.2	4	3.5	12	55	■	
2.5 R0.3	4	3.7	8	50		●
2.5 R0.3	4	3.7	10	50		●
2.5 R0.3	4	3.7	12	50		●
2.5 R0.3	4	3.7	14	50		○
2.5 R0.3	4	3.7	16	50		●
2.5 R0.3	4	3.7	18	60		○
2.5 R0.3	4	3.7	20	60		●
2.5 R0.3	4	3.7	25	75		●
2.5 R0.3	4	3.7	30	75		●
3 R0.2	6	4.5	10	55	■	
3 R0.2	6	4.5	16	55	■	
3 R0.3	6	4.5	8	50		●
3 R0.3	6	4.5	10	50		●
3 R0.3	6	4.5	10	55	●	
3 R0.3	6	4.5	12	50		●
3 R0.3	6	4.5	14	50		●
3 R0.3	6	4.5	16	55	●	
3 R0.3	6	4.5	16	60		●
3 R0.3	6	4.5	18	60		●
3 R0.3	6	4.5	20	60		●
3 R0.3	6	4.5	25	75		●
3 R0.5	6	4.5	10	55	●	
3 R0.5	6	4.5	16	55	●	
4 R0.2	6	6	20	60	●	
4 R0.3	6	6	12	55	●	
4 R0.3	6	6	20	60	●	
4 R0.4	6	4.5	10	60		●
4 R0.4	6	4.5	15	60		●
4 R0.4	6	4.5	20	60		●
4 R0.4	6	4.5	25	75		●
4 R0.4	6	4.5	30	75		●
4 R0.4	6	4.5	40	75		●
4 R0.5	6	6	12	55	●	
4 R0.5	6	6	20	60	●	

NEW

	OSAWA NORM
PAGE 261~263	



UH211

Ø mm	~6	>6
tol. D µ	0 / -12	0 / -15
tol. R µ	±10	±15

UH212

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	±10	±10

<p>< D₆</p>	 	
	<p>≥ D₆</p>	

D	d	l	l1	L	Stock	Stock	
mm 4	R1.0	6	6	16	55	●	
6	R0.5	6	9	15	60	●	
6	R1	6	9	15	60	●	
6	R2	6	9	15	60	●	
8	R0.5	8	12	20	65	●	
8	R1	8	12	20	65	●	
8	R2	8	9	25	60	●	
10	R0.5	10	15	25	70	●	
10	R1	10	15	25	70	●	
10	R2	10	15	25	70	●	
12	R0.5	12	18	30	80	●	
12	R1	12	18	30	80	●	
12	R2	12	18	30	80	●	

● stock standard ○ non-standard stock ■ stock exhaustion

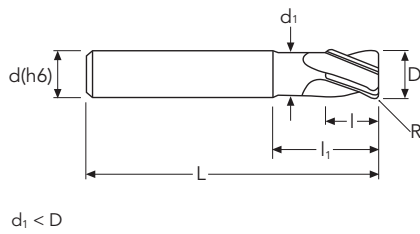
n **Vf**
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**OSAWA
NORM**

UHCS4

Ø mm	-6	>6
tol. D µ	0 / -12	0 / -15
tol. R µ	±10	±15

UHCS4



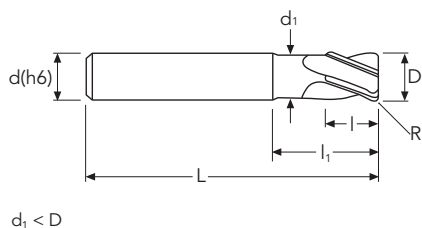
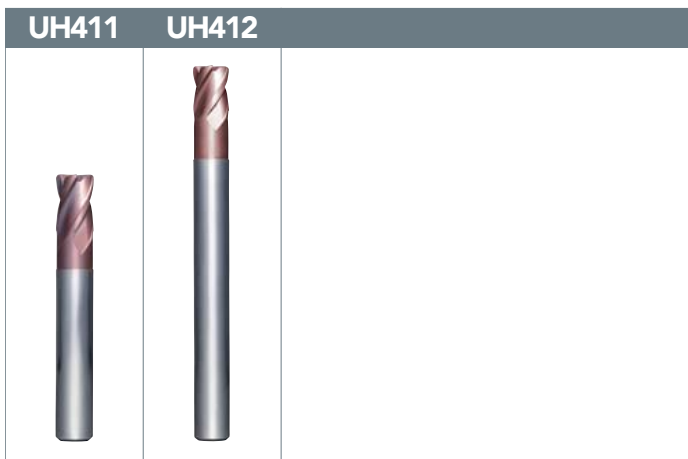
D	d	l	l1	L	Stock
mm 1 R0.1	4	2	3	50	●
1.5 R0.1	4	2.5	4	50	●
2 R0.1	4	3	6	50	●
3 R0.1	6	4	8	55	●
4 R0.1	6	6	10	55	●
5 R0.2	6	6	11	50	●
6 R0.2	6	9	15	60	●
8 R0.2	8	12	20	70	●
10 R0.2	10	15	25	70	●
12 R0.3	12	18	30	80	●

● stock standard ○ non-standard stock ■ stock exhaustion

	OSAWA NORM
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UH411 - UH412

Ø mm	~6	>6
tol. D µ	0 / -12	0 / -15
tol. R µ	±10	±15



NMG	NMG
UH RED	UH RED

D	d	l	l1	L	Stock	Stock
mm 2 R0.3	6	4	30	75		● NEW
2 R0.3	6	4	60	100		● NEW
3 R0.3	6	4	12	55	●	
3 R0.3	6	4	20	60	●	
3 R0.3	6	5	30	75		● NEW
3 R0.3	6	5	60	100		● NEW
3 R0.5	6	4	10	55	●	
3 R0.5	6	4	20	60	●	
3 R0.5	6	5	30	75		● NEW
3 R0.5	6	5	60	100		● NEW
4 R0.3	6	6	12	55	●	
4 R0.3	6	6	20	60	●	
4 R0.3	6	8	32	75		● NEW
4 R0.3	6	8	60	100		● NEW
4 R0.5	6	6	12	55	●	
4 R0.5	6	6	20	60	●	
4 R0.5	6	8	32	75		● NEW
4 R0.5	6	8	60	100		● NEW
4 R1.0	6	6	12	55	●	
6 R0.5	6	9	15	60	●	
6 R0.5	6	9	20	90	●	
6 R1.0	6	9	15	60	●	
6 R1.0	6	9	20	90	●	
8 R0.5	8	12	20	70	●	
8 R0.5	8	12	25	100	●	
8 R1.0	8	12	20	70	●	
8 R1.0	8	12	25	100	●	
8 R2.0	8	12	20	70	●	
10 R0.5	10	15	25	70	●	
10 R0.5	10	15	32	100	●	
10 R1.0	10	15	25	70	●	
10 R1.0	10	15	32	100	●	
10 R2.0	10	15	25	70	●	
10 R2.0	10	15	32	100	●	
12 R0.5	12	18	30	80	●	
12 R0.5	12	18	38	110	●	
12 R1.0	12	18	30	80	●	
12 R1.0	12	18	38	110	●	
12 R2.0	12	18	30	80	●	
12 R2.0	12	18	38	110	●	



UH600- UH612	
Ø mm	~20
tol. D µ	0 / -20



<p>UH600</p>	<p>Z6-Z8</p>	<p>Z6-Z8</p>
<p>UH612</p> <p>$d_1 < D$</p>	<p>UH RADIUS</p>	<p>UH RADIUS</p>
	<p>45°</p>	<p>45°</p>

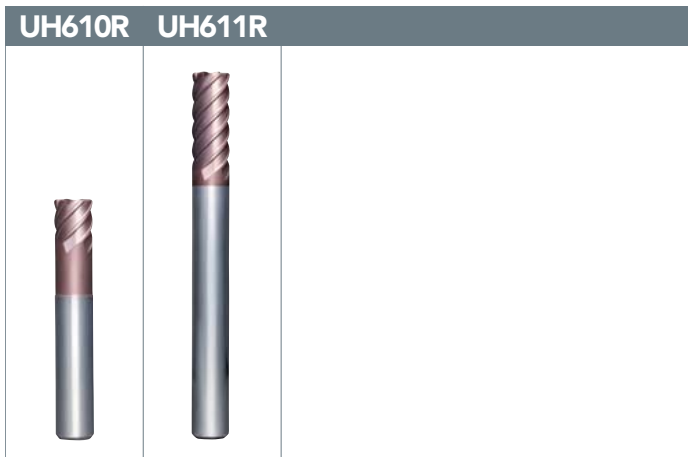
D	d	l	l1	L	Stock	Stock
mm 3	6	8		50	●	
3	6	19	30	75		●
4	6	11		50	●	
4	6	19	32	75		●
5	6	13		50	●	
5	6	19	32	75		●
6	6	20		60	●	
6	6	38	60	100		●
8	8	20		64	●	
8	8	41	60	100		●
10	10	22		70	●	
10	10	57	85	125		●
12	12	25		75	●	
12	12	75	110	150		●
14	14	30		90	●	
16	16	30		90	●	Z8
16	16	75	110	150	Z8	●
20	20	38		100	●	Z8

● stock standard ○ non-standard stock ■ stock exhaustion

	OSAWA NORM
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UH610R - UH611R

Ø mm	-20
tol. D µ	0 / -30
tol. R µ	±15



<p>UH611R</p>	<p>UH610R</p>	<p>Z6</p>	<p>Z6</p>
		<p>NMG UH RED</p>	<p>NMG UH RED</p>
		<p>UH RADIUS</p>	<p>UH RADIUS</p>
		<p>45°</p>	<p>45°</p>

D	d	l	l1	L	Stock	Stock
mm 6 R0.5	6	6	15	50	●	
6 R0.5	6	15		70		●
8 R0.5	8	8	25	60	●	
8 R0.5	8	20		100		●
10 R0.5	10	25	30	100		●
10 R1.0	10	10	30	70	●	
10 R1.0	10	25		100		●
12 R1.0	12	12	30	75	●	
12 R0.5	12	30		110		●
12 R1.0	12	30		110		●
16 R1.0	16	32		130		●
20 R1.0	20	38		140		●
20 R2.0	20	38		140		●

● stock standard ○ non-standard stock ■ stock exhaustion



MEX ORANGE

Ultra-fine micrograin for 30~55HRC

🇺🇸 MEX ultra fine micrograin: for high-performance machining on general up to hardened steel.

🇮🇹 MEX micrograna ultra fine: per lavorazione ad alto rendimento di acciai legati e temprati.

🇩🇪 MEX ultrafeine Mikrokörnung: für höchste Leistungen bei Bearbeitung von legierten Stählen und mittel gehärteten Stähle.

🇫🇷 MEX ultra fine micro-grain: pour l'usage haute performance des aciers alliés et traités.

🇪🇸 MEX micrograno ultra fino para mecanizados generales en alta producción o aceros de alta resistencia.

🇷🇺 MEX сверхмелкозернистый твёрдый сплав: для высокопроизводительной обработки сталей и закалённых сталей.

MEX

UMG

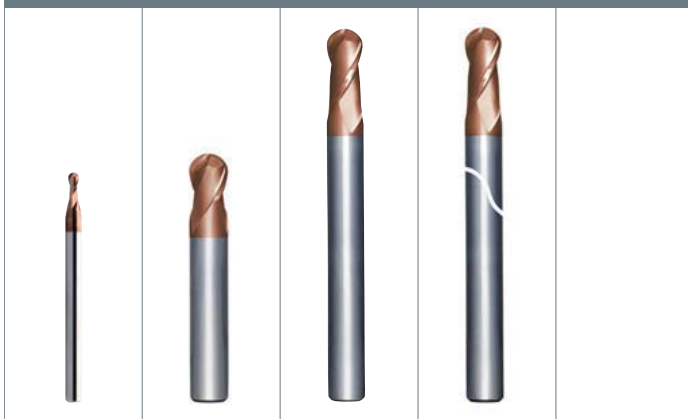
ENDLESS ORANGE COATING
ULTRA FINE MICROGRAIN

30~55HRC

n Vf

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MEXMB2 MEXCSB2 MEXCLSB2 MEX253



MEXMB2 - MEX253

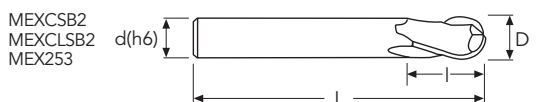
Ø mm	~0.8	≥0.8
tol. D μ	0 / -12	0 / -20
tol. R μ	0 / -20	0 / -20

MEXCLSB2

Ø mm	~6	>6
tol. D μ	0 / -12	0 / -15
tol. R μ	±10	±10

MEXCSB2

tol. D μ	0 / -30	0 / -30
tol. R μ	±10	±10



D	d	I	I1	L	Stock	Stock	Stock	Stcok
mm 0.2	4	0.4		40	●			
0.3	4	0.6		40	●			
0.4	4	0.8		40	●			
0.5	4	1.2		40	●			
0.6	4	1.4		40	●			
0.7	4	1.6		40	●			
0.8	4	1.8		40	●			
0.9	4	2		40	●			
1	3	3		38		●		
1	4	3		40	●			
1	4	2.5		50			●	
1	4	3		75				●
1	4	3		100				●
1.2	4	3		50			●	
1.5	3	3		38		●		
1.5	4	3		40	●			
1.5	4	4		50			●	
1.5	4	3		75				●
1.5	4	3		100				●
2	4	4		40	●			
2	6	3		50		●		
2	6	5		50			●	
2	4	4		75				●
2	6	4		80				■
2	4	4		100				●
2.5	4	4		40		●		
2.5	6	6		60			●	
3	6	4		50		●		
3	6	8		60			●	
3	6	5		75				●
3	6	5		100				●
4	6	5		54		●		
4	6	8		70			●	
4	6	8		100				●
5	6	6		54		●		
5	6	10		80			●	
5	6	9		100				●

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MEXMB2 - MEX253

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	0 / -20	0 / -20

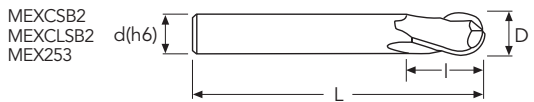
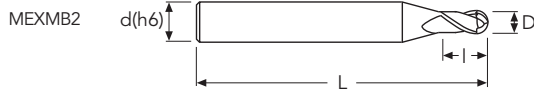
MEXCLS2

Ø mm	~6	>6
tol. D µ	0 / -12	0 / -15
tol. R µ	±10	±10

MEXCSB2

tol. D µ	0 / -30	0 / -30
tol. R µ	±10	±10

MEXMB2 MEXCSB2 MEXCLS2 MEX253



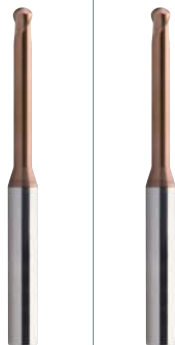
D	d	l	l1	L	Stock	Stock	Stock	Stok
mm 5	6	10		120				○
6	6	12		60		●		
6	6	12		90			●	
6	6	12		120				○
6	NEW 6	10		150				●
7	8	8		58		○	○	
8	8	14		60		●		
8	8	14		100			●	
8	8	12		150				●
10	10	18		70		●		
10	10	18		100			●	
10	NEW 10	14		150				●
10	10	20		180				○
12	12	22		80		●		
12	12	22		110			●	
12	NEW 12	16		150				●
12	12	24		200				○
14	14	32		90		●		
14	14	32		125			●	
16	16	32		90		●		
16	16	32		150			●	
16	NEW 16	32		200				○
18	18	38		100		○		
20	20	38		100		○		
20	20	38		150			○	
20	NEW 20	38		200				○
22	22	40		100		○		
25	25	40		100		○		

● stock standard ○ non-standard stock ■ stock exhaustion

NEW

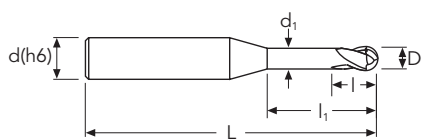
	OSAWA NORM
PAGE 268~270	

MEXCRB2 MEXLNB2



MEXCRB2	
Ø mm	~6
tol. D µ	0 / -12
tol. R µ	±10

MEXLNB2		
Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	0 / -20	0 / -20



D	d	l	l1	L	Stock	Stock
mm 0.2	4	0.2	0.5	50		●
0.2	4	0.2	1	50		●
0.2	4	0.2	1.5	50		●
0.3	4	0.3	1	50		●
0.3	4	0.3	2	50		●
0.3	4	0.3	3	50		●
0.4	4	0.4	1	50		●
0.4	4	0.4	2	50		●
0.4	4	0.4	3	45	■	
0.4	4	0.4	3	50		●
0.4	4	0.4	4	50		●
0.4	4	0.4	5	50		●
0.5	4	0.4	2	50		●
0.5	6	0.5	2.5	60		●
0.5	4	0.4	3	50		●
0.5	4	0.4	4	50		●
0.5	4	0.4	5	50		●
0.5	4	0.5	6	45	■	
0.5	4	0.4	6	50		●
0.5	4	0.5	8	45	■	
0.5	4	0.4	8	50		●
0.6	4	0.5	2	50		●
0.6	4	0.5	3	50		●
0.6	4	0.5	4	50		●
0.6	4	0.5	5	50		●
0.6	4	0.6	6	45	■	
0.6	4	0.5	6	50		●
0.6	6	0.6	6	60		●
0.6	4	0.6	8	45	■	
0.6	4	0.5	8	50		●
0.8	4	0.6	2	50		●
0.8	4	0.6	4	50		●
0.8	6	0.8	4	60		●
0.8	4	0.8	6	45	■	
0.8	4	0.6	6	50		●
0.8	4	0.8	8	45	■	

● stock standard ○ non-standard stock ■ stock exhaustion


 PAGE
 268~270

OSAWA
NORM

MEXCRB2

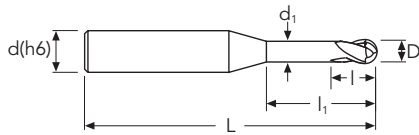
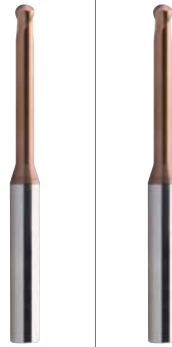
Ø mm	~6
tol. D µ	0 / -12
tol. R µ	±10

MEXLNB2

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	0 / -20	0 / -20

NEW

MEXCRB2 MEXLNB2



$d_1 < D$

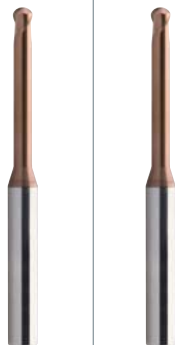


D	d	l	l1	L	Stock		
mm 0.8	4	0.6	8	50			●
0.8	6	0.8	8	60			●
0.8	4	0.6	10	50			●
1	4	0.8	3	50			●
1	4	0.8	4	50			●
1	4	0.8	5	50			●
1	6	1.5	5	60			●
1	4	1	6	45	●		
1	4	0.8	6	50			●
1	4	1	8	45	●		
1	4	0.8	8	50			●
1	6	1.5	8	60			●
1	4	0.8	10	50			●
1	4	1	12	45	●		
1	4	0.8	12	50			●
1	6	1.5	12	60			●
1	4	0.8	14	50			●
1	4	1	16	50	●		
1	4	0.8	16	50			●
1	4	1	20	55	■		
1	4	0.8	20	60			●
1.2	4	1	6	50			●
1.2	6	1.8	6	60			●
1.2	4	1.2	8	45	■		
1.2	4	1	8	50			●
1.2	4	1	10	50			●
1.2	4	1.2	12	45	■		
1.2	4	1	12	50			●
1.4	4	1.1	8	50			●
1.4	4	1.4	12	45	■		
1.4	4	1.1	12	50			●
1.4	4	1.1	16	50			●
1.5	4	1.5	8	45	●		
1.5	4	1.2	8	50			●
1.5	6	2.3	8	60			●
1.5	4	1.5	12	45	●		

NEW

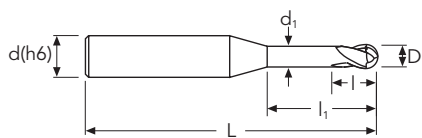
	OSAWA NORM
PAGE 268~270	

MEXCRB2 MEXLNB2



MEXCRB2	
Ø mm	~6
tol. D µ	0 / -12
tol. R µ	±10

MEXLNB2		
Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	0 / -20	0 / -20



$d_1 < D$

D	d	l	l1	L	Stock	Stock
mm 1.5	4	1.2	12	50		●
1.5	6	2.3	12	60		●
1.5	4	1.5	16	50	●	
1.5	4	1.2	16	50		●
1.5	6	2.3	16	60		●
1.5	4	1.2	18	60		●
1.5	4	1.5	20	55	■	
1.6	4	1.3	8	50		●
1.6	4	1.3	12	50		●
1.6	4	1.3	16	50		●
1.6	6	2.4	16	60		●
1.6	4	1.6	20	55	■	
1.6	4	1.3	20	60		●
1.8	4	1.4	8	50		●
1.8	4	1.4	12	50		●
1.8	4	1.4	16	50		●
1.8	4	1.4	16	50	■	
1.8	6	2.7	16	60		●
1.8	4	1.8	20	55	■	
1.8	4	1.4	20	60		●
2	4	1.6	4	50		●
2	4	1.6	6	50		●
2	4	2	8	45	●	
2	4	1.6	8	50		●
2	4	1.6	10	50		●
2	4	2	12	50	●	
2	4	1.6	12	50		●
2	6	3	12	60		●
2	4	1.6	14	50		●
2	4	2	16	50	●	
2	4	1.6	16	50		●
2	6	3	16	60		●
2	4	1.6	18	60		●
2	4	2	20	55	●	
2	4	1.6	20	60		●
2	6	3	20	75		●

● stock standard ○ non-standard stock ■ stock exhaustion

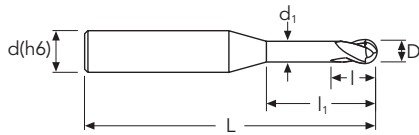
NEW

n **Vf**
PAGE
268~270

**OSAWA
NORM**

MEXCRB2	
Ø mm	~6
tol. D µ	0 / -12
tol. R µ	±10

MEXLNB2		
Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	0 / -20	0 / -20



$d_1 < D$

Z2 BALL	Z2 BALL
UMG ENDLESS ORANGE	UMG ENDLESS ORANGE
MEX BALL NOSE	MEX BALL NOSE
30°	30°

D	d	l	l1	L	Stock	
mm 2	4	1.6	22	60		○
2	4	1.6	25	75		●
2	4	2	26	70	■	
2	4	2	30	70	■	
2	4	1.6	30	75		●
3	6	2.4	8	50		●
3	6	2.4	10	50		●
3	6	3	16	55	●	
3	6	2.4	16	60		●
3	6	3	20	60	●	
3	6	2.4	20	60		●
3	6	2.4	25	75		●
3	6	3	26	70	■	
3	6	3	30	70	●	
3	6	2.4	30	75		●
3	6	2.4	35	75		●
4	6	3.2	10	50		●
4	6	4	16	60	●	
4	6	3.2	16	60		●
4	6	3.2	20	60		●
4	6	4	20	65	●	
4	6	3.2	25	75		●
4	6	4	26	70	■	
4	6	4	30	70	■	
4	6	3.2	30	75		●
4	6	3.2	35	75		●
4	6	4	40	90	■	
4	6	3.2	40	100		●
4	6	3.2	50	100		●
5	6	5	20	60	■	
5	6	5	30	80	■	
6	6	6	30	90	■	
6	6	6	40	100	■	
6	6	6	50	110	■	

● stock standard ○ non-standard stock ■ stock exhaustion

OSAWA NORM

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MEXM2

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20

MEXCS2

Ø mm	~25
tol. D µ	0 / -12

MEXCL2

Ø mm	~16
tol. D µ	0 / -30



MEXM2

MEXCS2
MEXCL2

UMG
ENDLESS ORANGE

MEX

UMG
ENDLESS ORANGE

MEX

UMG
ENDLESS ORANGE

MEX

D	d	I	I1	L	Stock	Stock	Stock
mm 0.1	4	0.2	40		●		
0.2	4	0.4	40		●		
0.3	4	0.6	40		●		
0.4	4	0.8	40		●		
0.5	4	1	40		●		
0.6	4	1.2	40		●		
0.7	4	1.4	40		●		
0.8	4	1.6	40		●		
0.9	4	1.8	40		●		
1	3	2	40		●		
1	4	2.5	40			●	
1	6	8	60				●
1.1	3	2.2	40		●		
1.1	4	2.5	40		●		
1.2	3	2.4	40		●		
1.2	4	4	40		●		
1.3	3	2.6	40		●		
1.4	3	2.8	40		●		
1.4	4	4	40		●		
1.5 NEW	3	3	40		●		
1.5	4	4	40			●	
1.5	6	12	60				●
1.6 NEW	3	3.2	40		●		
1.7 NEW	3	3.4	40		●		
1.8 NEW	3	3.6	40		●		
1.9 NEW	3	3.8	40		●		
2 NEW	3	4	40		●		
2	4	6	40			●	
2	6	12	60				●
2.5	4	8	40			●	
3	6	8	55			●	
3	6	15	60				●
3.5	6	10	55			●	
4	6	10	55			●	
4	6	20	60				●
4.5	6	12	55			●	

n **Vf**
PAGE
271-272

**OSAWA
NORM**

MEXM2

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20

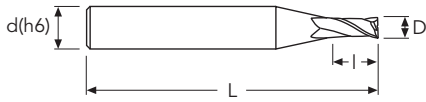






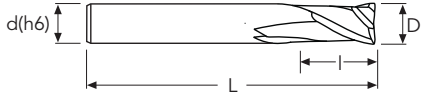






MEXCS2

Ø mm	~25
tol. D µ	0 / -12


MEXCL2

Ø mm	~16
tol. D µ	0 / -30



<p>MEXM2</p> 			
			
<p>MEXCS2 MEXCL2</p> 			
			

D	d	l	l1	L	Stock	Stock	Stock
mm 5	6	13		55		●	
5	6	25		70			●
5.5	6	14		55	●		
6	6	15		60		●	
6	6	25		70			●
6.5	8	17		65		○	
7	8	18		65		●	
8	8	20		70		●	
8	8	30		80			●
8.5	10	21		70		●	
9	10	23		70		●	
10	10	22		75		●	
10	10	35		90			●
11	12	28		75		●	
12	12	26		80		●	
12	12	40		90			●
14	14	32		90		●	
16	16	32		90		●	
18	18	38		100		●	
20	20	38		100		●	
22	22	40		100		○	
25	25	40		100		○	

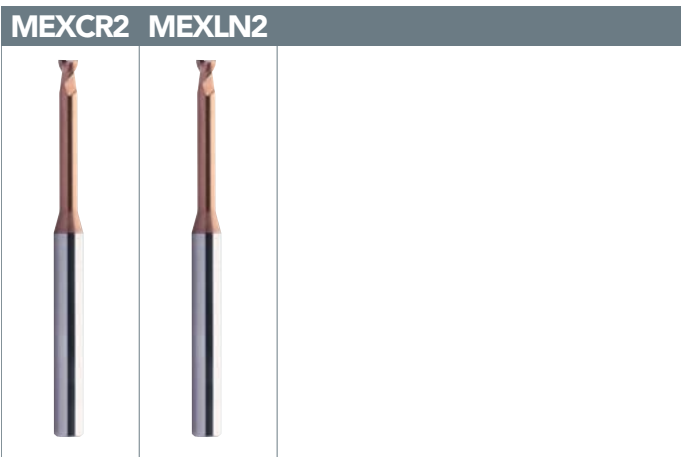
MEXCS2 ≥ Ø14 = 

● stock standard ○ non-standard stock ■ stock exhaustion

n Vf

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NEW

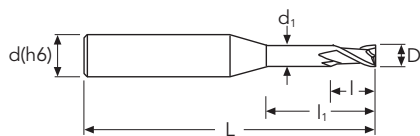


MEXCR2

Ø mm	~6
tol. D µ	0 / -12

MEXLN2

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20



$d_1 < D$

D	d	l	l1	L	Stock	Stock
mm 0.2	4	0.3	0.5	50		●
0.2	4	0.3	1	50		●
0.2	4	0.3	1.5	50		●
0.3	4	0.4	1	50		●
0.3	4	0.4	2	50		●
0.3	4	0.4	3	50		●
0.4	4	0.6	2	50		●
0.4	4	0.6	3	50		●
0.4	4	0.6	4	45	■	
0.4	4	0.6	4	50		●
0.4	4	0.6	5	50		●
0.5	4	0.7	2	50		●
0.5	4	0.7	4	50		●
0.5	4	0.7	6	45	■	
0.5	4	0.7	6	50		●
0.5	4	0.7	8	45	■	
0.5	4	0.7	8	50		●
0.6	4	0.9	2	50		●
0.6	4	0.9	4	50		●
0.6	4	0.9	6	45	■	
0.6	4	0.9	6	50		●
0.6	4	0.9	8	45	■	
0.6	4	0.9	8	50		●
0.6	4	0.9	10	50		●
0.7	4	1	2	50		●
0.7	4	1	4	50		●
0.7	4	1	6	45	■	
0.7	4	1	6	50		●
0.7	4	1	8	50		●
0.7	4	1	10	50		●
0.8	4	1.2	4	50		●
0.8	4	1.2	6	45	■	
0.8	4	1.2	6	50		●
0.8	4	1.2	8	50		●
0.8	4	1.2	10	50		●
0.8	4	1.2	12	45	■	
0.8	4	1.2	12	50		●

n **Vf**
PAGE
273~275

**OSAWA
NORM**

MEXCR2

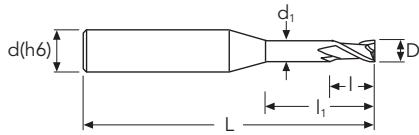
Ø mm	~6
tol. D µ	0 / -12

MEXLN2

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20

NEW

MEXCR2 MEXLN2



$d_1 < D$

D	d	l	l1	L	Stock	Stock
mm 0.9	4	1.4	6	50		●
0.9	4	1.4	8	50		●
0.9	4	1.4	10	50		●
0.9	4	1.4	15	45	■	●
0.9	4	1.4	15	50		●
1	4	1.5	6	45	●	
1	4	1.5	6	50		●
1	4	1.5	8	45	●	
1	4	1.5	8	50		●
1	4	1.5	10	50		●
1	4	1.5	12	45	●	
1	4	1.5	12	50		●
1	4	1.5	14	50		●
1	4	1.5	16	50	■	
1	4	1.5	16	50		●
1	4	1.5	20	55	■	
1.2	4	1.8	6	50		●
1.2	4	1.8	8	50		●
1.2	4	1.8	10	50		●
1.2	4	1.8	12	45	■	
1.2	4	1.8	12	50		●
1.2	4	1.8	16	50	■	
1.4	4	2.1	6	50		●
1.4	4	2.1	8	50		●
1.4	4	2.1	10	50		●
1.4	4	2.1	12	45	■	
1.4	4	2.1	12	50		●
1.4	4	2.1	14	50		○
1.4	4	2.1	16	50	■	●
1.5	4	2.3	6	50		●
1.5	4	2.3	8	45	●	
1.5	4	2.3	8	50		●
1.5	4	2.3	10	45	●	
1.5	4	2.3	10	50		●
1.5	4	2.3	12	45	●	
1.5	4	2.3	12	50		●
1.5	4	2.3	14	50		●

n	Vf	OSAWA NORM
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NEW

MEXCR2 MEXLN2

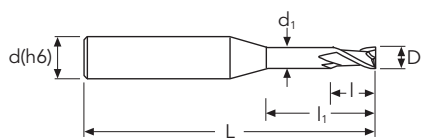


MEXCR2

Ø mm	~6
tol. D µ	0 / -12

MEXLN2

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20



$d_1 < D$

D	d	l	l1	L	Stock	Stock
mm 1.5	4	2.3	16	50	●	
1.5	4	2.3	18	60		●
1.5	4	2.3	20	55	●	
1.5	4	2.3	20	60		●
1.6	4	2.4	6	50		●
1.6	4	2.4	8	50		●
1.6	4	2.4	10	50		●
1.6	4	2.4	12	50		●
1.6	4	2.4	14	50		○
1.6	4	2.4	16	50		●
1.6	4	2.4	18	60		○
1.6	4	2.4	20	55	■	
1.6	4	2.4	20	60		●
1.8	4	2.7	6	50		●
1.8	4	2.7	8	50		●
1.8	4	2.7	10	50		●
1.8	4	2.7	12	50		●
1.8	4	2.7	14	50		○
1.8	4	2.7	16	50		●
1.8	4	2.7	18	60		○
1.8	4	2.7	20	60		●
2	4	3	6	50		●
2	4	3	8	50		●
2	4	3	10	50		●
2	4	3	12	45	●	
2	4	3	12	50		●
2	4	3	14	50		●
2	4	3	16	50	●	
2	4	3	16	50		●
2	4	3	18	60		●
2	4	3	20	55	●	
2	4	3	20	60		●
2	4	3	25	75		●
2	4	3	26	60	■	
2	4	3	30	70	■	
2	4	3	30	75		●
2.5	4	3.7	8	50		●
2.5	4	3.7	10	50		●

NEW

n **Vf**
PAGE
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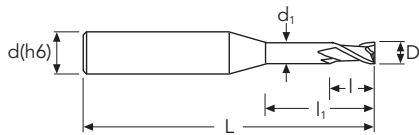
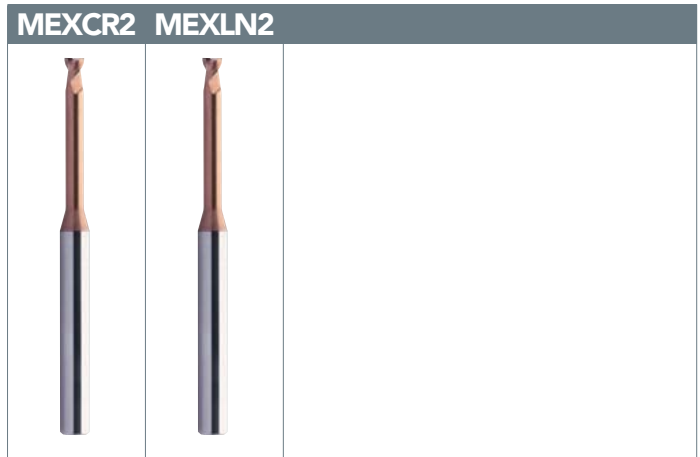
**OSAWA
NORM**

MEXCR2

Ø mm	~6
tol. D µ	0 / -12

MEXLN2

Ø mm	~0.8	≥0.8
tol. D µ	0 / -12	0 / -20



$d_1 < D$

D	d	l	l1	L	Stock	Stock
mm 2.5	4	3.7	12	45	■	
2.5	4	3.7	12	50		●
2.5	4	3.7	14	50		○
2.5	4	3.7	16	50		●
2.5	4	3.7	18	60		○
2.5	4	3.7	20	60	■	
2.5	4	3.7	20	60		●
2.5	4	3.7	25	60		●
2.5	4	3.7	30	75		●
2.5	4	3.7	30	80	■	
3	6	4.5	8	50		●
3	6	4.5	10	50		●
3	6	4.5	12	50		●
3	6	4.5	14	50	■	
3	6	4.5	14	50		●
3	6	4.5	16	60		●
3	6	4.5	18	55	■	
3	6	4.5	18	60		●
3	6	4.5	20	60		●
3	6	4.5	25	75		●
3	6	4.5	26	65	■	
3	6	4.5	30	70	■	
3	6	4.5	40	90	■	
4	6	4.5	10	60		●
4	6	4.5	15	60		●
4	6	4.5	20	60		●
4	6	6	20	60	■	
4	6	4.5	25	75		●
4	6	6	26	70	■	
4	6	4.5	30	75		●
4	6	4.5	40	75		●
4	6	6	40	90	■	
5	6	7.5	26	70	■	
5	6	7.5	30	80	■	
5	6	7.5	50	110	■	
6	6	9	30	90	■	
6	6	9	50	110	■	

OSAWA NORM

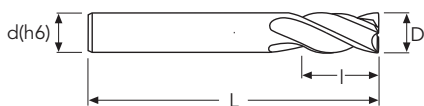
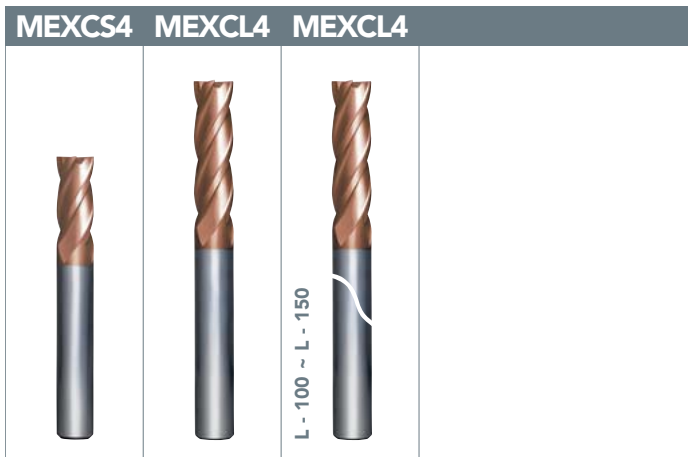
MEXCS4

Ø mm	~25
tol. D µ	0 / -30

MEXCL4

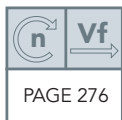
Ø mm	~20
tol. D µ	0 / -20

NEW



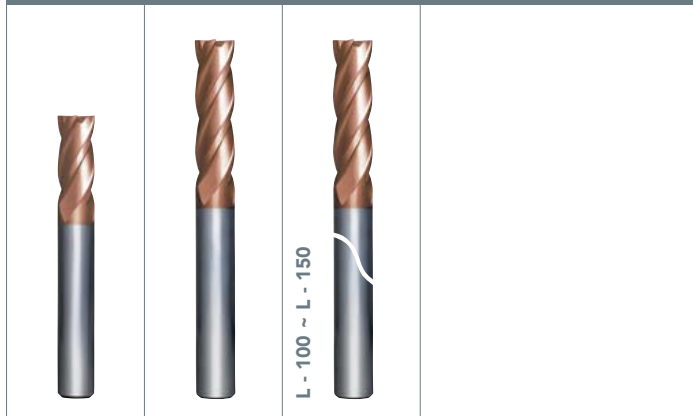
D	d	l	l1	L	Stock	Stock	Stock
mm 1	4	3		40	●		
1.5	4	4.5		40	●		
2	4	6		40	●		
2	6	8		60		●	
2.5	4	8		40	●		
3	6	8		45	●		
3	6	15		60		●	
3	6	25		100			●
3.5	6	10		45	●		
4	6	11		45	●		
4	6	20		60		●	
4	6	31		100			●
4.5	6	11		45	●		
5	6	13		50	●		
5	6	25		70		●	
5	6	31		100			●
5.5	6	13		50	●		
6	6	13		50	●		
6	6	25		70		●	
6	6	38		100			●
6.5	8	17		65	●		
7	8	18		65	●		
8	8	20		70	●		
8	8	30		80		●	
8	8	41		100			●
9	10	23		70	●		
10	10	22		75	●		
10	10	35		90		●	
10	10	57		125			●
11	12	28		75	●		
12	12	26		80	●		
12	12	40		90		●	
12	12	75		150			●
14	12	35		90	●		
14	16	50		110		●	
14	14	75		150			●

● stock standard ○ non-standard stock ■ stock exhaustion



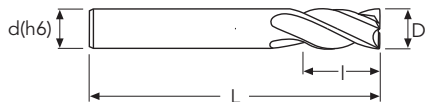
NEW

MEXCS4 MEXCL4 MEXCL4



MEXCS4 - MEXCL4

Ø mm	~25
tol. D µ	0 / -30



UMG ENDLESS ORANGE	UMG ENDLESS ORANGE	UMG ENDLESS ORANGE
MEX	MEX	MEX

D	d	l	l1	L	Stock	Stockq	Stock
mm 16	16	32	100		●		
16	16	50	110			●	
16	16	75	150				●
18	20	50	110			○	
20	20	38	105		●		
20	20	55	110			●	
20	20	75	150				●
22	22	40	100		○		
25	25	40	100		●		
25	25	50	120		■		
25	25	70	130			●	

● stock standard ○ non-standard stock ■ stock exhaustion

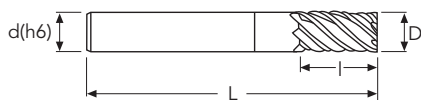
MEXCS4 ≤ Ø1.5 =
 ≥ Ø22 =

	OSAWA NORM
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MEXCSHM - MEXCLHM

Ø mm	~25
tol. D µ	0 / -30

MEXCSHM MEXCLHM



D	d	I	I1	L	Stock	Stock
mm 6	6	15		60	●	
6	6	25		80		●
8	8	20		70	●	
8	8	40		100		●
10	10	25		80	●	
10	10	45		120		●
12	12	30		80	●	
12	12	60		120		●
14	14	30		90	●	
16	16	40		100	●	
16	16	80		150		●
18	18	35		100	●	
20	20	50		100	●	
20	20	80		150		●
25	25	90		150		○

● stock standard ○ non-standard stock ■ stock exhaustion

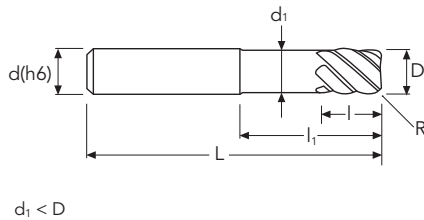
n **Vf**
PAGE
282-283

**OSAWA
NORM**

MEX610R - MEX611R

Ø mm	~20
tol. D µ	0 / -30
tol. R µ	±20

MEX610R MEX611R



Z6	Z6
UMG ENDLESS ORANGE	UMG ENDLESS ORANGE
MEX RADIUS	MEX RADIUS
45°	45°

D	d	l	l1	L	Stock	Stock
mm 6 R0.5	6	6	14	50	●	
6 R0.5	6	15		90		●
8 R0.5	8	8	24	60	●	
8 R0.5	8	20		100		●
10 R0.5	10	25		100		●
10 R1.0	10	10	30	70	●	
10 R1.0	10	25		100		●
12 R0.5	12	30		100		●
12 R1.0	12	12	30	75	●	
12 R1.0	12	30		100		●

● stock standard ○ non-standard stock ■ stock exhaustion

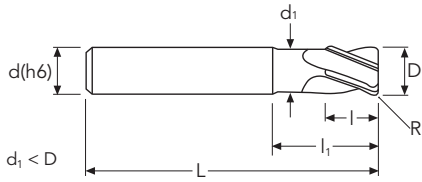
n **Vf**
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**OSAWA
NORM**

MEX410R



MEX410R	~6	>6
Ø mm	~6	>6
tol. D µ	0 / -12	0 / -15
tol. R µ	±20	±20



D	d	l	l1	L	Stock
mm 2 R0.2	6	2.5	5	50	●
2.5 R0.25	6	3	6	50	●
3 R0.3	6	4	7	50	●
4 R0.5	6	5	9	50	●
5 R0.5	6	6	12	50	●
6 R0.5	6	7	14	60	●
8 R1.0	8	10	18	70	●
10 R1.0	10	12	25	75	●
12 R1.0	12	15	30	80	●

● stock standard ○ non-standard stock ■ stock exhaustion

	OSAWA NORM
PAGE 278~282	

MEXCL2R - MEXCL4R

Ø mm	~6	>6
tol. D µ	0 / -12	0 / -15
tol. R µ	±20	±20

MEXLS2R - MEXLS4R

Ø mm	~16
tol. D µ	0 / -20
tol. R µ	±10

NEW

NEW

MEXCL2R MEXLS2R MEXCL4R MEXLS4R



<p>MEXCL2R MEXCL4R</p>				
<p>MEXLS2R MEXLS4R</p>				

D	d	l	L	Stock	Stock	Stock	Stock
mm 2 R0.3	6	4	75		●		●
3 R0.3	6	8	50	■			
3 R0.3	6	5	75		●		●
3 R0.5	6	5	75		●		●
4 R0.3	6	10	50	■		■	
4 R0.3	6	8	75		●		●
4 R0.5	6	10	50	■		■	
4 R0.5	6	8	75		●		●
5 R0.3	6	13	50		●		●
5 R0.3	6	9	75		●		●
5 R0.5	6	13	50	■		■	
5 R0.5	6	9	75		●		●
6 R0.3	6	15	60	■		■	
6 R0.3	6	10	75		●		●
6 R0.5	6	15	60	■		■	
6 R0.5	6	10	75		●		●
6 R1.0	6	15	60	■		■	
6 R1.0	6	10	75		●		●
8 R0.3	8	12	75		●		●
8 R0.5	8	20	70	■		■	
8 R0.5	8	12	75		●		●
8 R1.0	8	20	70	■		■	
8 R1.0	8	12	75		●		●
8 R2.0	8	25	70	■		■	
10 R0.3	10	25	90		●		●
10 R0.5	10	25	90	■		■	
10 R0.5	10	14	100		●		●
10 R1.0	10	25	90	■		■	
10 R1.0	10	14	100		●		●
10 R2.0	10	25	90	■		■	
10 R2.0	10	14	100		○		○
12 R0.5	12	30	100	■		■	
12 R0.5	12	16	100		●		●
12 R1.0	12	30	100		●	■	●
12 R1.0	12	16	100		●		●
12 R2.0	12	30	100	■		■	
12 R2.0	12	16	100		○		○
16 R0.5	16	22	125		●		●
16 R1.0	16	22	125		●		●
16 R2.0	16	40	110			■	
16 R2.0	16	22	125		○		○

● stock standard ○ non-standard stock ■ stock exhaustion

n **Vf**
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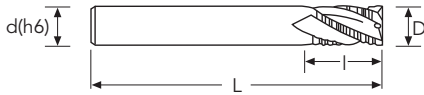
**OSAWA
NORM**

MEXCSFR



MEXWSFR - MEXCSFR

Ø mm	~6	7~10	11~18	20
tol. D μ	0 / -48	0 / -58	0 / -70	0 / -84



D	d	l	l1	L	Z	Stock
mm 6	6	15		60	3	●
7	6	18		70	3	●
8	8	20		65	3	●
9	10	22		70	4	●
10	10	25		70	4	●
12	12	30		80	4	●
14	14	25		100	4	●
16	16	40		100	4	●
20	20	50		100	4	●

● stock standard ○ non-standard stock ■ stock exhaustion



HF EVOLUTION

*Variable Helix and unequal pitch,
solid carbide ~55HRC*

✚ Variable helix and unequal pitch for universal application, allowing a very high feed and enabling to cut 1xD slots in a single pass.

🇮🇹 Elica variabile e passo differenziato, per applicazione universale: altissimi avanzamenti e realizzazione di cave 1xD in un'unica passata.

🇩🇪 Hochleistungsfräser mit ungleicher Teilung und Winkel, für universellen Einsatz: ermöglichen sehr hohe Vorschübe, die Ihnen auch die Möglichkeit geben Nutenfräsen 1xD in einem Arbeitsvorgang herzustellen.

🇫🇷 Hélice et pas variables pour une application universelle: avance très haute et réalisation de rainures 1xD dans une seule passe.

🇪🇸 Herramienta de hélice variable y paso diferenciado, para aplicación general: avance muy alto y fresado de ranuras 1xD en una pasada.

🇷🇺 Изменяемый угол наклона винтовой канавки и не прямой угол между режущими кромками, предназначена для универсального применения: позволяет достичь высоких подач и глубины фрезерования канавки 1xD за один проход.



PV300 COATING
~40HRC



PV300 COATING
30-55HRC

	OSAWA NORM
PAGE 284-285	

Ø mm	3-20
tol. D µ	0 / -30
tol. R µ	±20



						HF840	HF440	HF441	HF850	HF450	HF451
						~40HRC	~40HRC	~40HRC	35-55HRC	35-55HRC	35-55HRC
						MG	MG	MG	MG	MG	MG
						PV300	PV300	PV300	PV300	PV300	PV300
						HF UNI	HF UNI	HF UNI	HF HARD	HF HARD	HF HARD
D	C (45°)	d(h6)	I	I1	L	Stock	Stock	Stock	Stock	Stock	Stock
mm 3	0,1	6	9		57	●			●		
	0,1	6	9	15	57		●	●	●	●	●
4	0,1	6	11		57	●			●		
	0,1	6	11	20	57		●	●	●	●	●
5	0,1	6	13		57	●			●		
	0,1	6	13	20	57		●	●	●	●	●
6	0,1	6	13		57	●			●		
	0,1	6	13	20	57		●	●	●	●	●
8	0,2	8	20		64	●			●		
	0,2	8	20	26	64		●	●	●	●	●
10	0,2	10	22		72	●			●		
	0,2	10	22	30	72		●	●	●	●	●
12	0,2	12	26		83	●			●		
	0,2	12	26	36	83		●	●	●	●	●
14	0,3	14	26		83	●			●		
	0,3	14	26	36	83		●	●	●	●	●
16	0,3	16	32		92	●			●		
	0,3	16	32	42	92		●	●	●	●	●
18	0,3	18	32		92	●			○		
	0,3	18	32	42	92		○	●			
20	0,4	20	38		104	●			●		
	0,4	20	38	50	104		●	●		●	●

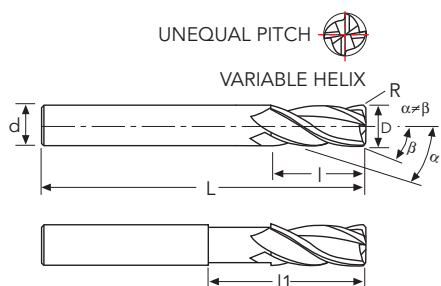
● stock standard ○ non-standard stock ■ stock exhaustion

n Vf

**OSAWA
NORM**

PAGE
284-285

\varnothing mm	3~20
tol. D μ	0 / -30
tol. R μ	± 10



MG	MG	MG	MG	MG
PV300	PV300	PV300	PV300	PV300

D	R	d(h6)	l	l1	L	Stock	Stock	Stock	Stock	Stock
mm 3	0,3	6	9	15	57		●	●		●
	0,5	6	9	15	57		●	●		●
4	0,3	6	11	20	57	●	●	●	●	●
	0,5	6	11	20	57	●	●	●	●	●
5	0,3	6	13		57	●				
	0,3	6	13	20	57		●			○
	0,3	6	15		57				●	
	0,5	6	13		57	●				
6	0,5	6	13	20	57		●	●		●
	0,5	6	15		57				●	
	0,3	6	13		57	●				
	0,3	6	13	20	57		○			
8	0,3	6	16		57				●	
	0,5	6	13		57	●				
	0,5	6	13	20	57		●	●		●
	0,5	6	16		57				●	
	1	6	13		57	●				
	1	6	13	20	57		●	●		●
10	1	6	16		57				●	
	0,3	8	20		64	○			○	
	0,5	8	20		64	●			●	
	0,5	8	20	26	64		●	●		●
12	1	8	20		64	●			●	
	1	8	20	26	64		●	●		●
	0,3	10	22		72	○			○	
	0,5	10	22		72	●			●	
12	0,5	10	22	30	72		●	●		●
	1	10	22		72	●			●	
	1	10	22	30	72		●	●		●
	0,5	12	26		83	●			●	
	0,5	12	26	36	83		●	●		●
12	1	12	26		83	●			●	
	1	12	26	36	83		●	●		●
	2	12	26		83	●			●	

n **Vf**
PAGE
284-285

**OSAWA
NORM**

Ø mm	3-20
tol. D µ	0 / -30
tol. R µ	±10

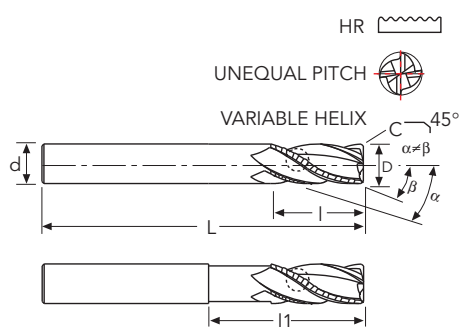


						HF842 ~40HRC	HF442 ~40HRC	HF443 ~40HRC	HF852 35-55HRC	HF452 35-55HRC
D	R	d(h6)	l	l1	L	Stock	Stock	Stock	Stock	Stock
mm 12	3	12	26		83	●			●	
14	1	14	26		83	●			●	
	1	14	26	36	83		●	●		
	1	14	32		83				●	
	2	14	26		83	○				
	2	14	32		83				○	
	3	14	26		83	○				
16	1	16	32		92	●			●	
	1	16	32	42	92		●	●		●
	2	16	32		92	●			●	
	2	16	32	42	92		●			●
	3	16	32		92	●			○	
	4	16	32		92	○			○	
18	1	18	32		92	○				
	2	18	32		92	○				
	3	18	32		92	○				
20	1	20	38		104	●			●	
	1	20	38	50	104		●	●		●
	2	20	38		104	●			●	
	2	20	38	50	104		●			●
	3	20	38		104	○			○	
	4	20	38		104	○			○	

● stock standard ○ non-standard stock ■ stock exhaustion

	OSAWA NORM
PAGE 284-285	

Ø mm	6~20
tol. D µ	0 / -50
tol. R µ	±20



MG	MG	MG
PV300	PV300	PV300

D	C (45°)	d(h6)	l	l1	L	Stock	Stock	Stock
mm 6	0,1	6	13	20	57	●	●	●
	0,1	6	16		57	●	●	●
8	0,2	8	20		64	●	●	●
	0,2	8	20	26	64	●	●	●
10	0,2	10	22		72	●	●	●
	0,2	10	22	30	72	●	●	●
12	0,2	12	26		83	●	●	●
	0,2	12	26	36	83	●	●	●
14	0,3	14	26		83	●	●	●
	0,3	14	26	36	83	●	●	●
16	0,3	16	32		92	●	●	●
	0,3	16	32	42	92	●	●	●
18	0,3	18	32		92	●	●	●
20	0,4	20	38		104	●	●	●
	0,4	20	38	50	104	●	●	●

● stock standard ○ non-standard stock ■ stock exhaustion



MEF ENDLESS

Ultra-fine micrograin for stainless steel and super alloys

🇺🇸 MEF ultra fine micrograin: high performance for stainless steel, titanium and Inconel.

🇮🇹 MEF micrograna ultra fine: per acciaio inossidabile, titanio e Inconel.

🇩🇪 MEF ultrafeine Mikrokörnung: für rostfreie Stähle, Titanium und Inconel.

🇫🇷 MEF ultra fine micro-grain: pour l'acier inoxydable, titane et l'Inconel.

🇪🇸 MEF micrograno ultra fino para mecanizados en alta producción de Inoxidables, Titanio e Inconel.

🇷🇺 MEF сверхмелкозернистый твёрдый сплав: для обработки нержавеющей сталей, титана и закалённых сталей.



ENDLESS COATING
ULTRA FINE MICROGRAIN

INOX VA - TITANIUM Ti - NICKEL BASE Ni

	OSAWA NORM
PAGE 286-287	



MEFCS2 - MEFCSH3 - MEFCS4	
Ø mm	1~20
tol. D µ	0 / -30

MEFCS2				
MEFCSH3				
MEFCS4				

D	d(h6)	I	L	Stock	Stock	Stock
mm 1	4	2.5	40	●		
1.5	4	4	40	●		
2	4	6	40	●		●
2.5	4	8	40	●		●
3	6	8	45	●		●
4	6	11	45	●		●
5	6	13	50	●		●
6	6	13	50	●	●	●
7	8	16	60	○		○
8	8	19	60	●	●	●
10	10	22	70	●	●	●
12	12	26	75	●	●	●
14	16	26	85	●	●	●
16	16	32	100	●	●	●
18	16	32	100		○	
20	20	38	105		● (Z4)	●

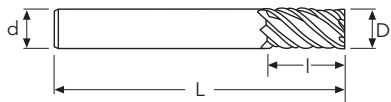
● stock standard ○ non-standard stock ■ stock exhaustion

n **Vf**
PAGE 287

**OSAWA
NORM**

MEF600	
Ø mm	6~20
tol. D µ	0 / -30

MEF600



D	d(h6)	l	L	Z	Stock
mm 6	6	13	57	6	●
8	8	19	63	6	●
10	10	22	72	6	●
12	12	26	83	6	●
16	16	32	92	6	●
20	20	38	104	8	●

● stock standard ○ non-standard stock ■ stock exhaustion

	OSAWA NORM
PAGE 288	



MEF901 - MEF902 (h10)

Ø mm	~6	7~10	11~18	19~20
tol. R µ	0 / -48	0 / -58	0 / -70	0 / -84

<p>MEF901</p>	 	<p>MEF902</p>	
---------------	--------------	---------------	--------------

D(h10)	d(h6)	I	I1	L	Z	Stock	Stock
mm 4	6	11		57	3	●	
5	6	13		57	4	●	
6	6	16		57	4	●	
6	6	16	20	57	4		●
8	8	16		63	4	●	
8	8	16	26	63	4		●
9	10	19		72	4	○	
10	10	22		72	4	●	
10	10	22	31	72	4		●
12	12	26		83	4	●	
12	12	26	37	83	4		●
14	14	26		83	5	●	
16	16	32		92	5	●	
16	16	32	51	100	5		●
20	20	38		104	6	●	
20	20	38	59	110	6		●

● stock standard ○ non-standard stock ■ stock exhaustion



ALU

Solid carbide for aluminum and alloys

🇺🇸 ALU MILLS micrograin: high performance for aluminium and alloy with polished flutes.

🇮🇹 ALU MILLS micrograna: per l'alluminio e le sue leghe.

🇩🇪 ALU MILLS Mikrokörnung: für Aluminium und Alu-Legierungen.

🇫🇷 ALU MILLS micrograin: pour l'aluminium et ses alliages avec gorges polies.

🇪🇸 ALU Fresas de micrograno para Aluminio y aleaciones en alta producción, labios lapeados.

🇷🇺 ALU MILLS микро-зернистый твёрдый сплав: для высокопроизводительной обработки алюминия и цветных сплавов с полированными стружечными канавками.

n **Vf**
PAGE
288-289

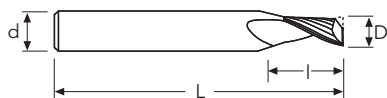
**OSAWA
NORM**

NEW

MDCSA1



Ø mm	2~12
tol. D μ	0 / -20



**MG
LAPPED**

ALU



D	d(h6)	l	L	Stock
mm 2	2	10	40	●
3	3	12	40	●
4	4	15	50	●
5	5	16	50	●
6	6	20	60	●
8	8	22	63	●
10	10	25	72	●
12	12	30	83	●

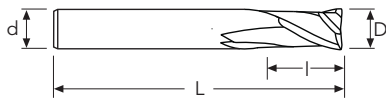
● stock standard ○ non-standard stock ■ stock exhaustion

n **Vf**
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**OSAWA
NORM**

MDCSA2	
Ø mm	3~20
tol. D µ	0 / -30

MDCSA2



D	d(h6)	l	L	Stock
mm 3	6	8	57	●
4	6	11	57	●
5	6	13	57	●
6	6	13	57	●
8	8	19	63	●
10	10	22	72	●
12	12	26	83	●
14	14	26	83	●
16	16	32	92	●
18	18	32	92	●
20	20	38	104	●

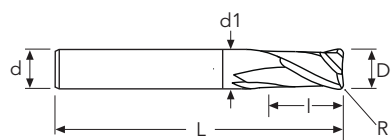
● stock standard ○ non-standard stock ■ stock exhaustion

	OSAWA NORM
PAGE 290	

MCA212R



MCA212R	
Ø mm	2~12
tol. D µ	0 / -30
tol. R µ	±



d1 < D



MG

TICN



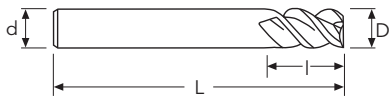
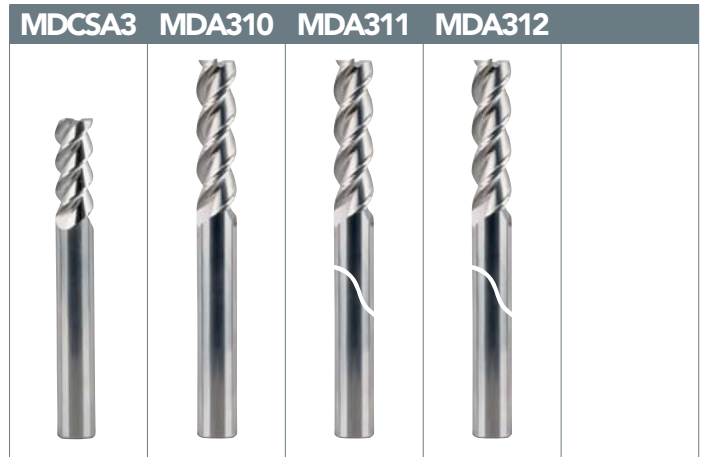
D	d(h6)	l	l1	L	Stock
mm 2 xR0.2	3	3	6	40	●
3 xR0.2	3	4	8	40	●
4 xR0.2	4	5	12	50	●
5 xR0.2	5	8	14	50	●
6 xR0.2	6	8	18	65	●
8 xR0.2	8	10	22	70	●
10 xR0.2	10	14	28	80	●
12 xR0.2	12	16	35	90	●

● stock standard ○ non-standard stock ■ stock exhaustion

	OSAWA NORM
PAGE 290	

MDCSA3			
Ø mm	~6	8~12	16~20
tol. D µ	0 / -20	0 / -25	0 / -30

MDA310 - MDA311 - MDA312			
Ø mm	~6	8~12	16~20
tol. D µ	0 / -30	0 / -35	0 / -40



d1 < D

MG LAPPED	MG LAPPED	MG LAPPED	MG LAPPED
ALU	ALU	ALU	ALU

D	d(h6)	l	L	Stock	Stock	Stock	Stock
mm 1	4	3	50	●			
1.5	4	4.5	50	●			
2	4	6	50	●			
3	4	8	50	●			
3	6	12	75		●		
3	6	15	100			●	
4	4	11	50	●			
4	6	16	75		●		
4	6	20	100			●	
5	6	13	50	●			
5	6	20	75		●		
5	6	25	100			●	
6	6	15	50	●			
6	6	30	75		●		
8	8	20	60	●			
8	8	35	100			●	
8	8	40	150				●
10	10	25	75	●			
10	10	40	100			●	
10	10	50	150				●
12	12	30	75	●			
12	12	45	100			●	
12	12	50	150				●
16	16	40	100	●			
16	16	70	150				●
20	20	40	100	●			
20	20	80	150				●

● stock standard ○ non-standard stock ■ stock exhaustion

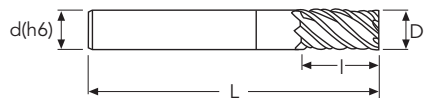
	OSAWA NORM
PAGE 291	

NEW

MDCSAM



Ø mm	6~20
tol. D µ	0 / -20



- Z6-Z8
- MG LAPPED
- ALU**
- 50°

D	d(h6)	I	I1	L	Stock
mm 6	6	15		57	●
8	8	20		65	●
10	10	22		75	●
12	12	25		75	●
16	16	30		90	● Z8
20	20	38		104	● Z8

● stock standard ○ non-standard stock ■ stock exhaustion

n **Vf**
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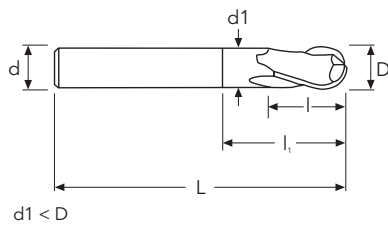
**OSAWA
NORM**

MDCAB2



MDCAB2

Ø mm	~6	8~12
tol. D µ	0 / -20	0 / -25
tol. R µ	± 10	± 10



D	d(h6)	l	l1	L	Stock
mm 1	4	2		50	●
1.5	4	3		50	●
2	4	4		50	●
3	4	6		50	●
4	4	8		50	●
5	6	10		50	●
6	6	12		50	●
8	8	16		60	●
10	10	20		75	●
12	12	24		75	●

● stock standard ○ non-standard stock ■ stock exhaustion



MDC

Diamond coated, solid carbide for graphite

✚ MDC Diamond, micro grain carbide, geometry specifically designed to machine graphite. New coating MDC-Diamond with increased thickness to achieve an even longer tool life.

🇮🇹 MDC Diamond, metallo duro micrograna, con geometria specifica per la lavorazione della grafite. Nuovo rivestimento diamante MDC a spessore maggiorato per garantire una durata ancor più lunga.

🇩🇪 MDC Diamond aus Hartmetall Mikrokorn, mit Spezialgeometrie entworfen für das Fresen von Graphit. Dank der neuen extra-starken MDC Diamant Beschichtung, wird eine noch längere Lebensdauer garantiert.

🇫🇷 MDC Diamond, carbure micro grain revêtu monobloc, avec géométrie spécifique pour l'usinage de la graphite et nouveau revêtement diamant MDC à grande épaisseur, pour une durée encore plus longue.

🇪🇸 MDC Diamond, metal duro micrograno, con geometría específica para la mecanización de grafito y nuevo recubrimiento diamante MDC de mayor espesor para garantizar una duración mayor.

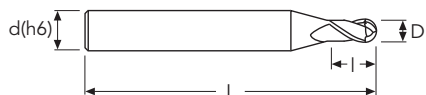
🇷🇺 MDC Diamond, микрозернистый твёрдый сплав, со специальной геометрией для обработки графита с алмазным напылением MDC повышенной толщины для обеспечения еще более длительного рабочего ресурса инструмента.

	OSAWA NORM
PAGE 292	

Ø mm	<0.8	>0.8
tol. D µ	0 / -12	0 / -20
tol. R µ	0 / -20	0 / -20

NEW **NEW**

MDC2254 MDC2250 MDC2251



MDC	MDC	MDC

D	d	l	l1	L	Stock	Stock	Stock
mm 0.5	4	1	6	50		●	
0.6	4	1.2	6	50		●	
0.8	4	1.6	8	50		●	
1	3	3		40	●		
1	4	3	10	60		●	
1.5	3	3		40	●		
1.5	4	3	15	60		●	
2	3	4		40	●		
2	4	4	20	60		●	
2	4	10	20	80			■
2.5	3	4		40	●		
2.5	4	4	25	60		●	
3	3	5		40	●		
3	4	15	25	80			■
3	4	15	25	100			●
3	3	5	30	100		●	
4	4	8		50	●		
4	4	20	30	80			■
4	4	20	30	100			●
4	4	8	40	100		●	
5	5	9		50	●		
5	5	9	50	100		●	
5	6	30	50	100			■
5	6	30	50	120			●
6	6	10		60	●		
6	6	10	60	100		●	
6	6	30	50	100			■
6	6	30	50	150			●
8	8	12	60	100		●	
8	8	40	60	150			●
10	10	14	60	100		●	
12	12	16	60	100		●	

● stock standard ○ non-standard stock ■ stock exhaustion

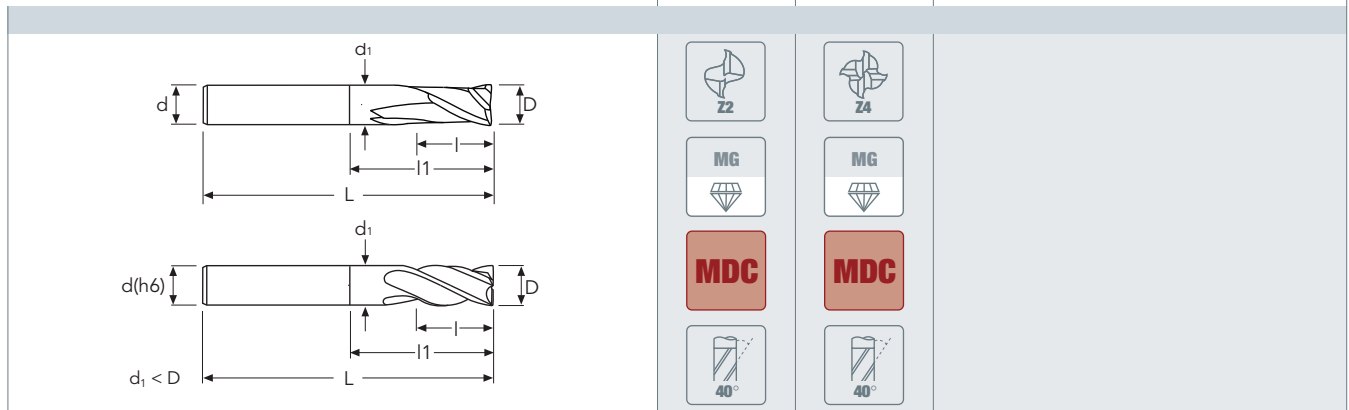
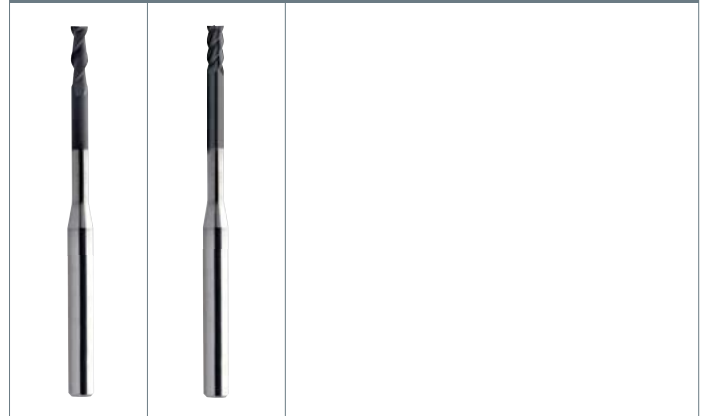


OSAWA
NORM

Ø mm	<0.8	>0.8
tol. D µ	0 / -12	0 / -20

NEW **NEW**

MDC2202 **MDC2204**



D	d	l	l1	L	Stock	Stock
mm 0.5	4	1	6	50	●	●
0.6	4	1.2	6	50	●	●
0.8	4	1.6	8	50	●	●
1	4	3	10	60	●	●
1.5	4	4.5	15	60	●	●
2	4	6.5	20	60	●	●
2.5	4	6.5	25	60	●	●
3	3	9	30	75	●	●
3	3	19	30	100	●	●
4	4	12	32	75	●	●
4	4	25	40	100	●	●
5	5	15	32	75	●	●
5	5	25	60	100	●	●
6	6	25	60	100	●	●
8	8	25	60	100	●	●
10	10	25	60	100	●	●
12	12	25	60	100	●	●

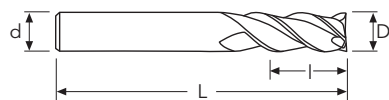
● stock standard ○ non-standard stock ■ stock exhaustion

	OSAWA NORM
PAGE 293	

MDC3311



MDC3311	
Ø mm	-12
tol. D µ	0 / -30
tol. R µ	±10



D	d(h6)	I	I1	L	Stock
mm 2	R0.15	2	9	60	●
3	R0.15	3	30	60	●
4	R0.2	4	30	60	●
5	R0.3	5	35	70	●
6	R0.3	6	40	100	●
8	R0.5	8	40	100	●
10	R0.5	10	40	100	●
12	R0.5	12	45	100	●

● stock standard ○ non-standard stock ■ stock exhaustion



G2

Solid carbide for general purpose ~45HRC

✦ A new generation 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. An extremely competitive price, thanks to a fully optimized manufacturing process and to large production batches.

🇮🇹 Una nuova generazione di frese per uso generico, dotate di geometria di taglio e rivestimenti innovativi per garantirne prestazioni ancora più elevate. La risposta forte di Osawa a un mercato che chiede utensili sempre più performanti. Un prezzo estremamente competitivo, grazie all'ottimizzazione del processo produttivo e agli alti volumi di produzione.

🇩🇪 Eine neue Generation von Fräsern für allgemeine Anwendung, mit neuer Schnittgeometrie und innovativen Beschichtungen für noch höheren Leistungen. Die starke Entgegnung von Osawa zu einem Markt, der immer leistungsfähigere Werkzeuge erfordert. Extrem konkurrenzfähiger Preis durch optimale Produktionsprozesse und große Produktionsumfänge.

🇫🇷 Une nouvelle génération de fraises passe-partout, caractérisées par une géométrie de coupe innovante et des nouveaux revêtements, qui garantissent des performances encore plus hautes. La réponse de Osawa à un marché qui demande des outils de plus en plus performants. Un prix extrêmement compétitif, grâce à l'optimisation du processus d'affûtage et à des volumes de production très importants.

🇪🇸 Nueva generación de Fresas para uso general, con nuevas geometrías de corte y recubrimientos innovadores para mejorar el rendimiento. G2: la respuesta de Osawa a la demanda del mercado de herramientas de más alto rendimiento. Gracias a un proceso de fabricación totalmente optimizado y a grandes lotes de producción, G2 combina una excelente calidad con un coste altamente competitivo.

🇷🇺 Новое поколение концевых фрез общего назначения обладающих передовой геометрией резания и инновационными покрытиями для повышения производительности. G2: это ответ Osawa на требования рынка о необходимости высокопроизводительного инструмента. Благодаря оптимизации производства и большим производственным партиями, G2 воплощает в себе высочайшее качество и низкую стоимость.



PV200 COATING
MICROGRAIN

GENERAL PURPOSE · USO GENERICO
ALLGEMEINE ANWENDUNGEN · APPLICATIONS GÉNÉRIQUES
UTILIZACIÓN GENERAL · ОБЩЕГО НАЗНАЧЕНИЯ

n Vf
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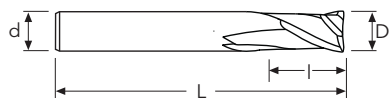
**OSAWA
NORM**


GB205 - G2CS2

Ø mm	-6	6.5~12	13~20
tol. D μ	0 / -20	0 / -25	0 / -30

G2210 - G2211 - G2212 - G2213

Ø mm	-6	6.5~12	13~20
tol. D μ	0 / -30	0 / -35	0 / -40



MG BR	MG PV200	MG PV200	MG PV200	MG PV200	MG PV200
N	N	N	N	N	N

D	d	l	L	Stock	Stock	Stock	Stock	Stock	Stock
mm 1	4	3	50	●	●				
1.5	4	4.5	50	●	●				
2	4	6	50	●	●				
2	4	9	75			●			
2.5	4	7	50		●				
3	4	8	50	●	●				
3	4	15	75			●			
3.5	4	10	50		●				
4	4	11	50	●	●				
4	4	20	75			●			
4.5	6	13	50		●				
5	6	13	50	●	●				
5	6	25	75			●			
5	6	30	100				●		
5.5	6	13	50		●				
6	6	15	50	●	●				
6	6	25	75			●			
6	6	30	100				●		
6.5	8	17	60		●				
7	8	17	60		●				
7	8	35	100				○		
7.5	8	17	60		●				
8	8	20	60	●	●				
8	8	35	100				●		
8	8	40	150					●	
8.5	10	23	75		●				
9	10	23	75		●				
9	10	40	100				○		
10	10	30	75	●	●				
10	10	40	100				●		
10	10	50	150					●	
10.5	12	25	75		●				
11	12	28	75		●				
11	12	45	100				○		
12	12	30	75	●	●				
12	12	45	100				●		

● stock standard ○ non-standard stock ■ stock exhaustion

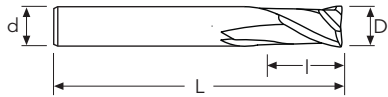


GB205 - G2CS2

Ø mm	~6	6.5~12	13~20
tol. D µ	0 / -20	0 / -25	0 / -30

G2210 - G2211 - G2212 - G2213

Ø mm	~6	6.5~12	13~20
tol. D µ	0 / -30	0 / -35	0 / -40



MG BR	MG PV200	MG PV200	MG PV200	MG PV200	MG PV200
N	N	N	N	N	N

D	d	l	L	Stock	Stock	Stock	Stock	Stock	Stock
mm 12	12	50	150					●	
14	14	26	83		●				
16	16	32	92		●				
16	16	70	150					●	
16	16	40	200						○
18	20	40	100		●				
18	20	80	150					○	
20	20	40	100		●				
20	20	80	150					○	
20	20	40	200						○

● stock standard ○ non-standard stock ■ stock exhaustion

n Vf
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**OSAWA
NORM**


GB305 - G2CSH3

Ø mm	-6	6.5~12	13~20
tol. D μ	0 / -20	0 / -25	0 / -30

G2310 - G2311 - G2312

Ø mm	-6	6.5~12	13~20
tol. D μ	0 / -30	0 / -35	0 / -40



MG BR	MG PV200	MG PV200	MG PV200	MG PV200
N	N	N	N	N

D	d	l	L	Stock	Stock	Stock	Stock	Stock
mm 1	4	3	50	●	●			
1.5	4	4.5	50	●	●			
2	4	6	50	●	●			
2	4	9	75			●		
2.5	4	7	50		●			
3	4	8	50	●	●			
3	4	15	75			●		
3.5	4	10	50		●			
4	4	11	50	●	●			
4	4	20	75			●		
4.5	6	13	50		●			
5	6	13	50	●	●			
5	6	25	75			●		
5	6	30	100				●	
5.5	6	13	50		●			
6	6	15	50	●	●			
6	6	25	75			●		
6	6	30	100				●	
6.5	8	17	60		●			
7	8	17	60		●			
7	8	35	100				○	
7.5	8	17	60		●			
8	8	20	60	●	●			
8	8	35	100				●	
8	8	40	150					●
8.5	10	23	75		●			
9	10	23	75		●			
9	10	40	100				○	
10	10	30	75	●	●			
10	10	40	100				●	
10	10	50	150					●
10.5	12	25	75		○			
11	12	28	75		●			
11	12	45	100				○	
12	12	30	75	●	●			
12	12	45	100				●	



GB305 - G2CSH3

Ø mm	~6	6.5-12	13-20
tol. D µ	0 / -20	0 / -25	0 / -30

G2310 - G2311 - G2312

Ø mm	~6	6.5-12	13-20
tol. D µ	0 / -30	0 / -35	0 / -40



				MG BR	MG PV200	MG PV200	MG PV200	MG PV200
				N	N	N	N	N
D	d	I	L	Stock	Stock	Stock	Stock	Stock
mm 12	12	50	150					●
14	14	26	83		●			
16	16	32	92		●			
16	16	70	150					●
18	20	40	100		○			
18	20	80	150					●
20	20	40	100		●			
20	20	80	150					●

● stock standard ○ non-standard stock ■ stock exhaustion



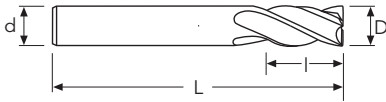
**OSAWA
NORM**

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GB405 - G2CS4			
Ø mm	-6	6.5~12	13~20
tol. D µ	0 / -20	0 / -25	0 / -30

G2410 - G2411 - G2412 - G2413			
Ø mm	-6	6.5~12	13~20
tol. D µ	0 / -30	0 / -35	0 / -40



MG BR	MG PV200	MG PV200	MG PV200	MG PV200	MG PV200
N	N	N	N	N	N

D	d	l	L	Stock	Stock	Stock	Stock	Stock	Stock
mm 1	4	3	50	●	●				
1.5	4	4.5	50	●	●				
2	4	6	50	●	●				
2	4	9	75			●			
2.5	4	7	50		●				
3	4	8	50	●	●				
3	4	15	75			●			
3.5	4	10	50		●				
4	4	11	50	●	●				
4	4	20	75			●			
4.5	6	13	50		●				
5	6	13	50	●	●				
5	6	25	75			●			
5	6	30	100				●		
5.5	6	13	50		●				
6	6	15	50	●	●				
6	6	25	75			●			
6	6	30	100				●		
6.5	8	17	60		●				
7	8	17	60		●				
7	8	35	100				○		
7.5	8	17	60		●				
8	8	20	60	●	●				
8	8	35	100				●		
8	8	40	150					●	
8.5	10	23	75		●				
9	10	23	75		●				
9	10	40	100				○		
10	10	30	75	●	●				
10	10	40	100				●		
10	10	50	150					●	
10.5	12	25	75		●				
11	12	28	75		●				
11	12	45	100				○		
12	12	30	75	●	●				
12	12	45	100				●		

● stock standard ○ non-standard stock ■ stock exhaustion



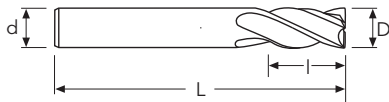
OSAWA
NORM

GB405 - G2CS4

Ø mm	~6	6.5-12	13-20
tol. D µ	0 / -20	0 / -25	0 / -30

G2410 - G2411 - G2412 - G2413

Ø mm	~6	6.5-12	13-20
tol. D µ	0 / -30	0 / -35	0 / -40



MG BR	MG PV200	MG PV200	MG PV200	MG PV200	MG PV200
N	N	N	N	N	N

D	d	l	L	Stock	Stock	Stock	Stock	Stock	Stock
mm 12	12	50	150					●	
14	14	26	83		●			●	
16	16	32	92		●				
16	16	70	150					●	
16	16	40	200						●
18	20	40	100		●				
18	20	80	150					○	
20	20	40	100		●				
20	20	80	150					●	
20	20	40	200						●

● stock standard ○ non-standard stock ■ stock exhaustion

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OSAWA
NORM

Ø mm	-6	8~12	14~20
tol. D µ	0 / -20	0 / -25	0 / -30



G2WS2 							
G2WS2H3 							
G2WS4 							

D	d	l	L	Stock	Stock	Stock
mm 3	6	8	57	●	●	●
4	6	11	57	●	●	●
5	6	13	57	●	●	●
6	6	13	57	●	●	●
8	8	19	63	●	●	●
10	10	22	72	●	●	●
12	12	26	83	●	●	●
14	14	26	83	●	●	●
16	16	32	92	●	●	●
20	20	38	104	●	●	●

● stock standard ○ non-standard stock ■ stock exhaustion

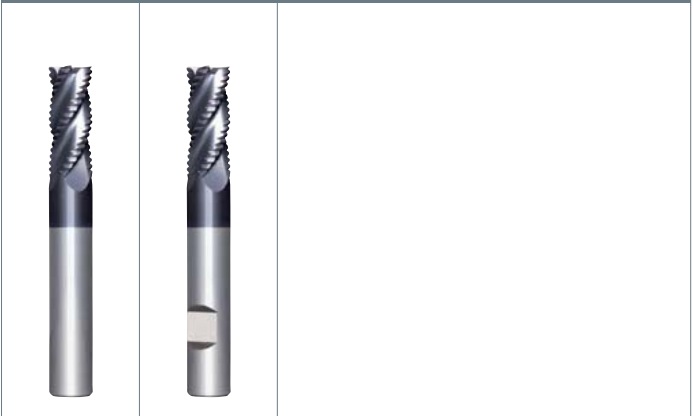
n **Vf**
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295-296

**OSAWA
NORM**

G2CSFR - G2WSFR

Ø mm	-20
tol. D µ	0 / -50

G2CSFR G2WSFR



G2CSFR

G2WSFR

Z3-Z4

MG

PV200

HR FINE

30°

Z3-Z4

MG

PV200

HR FINE

30°

D	d	l	L	Z	Stock	Stock
mm 6	6	15	50	3	●	
8	8	20	60	3	●	
10	10	30	75	4	●	
12	12	30	75	4	●	
14	14	30	83	4	●	
16	16	35	92	4	●	
20	20	40	100	4	●	
6	6	13	57	3		●
8	8	19	63	3		●
10	10	22	72	4		●
12	12	26	83	4		●
14	14	26	83	4		●
16	16	32	92	4		●
20	20	38	104	4		●

● stock standard ○ non-standard stock ■ stock exhaustion

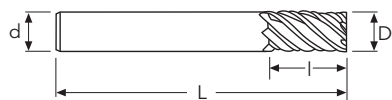
	OSAWA NORM
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G2CSHM



G2CSHM

Ø mm	-6	6.5~12	13~20
tol. D µ	0 / -20	0 / -25	0 / -30



D	d	l	L	Stock
mm 6	6	15	50	●
8	8	20	60	●
10	10	30	75	●
12	12	30	75	●
14	14	30	83	●
16	16	35	92	●
20	20	40	100	●

● stock standard ○ non-standard stock ■ stock exhaustion



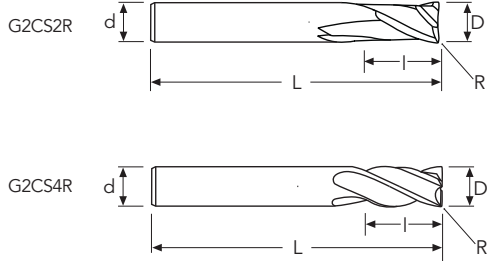
OSAWA
NORM

Ø mm	~6	8~12
tol. D µ	0 / -20	0 / -25
tol. R µ	± 10	± 10

NEW

NEW

G2CS2R G2CS4R



D	d	I	L	Stock	Stock
mm 1 R0.2	4	2	50	●	●
1.5 R0.2	4	3	50	●	●
1.5 R0.5	4	3	50	●	●
2 R0.2	4	4	50	●	●
2 R0.5	4	4	50	●	●
2.5 R0.2	4	5	50	●	●
2.5 R0.5	4	5	50	●	●
3 R0.2	4	6	50	●	●
3 R0.5	4	6	50	●	●
3 R1	4	6	50	●	●
4 R0.2	4	8	50	●	●
4 R0.5	4	8	50	●	●
4 R1	4	8	50	●	●
5 R0.5	6	10	50	●	●
5 R1	6	10	50	●	●
6 R0.2	6	12	50	●	●
6 R0.5	6	12	50	●	●
6 R1	6	12	50	●	●
6 R1.5	6	12	50	●	●
6 R2	6	12	50	●	●
8 R0.5	8	16	60	●	●
8 R1	8	16	60	●	●
8 R1.5	8	16	60	●	●
8 R2	8	16	60	●	●
10 R0.5	10	20	75	●	●
10 R1	10	20	75	●	●
10 R1.5	10	20	75	●	●
10 R2	10	20	75	●	●
10 R2.5	10	20	75	○	●
10 R3	10	20	75	○	●
12 R0.5	12	24	75	●	●
12 R1	12	24	75	●	●
12 R1.5	12	24	75	●	●
12 R2	12	24	75	●	●
12 R2.5	12	24	75	○	●
12 R3	12	24	75	○	●



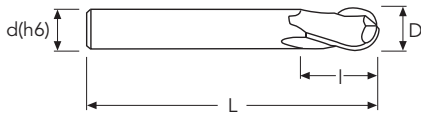
**OSAWA
NORM**

GB255 - G2CSB2 - G2CSB4

Ø mm	~6	7~12	14~20
tol. D µ	0 / -20	0 / -25	0 / -30
tol. R µ	±15	±15	0 / -30

G2250 - G2251

Ø mm	~6	7~12	14~20
tol. D µ	0 / -25	0 / -30	0 / -35
tol. R µ	±15	±15	0 / -30



MG BR	MG PV200	MG PV200	MG PV200	MG PV200

D	d	l	L	Stock	Stock	Stock	Stock	Stock
mm 1	4	2	50	●	●			○
1	4	2	75			●		
1.5	4	3	50	●	●			○
1.5	4	3	75			●		
2	4	4	50	●	●			●
2	4	4	75			●		
2.5	4	5	50		●			○
3	4	6	50	●	●			●
3	4	6	75			●		
4	4	8	50	●	●			●
4	4	8	75			●		
5	6	10	50	●	●			●
5	6	10	75			●		
6	6	12	50	●	●			●
6	6	12	100			●		
6	6	12	150				○	
7	8	14	60		○			○
8	8	16	60	●	●			●
8	8	16	100			●		
8	8	16	150				○	
9	10	18	75		○			○
10	10	20	75	●	●			●
10	10	20	100			●		
10	10	20	150				○	
12	12	24	75	●	●			●
12	12	24	100			●		
12	12	24	150				○	
16	16	30	92		●			○
16	16	30	150				○	
20	20	30	100		●			○
20	20	30	150				○	

● stock standard ○ non-standard stock ■ stock exhaustion



MDTA

Solid carbide for general purpose ~45HRC

✚ MDTA is the Osawa range of micrograin carbide with PV200 coating. The MDTA endmills have been developed for general purpose milling up to 45 HRC. The exclusive and innovative PV200 coating (3500HV) ensures the best performance in dry machining (air blow or mist oil).

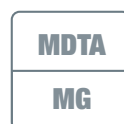
🇮🇹 MDTA sono le frese Osawa in metallo duro micrograna con rivestimento PV200. Le frese della serie MDTA sono state sviluppate per la fresatura di materiali generici sino a 45HRC. L'esclusivo e innovativo rivestimento PV200 (3500HV) garantisce performance elevate nelle lavorazioni a secco (getto d'aria o nebulizzazione).

🇩🇪 MDTA ist die Osawa Fräserreihe aus Hartmetall Mikrokorn mit PV200 Beschichtung. MDTA Fräuserserie ist für die Fräsarbeit von allgemeinen Materialien bis zum 45HRC entwickelt worden. Die exklusive und erneuernde PV200 Beschichtung (3500HV) garantiert ausgezeichnete Leistungen auf trockene Bearbeitungen (Luftstrahl oder Verstäubung).

🇫🇷 MDTA est la gamme Osawa de fraises carbure micrograin avec revêtement PV200. Les fraises MDTA ont été développées pour les applications de fraisage générique et pour le fraisage des aciers jusqu'à 45HRC. L'exclusif et innovant revêtement PV200 (3500HV) garantit la meilleure performance dans l'usinage en sec (soufflage d'air ou huile atomisé).

🇪🇸 MDTA son las fresas Osawa de metal duro micrograno con recubrimiento PV200. Las fresas de la serie MDTA han sido desarrolladas para fresar materiales genéricos hasta 45HRC. El exclusivo e innovador recubrimiento PV200 (3500HV) garantiza un elevado rendimiento de el mecanizado en seco (chorro de aire o nebulización).

🇷🇺 MDTA это фрезы Osawa из микрoзернистого твёрдого сплава с покрытием PV200. Фрезы серии MDTA были разработаны для общей обработки материалов с твёрдостью до 45HRC. Эксклюзивное и передовое покрытие PV200 (3500HV) гарантирует повышенную производительность без СОЖ(поток воздушно-маслянной смеси).



PV200 COATING
MICROGRAIN

GENERAL PURPOSE · USO GENERICO
ALLGEMEINE ANWENDUNGEN · APPLICATIONS GÉNÉRIQUES
UTILIZACIÓN GENERAL · ОБЩЕГО НАЗНАЧЕНИЯ

n Vf
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**OSAWA
NORM**

MDTACS2 MDTA210 MDCL2

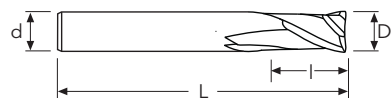


MDTACS2 - MDTA210

Ø mm	1~20
tol. D μ	0 / -30

MDCL2 - MDTACL2 (h10)

Ø mm	1~3	3.5~6	7~10	12~18	20~30
tol. D μ	0 / -40	0 / -48	0 / -58	0 / -70	0 / -84



MG PV200	MG PV200	MG BR
N	N	N

D	d(h6)	l	L	Stock	Stock	Stock
mm 1	4	3	40	●		
1.5	4	4.5	40	●		
2	2	8	32	●		
2.5	2.5	8	32	●		
3	3	12	32	●		
3	3	20	60		●	
3	3	30	75			●
4	4	12	40	●		
4	4	20	60		●	
4	4	30	75			●
5	5	14	50	●		
5	5	25	75		●	
5	5	40	100			●
6	6	16	50	●		
6	6	30	75		●	
6	6	50	150			●
7	7	20	60	●		
8	8	20	60	●		
8	8	30	75		●	
8	8	50	150			●
9	9	20	60	●		
10	10	22	70	●		
10	10	40	100		●	
10	10	60	150			●
12	12	22	70	●		
12	12	45	100		●	
12	12	75	150			●
14	14	25	75	●		
14	14	45	100		●	
14	14	65	150			○
16	16	25	75	●		
16	16	45	100		●	
16	16	65	150			○
20	20	32	100	●		
20	20	65	150			○

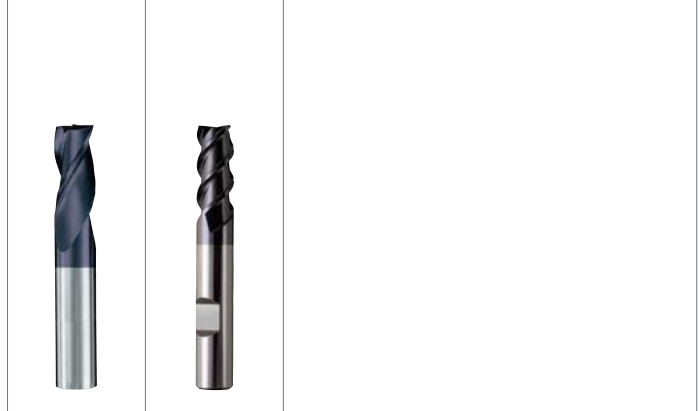
● stock standard ○ non-standard stock ■ stock exhaustion

	OSAWA NORM
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MDTACS3 - MDTAWSH3

Ø mm	1~20
tol. D µ	0 / -30

MDTACS3 MDTAWSH3



<p>MDCS3 MDTACS3</p>	<p>MDTAWSH3 DIN6527</p>	<p>Z3</p>	<p>Z3</p>
		<p>MG PV200</p>	<p>MG PV200</p>
		<p>N</p>	<p>N</p>
		<p>30°</p>	<p>50°</p>

D	d(h6)	l	L	Stock	Stock
mm 2	2	8	32	●	
3	3	12	32	●	
3	6	7	57		●
4	4	12	40	●	
4	6	8	57		●
5	5	14	50	●	
5	6	10	57		●
6	6	16	50	●	
6	6	10	57		●
7	7	20	60	●	
8	8	20	60	●	
8	8	16	63		●
9	9	20	60	●	
10	10	22	70	●	
10	10	19	72		●
12	12	22	70	●	
12	12	22	83		●
14	14	25	75	●	
14	14	22	83		●
16	16	25	75	●	
16	16	26	92		●
20	20	32	100	●	
20	20	32	104		●

● stock standard ○ non-standard stock ■ stock exhaustion

	OSAWA NORM
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MDTACS4 MDTA410 MDCL4

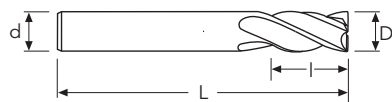


MDTACS4 - MDTA410

Ø mm	1~20
tol. D µ	0 / -30

MDCL4 - MDTACL4 (h10)

Ø mm	1~3	3.5~6	7~10	12~18	20~30
tol. D µ	0 / -40	0 / -48	0 / -58	0 / -70	0 / -84



D(h10)	d(h6)	l	L	Stock	Stock	Stock
mm 2	2	8	32	●		
2.5	2.5	8	32	●		
3	3	12	32	●		
3	3	20	60		●	
3	3	30	75			●
4	4	12	40	●		
4	4	20	60		●	
4	4	30	75			●
5	5	14	50	●		
5	5	25	75		●	
5	5	40	100			●
6	6	16	50	●		
6	6	30	75		●	
6	6	50	150			●
7	7	20	60	●		
8	8	20	60	●		
8	8	30	75		●	
8	8	50	150			●
9	9	20	60	●		
10	10	22	70	●		
10	10	40	100		●	
10	10	60	150			●
12	12	22	70	●		
12	12	45	100		●	
12	12	75	150			●
14	14	25	75	●		
14	14	45	100		●	
14	14	65	150			○
16	16	25	75	●		
16	16	45	100		●	
16	16	65	150			●
20	20	32	100	●		
20	20	65	150			●

● stock standard ○ non-standard stock ■ stock exhaustion

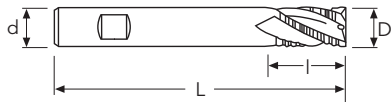

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**OSAWA
 NORM**

MDTAWSR (h10)

Ø mm	1-3	3.5-6	7-10	12-18	20-30
tol. D µ	0 / -40	0 / -48	0 / -58	0 / -70	0 / -84

MDTAWSR



D(h10)	d(h6)	I	L	Z	Stock
mm 6	6	16	57	3	●
8	8	16	63	3	●
10	10	22	72	4	●
12	12	26	83	4	●
14	14	26	83	4	●
16	16	32	92	4	●
20	20	38	104	4	●

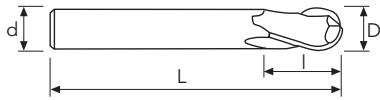
● stock standard ○ non-standard stock ■ stock exhaustion

MDTACSB2 MDTA250



MDTACSB2 - MDTA250

Ø mm	1~20
tol. D µ	0 / -30
tol. R µ	±20



D(h10)	d (h6)	l	L	Stock	Stock
mm 1	3	3	39	●	
1.5	3	5	39	●	
2	3	7	39	●	
2.5	3	8	39	●	
3	3	10	39	●	
3	3	5	75		●
4	4	12	40	●	
4	4	8	75		●
5	5	14	50	●	
5	5	9	75		●
6	6	7	51	●	
6	6	10	100		●
8	8	9	59	●	
8	8	12	100		●
10	10	10	60	●	
10	10	14	100		●
12	12	14	71	●	
12	12	16	100		●

● stock standard ○ non-standard stock ■ stock exhaustion



ULTRA MILLS

HSS-P for general purpose

✚ Ultra Mills, made of powder HSS, can meet the highest requirements whenever the use of solid carbide end mills is not allowed.

🇮🇹 La linea di fresatura Ultra Mills in HSS sinterizzato soddisfa le esigenze di alto rendimento in tutte le applicazioni in cui l'utilizzo del metallo duro non sia consentito.

🇩🇪 Die Ultra Mills Produktpalette wird aus gesintertem HSS hergestellt. Sie befriedigt damit alle Bedürfnisse der Anwendungen, wo Vollhartmetall nicht verwendet werden kann.

🇫🇷 La gamme de fraise Ultra Mills, en acier fritté, satisfait toutes exigences de haute performance quand l'utilisation du carbure n'est pas possible.

🇪🇸 La línea de fresado Ultra Mills de HSS sinterizado satisface las exigencias de alto rendimiento para todas las aplicaciones en las cuales el uso del metal duro no está permitido.

🇷🇺 Фрезы Ultra mills, изготовленные из порошкового HSS, дают возможность получить высокую эффективность фрезерования в ситуациях, когда твёрдосплавные фрезы не могут быть использованы.



PV200 COATING
POWDER STEEL

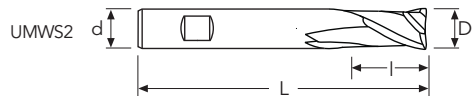
HIGH PERFORMANCE · ALTO RENDIMENTO
HOCHLEISTUNG · HAUTE PERFORMANCE
ALTO RENDIMIENTO · ВЫСОКОПРОИЗВОДИТЕЛЬНАЯ

	DIN 327
PAGE 298-299	



UMWS2 - UMWS3 (e8)

Ø mm	1~3	4~6	7~10	12~18	20~25
tol. D μ	-14 / -28	-20 / -38	-25 / -47	-32 / -59	-40 / -73



HSS-P	HSS-P
PV200	PV200
UM	UM

D(e8)	d(h6)	l	L	Stock	Stock
mm 2	6	4	48	●	●
3	6	5	49	●	●
4	6	7	51	●	●
5	6	8	52	●	●
6	6	8	52	●	●
7	10	10	60	●	○
8	10	11	61	●	●
9	10	11	61	●	○
10	10	13	63	●	●
12	12	16	73	●	●
14	12	16	73	●	●
16	16	19	79	●	●
18	16	19	79	●	●
20	20	22	88	●	●

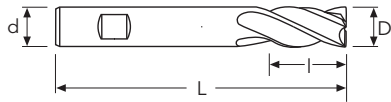
● stock standard ○ non-standard stock ■ stock exhaustion


 PAGE 299

**DIN
844**

UMWS4	
Ø mm	1~20
tol. D µ	0 / +30

UMWS4



D	d(h6)	l	L	Stock
mm 3	6	8	52	●
4	6	11	55	●
5	6	13	57	●
6	6	13	57	●
8	10	19	69	●
10	10	22	72	●
12	12	26	83	●
14	12	26	83	●
16	16	32	92	●
18	16	32	92	●
20	20	38	104	●

● stock standard ○ non-standard stock ■ stock exhaustion

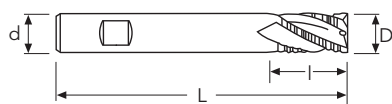
	DIN 844
PAGE 300	

UMWSFR



UMWSFR (js12)

Ø mm	3~6	7~10	12~18	20~25
tol.D μ	±60	±75	±90	±105



- Z3-Z4
- HSS-P
- PV200
- UM HR FINE
- 30°

D(js12)	d(h6)	l	L	Z	Stock
mm 6	6	13	57	3	●
7	10	16	66	3	●
8	10	19	69	3	●
9	10	19	69	3	●
10	10	22	72	4	●
12	12	26	83	4	●
14	12	26	83	4	●
16	16	32	92	4	●
18	16	32	92	4	●
20	20	38	104	4	●

● stock standard ○ non-standard stock ■ stock exhaustion



HSS/CO

General purpose

🇺🇸 The Osawa catalogue also includes a wide range of HSS/Co end mills, both coated and uncoated.

🇮🇹 Il catalogo Osawa include un'ampia scelta di frese in HSS/Co nudo e rivestito.

🇩🇪 Der Osawa Katalog umfasst eine große Auswahl an beschichteten und unbeschichteten Fräsern aus HSS/Co.

🇫🇷 Le catalogue Osawa inclut une large gamme de fraises en HSS/Co, soit revêtues, soit non revêtues.

🇪🇸 El catálogo Osawa incluye una amplia variedad de fresas de HSS/Co con o sin recubrimiento.

🇷🇺 В каталоге Osawa также представлена широкая гамма концевых фрез изготовленных из HSS/Co с покрытием и без покрытия.

HSS/Co

HSS/Co
HIGH SPEED STEEL

	DIN 327
PAGE 301~303	

WS2 - TAWS2 - WSB2 - TAWSB2 (e8)

Ø mm	1~3	3.5~6	6.5~10	10.5~18	19~30	32~40
tol. D μ	-14 / -28	-20 / -38	-25 / -47	-32 / -59	-40 / -73	-50 / -89
tol. R μ	±20					



<p>WS2 TAWWS2</p>				
<p>WSB2 TAWWSB2</p>				

D(e8)	d(h6)	l	L	Stock	Stock	Stock	Stock
mm 1	6	2.5	47	●	●		
1.5	6	3	47	●	●		
2	6	4	48	●	●	●	○
2.5	6	5	49	●	●		
3	6	5	49	●	●	●	●
3.5	6	6	50	●	●		
4	6	7	51	●	●	●	●
4.5	6	7	51	●	●		
5	6	8	52	●	●	●	●
5.5	6	8	52	●	●		
6	6	8	52	●	●	●	●
6.5	10	10	60	●	●		
7	10	10	60	●	●	○	
7.5	10	10	60	●	●		
8	10	11	61	●	●	●	●
8.5	10	11	61	●	●		
9	10	11	61	●	●		
9.5	10	11	61	●	●		
10	10	13	63	●	●	●	●
10.5	12	13	70	●	●		
11	12	13	70	●	●		
11.5	12	13	70	●	●		
12	12	16	73	●	●	●	●
12.5	12	16	73	●	●		
13	12	16	73	●	●		
13.5	12	16	73	●	●		
14	12	16	73	●	●	●	●
15	12	16	73	●	●		
16	16	19	79	●	●	●	●
17	16	19	79	●	●		
18	16	19	79	●	●	●	●
19	16	19	79	●	●		
20	20	22	88	●	●	●	●
21	20	22	88	○	●		
22	20	22	88	●	●	○	
24	25	26	102	●	○		

n **Vf**
PAGE
301~303

DIN
327

WS2 - TAWS2 - WSB2 - TAWSB2 (e8)

Ø mm	1~3	3.5~6	6.5~10	10.5~18	19~30	32~40
tol. D µ	-14 / -28	-20 / -38	-25 / -47	-32 / -59	-40 / -73	-50 / -89
tol. R µ	±20					



<p>WS2 TAWS2</p>							
						HSS/Co BR	HSS/Co PV200
<p>WSB2 TAWSB2</p>							
						N	N
D(e8)	d(h6)	I	L	Stock	Stock	Stock	Stock
mm 25	25	26	102	●	●	○	○
26	25	26	102	●			
28	25	26	102	●		○	○
30	25	26	102	●		○	○
32	32	32	112	○			

● stock standard ○ non-standard stock ■ stock exhaustion

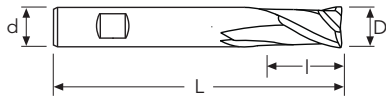
n **Vf**
PAGE 304

DIN 844

WSA2



WSA2	3~6	7~10	12~18	20~25
Ø mm	3~6	7~10	12~18	20~25
tol.D μ	±60	±75	±90	±105



D(e8)	d(h6)	l	L	Stock
mm 2	6	7	51	●
2.5	6	8	52	●
3	6	8	52	●
4	6	11	55	●
5	6	13	57	●
6	6	13	57	●
8	10	19	69	●
10	10	22	72	●
12	12	26	83	●
14	12	26	83	●
16	16	32	92	●
18	16	32	92	●
20	20	38	104	●

● stock standard ○ non-standard stock ■ stock exhaustion

	DIN 844
PAGE 301-302	

WS3 - TAWS3 (e8)

Ø mm	1~3	3.5~6	6.5~10	10.5~18	19~30	32~40
tol. D µ	-14 / -28	-20 / -38	-25 / -47	-32 / -59	-40 / -73	-50 / -89

TAWSH3

Ø mm	1~3	3.5~6	6.5~10	10.5~18	19~30	32~40
tol. D µ		0 / +48	0 / +58	0 / +70	0 / +84	



<p>WS3 TAWS3</p>	<p>WSH3 TAWSH3</p>			
		HSS/Co BR	HSS/Co PV200	HSS/Co PV200
		N	N	N

D	d(h6)	I	L	Stock	Stock	Stock
mm 1	6	3	47	●	○	
1.5	6	7	51	●	○	
2	6	7	51	●	●	
2.5	6	8	52	●	●	
3	6	8	52	●	●	
3.5	6	10	54	●	●	
4	6	11	55	●	●	
4.5	6	11	55	●	●	
5	6	13	57	●	●	
5.5	6	13	57	●	●	
6	6	13	57	●	●	●
6.5	10	16	66	●	●	
7	10	16	66	●	●	
8	10	19	69	●	●	●
8.5	10	19	69	●	●	
9	10	19	69	●	●	
10	10	22	72	●	●	●
11	12	22	79	●	●	
12	12	26	83	●	●	●
13	12	26	83	●	●	
14	12	26	83	●	●	●
15	12	26	83	●	●	
16	16	32	92	●	●	●
18	16	32	92	●	●	●
20	20	38	104	●	●	●
22	20	38	104	●	●	
25	25	45	121	●	●	
30	25	45	121	●	○	
32	32	53	133	●	○	

● stock standard ○ non-standard stock ■ stock exhaustion



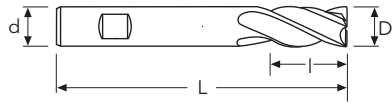
**DIN
844**



WS4 (6) TAWS4 (6)



WS4 - TAWS4	
Ø mm	2~40
tol. D µ	0 / +40



HSS/Co
BR

N



HSS/Co
PV200

N



D	d(h6)	I	L	Stock	Stock
mm 2	6	7	51	●	●
3	6	8	52	●	●
4	6	11	55	●	●
5	6	13	57	●	●
6	6	13	57	●	●
7	10	16	66	●	●
8	10	19	69	●	●
9	10	19	69	●	●
10	10	22	72	●	●
11	12	22	79	●	●
12	12	26	83	●	●
13	12	26	83	●	●
14	12	26	83	●	●
15	12	26	83	●	●
16	16	32	92	●	●
17	16	32	92	●	●
18	16	32	92	●	●
19	16	32	92	●	○
20	20	38	104	●	●
22	20	38	104	●	●
24	25	45	121	● (Z6)	○ (Z6)
25	25	45	121	●	●
26	25	45	121	●	○ (Z6)
28	25	45	121	● (Z6)	○ (Z6)
30	25	45	121	● (Z6)	● (Z6)
32	32	53	133	●	● (Z6)
36	32	53	133	●	● (Z6)
40	32	63	143	●	● (Z6)

● stock standard ○ non-standard stock ■ stock exhaustion



DIN 844



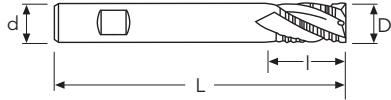
TAWSR ≤ Ø20
WSFR ≤ Ø20
TAWSFR ≤ Ø40



TAWSR ≥ Ø22
WSFR ≥ Ø22

TAWSR - WSFR - TAWSFR (js12)

Ø mm	~6	6.5~10	10.5~18	19~30	32~40
tol. D µ	±60	±75	±90	±105	±125



HSS/Co PV200	HSS/Co BR	HSS/Co PV200	HSS/Co BR

D(js12)	d(h6)	I	L	Z	Stock	Stock	Stock	Stock
mm 6	6	13	57	3	●	●	●	●
7	10	16	66	3	●	○	●	●
8	10	19	69	3	●	●	●	●
9	10	19	69	3	●	○	●	●
10	10	22	72	4	●	●	●	●
11	12	22	79	4	●	○	●	●
12	12	26	83	4	●	●	●	●
13	12	26	83	4	●	○	●	●
14	12	26	83	4	●	●	●	●
15	12	26	83	4	●	○	●	●
16	16	32	92	4	●	●	●	●
17	16	32	92	4	●	●	●	●
18	16	32	92	4	●	●	●	●
19	16	32	92	4	○	●	●	●
20	20	38	104	4	●	●	●	●
22	20	38	104	5			●	●
25	25	45	121	5			●	●
28	25	45	121	6			●	
30	25	45	121	6			●	
32	32	53	133	6			●	
36	32	53	133	6			●	
38	32	63	155	6				
40	32	63	155	6			●	

● stock standard ○ non-standard stock ■ stock exhaustion

	DIN 844 1889
PAGE 301~303	

WL2 - TAWL2 - WLB2 - TAWLB2 (e8)

Ø mm	1~3	3.5~6	6.5~10	10.5~18	19~30	32~40
tol. D µ	-14 / -28	-20 / -38	-25 / -47	-32 / -59	-40 / -73	-50 / -89
tol. R µ	±20					



HSS/Co BR	HSS/Co PV200	HSS/Co BR	HSS/Co PV200
N	N	N BALL NOSE	N BALL NOSE

D(e8)	d(h6)	I	L	Stock	Stock	Stock	Stock
mm 3	6	8	56	●	●	●	○
4	6	11	63	●	●	●	○
5	6	13	68	●	●	●	○
6	6	13	68	●	●	●	○
7	10	16	80	●	○		
8	10	19	88	●	●	●	○
9	10	19	88	●	○		
10	10	22	95	●	●	●	○
11	12	22	102	●	○		
12	12	26	110	●	●	●	○
13	12	26	110	●	○		
14	12	26	110	●	●	●	○
15	12	26	110	●	○		
16	16	32	123	●	●	●	○
17	16	32	123	●	○		
18	16	32	123	●	●	●	○
20	20	38	141	●	●	●	○
22	20	38	141	●			
24	25	45	166	○			
25	25	45	166	●			
28	25	45	166	●			
30	25	45	166	●			
32	32	53	186	○			
36	32	53	186	○			
40	32	63	207	○			

● stock standard ○ non-standard stock ■ stock exhaustion



DIN 844



WL3 - TAWL3 (e8)

Ø mm	~3	3.5~6	6.5~10	10.5~18	19~30	32~40
tol. D µ	-14 / -28	-20 / -38	-25 / -47	-32 / -59	-40 / -73	-50 / -89

WL4 - TAWL4

Ø mm	3~6	7~40
tol. D µ	0 / +40	0 / +50



D	d(h6)	I	L	Stock	Stock	Stock	Stock
mm							
3	6	12	56	●	●	●	○
4	6	19	63	●	●	●	○
5	6	24	68	●	●	●	○
6	6	24	68	●	●	●	●
7	10	30	80	●	●	●	○
8	10	38	88	●	●	●	●
9	10	38	88	●	●	●	○
10	10	45	95	●	●	●	●
11	12	45	102	●	●	●	○
12	12	53	110	●	●	●	●
13	12	53	110	●	●	●	○
14	12	53	110	●	●	●	●
15	12	53	110	●	●	●	○
16	16	63	123	●	●	●	●
17	16	63	123	●	●	●	●
18	16	63	123	●	●	●	●
19	16	63	123	●	●	●	○
20	20	75	141	●	●	●	●
22	20	75	141	●	○	● (Z6)	● (Z6)
25	25	90	166	●	○	● (Z6)	● (Z6)
30	25	90	166	●	○	● (Z6)	● (Z6)
32	32	106	186	●	○	● (Z6)	● (Z6)
36	32	106	186	●	○	● (Z6)	● (Z6)
40	40	125	217	●	○	● (Z6)	● (Z6)

● stock standard ○ non-standard stock ■ stock exhaustion

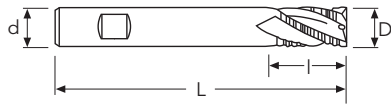


DIN 844



WLFR - TAWLFR (j12)

Ø mm	~6	6.5~10	10.5~18	19~30	32~40
tol. D μ	±60	±75	±90	±105	±125



Z3-Z6	Z3-Z6
HSS/Co BR	HSS/Co PV200
HR FINE	HR FINE
30°	30°

D(js 12)	d(h6)	l	L	Z	Stock	Stock
mm 6	6	24	68	3	●	●
8	10	38	88	3	●	●
10	10	45	95	4	●	●
12	12	53	110	4	●	●
14	12	53	110	4	●	●
16	16	63	123	4	●	●
18	16	63	123	4	●	●
20	20	75	141	4	●	●
22	20	75	141	5		●
25	25	90	166	5		●
30	25	90	166	6		●
32	32	106	186	6		●
36	32	106	186	6		●
40	32	125	217	6		●

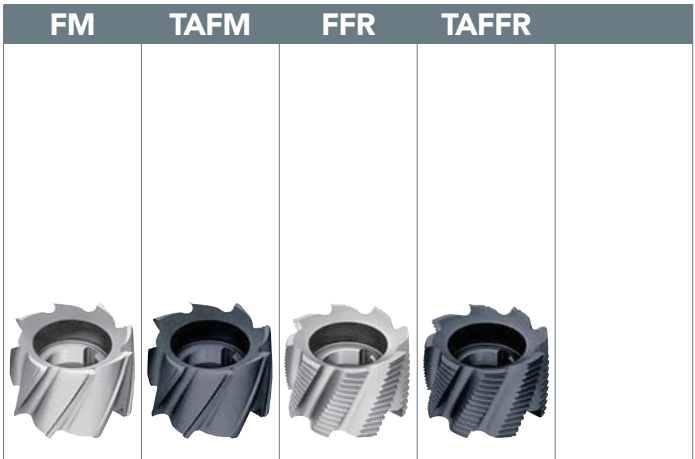
● stock standard ○ non-standard stock ■ stock exhaustion

n **Vf**
PAGE
305-306

DIN
1880

FM - TAFM - FFR - TAFFR

tol. D mm	+0.25 / -0.15
tol. d1 mm	+0.02 / -0
tol. H mm	+0.5 / -0

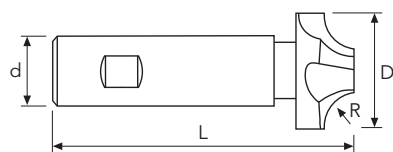
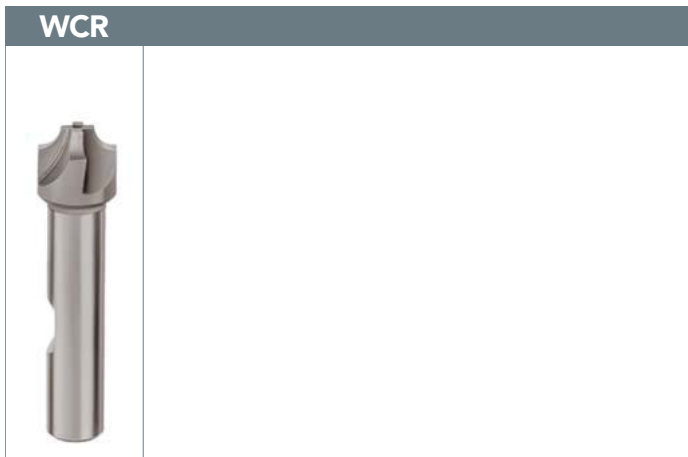


			 Z8-Z14	 Z8-Z14	 Z6-Z12	 Z6-Z12
			HSS/Co BR	HSS/Co PV200	HSS/Co BR	HSS/Co PV200
			N	N	HR FINE	HR FINE
			30°	30°	30°	30°
D	d1	H	Stock	Stock	Stock	Stock
mm 40	16	32	● (Z8)	● (Z8)	● (Z6)	● (Z6)
50	22	36	● (Z8)	● (Z8)	● (Z8)	● (Z8)
63	27	40	● (Z8)	● (Z8)	● (Z8)	● (Z8)
80	27	45	○ (Z10)	○ (Z10)	○ (Z10)	○ (Z10)
100	32	50	○ (Z10)	○ (Z10)	○ (Z10)	○ (Z10)
160	50	63	○ (Z14)	○ (Z14)	○ (Z12)	○ (Z12)

● stock standard ○ non-standard stock ■ stock exhaustion

	DIN 6518
PAGE 306	

WCR (H11)				
Ø mm	8-12	13-20	21-28	31-52
tol. R µ	+60 / 0	+75 / 0	+90 / 0	+110 / 0



D	R(H11)	d(h6)	L	Stock
mm 8	1.0	10	60	●
9	1.5	10	60	●
10	2.0	10	60	●
11	2.5	10	60	●
12	3.0	12	60	●
13	3.5	12	60	●
14	4.0	12	60	●
15	4.5	12	60	●
16	5.0	12	60	●
19	5.5	16	67	●
20	6.0	16	67	●
21	6.5	16	71	●
22	7.0	16	71	●
23	7.5	16	71	●
24	8.0	16	71	●
25	8.5	25	85	●
26	9.0	25	85	●
27	9.5	25	85	●
28	10.0	25	85	●
31	10.5	25	90	○
32	11.0	25	90	●
34	12.0	25	90	●
41	12.5	25	100	○
42	13.0	25	100	○
44	14.0	25	100	○
46	15.0	25	100	○
48	16.0	25	100	○
52	18.0	32	112	○
56	20	32	112	○

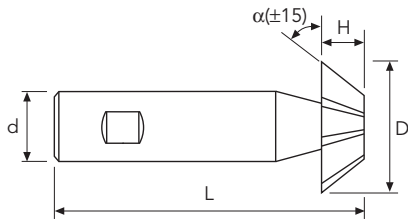
● stock standard ○ non-standard stock ■ stock exhaustion



DIN 1833

WDC45 - WDC60 - WDD45 - WDD60 (js16)

Ø mm	~18	20~30	32~38
tol. D mm	±0.65	±0.65	±0.80



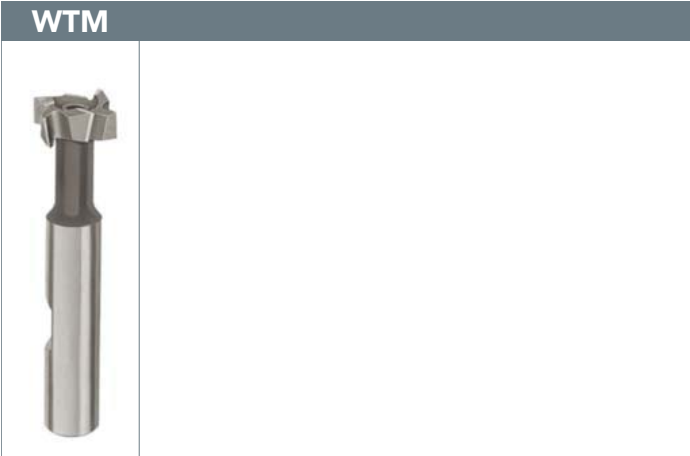
HSS/Co	HSS/Co	HSS/Co	HSS/Co
BR	BR	BR	BR
N	N	N	N
α 45°	α 60°	α 45°	α 60°

D(js16)	d(h6)	H	L	Z	Stock	Stock	Stcok	Stock
mm 16	12	4	60	6	●		●	
20	12	5	63	6	●		●	
22	12	6	67	6	●		●	
25	16	6.3	67	8	●		●	
28	16	7.5	67	8	●		●	
32	16	8	71	10	●		●	
38	16	10	80	12	○		○	
mm 16	12	6.3	60	6		●		●
20	12	8	63	6		●		●
22	12	9	67	6		●		●
25	16	10	67	8		●		●
28	16	11	67	8		●		●
32	16	12.5	71	10		●		●
38	16	16	80	12		○		○

● stock standard ○ non-standard stock ■ stock exhaustion

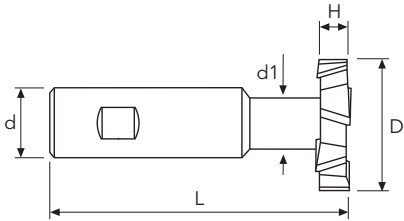
n **Vf**
PAGE 307

DIN 851



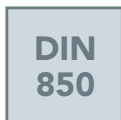
WTM (d11)

Ø mm	10~18	19~30	32~40
tol. D µ	-50 / -160	-65 / -195	-80 / -240



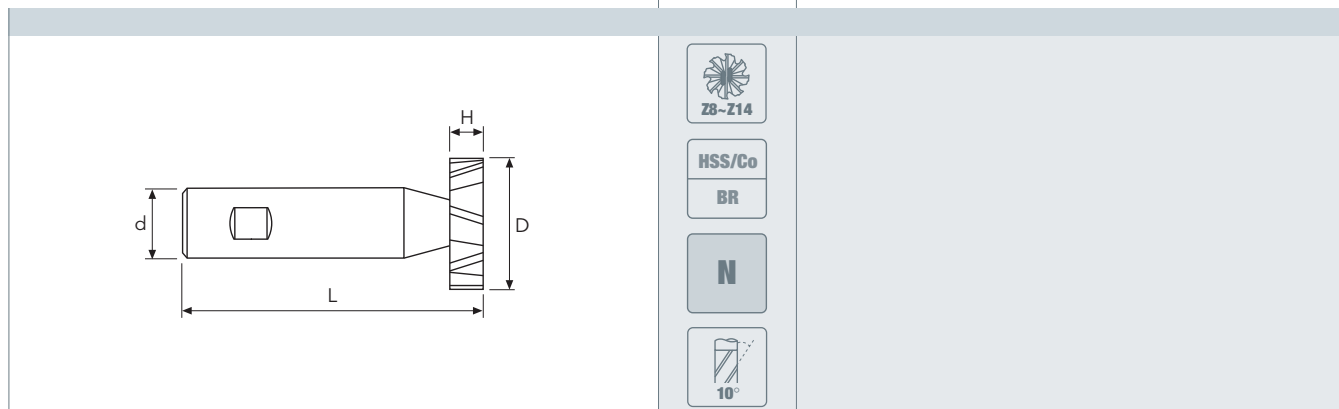
D(d11)	d(h6)	d1	H(d11)	L	Z	Stock
mm 12.5	10	5	6	57	6	●
16	10	6.5	8	62	6	●
18	12	8	8	70	6	●
19	12	8	9	71	6	●
21	12	10	9	74	6	●
22	12	10	10	75	6	●
25	16	12	11	82	6	●
28	16	13	12	83	6	●
32	16	15	14	90	8	●
36	25	17	16	103	8	●
40	25	19	18	108	8	○

● stock standard ○ non-standard stock ■ stock exhaustion



WWK (h11 - e8)

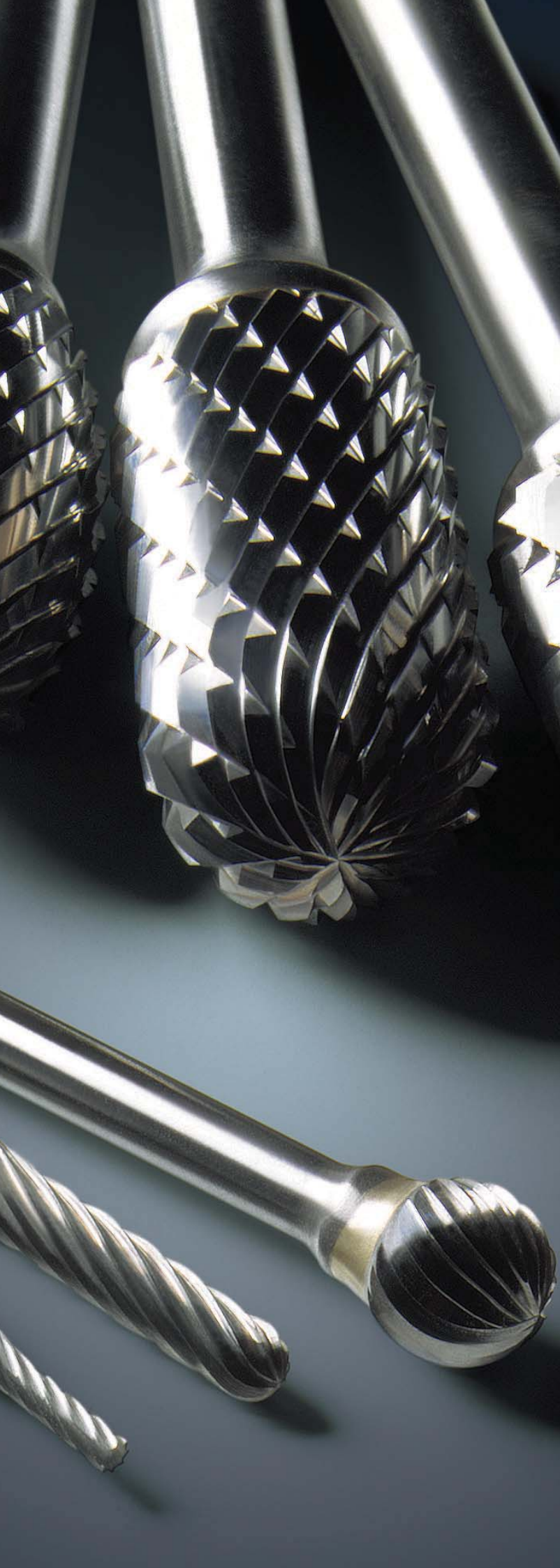
Ø mm	10-18	19-30	32-50
tol. D µ	0 / -110	0 / -130	0 / -160
tol. H µ	-32 / -59	-40 / -73	-50 / -89



D(h11)	d(h6)	H(e8)	L	Z	Stock
mm 10.5	6	2	50	8	●
10.5	6	2.5	50	8	●
10.5	6	3	50	8	●
13.5	10	2	56	8	●
13.5	10	2.5	56	8	●
13.5	10	3	56	8	●
13.5	10	4	56	8	●
16.5	10	2.5	56	8	●
16.5	10	3	56	8	●
16.5	10	4	56	8	●
16.5	10	5	56	8	●
19.5	10	3	63	8	●
19.5	10	4	63	8	●
19.5	10	5	63	8	●
19.5	10	6	63	8	●
22.5	10	4	63	10	●
22.5	10	5	63	10	●
22.5	10	6	63	10	●
22.5	10	8	63	10	●
25.5	10	5	63	10	●
25.5	10	6	63	10	●
25.5	10	7	63	10	●
25.5	10	8	63	10	●
28.5	10	5	63	10	●
28.5	10	6	63	10	●
28.5	10	7	63	10	○
28.5	10	8	63	10	○
32.5	12	5	71	12	●
32.5	12	6	71	12	●
32.5	12	7	71	12	○
32.5	12	8	71	12	●
32.5	12	10	71	12	●
38.5	12	7	71	12	●
38.5	12	8	71	12	○
38.5	12	9	71	12	○
38.5	12	10	71	12	○
45.5	12	10	71	14	○



CARBIDE BURRS



CARBIDE BURRS

🇬🇧 Don't give up Osawa quality on carbide rotary burrs, which are 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-Rotierfeilen. 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.



M
DOUBLE CUT · DOPPIO TAGLIO
2 SCHNEIDEN · COUPE DOUBLE
DOBLE CORTE · ДВОЙНАЯ ЗАТОЧКА



MPC
PLAIN CUT · TAGLIO PIANO
FLACHSCHNEIDE · COUPE PLANE
CORTE PLANO · ОБЫЧНАЯ ЗАТОЧКА

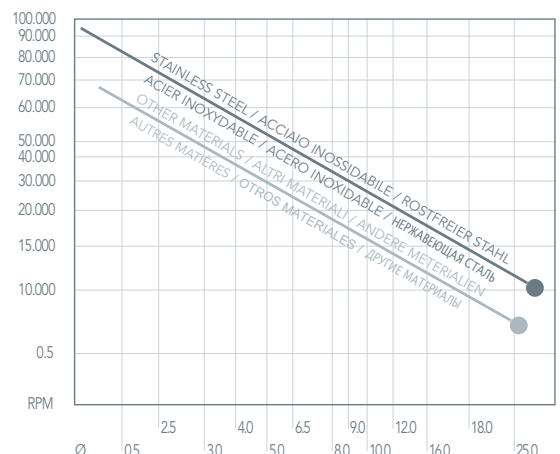


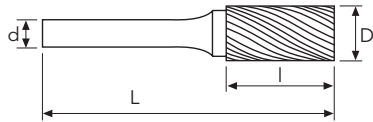
MDC
DIAMOND CUT · TAGLIO DIAMANTE
DIAMANT SCHNEIDEN · COUPE DIAMANT
CORTE DIAMANTE · АЛМАЗНАЯ ЗАТОЧКА



MNF
ALUCUT

SPEED TABLE · TABELLA VELOCITÀ
GESCHWINDIGKEITSTABELLE · TABLEAU DE VITESSE
TABLA DE VELOCIDAD · ТАБЛИЦА СКОРОСТЕЙ





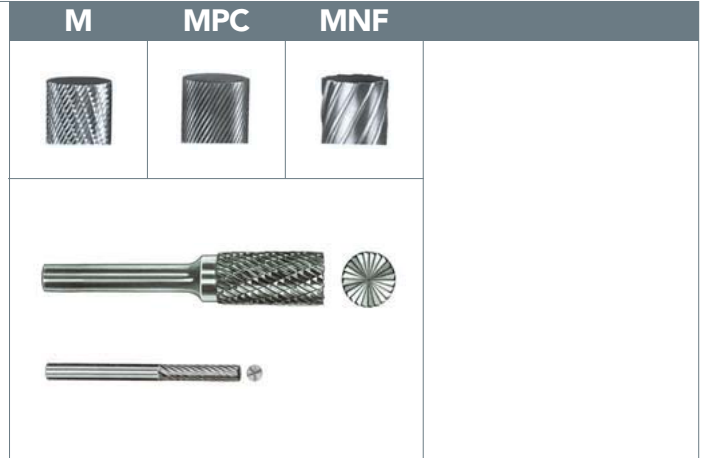
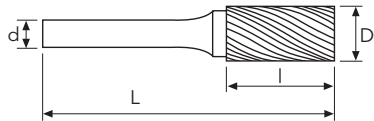
Item No.	D	d	l	L	Stock	Stock	Stock
SA41	1.5	3	6	38	●	●	
SA41 - L2	1.5	3	6	50	○	○	
SA41 - L3	1.5	3	6	75	○	○	
SA42	2.5	3	11	38	●	●	
SA42 - L2	2.5	3	11	50	○	○	
SA42 - L3	2.5	3	11	75	○	○	
SA43	3	3	14	38	●	●	
SA43 - L2	3	3	14	50	○	○	
SA43 - L3	3	3	14	75	○	○	
SA52	4	3	12.7	38	●	●	
SA53	5	3	12.7	38	○	●	
SA51	6.3	3	12.7	50	●	●	
SA11	3	6	12	56	●	○	
SA13	4	6	16	50	●	○	
SA14	5	6	16	50	●	○	
SA1	6	6	16	50	●	○	●
SA1 - L	6	6	25	50	○	○	
SA2	8	6	19	63	●	○	
SA3	9.5	6	19	63	●	○	●
SA3 - L	9.5	6	25	69	○	○	
SA4	11	6	25	69	●	○	
SA5	12.7	6	25	69	●	○	●
SA6	16	6	25	69	●	○	○
SA7	19	6	25	69	●	○	○
SA9	25	6	25	69	●	○	

MDC a richiesta · on request · auf Anfrage · sur demande · a petición · по запросу

● stock standard ○ non-standard stock ■ stock exhaustion



⚠ Always wear goggles when using the rotary burrs 🇮🇹 Per l'uso delle lime rotative è obbligatorio indossare occhiali protettivi
 🇩🇪 Tragen Sie immer die Schutzbrille wenn Sie die Fräser benutzen 🇫🇷 Toujours porter les lunettes de sécurité en utilisant les limes rotatives
 🇪🇸 Para usar las limas rotativas es obligatorio usar gafas de protección 🇷🇺 При работе с борфрезами всегда используйте защитные очки



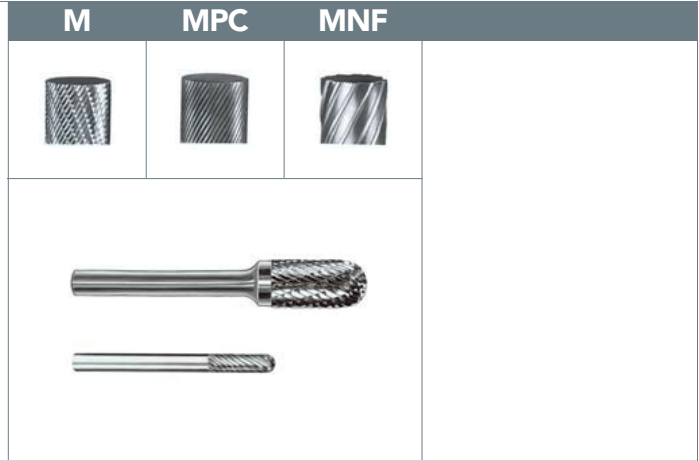
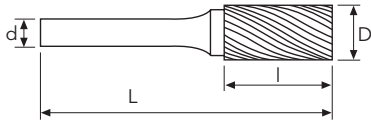
Item No.	D	d	l	L	M	MPC	MNF
					Stock	Stock	Stock
SB41	1.5	3	6	38	●	●	
SB41 - L2	1.5	3	6	50	○	○	
SB41 - L3	1.5	3	6	75	○	○	
SB42	2.5	3	11	38	○	●	
SB42 - L2	2.5	3	11	50	○	○	
SB42 - L3	2.5	3	11	75	○	○	
SB43	3	3	14	38	●	●	
SB43 - L2	3	3	14	50	○	○	
SB43 - L3	3	3	14	75	○	○	
SB51	6.3	3	4.7	43	●	●	
SB11	3	6	12	56	●	○	
SB13	4	6	16	50	●	○	
SB14	5	6	16	50	●	○	
SB1	6	6	16	50	●	○	○
SB1 - L	6	6	25	50	○	○	
SB2	8	6	19	63	●	○	
SB3	9.5	6	19	63	●	○	○
SB3 - L	9.5	6	25	69	○	○	
SB4	11	6	25	69	●	○	
SB5	12.7	6	25	69	●	○	○
SB6	16	6	25	69	●	○	○
SB7	19	6	25	69	●	○	○
SB9	25	6	25	69	●	○	

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 Para usar las limas rotativas es obligatorio usar gafas de protección  При работе с борфрезами всегда используйте защитные очки



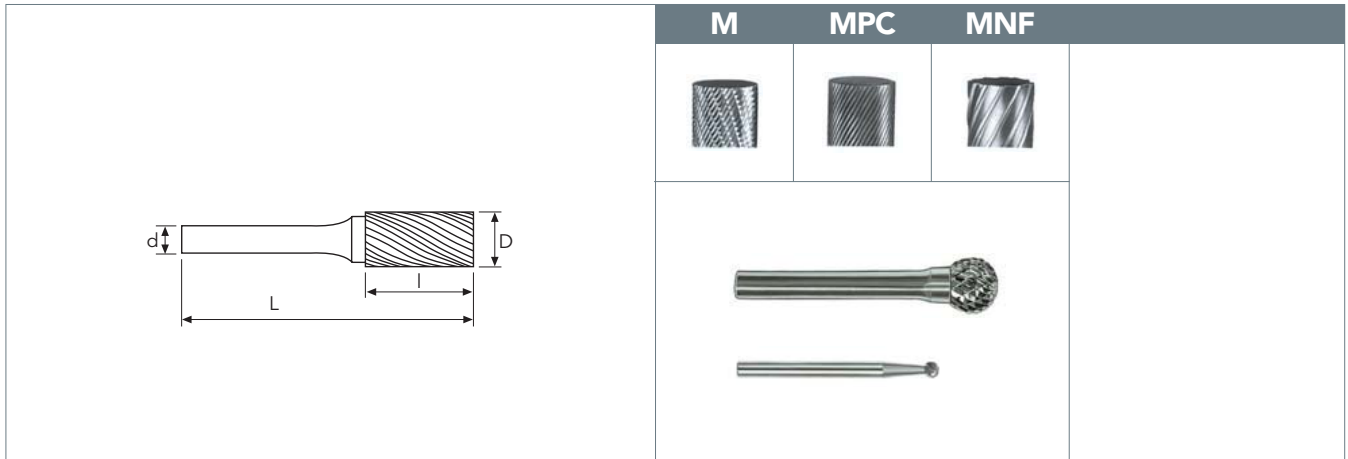
Item No.	D	d	l	L	Stock	Stock	Stock
SC41	2.5	3	11	38	●	●	
SC42	3	3	14	38	●	●	
SC42 - L2	3	3	14	50	○	○	
SC42 - L3	3	3	14	75	○	○	
SC51	6.3	3	12.7	50	○	●	
SC52	4	3	12.7	38	●	●	
SC53	5	3	12.7	38	●	●	
SC11	3	6	12	56	●	○	
SC13	4	6	16	50	●	○	
SC14	5	6	16	50	●	○	
SC1	6	6	16	50	●	○	●
SC1 - L	6	6	25	50	○	○	
SC2	8	6	19	63	●	○	
SC3	9.5	6	19	63	●	○	●
SC3 - L	9.5	6	25	69	○	○	
SC4	11	6	25	69	●	○	
SC5	12.7	6	25	69	●	○	●
SC6	16	6	25	69	●	○	○
SC7	19	6	25	69	●	○	○
SC9	25	6	25	69	●	○	

MDC a richiesta · on request · auf Anfrage · sur demande · a petición · по запросу

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⚠ Always wear goggles when using the rotary burrs ⚠ Per l'uso delle lime rotative è obbligatorio indossare occhiali protettivi
 ⚠ Tragen Sie immer die Schutzbrille wenn Sie die Fräser benutzen ⚠ Toujours porter les lunettes de sécurité en utilisant les limes rotatives
 ⚠ Para usar las limas rotativas es obligatorio usar gafas de protección ⚠ При работе с борфрезами всегда используйте защитные очки



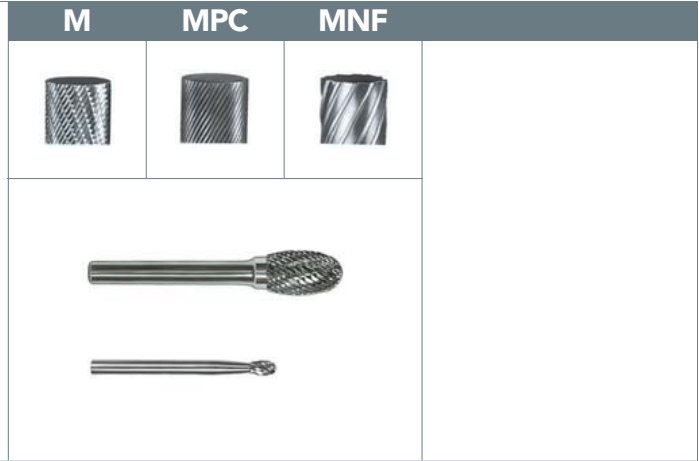
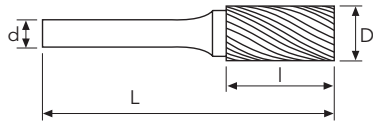
Item No.	D	d	l	L	M	MPC	MNF
					Stock	Stock	Stock
SD41	2.5	3	2.3	38	●	●	
SD42	3	3	2.8	38	●	●	
SD42 - L2	3	3	2.8	50	○	○	
SD42 - L3	3	3	2.8	75	○	○	
SD51	6.3	3	5	44	●	●	
SD53	5	3	4	38	●	●	
SD11	3	6	2.8	50	●	○	
SD14	5	6	4	50	●	○	
SD1	6	6	5	50	●	○	○
SD2	8	6	6.4	50	●	○	
SD3	9.5	6	8	52	●	○	○
SD4	11	6	9.5	54	●	○	
SD5	12.7	6	11	55	●	○	○
SD6	16	6	14	58	●	○	○
SD7	19	6	16	62	●	○	○
SD9	25	6	23	68	●	○	

MDC a richiesta · on request · auf Anfrage · sur demande · a petición · по запросу

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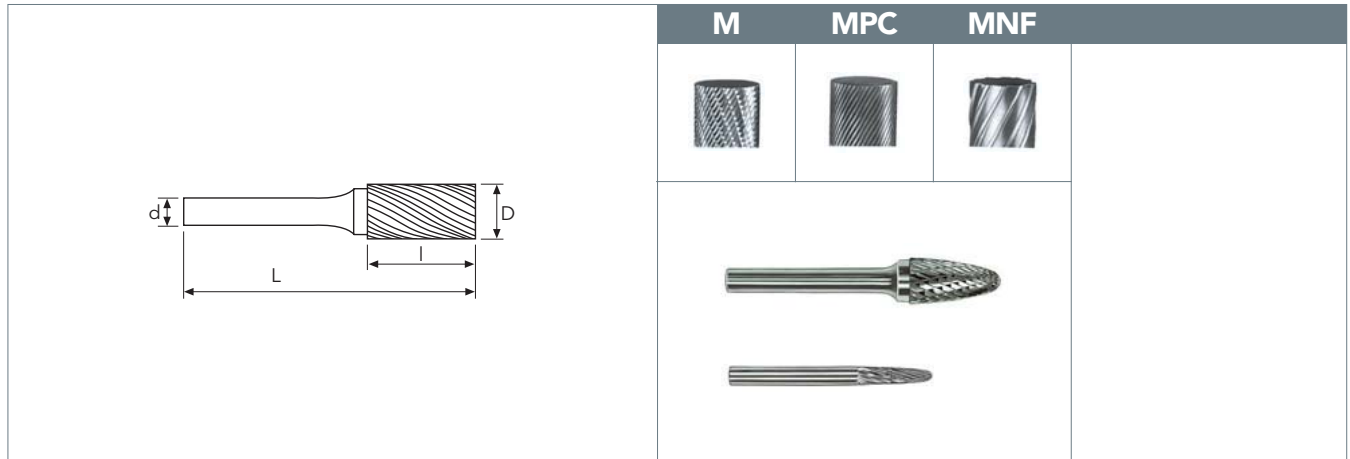
Item No.	D	d	l	L	Stock	Stock	Stock
SE41	3	3	5.5	38	●	●	
SE41 - L2	3	3	5.5	50	○	●	
SE41 - L3	3	3	5.5	75	○	●	
SE51	6.3	3	9.5	47	●	●	
SE53	5	3	7.1	38	●	●	
SE1	6	6	9.5	50	●	○	
SE3	9.5	6	16	60	●	○	○
SE5	12.7	6	22	66	●	○	○
SE6	16	6	25	69	●	○	○
SE7	19	6	25	69	●	○	○

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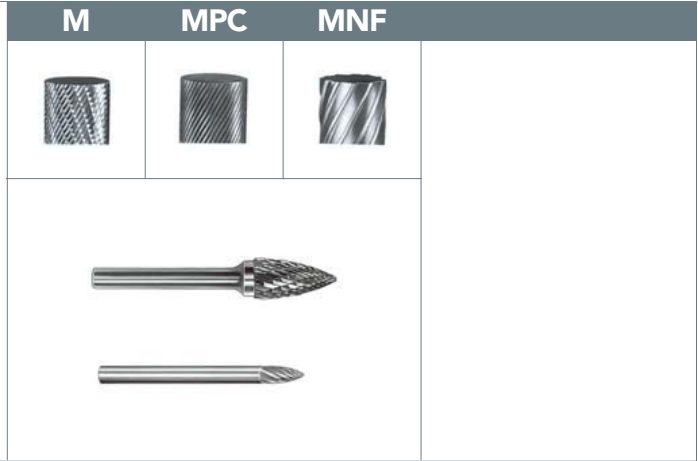
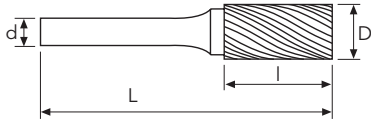
Item No.	D	d	l	L	M	MPC	MNF
					Stock	Stock	Stock
SF41	3	3	6	38	○	●	
SF42	3	3	12.7	38	●	●	
SF42 - L2	3	3	12.7	50	○	○	
SF42 - L3	3	3	12.7	75	○	○	
SF51	6.3	3	12.7	50	●	●	
SF53	5	3	12.7	38	●	●	
SF11	3	6	12.7	56	●	○	
SF1	6	6	16	50	●	○	○
SF3	9.5	6	19	63	●	○	○
SF4	11	6	25	69	●	○	
SF13	12.7	6	19	63	○	○	
SF5	12.7	6	25	69	●	○	○
SF6	16	6	25	69	●	○	○
SF7	19	6	25	69	●	○	
SF14	19	6	32	76	○	○	○
SF15	19	6	38	82	○	○	

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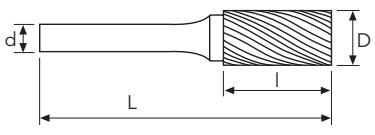




Item No.	D	d	l	L	Stock	Stock	Stock
SG41	3	3	6	38	●	●	
SG43	3	3	9.5	38	●	●	
SG44	3	3	12.7	38	●	●	
SG44 - L2	3	3	12.7	50	○	○	
SG44 - L3	3	3	12.7	75	○	●	
SG51	6.3	3	12.7	50	●	●	
SG53	5	3	12.7	38	●	●	
SG1	6	6	16	50	●	○	
SG2	8	6	19	63	●	○	
SG3	9.5	6	19	63	●	○	
SG13	12.7	6	19	63	○	○	
SG5	12.7	6	25	69	●	○	
SG6	16	6	25	69	●	○	
SG7	19	6	25	69	●	○	
SG15	19	6	38	82	○	○	

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Always wear goggles when using the rotary burrs Per l'uso delle lime rotative è obbligatorio indossare occhiali protettivi
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 Para usar las limas rotativas es obligatorio usar gafas de protección При работе с борфрезами всегда используйте защитные очки

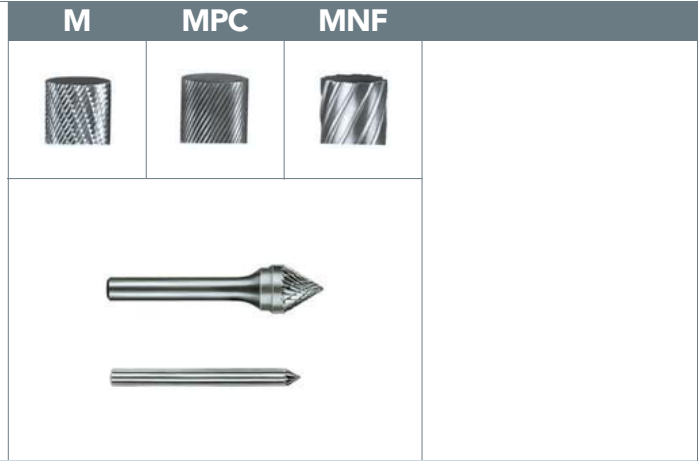
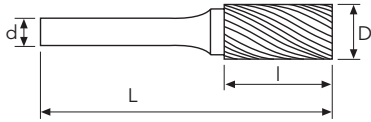
								
	M	MPC	MNF					
								
								
Item No.	D	d	l	L		Stock	Stock	Stock
SH41	3	3	6.3	38	●	●		
SH41 - L2	3	3	6.3	50	○	○		
SH41 - L3	3	3	6.3	75	○	○		
SH53	5	3	9.5	38	○	●		
SH2	8	6	19	63	●	○		
SH5	12.7	6	32	76	●	○		
SH6	16	6	36	80	●	○		
SH7	19	6	41	85	●	○		

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 ● Para usar las limas rotativas es obligatorio usar gafas de protección 🇷🇺 При работе с борфрезами всегда используйте защитные очки



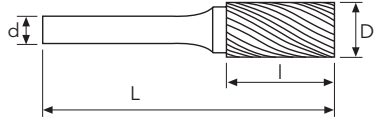





Item No.	D	d	l	L	α	Stock	Stock	Stock
SJ42	3	3	2.5	38	60°	○	●	
SJ1	6	6	4	50	60°	●	○	
SJ3	9.5	6	8	55	60°	●	○	
SJ5	12.7	6	11	58	60°	●	○	
SJ6	16	6	13.5	61	60°	●	○	
SJ7	19	6	16.5	65	60°	○	○	
SJ9	25	6	21.5	68	60°	○	○	

MDC a richiesta · on request · auf Anfrage · sur demande · a petición · по запросу

● stock standard ○ non-standard stock ■ stock exhaustion



⚠ Always wear goggles when using the rotary burrs 🇮🇹 Per l'uso delle lime rotative è obbligatorio indossare occhiali protettivi
 🇩🇪 Tragen Sie immer die Schutzbrille wenn Sie die Fräser benutzen 🇫🇷 Toujours porter les lunettes de sécurité en utilisant les limes rotatives
 🇪🇸 Para usar las limas rotativas es obligatorio usar gafas de protección 🇷🇺 При работе с борфрезами всегда используйте защитные очки

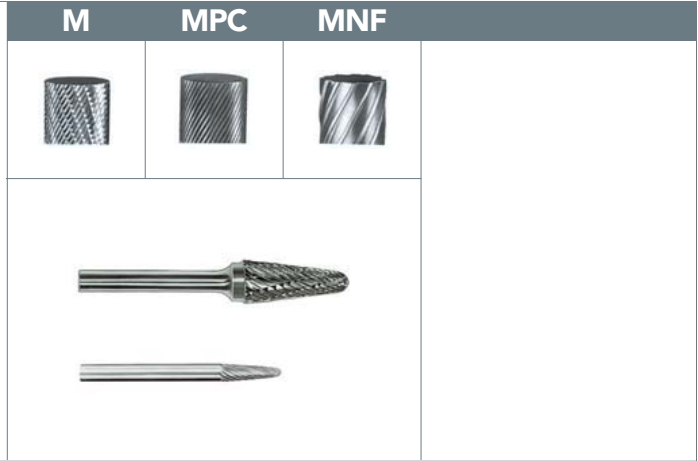
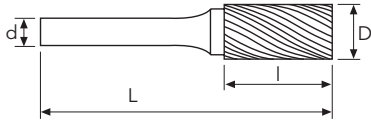
						M	MPC	MNF
								
								
								
Item No.	D	d	l	L	α	Stock	Stock	Stock
SK42	3	3	1.5	38	90°	○	●	
SK1	6	6	3	50	90°	●	○	
SK3	9.5	6	4.7	52	90°	●	○	
SK5	12.7	6	6.3	54	90°	●	○	
SK6	16	6	8	57	90°	●	○	
SK7	19	6	9.5	58	90°	○	○	
SK9	25	6	12.7	60	90°	○	○	

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 Tragen Sie immer die Schutzbrille wenn Sie die Fräser benutzen
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 Para usar las limas rotativas es obligatorio usar gafas de protección
  При работе с борфрезами всегда используйте защитные очки



Item No.	D	d	l	L	α	M	MPC	MNF
						Stock	Stock	Stock
SL41	3	3	9.5	38	8°	●	●	
SL42	3	3	12.7	38	8°	●	●	
SL42 - L2	3	3	12.7	50	8°	○	○	
SL42 - L3	3	3	12.7	75	8°	○	○	
SL53	5	3	12.7	38	14°	○	●	
SL1	6	6	16	50	14°	●	○	
SL2	8	6	22	69	14°	●	○	
SL3	9.5	6	27	74	14°	●	○	○
SL4	12.7	6	28	76	14°	●	○	●
SL5	16	6	30	77	14°	●	○	○
SL7	19	6	38	85	14°	○	○	

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 🇪🇸 Para usar las limas rotativas es obligatorio usar gafas de protección 🇷🇺 При работе с борфрезами всегда используйте защитные очки

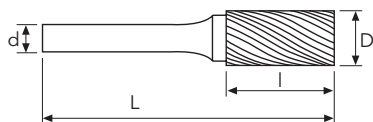
Item No.	D	d	l	L	α	M	MPC	MNF		
						Stock	Stock	Stock		
SM41	3	3	8.9	38	12°	●	●			
SM42	3	3	11	38	14°	●	●			
SM42 - L2	3	3	11	50	14°	○	○			
SM42 - L3	3	3	11	75	14°	○	○			
SM43	3	3	16	38	7°	●	●			
SM51	6.3	3	12.7	53	22°	●	●			
SM53	5	3	12.7	38	16°	○	●			
SM1	6	6	12.7	50	22°	●	○			
SM2	6	6	19	50	14°	●	○			
SM3	6	6	25	50	10°	●	○			
SM4	9.5	6	16	63	28°	●	○			
SM5	12.7	6	22	69	28°	●	○			
SM6	16	6	25	73	31°	●	○			

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 Tragen Sie immer die Schutzbrille wenn Sie die Fräser benutzen  Toujours porter les lunettes de sécurité en utilisant les limes rotatives
 Para usar las limas rotativas es obligatorio usar gafas de protección  При работе с борфрезами всегда используйте защитные очки



Item No.	D	d	l	L	α	Stock	Stock	Stock
SN41	2.5	3	3	38	10°	●	●	
SN42	3	3	4	38	10°	●	●	
SN51	6.3	3	6	44	10°	○	●	
SN53	5	3	6.3	38	10°	○	●	
SN1	6	6	8	50	10°	●	○	
SN2	9.5	6	9.5	53	13°	●	○	
SN4	12.7	6	12.7	57	28°	●	○	
SN6	16	6	19	63	18°	●	○	
SN7	19	6	16	70	30°	○	○	

MDC a richiesta · on request · auf Anfrage · sur demande · a petición · по запросу

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BUR10 M TYPE

Set 10pcs.
shank Ø6 mm
SA1 - SB1 - SC1 - SD1 - SE1
SF1 - SG1 - SL1 - SM1 - SN1



A15FW MPC TYPE

Set 15pcs.
shank Ø3 mm
SA41 - SA42 - SA43 - SA52 - SB43 - SC42 - SD41
SD42 - SD53 - SE41 - SG43 - SL42 - SM42 - SM43 - SN42

A16FW M TYPE

Set 15pcs.
shank Ø3 mm
SA41 - SA42 - SA43 - SA52 - SB43 - SC42 - SD41
SD42 - SD53 - SE41 - SG43 - SL42 - SM42 - SM43 - SN42



Always wear goggles when using the rotary burrs  Per l'uso delle lime rotative è obbligatorio indossare occhiali protettivi
 Tragen Sie immer die Schutzbrille wenn Sie die Fräser benutzen  Toujours porter les lunettes de sécurité en utilisant les limes rotatives
 Para usar las limas rotativas es obligatorio usar gafas de protección  При работе с борфрезами всегда используйте защитные очки

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MATERIAL GROUPS	AISI	W-stoff	DIN	BS	SS
1 <550 N/mm² LOW CARBON AND FREE CUTTING STEEL ACCIAI A BASSO TENORE DI CARBONIO ED AUTOMATICI KOHLENSTOFFARME STÄHLE ACIERS BAS CARBONE ET POUR DÉCOLLETAGE ACEROS DE BAJO CARBONO НИЗКОУГЛЕРОДИСТАЯ И АВТОМАТНАЯ СТАЛЬ	A570-36	1.0038	RSt 37-2	4360 40 C	1311
	A36	1.0044	St 44-2	4360 43 A	1411
	A573-81 65	1.0116	St 37-3	4360 40 B	1312
	1006	1.0201	St 36	-	1160
	A515-65	1.0345	H I	1501 161	1330
	1015	1.0401	C 15	080 M 15	1350
	1020	1.0402	C22	050 A 20	1450
	-	1.0425	H II	-	1432
	1213	1.0715	9 SMn 28	230 M 07	1912
	(12L13)	1.0718	9 SMnPb 28	-	1914
	-	1.0723	15 S 20	210 A 15	1922
	1140	1.0726	35 S 20	212 M 36	1957
	1146	1.0727	45 S 20	212 M 44	1973
	1215	1.0736	9 SMn 36	240 M 07	-
	-	1.0765	-	-	-
	1010	1.1121	Ck 10	045 M 10	1265
	-	1.1121	St 37-1	4360 40 A	1300
	1022	1.1133	GS-20Mn 5	120 M 19	1410
	1015	1.1141	Ck 15	080 M 15	1370
	1025	1.1158	Ck 25	070 M 26	1450
1018	-	-	-	-	
2 450-700 N/mm² MEDIUM CARBON STEEL ACCIAI A MEDIO TENORE DI CARBONIO MITTELGEKOHLTE FLUSSSTÄHLE ACIERS MOYEN CARBONE ACEROS DE MEDIO CARBONO СРЕДНЕУГЛЕРОДИСТАЯ СТАЛЬ	A662 C	1.0436	ASt 45	1501 224	2103
	1035	1.0501	C 35	060 A 35	1550
	1035	1.0501	C 35	080 M 36	1550
	1045	1.0503	C 45	080 M 46	1650
	1040	1.0511	C 40	080 M 40	-
	1055	1.0535	C 55	070 M 55	1655
	-	1.0570	St 52-3	4360 50 B	2132
	A738	1.0577	ASt 52	1501 224	2107
	1039	1.1157	40Mn4	150 M 36	-
	1035	1.1181	Ck 35	060 A 35	1572
	1035	1.1183	Cf 35	080 M 36	1572
	1045	1.1191	Ck 45	808 M 46	1672
	1055	1.1203	Ck55	070 M 55	-
	1050	1.1213	Cf 53	060 A 52	1674
	1045	1.1730	C45W	En 43 B	1672
	A572-60	1.8900	StE 380	4360 55 E	2145
	-	1.8905	StE 460	HP 6	-
	3 550-850 N/mm² HIGH CARBON STEEL ACCIAI AD ELEVATO TENORE DI CARBONIO KOHLENSTOFFREICHE STÄHLE ACIERS HAUT CARBONE ACEROS DE ALTO CARBONO ВЫСОКОУГЛЕРОДИСТАЯ СТАЛЬ	1060	1.0601	C60	060 A 62
1064		1.1221	Ck 60	060 A 62	1678
1070		1.1231	Ck 67	070 A 72	1770
1080		1.1248	Ck 75	060 A 78	1774
1095		1.1274	Ck 101	060 A 96	1870
-		-	-	-	-
4 600-900 N/mm² LOW ALLOY STEEL ACCIAI DEBOLMENTE LEGATI NIEDRIGLEGIERTE STÄHLE ACIERS FAIBLEMENT ALLIÉS ACEROS DEBILMENTE ALEADOS НИЗКОЛЕГИРОВАННАЯ СТАЛЬ	9255	1.0904	55 Si 7	250 A 53	2090
	1335	1.1167	36 Mn 5	150 M 36	2120
	1330	1.1170	28 Mn 6	150 M 28	-
	P4	1.2341	X6 CrMo 4	-	-
	52100	1.3505	100 Cr 6	534 A 99	2258
	A204A	1.5415	15 Mo 3	1501 240	2912
	8620	1.6523	21 NiCrMo 2	805 M 20	2506
	8740	1.6546	40NiCrMo22	311-Type 7	-
	-	1.6587	17CrNiMo6	820 A 16	-
	5132	1.7033	34 Cr 4	530 A 32	-
	5140	1.7035	41 Cr 4	530 A 40	-
	5140	1.7035	41 Cr 4	530 A 40	-
	5140	1.7045	42 Cr 4	530 A 40	2245
	5115	1.7131	16 MnCr 5	(527 M 20)	2511
	5155	1.7176	55 Cr 3	527 A 60	2253
	4130	1.7218	25 CrMo 4	1717CDS 110	2225
	4135 (4137)	1.7220	35 CrMo 4	708 A 37	2234
	4142	1.7223	41 CrMo 4	708 M 40	2244
	4140	1.7225	42 CrMo 4	708 M 40	2244
	4137	1.7225	42 CrMo 4	708 M 40	2244
	A387 12-2	1.7337	16 CrMo 4 4	1501 620	2216
	-	1.7361	32CrMo12	722 M 24	2240
	A182 F-22	1.7380	10 CrMo9 10	1501 622	2218
	6150	1.8159	50 CrV 4	735 A 50	2230
	-	1.8515	31 CrMo 12	722 M 24	2240
	-	-	-	-	-

MATERIAL GROUPS	AISI	W-stoff	DIN	BS	SS
5 700-1000 N/mm² ALLOY STEEL ACCIAI LEGATI LEGIERTE STÄHLE ACIERS ALLIÉS ACEROS ALEADOS СРЕДНЕЛЕГИРОВАННАЯ СТАЛЬ	W1	1.1545	C105W1	BW1A	1880
	L3	1.2067	100Cr6	BL 3	(2140)
	L2	1.2210	115 CrV 3	-	-
	P20 + S	1.2312	40 CrMnMoS 8 6	-	-
	-	1.2419	105WCr6	-	2140
	O1	1.2510	100 MnCrW 4	BO1	-
	S1	1.2542	45 WCrV 7	BS1	2710
	4340	1.6582	34 CrNiMo 6	817 M 40	2541
	5120	1.7147	20 MnCr 5	-	-
	-	-	-	-	-
6 900-1200 N/mm² TOOL AND HIGH ALLOY STEEL ACCIAI DA UTENSILI E ALTO LEGATI WERKZEUG- UND HOCHLEGIERTE STÄHLE ACIERS POUR OUTILS ET FORTEMENT ALLIÉS ACEROS MUY ALEADOS Y ACEROS PARA HERRAMIENTAS I ИНСТРУМЕНТАЛЬНАЯ ВЫСОКЛЕГИРОВАННАЯ СТАЛЬ	D3	1.2080	X210 Cr 12	BD3	2710
	P20	1.2311	40 CrMnMo 7	-	-
	H13	1.2344	X40CrMoV 5 1	BH13	2242
	A2	1.2363	X100 CrMoV 5 1	BA2	2260
	D2	1.2379	X155 CrMoV 12 1	BD2	2310
	D4 (D6)	1.2436	X210 CrW 12	BD6	2312
	H21	1.2581	X30WCrV9 3	BH21	-
	L6	1.2713	55NiCrMoV 6	-	-
	M 35	1.3243	S6/5/2/5	BM 35	2723
	M 2	1.3343	S6/5/2	BM2	2722
	M 7	1.3348	S2/9/2	-	2782
	HW 3	1.4718	X45CrSi 9 3	401 S 45	-
	-	1.7321	20 MoCr 4	-	2625
7 1200-1500 N/mm² (35-45HRC) HIGH TENSILE STRENGTH STEEL ACCIAI AD ELEVATA RESISTENZA HOCHFESTE STÄHLE ACIERS HAUTE RESISTANCE ACEROS DE ALTA RESISTENCIA ВЫСОКОПРОЧНЫЕ СТАЛИ	A128 (A)	1.3401	G-X120 Mn 12	BW10	2183
8 45-63HRC HARDENED STEEL ACCIAI TEMPRATI GEHÄRTETE STÄHLE ACIERS TREMPÉS ACEROS TEMPLADOS ЗАКАЛЕННАЯ СТАЛЬ	-	-	-	-	-
9 MARTENSITIC AND FERRITIC STAINLESS STEEL ACCIAI INOSSIDABILI MARTENSITICI E FERRITICI MARTENSITISCHE UND FERRITISCHE ROSTFREIE STÄHLE ACIERS INOXYDABLES MARTENSITIQUES ET FERRITIQUES ACEROS INOXIDABLES AUSTENITICOS Y FERRITICOS МАРТЕНСИТНЫЕ И ФЕРРИТНЫЕ НЕРЖАВЕЮЩИЕ СТАЛИ	420 C	1.4034	X43Cr16		
	440 B/1	1.4112	X90 Cr Mo V18		
	-	1.2083	X42 Cr 13	-	2314
	403	1.4000	X6Cr13	403 S 17	2301
	(410S)	1.4001	X7 Cr 14	(403 S17)	2301
	405	1.4002	X6 CrAl 13	405 S 17	-
	416	1.4005	X12 CrS 13	416 S 21	2380
	410	1.4006	X 10 Cr 13	410 S21	2302
	430	1.4016	X6 Cr 17	430 S 17	2320
	420	1.4021	X20 Cr 13	420 S 37	2303
	420F	1.4028	X30 Cr 13	420 S 45	(2304)
	(420)	1.4031	X39Cr13	420 S 45	(2304)
	431	1.4057	X20 CrNi 17 2	431 S 29	2321
	430F	1.4104	X12 CrMoS 17	-	2383
	434	1.4113	X6 CrMo 17	434 S 17	2325
	430Ti	1.4510	X6 CrTi 17	-	-
	409	1.4512	X5 CrTi 12	409 S 17	-
10 AUSTENITIC STAINLESS STEEL (V2A) ACCIAI INOSSIDABILI AUSTENITICI (V2A) AUSTENITISCHE ROSTFREIE STÄHLE (V2A) ACIERS INOXYDABLES AUSTENITIQUES (V2A) ACEROS INOXIDABLES AUSTENITICOS (V2A) АУСТЕНИТНЫЕ НЕРЖАВЕЮЩИЕ СТАЛИ (V2A)	304	1.4301	X5 CrNi 18 9	304 S 15	2332
	305	1.4303	X5 CrNi 18 12	305 S 19	-
	303	1.4305	X12 CrNiS 18 8	303 S 21	2346
	304L	1.4306	X2 CrNiS 18 9	304 S 12	2352
	301	1.4310	X12 CrNi 17 7	-	2331
	304	1.4350	X5 CrNi 18 9	304 S 31	2332
	304	1.4350	X5 CrNi 18 9	304 S 31	2333
	304LN	1.4311	X2 CrNiN 18 10	304 S 62	2371
11 AUSTENITIC STAINLESS STEEL (V4A) ACCIAI INOSSIDABILI AUSTENITICI (V4A) AUSTENITISCHE ROSTFREIE STÄHLE (V4A) ACIERS INOXYDABLES AUSTENITIQUES (V4A) ACEROS INOXIDABLES AUSTENITICOS (V4A) АУСТЕНИТНЫЕ НЕРЖАВЕЮЩИЕ СТАЛИ (V4A)	316	1.4401	X5 CrNiMo 18 10	316 S 16	2347
	316L	1.4404	-	316 S 12/13/14/22/24	2348
	316LN	1.4429	X2 CrNiMoN 18 13	-	2375
	316L	1.4435	X2 CrNiMo 18 12	316 S 12/13/14/22/24	2353
	316	1.4436	-	316 S 33	2343
	317L	1.4438	X2 CrNiMo 18 16	317 S 12	2367
	329	1.4460	X3 CrNiMoN 27 5 2	-	2324
	321	1.4541	X10 CrNiTi 18 9	321 S 12	2337
	347	1.4550	X10 CrNiNb 18 9	347 S 17	2338
	316Ti	1.4571	X10 CrNiMoTi 18 10	320 S 17	2350
	309	1.4828	X15 CrNiSi 20 12	309 S 24	-
	330	1.4864	X12 NiCrSi 36 16	-	-

AFNOR	U.N.E. / I.H.A.	JIS	UNI	EN	ISO	TRADE MARK
Y 105	F.5118	SK 3	C100 KU	-	-	-
Y 100 C 6	F.520 L	-	-	-	-	-
-	-	-	-	-	-	-
40 CMD 8 +S	X210CrW12	-	-	-	-	Holdax
105W C 13	F.5233	SKS 31	107WCr5KU	-	-	-
90MnWCrV5	F.5220	(SK53)	95MnWCr5KU	-	-	-
55W20	F.5241	-	45WCrV8KU	-	-	-
35 NCD 6	F.1280	SNCM 447	35NiCrMo6KB	-	-	-
20 MC 5	-	-	-	-	-	-
-	-	-	-	-	-	Weldox 700
Z200 C 12	F.5212	SKD 1	X210Cr13KU	-	-	K 100
40 CMD 8	F.5263	-	-	-	-	-
Z 40 CDV 5	F.5318	SKD 61	X40CrMoV511KU	-	-	-
Z 100 CDV 5	F.5227	SKD 12	X100CrMoV51KU	-	-	-
Z 160 CDV 12	F.520.A	SKD11	X155CrVMo121KU	-	-	K 110
Z 200 CD 12	F.5213	SKD 2	X215CrW121KU	-	-	-
Z 30 WCV 9	F.526	SKD5	X30WCrV 9 3 KU	-	-	-
55 NCDV 7	F.520.S	SKT4	-	-	-	-
6-5-2-5	F.5613	SKH 55	HS6-5-5	-	-	-
Z 85 WDCV	F.5603	SKH 51	HS6-5-2-2	-	-	-
2 9 2	-	-	HS2-9-2	-	-	-
Z 45 CS 9	F.3220	SUH1	X45CrSi8	-	-	-
-	F.1523	-	30CrMo4	-	-	-
Z 120 M 12	F.8251	SCMnH 1	GX120Mn12	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	WRB WRA
Z 40 C 14	F.5263	SUS 420 J1	-	-	-	-
Z 6 C 13	F.3110	SUS 403	X6Cr13	-	-	-
Z 8 C 13	F.3110	SUS 410 S	X6Cr13	-	-	-
Z 8 CA 12	F.3111	SUS 405	X6 CrAl 13	-	-	-
Z 11 CF 13	F.3411	SUS 416	X12CrS13	-	-	-
Z 10 C 14	F.3401	SUS 410	X12Cr13	-	-	-
Z 8 C 17	F.3113	SUS 430	X8Cr17	-	-	-
Z 20 C 13	F.3402	SUS 420 J1	X20Cr13	-	-	-
Z 30 C 13	F.3403	SUS 420 J2	X30Cr13	-	-	-
Z 40 C 14	F.3404	(SUS 420 J1)	-	-	-	-
Z 15 CNi 16.02	F.3427	SUS 431	X16CrNi16	-	-	-
Z 10 CF 17	F.3117	SUS 430 F	X10CrS17	-	-	-
Z 8 CD 17.01	-	SUS 434	X8CrMo17	-	-	-
Z 4 CT 17	-	SUS 430 LX	X6CrTi17	-	-	-
Z 6 CT 12	-	SUH 409	X6CrTi12	-	-	-
Z 6 CN 18.09	F.3551	SUS 304	X5CrNi18 10	-	-	-
Z 8 CN 18.12	-	SUS 305	X8CrNi19 10	-	-	-
Z 10 CNF 18.09	F.3508	SUS 303	X10CrNiS 18 09	-	-	-
Z 2 CN 18.10	F.3503	SUS 304L	X2CrNi18 11	-	-	-
Z 12 CN 17.07	F.3517	SUS 301	X12CrNi17 07	-	-	-
Z 6 CN 18.09	F.3551	SUS 304	X5CrNi18 10	-	-	-
Z 6 CN 18.09	F.3551	SUS 304	X5CrNi18 10	-	-	-
Z 2 CN 18.10	-	SUS 304 LN	-	-	-	-
Z 6 CND 17.11	F.3543	SUS 316	X5CrNiMo17 12	-	-	-
Z 2 CND 17.13	-	SUS316L	X2CrNiMo17 12	-	-	-
Z 2 CND 17.13	-	SUS 316 LN	-	-	-	-
Z 2 CND 17.13	-	SUS316L	X2CrNiMo17 12	-	-	-
Z 6 CND18-12-03	-	-	X8CrNiMo 17 13	-	-	-
Z 2 CND 19.15	-	SUS 317 L	X2CrNiMo18 16	-	-	-
Z5 CND 27.05.Az	F.3309	SUS 329 J1	-	-	-	-
Z 6 CND 18.10	F.3553	SUS 321	X6CrNiTi18 11	-	-	-
Z 6 CNNb 18.10	F.3552	SUS 347	X6CrNiNb18 11	-	-	-
Z 6 CNDT 17.12	F.3535	-	X6CrNiMoTi 17 12	-	-	-
Z 15 CNS 20.12	-	SUH 309	X16 CrNi 24 14	-	-	-
Z 12 NCS 35.16	-	SUH 330	-	-	-	-

MATERIAL GROUPS	AISI	W-stoff	DIN	BS	SS
12 DUPLEX	S32750	1.4410	X 2 CrNiMoN 25 7 4	-	2328
	S31500	1.4417	X 2 CrNiMoSi 19 5	-	2376
	S31803	1.4462	X 2 CrNiMoN 22 5 3	-	2377
	S32760	1.4501	X 3 CrNiMoN 25 7	-	-
	630	1.4542	X5CrNiCNb16-4	-	-
	A564/630	-	-	-	-
13 GREY CAST IRON GHISA GRIGIA GRAUGUSS FONTE GRISE FUNDICION GRIS ЧУГУН	A48-20B	0.6010	GG-10	Grade 100	0110-00
	A48-25B	0.6015	GG-15	Grade 150	0115-00
	A48-30B	0.6020	GG-20	Grade 200	0120-00
	A48-40B	0.6025	GG-25	Grade 250	0125-00
	A48-45B	0.6030	GG-30	Grade 300	0130-00
	A48-50B	0.6035	GG-35	Grade 350	0135-00
	A48-60B	0.6040	GG-40	Grade 400	0140-00
	32510	-	GTS-35	B340/12	0815-00
	A220-40010	0.8145	GTS-45	P440/7	0852-00
	A220-50005	0.8155	GTS-55-04	P510/4	0854-00
	A220-70003	0.8165	GTS-65-02	P570/3	0856-00
A220-70003	-	GTS-65	P570/3	0858	
A220-80002	0.8170	GTS-70-02	P690/2	0862-00	
14 NODULAR CAST IRON GHISA SFEROIDALE SPHÄROGUSS FONTE NODULAIRE FUNDICION NODULAR ЧУТУН С ШАРОВИДНЫМ ГРАФИТОМ	-	0.7033	GGG-35.3	350/22L40	0717-15
	60/40/18	0.7040	GGG-40	420/12	0717-02
	(60/40/18)	0.7043	GGG-40.3	370/17	0717-12
	65/45/12	0.7050	GGG-50	500/7	0727-02
	80/55/06	0.7060	GGG-60	600/3	0727-03
	100/70/03	0.7070	GGG-70	700/2	0737-01
	120/90/02	0.7080	GGG-80	800/2	-
15 WROUGHT (ROLLED) ALUMINIUM ALLUMINIO LAMINATO GEWALZTES ALUMINIUM ALUMINIUM LAMINE LAMINADO DE ALUMINIO КОВАНЫЙ АЛЮМИНИЙ	1200	3.0205	Al 99	1C	4010
	1050	3.0255	Al 99,5	1B	4007
	1350	3.0257	E-Al	E1E	-
	1070	3.0275	Al 99,7	-	-
	1080	3.0285	Al 99,8	1A	-
	1099	3.0385	AL99,98R	1	-
	3105	3.0505	AlMn0,5Mg0,5	N31	-
	3103	3.0515	AlMn1	N3	4054
	3003	3.0517	AlMn	N3	-
	3005	3.0525	AlMn1Mg0,5	-	-
	3004	3.0526	AlMn1Mg1	-	-
	6012	3.0615	AlMgSiPb	-	-
	2014	3.1255	AlCuSiMn	H15	4338
	2117	3.1305	AlCuMg0,5	L86	-
	2017	3.1325	AlCuMg 1	(H14)	-
	2024	3.1355	AlCuMg 2	DTD5090	-
	2030	3.1645	AlCuMgPb	-	4335
	2011	3.1655	AlCuBiPb	FC1	4355
	6082	3.2315	AlMgSi 1	H30	4212
	6060	3.3206	AlMgSi0,5	H9	4103/4104
	6005	3.3210	AlMgSi0,7	-	-
	6061	3.3211	AlMg1SiCu	H20	-
	5005	3.3315	AlMg1	N41	4106
	5050	3.3316	AlMg1,5	-	-
	5052	3.3523	AlMg2,5	-	4120
	5251	3.3525	AlMg2Mn0,3	N4	-
	5154	3.3535	AlMg3	N5/N56	-
5454	3.3537	AlMg2,7Mn	N51	-	
5086	3.3545	AlMg4Mn	-	-	
5083	3.3547	AlMg4,5Mn	N8	4140	
5056	3.3555	AlMg5	N6	-	
7020	3.4335	AlZn4,5Mg1	H17	4425	
7075	3.4365	AlZnMgCu1,5	2L95	-	
3304	-	AlMgMn	-	-	
7010	-	AlZn6MgCu	DTD5130	-	
16 DIE-CAST ALUMINIUM (SI<12%) ALLUMINIO PRESSOFUSO (SI<12%) AL-GUSSLEGIERUNGEN (SI<12%) ALUMINIUM MOULÉ SOUS PRESSION (SI<12%) FUNDICION DE ALUMINIO (SI<12%) ЛИТОЙ АЛЮМИНИЙ (SI<12%)	A356	3.2371	G-AlSi7Mg	LM25	4244
	-	3.2373	G-AlSi9Mg	-	-
	A360	3.2381	G-AlSi10Mg	LM9	4253
	A413.2	3.2581	G-AlSi12	LM6	4261
	A413.0	3.2582	GD-AlSi12	-	4247
	A413.1	3.2583	G-AlSi12(Cu)	LM20	4260
	-	3.3561	G-AlMg5	LM5	4252
	-	3.5101	G-MgZn4SE1Zr1	MAG5	-
	-	3.5103	MgSE3Zn2Zr1	MAG6	-
	-	3.5106	G-MgAg3SE2Zr1	MAG 12	-

AFNOR	U.N.E. / I.H.A.	JIS	UNI	EN	ISO	TRADE MARK
Z3 CND 25.06 Az	-	-	-	-	-	-
Z2 CND 18.05.03	-	-	-	-	-	-
Z 3 CND 22.05 (Az)	-	-	-	-	-	-
Z 3 CND 25.06 Az	-	-	-	-	-	ZERON 100
-	-	-	-	-	-	-
-	-	-	-	-	-	17/4 PH
-	-	FC 100	G 10	-	-	-
Ft 15 D	FG 15	FC 150	G 15	-	-	-
Ft 20 D	FG 20	FC 200	G 20	-	-	-
Ft 25 D	FG 25	FC 250	G 25	-	-	-
Ft 30 D	FG 30	FC 300	G 30	-	-	-
Ft 35 D	FG 35	FC 350	G 35	-	-	-
Ft 40 D	-	FC 40	-	-	-	-
MN 35-10	-	FCMW 330	-	-	-	-
MN 450	-	FCMP 440/490	GMN 45	-	-	-
MP 50-5	-	FCMP 490	GMN 55	-	-	-
MN 650-3	-	FCMP 590	GMN 65	-	-	-
MN 60-3	-	FCMP 540	-	-	-	-
MN 700-2	-	FCMP 690	GMN 70	-	-	-
FGS 370/17	-	-	-	-	-	-
FGS 400/12	FGE 38-17	FCD 400	GS 400-12	-	-	-
FGS 370/17	-	-	GSO 42-12	-	-	-
FGS 500/7	FGE 50-7	FCD 500	GS 500-7	-	-	-
FGS 600/3	FGE 60-2	FCD 600	GS 600-3	-	-	-
FGS 700/2	FGS 70-2	FCD 700	GS 700-2	-	-	-
FGS 800/2	-	-	GS-800/2	-	-	-
A4	L-3001	A1x3	9001/1	-	-	-
A5	L-3051	A1x1	9001/2	-	-	-
-	-	-	-	-	-	-
A7	-	-	-	-	-	-
A8	-	-	-	-	-	-
A99	-	-	-	-	-	-
-	-	-	-	-	-	-
-	L-3811	-	9003/3	-	-	-
AM1	L-3810	A2x3	9003/1	-	-	Aluman 100
AMG0,5	-	-	9003/4	-	-	-
AM1G	L-3820	-	9003/2	-	-	-
ASGPB	-	-	-	-	-	-
AU4SG	L-3130	A3x1	9002/3	-	-	Avional 660
AU2G	-	-	9002/1	-	-	Avional 050
AU4G	L-3120	A3x2	9002/2	-	-	Avional 100
AU4G1	L-3140	A3x4	9002/4	-	-	Avional 150
AU4Pb	L-3121	-	9002/8	-	-	-
AU5PbBi	L-3192	-	9002/5	-	-	Recidal 11
ASGM 0,7	L-3451	-	9006/4	-	-	Anticorodal 100
AGS	L-3441	A2x5	9006/1	-	-	Anticorodal 063
ASG0,5	L-3454	A6NO1	9006/6	-	-	-
AGSUC	L-3420	A2x4	9006/2	-	-	Anticorodal 061
AG0,6	L-3350	A2x8	9005/1	-	-	Peraluman 080
-	-	-	9005/7	-	-	Peraluman 150
AG2,5C	L-3360	A2x1	9005/2	-	-	Peraluman 250
AG2M	L-3361	-	-	-	-	-
AG3	-	-	9005/8	-	-	Peraluman 350
AG2,5MC	L-3391	A2x9	9005/3	-	-	-
AG4MC	L-3322	-	9005/4	-	-	-
AG4,5MC	L-3321	A2x7	9005/5	-	-	Peraluman 440
A-G5	-	-	-	-	-	Peraluman 500
AZ5G	L-3741	-	9007/1	-	-	-
AZ5GU	L-3710	A34x6	9007/2	-	-	Ergal 55
AM1G	-	-	-	-	-	-
-	-	-	9007/4	-	-	-
A-S7G	-	AC4C	-	42000	AlSi7Mg	-
-	-	-	-	-	-	-
A-S10G	-	-	-	43100	Al Si 10 Mg	-
A-S12U	-	AC3A	-	44100	Al Si 12	-
-	-	-	-	-	-	-
A-S12	-	-	-	47000	Al Si 12 (Cu)	-
A-SU12	-	AC4A	-	51300	ALMg 6	-
G-Z4TR	-	-	-	-	-	-
G-TR3Z2	-	-	-	-	-	-
G-Ag22,5	-	-	-	-	-	-

Material groups

Gruppi materiale
 Werkstoffegruppe
 Groupes matière
 Grupos de materiales
 Группы материалов

MATERIAL GROUPS	AISI	W-stoff	DIN	BS	SS
16 DIE-CAST ALUMINIUM (Si<12%) ALLUMINIO PRESSOFUSO (Si<12%) AL-GUSSLEGIERUNGEN (Si<12%) ALUMINIUM MOULÉ SOUS PRESSION (Si<12%) FUNDICIÓN DE ALUMINIO (Si<12%) ЛИТОЙ АЛЮМИНИЙ (Si<12%)	-	3.5812	G-MgAl8Zn1	MAG1	-
	-	3.5912	G-MgAl9Zn1	MAG7	-
	355.1	-	G-ALSi5	LM16	-
	A380	-	G-ALSi8Cu3	LM24	4250
	319	-	G-ALSi6Cu4	LM21	-
	319.2	-	G-ALSi6Cu4	LM22	-
17 COPPER RAME KUPFER CUIVRE COBRE МЕДЬ	C10200	2.0040	OF Cu	C103	-
	C11000	2.0060	E-Cu57	C101	-
	-	2.0065	E-Cu58	-	-
	C10300	2.0070	SE Cu	-	-
	C12200	2.0090	SF Cu	C106	-
	C12500	-	Cu-FRTP	C104	-
	C70320	2.0857	-	-	-
	C14200	2.1202	SB Cu	C107	-
	-	2.1356	Cu Mn 3	-	-
	-	2.1522	Cu Si2 Mn	-	-
	C16200	-	-	C108	-
	C18200	-	-	CC101	-
	C191010	-	-	-	-
	C70250	-	-	CC102	-
	C17200	-	-	CB101	-
	C17300	-	-	-	-
	C17510	-	-	-	-
	C17500	-	-	C112	-
	C15000	-	-	-	-
	C65100	-	-	-	-
C65500	-	-	CS101	-	
C14500	-	-	C109	-	
C14700	-	-	C111	-	
C18700	-	-	-	-	
18 BRASS OTTONE MESSING LAITON LATÓN ЛАТУНЬ	C21000	2.0220	CuZn5	CZ125	-
	C22000	2.0230	CuZn10	Cz101	-
	C23000	2.0240	CuZn15	CZ102	-
	C24000	2.0250	CuZn20	CZ103	-
	C25600	-	CuZn28	-	-
	C26000	2.0265	CuZn30	CZ106	-
	C26800	2.0280	CuZn33	-	-
	C27200	-	CuZn36	-	-
	C27200	2.0321	CuZn37	CZ108	-
	C27000	2.0335	CuZn36	CZ107	-
	C28000	2.0360	CuZn40	CZ109	-
	19 DIE-CAST BRASS OTTONE DA FUSIONE GUSSMESSING LAITON MOULÉ SOUS PRESSION LATÓN FUNDIDO ЛИТАЯ ЛАТУНЬ	C33500	-	CuZn37Pb0.5	-
C34000		-	CuZn35Pb1	CZ118	-
C34500		2.0331	CuZn36Pb1,5	CZ119	-
C34000		2.0331	CuZn36Pb1,5	CZ119	-
C35300		2.0371	CuZn38Pb1,5	CZ128	-
C36500		2.0372	CuZn39Pb0,5	CZ123	-
C36000		2.0375	CuZn36Pb3	CZ124	-
C37700		2.0380	CuZn39Pb2	CZ 131 / (CZ128)	-
C38500		2.0401	CuZn39Pb3	CZ121	-
C38000		2.0402	CuZn40Pb2	CZ122	-
-		2.0410	CuZn44Pb2	CZ130	-
C68700		2.0460	CuZn20Al2	CZ110	-
C44300		2.0470	CuZn28Sn1	CZ111	-
-		2.0530	CuZn38Sn1	-	-
-		2.0550	CuZn40Al2	-	-
-		2.0561	CuZn40Al1	-	-
-		2.0572	CuZn40Mn2	CZ136	-
C61400		2.0932	CuAl8Fe3	-	-
C63000	2.0966	CuAl10Ni5Fe4	CA104	-	
20 BRONZE BRONZO BRONZE BRONZE BRONCE БРОНЗА	C50700	2.1010	CuSn2	-	-
	C51100	2.1016	CuSn4	PB101	-
	C51000	-	CuSn5	PB102	-
	C51900	2.1020	CuSn6	PB103	-
	C52100	2.1030	CuSn8	PB104	-
	-	-	CuSn10	-	-
	-	-	CUSn11	-	-
-	-	CuSn12	-	-	
21 AMPCO	-	-	-	-	-
	-	-	-	-	-
	-	-	-	-	-

MATERIAL GROUPS	AISI	W-stoff	DIN	BS	SS
22 <30HRC NICKEL-BASE ALLOYS LEGHE DI NICKEL NICKELLEGIERUNGEN ALLIAGES DE NICKEL ALEACIONES DE NIQUEL СПЛАВЫ НИКЕЛЯ	N08800	1.4876	X10NiCrAlTi32-21	3075(NA15)	-
	N06075	2.4630	NiCr20Ti	HR5,203-4	-
	N07080	2.4631	NiCr20TiAl	HR401,601	-
	N06617	2.4663	-	-	-
	N06002	2.4665	NiCr22FeMo	HR6,204	-
	N06600	2.4816	-	-	-
	N06601	2.4851	NiCr23Fe	-	-
	N06625	2.4856	NiCr22Mo9Nb	-	-
	N08825	2.4858	NiCr21Mo	3072-76	-
23 >30HRC NICKEL-BASE ALLOYS LEGHE DI NICKEL NICKELLEGIERUNGEN ALLIAGES DE NICKEL ALEACIONES DE NIQUEL СПЛАВЫ НИКЕЛЯ	N10665	2.4617	NiMo28	-	-
	N10002	-	NiCr17Mo17Few	-	-
	N10003	-	-	-	-
	-	2.4642	-	-	-
	-	-	NiCo29Cr15MOAlTi	-	-
	N07718	2.4668	NiCr19Fe19NbMo	Hr8	-
	-	-	NiCr16FeTi	-	-
	N07725	-	-	-	-
	N07750	2.4669	NiCr 15 Fe 7 TiAl	HR505	-
N07751	2.4694	-	-	-	
24 HARDOX 400, STAVAX, RAMAX	-	-	-	-	-
	-	1.2365	-	-	-
	-	-	-	-	-
25 HARDOX 500	-	-	-	-	-
	-	-	-	-	-
26 TITANIUM ALLOYS LEGHE DI TITANIO TITAN-LEGIERUNGEN ALLIAGES DE TITANE ALEACIONES DE TITANIO СПЛАВЫ ТИТАНА	-	3.7025	Ti 99,8	-	-
	-	3.7035	Ti 99,7a	-	-
	-	3.7055	Ti 99,6	-	-
	-	3.7065	Ti 99,5	-	-
	-	3.7115	TiAl5Sn2.5	TA14/17	-
	-	3.7164	TiAl6V4	TA10-13/TA29	-
	-	3.7175	TiAl6V6Sn2	-	-
	-	3.7185	TiAl4Mo4Sn2	-	-

AFNOR	U.N.E. / I.H.A.	JIS	UNI	EN	ISO	TRADE MARK
-	-	-	-	-	-	Incoloy 800
NC20T	-	-	-	-	-	Nimonic 75
NC20TA	-	-	-	-	-	Nimonic 80A
-	-	-	-	-	-	Inconel 617
NC22FeD	-	-	-	-	-	Hastelloy X
NC15Fe	-	-	-	-	-	Inconel 600
-	-	-	-	-	-	Inconel 601
NC22DNb	-	-	-	-	-	Inconel 625
NC21FeDU	-	-	-	-	-	Incoloy 825
-	-	-	-	-	-	Hastelloy B
NC17DWY	-	-	-	-	-	Hastelloy C
-	-	-	-	-	-	Hastelloy N
-	-	-	-	-	-	Inconel 690
NK27CADT	-	-	-	-	-	Inconel 700
Nc19FeNb	-	-	-	-	-	Inconel 718
Nc16FeTi	-	-	-	-	-	Inconel 722
-	-	-	-	-	-	Inconel 725
NC19FeNB	-	-	-	-	-	Inconel 750-X
-	-	-	-	-	-	Inconel 751
-	-	-	-	-	-	Hardox 400
-	-	-	-	-	-	Ramax
-	-	-	-	-	-	Stavax
-	-	-	-	-	-	Hardox 500
TA 1	-	-	-	-	-	-
TA 2-5	-	-	-	-	-	-
-	-	-	-	-	-	-
TA 6	-	-	-	-	-	-
-A6V	-	-	-	-	-	-
T-A5E	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

All the trademarks or tradenames mentioned belong to their respective owners.

1 <550 N/mm²

- LOW CARBON AND FREE CUTTING STEEL
- ACCIAI A BASSO TENORE DI CARBONIO ED AUTOMATICI
- KOHLENSTOFFARME STÄHLE
- ACIERS BAS CARBONE ET POUR DÉCOLLETAGE
- ACEROS DE BAJO CARBONO
- НИЗКОУГЛЕРОДИСТАЯ И АВТОМАТНАЯ СТАЛЬ

2 450-700 N/mm²

- MEDIUM CARBON STEEL
- ACCIAI A MEDIO TENORE DI CARBONIO
- MITTELGEKOHLTE FLUSSSTÄHLE
- ACIERS MOYEN CARBONE
- ACEROS DE MEDIO CARBONO
- СРЕДНЕУГЛЕРОДИСТАЯ СТАЛЬ

3 550-850 N/mm²

- HIGH CARBON STEEL
- ACCIAI AD ELEVATO TENORE DI CARBONIO
- KOHLENSTOFFFREICHE STÄHLE
- ACIERS HAUT CARBONE
- ACEROS DE ALTO CARBONO
- ВЫСОКОУГЛЕРОДИСТАЯ СТАЛЬ

4 600-900 N/mm²

- LOW ALLOY STEEL
- ACCIAI DEBOLMENTE LEGATI
- NIEDRIGLEGIERTE STÄHLE
- ACIERS FAIBLEMENT ALLIÉS
- ACEROS DEBILMENTE ALEADOS
- НИЗКОЛЕГИРОВАННАЯ СТАЛЬ

5 700-1000 N/mm²

- ALLOY STEEL
- ACCIAI LEGATI
- LEGIERTE STÄHLE
- ACIERS ALLIÉS
- ACEROS ALEADOS
- СРЕДНЕЛЕГИРОВАННАЯ СТАЛЬ

6 900-1200 N/mm²

- TOOL AND HIGH ALLOY STEEL
- ACCIAI DA UTENSILI E ALTO LEGATI
- WERKZEUG- UND HOCHLEGIERTE STÄHLE
- ACIERS POUR OUTILS ET FORTEMENT ALLIÉS
- ACEROS MUY ALEADOS Y ACEROS PARA HERRAMIENTAS
- ИНСТРУМЕНТАЛЬНАЯ ВЫСОКОЛЕГИРОВАННАЯ СТАЛЬ

7 1200-1500 N/mm² (35-45HRC)

- HIGH TENSILE STRENGTH STEEL
- ACCIAI AD ELEVATA RESISTENZA
- HOCHFESTE STÄHLE
- ACIERS HAUTE RÉSIDENCE
- ACEROS DE ALTA RESISTENCIA
- ВЫСОКОПРОЧНЫЕ СТАЛИ

8 45-63HRC

- HARDENED STEEL
- ACCIAI TEMPRATI
- GEHÄRTETE STÄHLE
- ACIERS TREMPÉS
- ACEROS TEMPLADOS
- ЗАКАЛЁННАЯ СТАЛЬ

9

- MARTENSITIC AND FERRITIC STAINLESS STEEL
- ACCIAI INOSSIDABILI MARTENSITICI E FERRITICI
- MARTENSITISCHE UND FERRITISCHE ROSTFREIE STÄHLE
- ACIERS INOXYDABLES MARTENSITIQUES ET FERRITIQUES
- ACEROS INOXIDABLES AUSTENITICOS Y FERRITICOS
- МАРТЕНСИТНЫЕ И ФЕРРИТНЫЕ НЕРЖАВЕЮЩИЕ СТАЛИ

10

- AUSTENITIC STAINLESS STEEL (V2A)
- ACCIAI INOSSIDABILI AUSTENITICI (V2A)
- AUSTENITISCHE ROSTFREIE STÄHLE (V2A)
- ACIERS INOXYDABLES AUSTENITIQUES (V2A)
- ACEROS INOXIDABLES AUSTENITICOS (V2A)
- АУСТЕНИТНЫЕ НЕРЖАВЕЮЩИЕ СТАЛИ (V2A)

11

- AUSTENITIC STAINLESS STEEL (V4A)
- ACCIAI INOSSIDABILI AUSTENITICI (V4A)
- AUSTENITISCHE ROSTFREIE STÄHLE (V4A)
- ACIERS INOXYDABLES AUSTENITIQUES (V4A)
- ACEROS INOXIDABLES AUSTENITICOS (V4A)
- АУСТЕНИТНЫЕ НЕРЖАВЕЮЩИЕ СТАЛИ (V4A)

12

DUPLEX

13

- GREY CAST IRON
- GHISA GRIGIA
- GRAUGUSS
- FONTE GRISE
- FUNDICION GRIS
- ЧУГУН

14

- NODULAR CAST IRON
- GHISA SFEROIDALE
- SPHÄROGUSS
- FONTE NODULAIRE
- FUNDICION NODULAR
- ЧУГУН С ШАРОВИДНЫМ ГРАФИТОМ

15

- WROUGHT (ROLLED) ALUMINIUM
- ALLUMINIO LAMINATO
- GEWALZTES ALUMINIUM
- ALUMINIUM LAMINÉ
- LAMINADO DE ALUMINIO
- КОВАНЫЙ АЛЮМИНИЙ

16

- DIE-CAST ALUMINIUM (SI<12%)
- ALLUMINIO PRESSOFUSO (SI<12%)
- AL-GUSSLEGIERUNGEN (SI<12%)
- ALUMINIUM MOULÉ SOUS PRESSION (SI<12%)
- FUNDICIÓN DE ALUMINIO
- ЛИТОЙ АЛЮМИНИЙ

17

- COPPER
- RAME
- KUPFER
- CUIVRE
- COBRE
- МЕДЬ

18

- BRASS
- OTTONE
- MESSING
- LAITON
- LATÓN
- ЛАТУНЬ

19

- DIE-CAST BRASS
- OTTONE DA FUSIONE
- GUSSMESSING
- LAITON MOULÉ SOUS PRESSION
- LATÓN FUNDIDO
- ЛИТАЯ ЛАТУНЬ

20

- BRONZE
- BRONZO
- BRONZE
- BRONZE
- BRONCE
- БРОНЗА

22 <35HRC

- NICKEL-BASE ALLOYS
- LEGHE DI NICKEL
- NICKELLEGIERUNGEN
- ALLIAGES DE NICKEL
- ALEACIONES DE NIQUEL
- СПЛАВЫ НИКЕЛЯ

23 >35HRC

- NICKEL-BASE ALLOYS
- LEGHE DI NICKEL
- NICKELLEGIERUNGEN
- ALLIAGES DE NICKEL
- ALEACIONES DE NIQUEL
- СПЛАВЫ НИКЕЛЯ

26

- TITANIUM ALLOYS
- LEGHE DI TITANIO
- TITAN-LEGIERUNGEN
- ALLIAGES DE TITANE
- ALEACIONES DE TITANIO
- СПЛАВЫ ТИТАНА

<p>$V_c \text{ (m/min)} = \frac{\pi \times D \times n}{1000}$</p> <ul style="list-style-type: none"> SPEED VELOCITÀ GESCHWINDIGKEIT VITESSE VELOCIDAD СКОРОСТЬ <p>$V_f \text{ (mm/min)} = n \times Z_n \times f_z$</p> <ul style="list-style-type: none"> FEED AVANZAMENTO VORSCHUB AVANCE AVANCE ПОДАЧА <p>f_z</p> <ul style="list-style-type: none"> FEED PER TOOTH AVANZAMENTO-DENTE VORSCHUB (mm/SCHNEIDEN) AVANCE (mm/DENT) AVANCE POR DIENTE ПОДАЧА НА ЗУБ 	<p>$n \text{ (rev/min)} = \frac{1000 \times V_c}{\pi \times D}$</p> <ul style="list-style-type: none"> REVOLUTIONS PER MINUTE NR DI GIRI AL MINUTO U/MIN UMDREHUNGEN PRO MINUTE TOURS PAR MINUTE REVOLUCIONES POR MINUTO ОБОРОТЫ ЗА МИНУТУ <p>Z_n</p> <ul style="list-style-type: none"> NUMBER OF TEETH NUMERO TAGLIENTI SCHNEIDENANZAHL NUMÉRO DE DENTS NÚMERO DE DIENTES КОЛИЧЕСТВО ЗУБЬЕВ <p>$f_n \text{ (mm/rev)} = Z_n \times f_z$</p> <ul style="list-style-type: none"> FEED (mm/rev) AVANZAMENTO (mm/giro) VORSCHUB (mm/Umdrehungen) AVANCE (mm/tour) AVANCE (mm/revolución) ПОДАЧА(ММ/ОБОРОТ) 	<p>D</p> <ul style="list-style-type: none"> DIAMETER DIAMETRO DURCHMESSER DIAMÈTRE DIÁMETRO ДИАМЕТР <p>$\pi = 3,14$</p>
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APPLICATION APPLICAZIONE ANWENDUNG APPLICATION APLICACIÓN ПРИМЕНЕНИЕ		
<p>C</p>	<ul style="list-style-type: none"> copying copiatura kopierfräsen 	<ul style="list-style-type: none"> copiage copiado фрезерование методом копирования
<p>R</p>	<ul style="list-style-type: none"> rib processing nervature kleine Rippen 	<ul style="list-style-type: none"> réalisation de nervures nervadura жилкование
<p>S</p>	<ul style="list-style-type: none"> slotting scanalatura nutfräsen 	<ul style="list-style-type: none"> rainurage ranurado прорезание пазов
<p>SM</p>	<ul style="list-style-type: none"> shouldering spallamento konturfräsen 	<ul style="list-style-type: none"> épaulement contorneado обработка уступов

TYPHOON DRILLS - CUTTING SPEED TABLE

MATERIAL GROUPS	ISO	N/mm ²	3XD			5XD					8XD	8XD MINI	12XD MINI			
			343TA*	353TA	353HTA	353SUH	353ALH	353HRC	355TA	355HTA	355SUH**	355ALH	355HRC	3584HTA	358SUH	3512SUH
			Vc (m/min)													
1 2 3 4	P	~700	80~100	90~110	80~120	90~130			70~100	80~110	80~120			70~90	70~90	50~70
3 4 5		700~1000		75~95	85~105	75~115			75~95	75~105	75~105			65~105	65~105	45~65
6		1000~1300		70~90	80~100	70~110			70~90	70~100	70~100			60~80	60~80	40~60
7		40~45HRC		15~25	15~25	15~25			10~20	10~20	10~20			10~15	10~20	10~15
8		45~50HRC							15~25					10~20		
8	H	50~55HRC						10~16					8~13			
8		55~62HRC						8~14					7~12			
9 10				25~50		30~60			20~40		25~55			20~40	20~40	15~35
11	M			20~45		25~55			15~35		20~50			20~40	20~40	15~35
12				20~45		25~55			15~35		20~50			20~40	20~40	15~35
13		K			70~110	80~120	90~130			60~100	70~110	80~120			40~90	40~90
14				60~100	70~110	80~120			50~90	60~100	70~110			30~80	30~80	20~60
15	N		200~270				220~290		180~250			200~250		150~220	150~220	120~180
16			180~250				200~270		160~230			180~230		130~200	130~200	100~160
22	S	<35HRC		20~40	25~45	30~50			20~35	20~40	25~45			15~30	15~30	10~25
23		>35HRC		10~30	15~35	20~40			10~25	10~30	15~35			10~25	10~25	10~20
26				20~40	25~45	30~50			20~35	20~40	25~45			15~30	15~30	15~25

*318N: Vc -30%

**355SU: Vc -10%

TYPHOON DRILLS - FEED TABLE
MINI 355SUH* - 358SUH - 3512SUH

MATERIAL GROUPS	ISO	N/mm ²	Ø	1-1.5	1.6-2	2.1-2.5	2.6-2.9			
				fn (mm/rev)						
1 2 3 4	P	~700	355SUH*	0.062~0.070	0.072~0.079	0.080~0.088	0.090~0.094			
			358SUH	0.036~0.043	0.045~0.050	0.052~0.058	0.059~0.064			
			3512SUH	0.027~0.032	0.034~0.038	0.039~0.044	0.044~0.048			
3 4 5		700~1000	355SUH*	0.048~0.058	0.060~0.067	0.069~0.077	0.079~0.084			
			358SUH	0.036~0.043	0.045~0.050	0.052~0.058	0.059~0.064			
	3512SUH		0.027~0.032	0.034~0.038	0.039~0.044	0.044~0.048				
6	1000~1300	355SUH*	0.037~0.044	0.045~0.051	0.052~0.058	0.059~0.064				
		358SUH	0.030~0.035	0.036~0.039	0.040~0.044	0.045~0.047				
		3512SUH	0.023~0.026	0.027~0.029	0.030~0.033	0.034~0.035				
7	40~45HRC	355SUH*	0.013~0.015	0.015~0.017	0.017~0.019	0.019~0.020				
		358SUH	0.012~0.014	0.014~0.016	0.016~0.017	0.017~0.019				
		3512SUH	0.009~0.011	0.011~0.012	0.012~0.013	0.013~0.014				
9 10	M		355SUH*	0.043~0.048	0.050~0.054	0.055~0.061	0.062~0.065			
			358SUH	0.038~0.043	0.045~0.049	0.050~0.054	0.055~0.058			
			3512SUH	0.029~0.032	0.034~0.037	0.037~0.041	0.041~0.044			
11			355SUH*	0.043~0.048	0.050~0.054	0.055~0.061	0.062~0.065			
			358SUH	0.038~0.043	0.045~0.049	0.050~0.054	0.055~0.058			
	3512SUH		0.029~0.032	0.034~0.037	0.037~0.041	0.041~0.044				
12		355SUH*	0.029~0.035	0.036~0.039	0.041~0.045	0.046~0.049				
		358SUH	0.026~0.031	0.032~0.035	0.037~0.040	0.041~0.044				
		3512SUH	0.020~0.023	0.024~0.026	0.028~0.030	0.031~0.033				
13	K		355SUH*	0.048~0.059	0.062~0.070	0.071~0.080	0.082~0.088			
			358SUH	0.030~0.038	0.039~0.046	0.047~0.054	0.054~0.059			
			3512SUH	0.023~0.028	0.029~0.034	0.035~0.040	0.041~0.044			
14			355SUH*	0.046~0.056	0.058~0.066	0.068~0.076	0.078~0.084			
			358SUH	0.029~0.036	0.038~0.043	0.045~0.050	0.052~0.056			
	3512SUH		0.022~0.027	0.028~0.032	0.034~0.038	0.039~0.042				
15	N		355SUH*	0.074~0.087	0.089~0.099	0.101~0.111	0.113~0.121			
			358SUH	0.062~0.073	0.074~0.082	0.085~0.093	0.095~0.102			
			3512SUH	0.047~0.055	0.056~0.062	0.064~0.070	0.071~0.076			
16			355SUH*	0.071~0.084	0.087~0.098	0.100~0.111	0.115~0.122			
			358SUH	0.057~0.069	0.071~0.081	0.083~0.094	0.096~0.103			
	3512SUH		0.043~0.052	0.053~0.061	0.062~0.070	0.072~0.077				
22	S	<35HRC	355SUH*	0.025~0.029	0.029~0.033	0.034~0.037	0.038~0.040			
			358SUH	0.017~0.021	0.021~0.024	0.025~0.027	0.028~0.030			
			3512SUH	0.013~0.016	0.016~0.018	0.019~0.020	0.021~0.022			
23		>35HRC	355SUH*	0.019~0.023	0.024~0.028	0.029~0.032	0.032~0.035			
			358SUH	0.014~0.017	0.018~0.020	0.021~0.023	0.024~0.026			
	3512SUH		0.010~0.013	0.013~0.015	0.016~0.017	0.018~0.020				
26		355SUH*	0.031~0.036	0.037~0.041	0.042~0.046	0.047~0.050				
		358SUH	0.026~0.030	0.031~0.034	0.035~0.039	0.040~0.042				
		3512SUH	0.020~0.023	0.023~0.026	0.026~0.029	0.030~0.032				

*355SU: fn -10% ~ -20%

3XD			TYPHOON DRILLS - FEED TABLE 343TA - 353TA - 353HTA - 353SUH - 353ALH - 353HRC								
MATERIAL GROUPS	ISO	N/mm ²	Ø	3-4	4-6	6-8	8-10	10-12	12-14	14-17	17-20
				fn (mm/rev)							
1 2 3 4	P	~700	343TA	0.082~0.101	0.101~0.138	0.138~0.176	0.176~0.213	0.213~0.250	0.250~0.288	0.288~0.344	0.344~0.400
			353TA	0.086~0.106	0.106~0.145	0.145~0.185	0.185~0.224	0.224~0.263	0.263~0.302	0.302~0.361	0.361~0.420
			353HTA	0.108~0.128	0.128~0.167	0.167~0.206	0.206~0.246	0.246~0.285	0.285~0.323	0.323~0.382	0.382~0.441
			353SUH	0.113~0.134	0.134~0.175	0.175~0.216	0.216~0.257	0.257~0.298	0.298~0.339	0.339~0.400	0.400~0.462
3 4 5	P	700-1000	353TA	0.082~0.101	0.101~0.138	0.145~0.185	0.185~0.224	0.224~0.263	0.263~0.302	0.302~0.361	0.361~0.420
			353HTA	0.096~0.117	0.117~0.159	0.167~0.206	0.206~0.246	0.246~0.285	0.285~0.323	0.323~0.382	0.382~0.441
			353SUH	0.101~0.123	0.123~0.167	0.175~0.216	0.216~0.257	0.257~0.298	0.298~0.339	0.339~0.400	0.400~0.462
6	P	1000-1300	353TA	0.069~0.083	0.083~0.110	0.110~0.137	0.137~0.164	0.164~0.191	0.191~0.219	0.219~0.259	0.259~0.300
			353HTA	0.073~0.087	0.087~0.116	0.116~0.144	0.144~0.173	0.173~0.201	0.201~0.230	0.230~0.272	0.272~0.315
			353SUH	0.077~0.091	0.091~0.122	0.122~0.151	0.151~0.182	0.182~0.211	0.211~0.242	0.242~0.286	0.286~0.331
7	P	40-45HRC	353TA	0.024~0.029	0.029~0.038	0.038~0.047	0.047~0.055	0.055~0.064	0.064~0.073	0.073~0.087	0.087~0.100
			353HTA	0.026~0.032	0.032~0.042	0.042~0.052	0.052~0.061	0.061~0.070	0.070~0.080	0.080~0.096	0.096~0.110
			353SUH	0.024~0.029	0.029~0.038	0.038~0.047	0.047~0.055	0.055~0.064	0.064~0.073	0.073~0.087	0.087~0.100
8	H	45-50HRC	353HRC	0.024~0.050	0.030~0.080	0.050~0.100	0.060~0.120	0.080~0.140	0.100~0.150	0.120~0.160	0.140~0.180
		50-55HRC	353HRC	0.022~0.025	0.025~0.032	0.032~0.039	0.039~0.046	0.046~0.053	0.053~0.059	0.059~0.070	0.070~0.080
		55-62HRC	353HRC	0.018~0.021	0.021~0.027	0.027~0.033	0.033~0.039	0.039~0.045	0.045~0.052	0.052~0.061	0.061~0.070
9 10	M		353TA	0.074~0.088	0.088~0.114	0.114~0.141	0.141~0.167	0.167~0.194	0.194~0.220	0.220~0.260	0.260~0.300
			353SUH	0.078~0.092	0.092~0.120	0.120~0.148	0.148~0.175	0.175~0.204	0.204~0.231	0.231~0.273	0.273~0.315
11	M		353TA	0.074~0.088	0.088~0.114	0.114~0.141	0.141~0.167	0.167~0.194	0.194~0.220	0.220~0.260	0.260~0.300
			353SUH	0.078~0.092	0.092~0.120	0.120~0.148	0.148~0.175	0.175~0.204	0.204~0.231	0.231~0.273	0.273~0.315
12	M		353TA	0.056~0.067	0.067~0.090	0.090~0.113	0.113~0.136	0.136~0.159	0.159~0.181	0.181~0.216	0.216~0.250
			353SUH	0.059~0.070	0.070~0.095	0.095~0.119	0.119~0.143	0.143~0.167	0.167~0.190	0.190~0.227	0.227~0.263
13	K		353TA	0.076~0.095	0.095~0.133	0.133~0.171	0.171~0.209	0.209~0.248	0.248~0.286	0.286~0.343	0.343~0.400
			353HTA	0.101~0.125	0.125~0.172	0.172~0.219	0.219~0.266	0.266~0.312	0.312~0.359	0.359~0.430	0.430~0.500
			353SUH	0.106~0.131	0.131~0.181	0.181~0.230	0.230~0.279	0.279~0.328	0.328~0.377	0.377~0.452	0.452~0.525
14	K		353TA	0.072~0.090	0.090~0.127	0.127~0.163	0.163~0.199	0.199~0.235	0.235~0.271	0.271~0.326	0.326~0.380
			353HTA	0.096~0.119	0.119~0.163	0.163~0.208	0.208~0.252	0.252~0.297	0.297~0.341	0.341~0.408	0.408~0.475
			353SUH	0.101~0.125	0.125~0.171	0.171~0.218	0.218~0.265	0.265~0.312	0.312~0.358	0.358~0.428	0.428~0.499
15	N		343TA	0.129~0.155	0.155~0.207	0.207~0.259	0.259~0.311	0.311~0.363	0.363~0.414	0.414~0.492	0.492~0.570
			353ALH	0.152~0.182	0.182~0.242	0.242~0.301	0.301~0.361	0.361~0.422	0.422~0.482	0.482~0.571	0.571~0.662
16	N		343TA	0.132~0.162	0.162~0.223	0.223~0.284	0.284~0.345	0.345~0.406	0.406~0.467	0.467~0.559	0.559~0.650
			353ALH	0.155~0.189	0.189~0.257	0.257~0.326	0.326~0.394	0.394~0.462	0.462~0.530	0.530~0.633	0.633~0.735
22	S	<35HRC	353TA	0.038~0.046	0.046~0.063	0.063~0.080	0.080~0.097	0.097~0.113	0.113~0.130	0.130~0.155	0.155~0.180
			353HTA	0.046~0.055	0.055~0.073	0.073~0.091	0.091~0.110	0.110~0.128	0.128~0.146	0.146~0.173	0.173~0.200
			353SUH	0.048~0.058	0.058~0.077	0.077~0.096	0.096~0.116	0.116~0.134	0.134~0.153	0.153~0.182	0.182~0.210
23	S	>35HRC	353TA	0.034~0.042	0.042~0.060	0.060~0.077	0.077~0.094	0.094~0.111	0.111~0.128	0.128~0.154	0.154~0.180
			353HTA	0.040~0.050	0.050~0.068	0.068~0.087	0.087~0.106	0.106~0.125	0.125~0.144	0.144~0.172	0.172~0.200
			353SUH	0.042~0.053	0.053~0.071	0.071~0.091	0.091~0.111	0.111~0.131	0.131~0.151	0.151~0.181	0.181~0.210
26	S		353TA	0.054~0.064	0.064~0.085	0.085~0.106	0.106~0.126	0.126~0.147	0.147~0.168	0.168~0.199	0.199~0.230
			353HTA	0.057~0.069	0.069~0.091	0.091~0.114	0.114~0.137	0.137~0.159	0.159~0.182	0.182~0.216	0.216~0.250
			353SUH	0.060~0.072	0.072~0.096	0.096~0.120	0.120~0.144	0.144~0.167	0.167~0.191	0.191~0.227	0.227~0.263

5XD	Ø	3-4	4-6	6-8	8-10	10-12	12-14	14-17	17-20
		fn (mm/rev)							
5XD	355TA	fn (mm/rev) = fn 353TA (3XD) x 0,85							
	355HTA	fn (mm/rev) = fn 353HTA (3XD) x 0,85							
	355SUH	fn (mm/rev) = fn 353SUH (3XD) x 0,85							
	355HRC	fn (mm/rev) = fn 353HRC (3XD) x 0,85							
8XD	3584HTA	fn (mm/rev) = fn 353HTA (3XD) x 0,8							

C-SD-TA													
MATERIAL GROUPS	1 2 3		5 6		7 6		9 10		11		13 14		
HRC													
N/mm ²	~950		950~1100		1100~1300								
Vc [m/min]	80~110		60~70		30~45		30~55		30~50		50~110		
Ø mm.	n	fn	n	fn	n	fn	n	fn	n	fn	n	fn	
6	5100	0.140	3450	0.110	2050	0.070	1750	0.110	2150	0.090	4250	0.180	
8	3780	0.180	2600	0.140	1500	0.080	1320	0.130	1600	0.110	3200	0.230	
10	3050	0.220	2100	0.160	1200	0.100	1050	0.160	1280	0.140	2550	0.280	
12	2550	0.260	1750	0.180	1000	0.110	880	0.180	170	0.160	2130	0.320	
16	1900	0.330	1300	0.220	760	0.140	660	0.210	800	0.210	1600	0.410	
20	1520	0.400	1050	0.250	610	0.160	530	0.250	640	0.250	1280	0.500	

C-SD-TA													
MATERIAL GROUPS	15		16		18		22		23		26		
HRC									<35HRC		>35HRC		
N/mm ²													
Vc [m/min]	120~230		180~250		120~160		20~37		20~30		40~45		
Ø mm.	n	fn	n	fn	n	fn	n	fn	n	fn	n	fn	
6	9560	0.230	11700	0.220	7450	0.170	1600	0.070	1325	0.060	2280	0.090	
8	7180	0.290	8800	0.280	5580	0.220	1200	0.090	1000	0.070	1720	0.110	
10	5750	0.340	7050	0.330	4460	0.260	960	0.100	800	0.090	1370	0.140	
12	4800	0.390	5850	0.380	3720	0.300	800	0.120	670	0.100	1140	0.160	
16	3600	0.480	4400	0.480	2800	0.380	600	0.150	500	0.130	860	0.200	
20	2900	0.570	3500	0.570	2250	0.450	480	0.180	400	0.150	690	0.230	

218LFTA														
MATERIAL GROUPS	1 2 3		3 4		5 6		9 10		13 14		15 16 18 19 20			17
HRC	~22		22~27		27~35									
N/mm ²	500~800		800~900		900~1100									
Vc [m/min]	40~45		30~40		25~30		18~22		30~40		65~75			45~55
Ø mm.	n	fn	n	fn	n	fn	n	fn	n	fn	n	fn	n	fn
2	6850	0.080	5600	0.060	4500	0.050	3200	0.040	5600	0.070	11150	0.080	8000	0.070
5	2750	0.200	2250	0.160	1800	0.130	1300	0.100	2250	0.180	4500	0.200	3200	0.180
8	1700	0.280	1400	0.220	1100	0.180	800	0.140	1400	0.250	2800	0.280	2000	0.250
12	1150	0.400	930	0.310	750	0.250	530	0.200	930	0.360	1850	0.400	1330	0.360
16	850	0.500	700	0.400	560	0.310	400	0.250	700	0.450	1400	0.500	1000	0.450
20	690	0.560	560	0.450	450	0.350	320	0.280	560	0.500	1120	0.560	800	0.500

238LFTA														
MATERIAL GROUPS	1 2 3		3 4		5 6		9 10		13 14		15 16 18 19 20			17
HRC	~22		22~27		27~35									
N/mm ²	500~800		800~900		900~1100									
Vc [m/min]	30~35		25~30		20~25		15~18		25~30		50~60		35~45	
Ø mm.	n	fn	n	fn	n	fn	n	fn	n	fn	n	fn	n	fn
2	5500	0.067	4500	0.050	3600	0.042	2560	0.033	4500	0.060	8900	0.067	6400	0.058
5	2200	0.170	1800	0.130	1450	0.110	1040	0.084	1800	0.150	3600	0.170	2560	0.150
8	1350	0.240	1120	0.180	880	0.150	640	0.120	1120	0.210	2250	0.240	1600	0.210
12	920	0.340	750	0.260	600	0.210	430	0.170	750	0.300	1480	0.340	1070	0.300
16	680	0.420	560	0.330	450	0.260	320	0.210	560	0.380	1120	0.420	800	0.380
20	550	0.470	450	0.380	360	0.300	260	0.240	450	0.420	900	0.470	640	0.420

980SUTA - 990SUTA*														
MATERIAL GROUPS	1 2		9		10		15 16 18 19 20			17		22		26
HRC	~600													
N/mm ²														
Vc [m/min]	35~45		18~22		16~20		70~90		30~40		8~10		13~15	
Ø mm.	n	fn	n	fn	n	fn	n	fn	n	fn	n	fn	n	fn
2	6300	0.080	3100	0.070	2600	0.070	11000	0.090	5600	0.060	1250	0.03	2080	0.06
3	4200	0.130	2100	0.080	1800	0.080	7000	0.130	3800	0.080	850	0.05	1440	0.06
4	3200	0.140	1600	0.100	1300	0.100	7100	0.180	2800	0.100	630	0.06	1040	0.08
5	2500	0.160	1250	0.150	1100	0.140	5500	0.220	2300	0.130	500	0.08	840	0.11
6	2100	0.180	1100	0.180	900	0.170	4600	0.260	1900	0.150	430	0.09	720	0.14
8	1550	0.220	800	0.240	650	0.220	3500	0.340	1400	0.200	320	0.12	520	0.18
10	1250	0.260	650	0.300	550	0.260	2800	0.400	1100	0.250	260	0.15	440	0.21
12	1100	0.320	550	0.360	450	0.330	2300	0.500	950	0.300	210	0.18	360	0.26
14	900	0.360	450	0.440	400	0.360	2100	0.550	800	0.330	193	0.22	320	0.29
16	800	0.400	400	0.480	350	0.400	1800	0.620	700	0.350	178	0.24	280	0.32
18	700	0.450	350	0.500	300	0.430	1600	0.700	620	0.400	167	0.26	240	0.34
20	620	0.470	320	0.530	260	0.460	1500	0.750	560	0.400	159	0.28	208	0.37

*fn = -10%~15%

118N - 218NVA* - 138N - 238NVA - 234NVA* - 145N - 245N - 138NTI** - 145NTI

MATERIAL GROUPS	1 2		2 3 4		4 5		5 6		6		9		26	
HRC	~570		570~830		830~950		830~1110		1110~1260					
N/mm ²	~570		570~830		830~950		830~1110		1110~1260					
Vc [m/min]	24~28		18~22		14~18		16~20		10~12		18~22		10~12	
Ø mm.	n	fn	n	fn	n	fn	n	fn	n	fn	n	fn	n	fn
2	4250	0.025	3200	0.025	2400	0.015	3000	0.020	1750	0.015	3200	0.025	1750	0.020
2.5	3400	0.025	2600	0.025	1900	0.015	2400	0.020	1400	0.015	2600	0.025	1400	0.020
3	2700	0.050	2000	0.050	1500	0.025	1900	0.050	1100	0.020	2000	0.050	1100	0.025
4	2200	0.060	1650	0.060	1250	0.030	1600	0.060	900	0.020	1700	0.060	900	0.030
5	1700	0.065	1300	0.065	950	0.038	1200	0.063	700	0.025	1300	0.063	700	0.038
6	1500	0.090	1100	0.090	850	0.050	1100	0.090	600	0.030	1100	0.090	600	0.050
7	1250	0.110	950	0.110	700	0.060	900	0.110	520	0.030	950	0.110	520	0.060
8	1100	0.130	780	0.130	600	0.076	750	0.130	430	0.038	780	0.130	430	0.076
9	950	0.140	710	0.140	540	0.080	860	0.150	390	0.040	710	0.140	430	0.080
10	850	0.140	650	0.140	460	0.080	590	0.160	350	0.050	650	0.140	430	0.080
11	750	0.150	550	0.150	430	0.076	520	0.180	300	0.050	550	0.150	430	0.080
12	710	0.160	530	0.160	410	0.080	500	0.190	290	0.050	530	0.160	400	0.080
13	680	0.170	510	0.170	390	0.090	470	0.190	280	0.050	510	0.170	370	0.090
14	640	0.180	480	0.180	350	0.110	440	0.200	260	0.050	480	0.180	340	0.100
16	590	0.190	440	0.190	320	0.110	410	0.210	240	0.050	440	0.190	300	0.100
18	550	0.200	410	0.200	280	0.120	350	0.210	210	0.050	410	0.200	270	0.110
19	450	0.230	330	0.230	270	0.130	300	0.230	180	0.050	330	0.230	200	0.130
20	430	0.230	320	0.230	250	0.130	290	0.230	170	0.060	320	0.230	180	0.130
22	400	0.240	300	0.240	230	0.140	270	0.230	160	0.060	300	0.240	170	0.140
24	370	0.250	280	0.250	220	0.150	260	0.240	150	0.060	280	0.250	150	0.150
26	350	0.260	260	0.260	200	0.160	240	0.240	140	0.070	260	0.260	140	0.160
28	320	0.260	240	0.260	180	0.160	220	0.240	130	0.070	240	0.260	130	0.160
30	290	0.270	220	0.270	160	0.170	200	0.250	120	0.080	220	0.270	120	0.170
32	250	0.280	200	0.280	150	0.180	180	0.250	110	0.080	200	0.280	110	0.180
35	250	0.320	190	0.320	140	0.200	170	0.270	100	0.080	190	0.320	100	0.200
40	220	0.330	170	0.330	120	0.200	150	0.280	90	0.080	170	0.330	90	0.200
45	190	0.330	150	0.330	110	0.200	140	0.290	80	0.080	150	0.330	80	0.200
50	170	0.330	130	0.330	95	0.200	120	0.300	70	0.080	130	0.330	70	0.200

**n & fn = +30%~+15%

* DIN1897 - DIN340 - DIN1869 - DIN341 - DIN1870 : n= n x Q (page 251)
 DIN1897 - DIN340 - DIN1869 - DIN341 - DIN1870 : fn= fn x R (page 251)

LS DIN338*

MATERIAL GROUPS	3 4		5 6		13 14		13 14			
HRC	~30		20~40							
N/mm ²	700~1000		800~1200		~250 (HB)		~300 (HB)			
Vc [m/min]	15~18		12~14		24~28		10~12			
Ø mm.	n	fn	n	fn	n	fn	n	fn		
2	2650	0.030	2100	0.025	4200	0.060	1700	0.050		
2.5	2100	0.040	1700	0.030	3300	0.080	1300	0.060		
3	1700	0.050	1300	0.040	2650	0.100	1050	0.080		
4	1300	0.080	1050	0.050	2100	0.130	850	0.100		
5	1050	0.060	850	0.050	1700	0.130	660	0.100		
6	850	0.080	660	0.060	1300	0.180	530	0.130		
8	650	0.100	530	0.080	1050	0.200	420	0.170		
10	530	0.130	420	0.100	850	0.250	330	0.210		
13	420	0.130	330	0.100	650	0.250	260	0.210		
16	330	0.150	260	0.130	530	0.300	210	0.250		
20	260	0.200	210	0.150	420	0.400	170	0.300		
25	210	0.250	170	0.200	330	0.500	130	0.500		
30	170	0.250	130	0.200	260	0.500	110	0.500		

* DIN340 - DIN1869 - DIN341 - DIN1870 : n= n x Q (page 251)
 DIN340 - DIN1869 - DIN341 - DIN1870 : fn= fn x R (page 251)

MATERIAL GROUPS		13 14		15 16	
HRC	~23				
N/mm ²	570~830				
Vc [m/min]	19~20		18~55		
Ø mm.	n	fn	n	fn	
2	2800	0.025	8000	0.038	
2.5	2300	0.025	6400	0.038	
3	2000	0.050	5000	0.063	
4	1700	0.060	4100	0.070	
5	1300	0.063	3200	0.076	
6	1100	0.090	2800	0.110	
7	950	0.110	2400	0.150	
8	800	0.130	2000	0.180	
9	710	0.140	1800	0.160	
10	650	0.140	1600	0.190	
11	550	0.150	1400	0.200	
12	530	0.160	1350	0.210	
13	510	0.170	1260	0.230	
14	480	0.160	1200	0.240	
16	440	0.190	1100	0.250	
18	410	0.200	1000	0.260	
19	330	0.230	820	0.300	
20	320	0.230	800	0.310	
22	300	0.240	750	0.320	
24	280	0.250	700	0.330	
26	260	0.260	640	0.340	
28	240	0.260	590	0.360	
30	220	0.270	540	0.370	
32	200	0.280	500	0.380	
35	190	0.310	460	0.440	
40	170	0.320	410	0.450	
45	150	0.330	360	0.460	
50	130	0.330	300	0.460	

*** CUTTING SPEED AND FEED ADJUSTMENT ACCORDING TO THE DRILL LENGTH AND HOLE DEPTH**

🇮🇹 **VARIAZIONE VELOCITÀ E AVANZAMENTO IN BASE ALLA LUNGHEZZA DELLA PUNTA E ALLA PROFONDITÀ DEL FORO**

🇨🇭 **SCHNEIDGESCHWINDIGKEIT UND VORSCHUBSCHWANKUNG GEMÄSS DER BOHRERLÄNGE UND BOHRUNGSTIEFE**

🇫🇷 **VARIATION DE LA VITESSE DE COUPE ET DE L'AVANCE SELON LA LONGUEUR DU FORÊT ET LA PROFONDEUR DU TROU**

🇪🇸 **VARIACIÓN DE LA VELOCIDAD DE AVANCE EN FUNDITIÓN DE LA LONGITUD DE LA PUNTA Y DE LA PROFUNDIDAD DEL AGUJERO**

🇷🇺 **ИЗМЕНЕНИЕ СКОРОСТИ И ПОДАЧИ В ЗАВИСИМОСТИ ОТ ДЛИНЫ СВЕРЛА И ГЛУБИНЫ ОТВЕРСТИЯ**

	DIN1897	DIN338	DIN340	DIN1869			DIN345	DIN341	DIN1870	
				1	2	3			1	2
P	4xD	6~8xD	8~12xD	14~24xD	18~30xD	22~36xD	5~8xD	7~10xD	8~16xD	10~20xD
Q	1.25	1.00	0.80	0.70	0.60	0.50	1.00	0.80	0.70	0.60
R	1.20	1.00	0.90	0.80	0.70	0.60	1.00	0.90	0.80	0.70

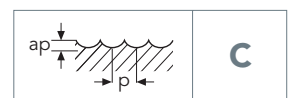
138HB			
MATERIAL GROUPS	18		
HRC			
N/mm ²			
Vc [m/min]	50~60		
Ø mm.	n	fn	
2	8800	0.08	
3	5900	0.10	
4	4400	0.12	
5	3500	0.14	
6	2900	0.16	
7	2500	0.18	
8	2200	0.20	
9	2000	0.22	
10	1800	0.25	
11	1600	0.27	
12	1500	0.28	
13	1300	0.32	

138WB				
MATERIAL GROUPS	15		16	
HRC				
N/mm ²				
Vc [m/min]	50~60		30~40	
Ø mm.	n	fn	n	fn
2	8000	0.08	5600	0.05
3	5300	0.10	3700	0.07
4	4000	0.12	2800	0.08
5	3200	0.14	2250	0.09
6	2700	0.16	1900	0.10
7	2300	0.18	1600	0.11
8	2000	0.20	1400	0.12
9	1800	0.22	1250	0.14
10	1600	0.25	1100	0.16
11	1500	0.28	1000	0.18
12	1350	0.32	950	0.20
13	1250	0.35	800	0.25

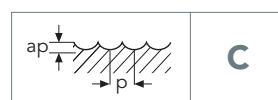
1386STI - 2386STI												
MATERIAL GROUPS	1 2		2 3 4		5 6		9 10		16		26	
HRC			~23		23~34							
N/mm ²	~570		570~830		830~1110							
Vc [m/min]	40~45		38~42		22~26		20~24		90~100		22~27	
Ø mm.	n	fn	n	fn	n	fn	n	fn	n	fn	n	fn
1	14000	0.020	12500	0.020	7700	0.020	7000	0.020	30000	0.020	8100	0.020
2	7000	0.060	6100	0.060	3900	0.060	3500	0.060	15000	0.060	4100	0.060
3	4700	0.100	4100	0.080	2500	0.080	2400	0.080	9900	0.100	2700	0.080
4	3500	0.110	3100	0.110	2000	0.100	1800	0.100	7500	0.110	2000	0.090
5	2800	0.120	2450	0.110	1600	0.100	1400	0.100	6000	0.120	1600	0.100
6	2400	0.140	2100	0.130	1300	0.120	1200	0.120	5000	0.140	1350	0.120
7	2000	0.160	1750	0.150	1100	0.140	1000	0.140	4300	0.160	1150	0.140
8	1700	0.180	1550	0.180	950	0.150	880	0.150	3700	0.180	1000	0.150
9	1500	0.200	1350	0.220	850	0.180	780	0.180	3300	0.200	900	0.170
10	1400	0.210	1250	0.220	770	0.180	700	0.180	3000	0.230	800	0.180
11	1250	0.220	1100	0.220	700	0.180	650	0.180	2700	0.230	730	0.180
12	1150	0.230	1000	0.220	650	0.200	690	0.200	2500	0.230	670	0.200
13	1000	0.230	950	0.220	650	0.200	550	0.200	2300	0.230	620	0.200

UHMB2													
MATERIAL GROUPS	8		8		8								
HRC	50~55		55~60		60~65								
N/mm ²					~								
Vc [m/min]	40~70		40~70		40~70								
Ø mm.	n	Vf	n	Vf	n	Vf							
0.2	40000	80	40000	64	40000	64							
0.3	40000	80	40000	64	40000	64							
0.4	40000	160	40000	128	40000	128							
0.5	39100	277	39100	221	39100	221							
0.6	35920	304	35920	243	35920	243							
0.7	31830	273	31830	218	31830	218							
0.8	27850	295	27850	236	27850	236							
0.9	25070	278	25070	222	25070	222							
C ap x p	0.05Dx0.1D		0.05Dx0.1D		0.05Dx0.1D								

UHCSB2 - UH250													
MATERIAL GROUPS	5 6 7		7 8										
HRC	30~40		40~50		50~55		55~60		60~65		65~70		
N/mm ²	1000~1250		1250~										
Vc [m/min]	30~260		30~250		30~230		25~200		20~180		20~160		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	
0.2	50000	1200	50000	1000	45000	950	40000	770	35000	660	32000	550	
0.3	50000	1500	50000	1350	45000	1200	40000	950	35000	840	32000	700	
0.4	50000	1900	50000	1700	45000	1500	40000	1200	35000	1000	32000	890	
0.5	50000	2400	50000	2100	45000	1900	40000	1500	35000	1300	32000	1100	
0.6	50000	2900	50000	2500	45000	2200	40000	1800	35000	1600	32000	1400	
0.8	50000	3900	50000	3300	45000	3000	40000	2400	35000	2100	32000	1800	
1	50000	4800	50000	4200	45000	3800	40000	3000	34000	2600	32000	2300	
1.2	50000	5100	48000	4300	43000	3800	38000	3000	33000	2700	30500	2300	
1.5	50000	5400	48000	4500	43000	4000	37000	3100	32000	2700	30000	2300	
2	48000	5700	46000	4800	40000	4000	35000	3100	21000	2800	28500	2300	
3	33000	6000	32000	5300	27000	4000	24000	3100	16000	2800	19000	2300	
4	24900	6000	24000	5300	20000	4000	18000	3100	14300	2800	14500	2300	
5	19100	5800	18000	4900	14700	3700	13500	3000	11500	2500	10500	2100	
6	14000	4800	14000	4100	11500	3100	10600	2500	9500	2100	8500	1700	
8	11500	4200	10800	3500	9200	2700	8000	2100	7200	1800	6400	1500	
10	9500	3700	8600	3100	7500	2400	6400	1900	5700	1600	5100	1350	
12	7000	2900	6700	2500	6100	1900	5300	1500	4800	1200	4200	1000	
C ap x p	0.05Dx0.02D		0.05Dx0.02D		0.05Dx0.02D		0.05Dx0.02D		0.05Dx0.02D		0.05Dx0.02D		



UH253							
MATERIAL GROUPS	8		8		8		
HRC	50~55		55~60		60~65		
N/mm ²					~		
Vc [m/min]	60~75		60~75		60~75		
Ø mm.	n	Vf	n	Vf	n	Vf	
1	22280	261	22280	209	22280	209	
1.5	14850	221	14850	177	14850	177	
2	11140	211	11140	168	11140	168	
2.5	8910	196	8910	157	8910	157	
3	7430	196	7430	156	7430	156	
4	5570	186	5570	149	5570	149	
5	4460	181	4460	145	4460	145	
6	3710	179	3710	143	3710	143	
8	2790	177	2790	141	2790	141	
10	2230	174	2230	139	2230	139	
12	1860	172	1860	138	1860	138	
C ap x p	0.05Dx0.1D		0.05Dx0.1D		0.05Dx0.1D		



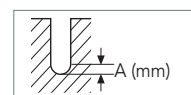
UHCRB2									
MATERIAL GROUPS			5 6 7	7 8	8				
HRC	30~45			45~55			55~65		
N/mm ²	1000~1480			1480~					
Vc [m/min]	50~70			40~60			40~60		
Ø mm.	n	Vf	ap (mm)	n	Vf	ap (mm)	n	Vf	ap (mm)
0.2x0.6	50000	350	0,016	50000	310	0,013	50000	265	0,012
0.2x1	50000	350	0,011	50000	310	0,009	50000	265	0,008
0.3x2	45000	416	0,011	45000	368	0,010	45000	336	0,009
0.3x3	45000	416	0,006	45000	368	0,006	45000	336	0,005
0.4x1	50000	790	0,032	50000	550	0,026	50000	460	0,024
0.4x3	45000	632	0,013	45000	440	0,010	45000	368	0,010
0.5x2	49500	870	0,028	35200	540	0,023	35200	480	0,021
0.5x4	44550	696	0,020	31680	432	0,016	31680	384	0,015
0.5x6	39600	566	0,011	28160	351	0,009	28160	312	0,008
0.6x2	40700	850	0,032	29700	540	0,026	29700	480	0,024
0.6x4	36630	680	0,022	26730	432	0,018	26730	384	0,017
0.6x6	36600	680	0,013	26730	432	0,010	26730	384	0,010
0.6x10	28500	425	0,003	20790	270	0,002	20790	240	0,002
0.8x2	30800	890	0,064	22000	550	0,052	22000	500	0,048
0.8x6	27700	712	0,026	19800	440	0,021	19800	400	0,019
0.8x10	24600	579	0,013	17600	358	0,010	17600	325	0,010
1x3	24200	850	0,080	17600	540	0,065	17600	500	0,060
1x6	21800	680	0,032	15840	432	0,026	15840	400	0,024
1x10	21800	680	0,024	15840	432	0,020	15840	400	0,018
1x16	19400	425	0,006	12320	270	0,005	12320	250	0,005
1x20	14500	340	0,004	10560	216	0,003	10560	200	0,003
1.2x4	18700	780	0,032	14000	540	0,026	14000	480	0,024
1.2x8	16800	624	0,022	12600	432	0,018	12600	384	0,017
1.2x12	16800	624	0,013	12600	432	0,010	12600	384	0,010
1.5x4	14300	760	0,048	11500	540	0,039	11500	480	0,036
1.5x10	12900	608	0,034	10350	432	0,027	10350	384	0,025
1.5x12	12900	608	0,034	10350	432	0,027	10350	384	0,025
1.5x20	11400	494	0,014	9200	351	0,012	9200	312	0,011
2x6	11000	800	0,160	8800	530	0,130	8800	480	0,120
2x10	11000	800	0,112	8800	530	0,091	8800	480	0,084
2x12	9900	640	0,064	7920	424	0,052	7920	384	0,048
2x16	9900	640	0,064	7920	424	0,052	7920	384	0,048
2x20	9900	640	0,048	7920	424	0,039	7920	384	0,036
2x25	8800	520	0,032	7040	345	0,026	7040	312	0,024
2x30	8800	520	0,013	7040	345	0,010	7040	312	0,010
3x12	8200	1000	0,240	5800	650	0,195	5800	620	0,120
3x16	7400	800	0,168	5220	520	0,137	5220	496	0,084
3x20	7400	800	0,168	5220	520	0,137	5220	496	0,084
3x30	7400	800	0,096	5220	520	0,078	5220	496	0,048
4x16	6200	990	0,224	4400	620	0,018	4400	570	0,168
4x20	6200	990	0,224	4400	620	0,018	4400	570	0,168
4x30	5600	792	0,128	3960	496	0,010	3960	456	0,096
4x40	5600	792	0,096	3960	496	0,008	3960	456	0,072

R ap x ae

apxD

apxD

apxD



R

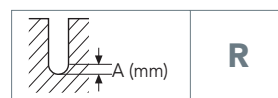
UHLNB2									
MATERIAL GROUPS	8			8			8		
HRC	50~55			55~60			60~65		
N/mm ²									
Vc [m/min]	50~70			40~60			40~60		
Ø mm.	n	Vf	ap (mm)	n	Vf	ap (mm)	n	Vf	ap (mm)
0.2 x 0.5	40000	80	0,008	40000	80	0,008	40000	80	0,008
0.2 x 1	40000	80	0,008	40000	80	0,008	40000	80	0,008
0.2 x 1.5	34000	48	0,008	34000	48	0,008	34000	48	0,008
0.3 x 1	40000	80	0,012	40000	80	0,012	40000	80	0,012
0.3 x 2	34000	48	0,012	34000	48	0,012	34000	48	0,012
0.3 x 3	28000	40	0,005	28000	40	0,005	28000	40	0,005
0.4 x 1	40000	160	0,016	39890	280	0,016	39890	280	0,016
0.4 x 2	40000	160	0,016	39890	280	0,016	39890	280	0,016
0.4 x 3	34000	96	0,016	33910	168	0,016	33910	168	0,016
0.4 x 4	28000	80	0,006	27930	140	0,006	27930	140	0,006
0.5 x 2	39100	277	0,020	27930	140	0,020	27930	140	0,020
0.5 x 3	33230	166	0,020	35920	264	0,020	35920	264	0,020
0.5 x 4	33230	166	0,020	30530	158	0,020	30530	158	0,020
0.5 x 5	27370	138	0,008	30530	158	0,008	30530	158	0,008
0.5 x 6	27370	138	0,008	25140	132	0,008	25140	132	0,008
0.5 x 8	23460	111	0,008	25140	132	0,008	25140	132	0,008
0.6 x 2	35920	304	0,024	31830	276	0,024	31830	276	0,024
0.6 x 3	35920	304	0,024	31830	276	0,024	31830	276	0,024
0.6 x 4	30530	182	0,024	27060	166	0,024	27060	166	0,024
0.6 x 5	30530	182	0,024	27060	166	0,024	27060	166	0,024
0.6 x 6	25140	152	0,010	22280	138	0,010	22280	138	0,010
0.6 x 8	25140	152	0,010	22280	138	0,010	22280	138	0,010
0.8 x 2	27850	295	0,032	23870	255	0,032	23870	255	0,032
0.8 x 4	27850	295	0,032	23870	255	0,032	23870	255	0,032
0.8 x 6	23670	177	0,032	20290	153	0,032	20290	153	0,032
0.8 x 8	19500	147	0,013	20290	153	0,013	20290	153	0,013
0.8 x 10	19500	147	0,013	20290	153	0,013	20290	153	0,013
1 x 3	22280	261	0,040	19100	226	0,040	19100	226	0,040
1 x 4	22280	261	0,040	19100	226	0,040	19100	226	0,040
1 x 5	22280	261	0,040	19100	226	0,040	19100	226	0,040
1 x 6	18940	157	0,040	16230	136	0,040	16230	136	0,040
1 x 7	18940	157	0,040	16230	136	0,040	16230	136	0,040
1 x 8	18940	157	0,040	16230	136	0,040	16230	136	0,040
1 x 9	18940	157	0,040	16230	136	0,040	16230	136	0,040
1 x 10	15600	131	0,016	13370	113	0,016	13370	113	0,016
1 x 12	15600	131	0,016	13370	113	0,016	13370	113	0,016
1 x 14	15600	131	0,016	13370	113	0,016	13370	113	0,016
1 x 16	13370	104	0,016	11460	90	0,016	11460	90	0,016
1 x 20	18570	234	0,016	11460	90	0,016	11460	90	0,016
1.2 x 6	15780	140	0,048	15920	202	0,048	15920	202	0,048
1.2 x 8	15780	140	0,048	13530	121	0,048	13530	121	0,048
1.2 x 10	13000	117	0,048	13530	121	0,048	13530	121	0,048
1.2 x 12	13000	117	0,019	11140	101	0,019	11140	101	0,019
1.4 x 8	15920	218	0,056	13530	121	0,056	13530	121	0,056
1.4 x 12	13530	131	0,056	13640	189	0,056	13640	189	0,056
1.4 x 16	11140	109	0,022	11600	113	0,022	11600	113	0,022
1.5 x 8	14850	221	0,060	9550	94	0,060	9550	94	0,060
1.5 x 12	12630	133	0,060	12730	191	0,060	12730	191	0,060
1.5 x 16	10400	111	0,024	10820	115	0,024	10820	115	0,024
1.5 x 18	10400	111	0,024	8910	96	0,024	8910	96	0,024
1.5 x 20	10400	111	0,024	8910	96	0,024	8910	96	0,024
1.6 x 8	13930	219	0,064	11940	189	0,064	11940	189	0,064
1.6 x 12	11840	131	0,064	10150	113	0,064	10150	113	0,064

R ap x ae

apxD

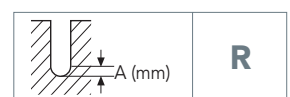
apxD

apxD



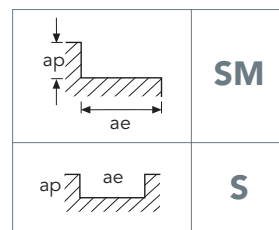
R

UHLNB2									
MATERIAL GROUPS	8			8			8		
HRC	50~55			55~60			60~65		
N/mm ²									
Vc [m/min]	50~70			40~60			40~60		
Ø mm.	n	Vf	ap (mm)	n	Vf	ap (mm)	n	Vf	ap (mm)
1.6 x 16	9750	109	0,026	8360	95	0,026	8360	95	0,026
1.6 x 20	9750	109	0,026	8360	95	0,026	8360	95	0,026
1.8 x 8	12380	209	0,072	10610	180	0,072	10610	180	0,072
1.8 x 12	10520	125	0,072	9020	108	0,072	9020	108	0,072
1.8 x 16	10520	125	0,072	9020	108	0,072	9020	108	0,072
1.8 x 20	8660	104	0,029	7430	90	0,029	7430	90	0,029
2 x 4	11140	211	0,080	9550	181	0,080	9550	181	0,080
2 x 6	11140	211	0,080	9550	181	0,080	9550	181	0,080
2 x 8	11140	211	0,080	9550	181	0,080	9550	181	0,080
2 x 10	11140	211	0,080	9550	181	0,080	9550	181	0,080
2 x 12	9470	126	0,080	8120	109	0,080	8120	109	0,080
2 x 14	9470	126	0,080	8120	109	0,080	8120	109	0,080
2 x 16	9470	126	0,080	8120	109	0,080	8120	109	0,080
2 x 18	9470	126	0,080	8120	109	0,080	8120	109	0,080
2 x 20	7800	105	0,032	6680	91	0,032	6680	91	0,032
2 x 22	7800	105	0,032	6680	91	0,032	6680	91	0,032
2 x 25	7800	105	0,032	6680	91	0,032	6680	91	0,032
2 x 30	7800	105	0,032	6680	91	0,032	6680	91	0,032
3 x 8	7430	196	0,120	6370	169	0,120	6370	169	0,120
3 x 10	7430	196	0,120	6370	169	0,120	6370	169	0,120
3 x 12	7430	196	0,120	6370	169	0,120	6370	169	0,120
3 x 16	6310	117	0,120	5410	101	0,120	5410	101	0,120
3 x 20	6310	117	0,120	5410	101	0,120	5410	101	0,120
3 x 25	5200	98	0,120	4460	85	0,120	4460	85	0,120
3 x 30	5200	98	0,048	4460	85	0,048	4460	85	0,048
3 x 35	5200	98	0,048	4460	85	0,048	4460	85	0,048
4 x 10	5570	186	0,160	4770	161	0,160	4770	161	0,160
4 x 16	5570	186	0,160	4770	161	0,160	4770	161	0,160
4 x 20	5570	186	0,160	4770	161	0,160	4770	161	0,160
4 x 25	4730	112	0,160	4060	97	0,160	4060	97	0,160
4 x 30	4730	112	0,160	4060	97	0,160	4060	97	0,160
4 x 35	4730	112	0,160	4060	97	0,160	4060	97	0,160
4 x 40	3900	93	0,064	3340	81	0,064	3340	81	0,064
4 x 45	3900	93	0,064	3340	81	0,064	3340	81	0,064
4 x 50	3900	93	0,064	3340	81	0,064	3340	81	0,064
R ap x ae	apxD			apxD			apxD		



UHF4									
MATERIAL GROUPS	5 6 7		7 8		8		8		
HRC	30~45		45~55		55~60		60~65		
N/mm ²	1000~1480		1480~						
Vc [m/min]	140~230		80~160		60~120		45~80		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	
2 x R0.5	21500 ~ 30100	8190 ~ 14280	9550 ~ 14320	3878 ~ 7728	7160 ~ 11940	2108 ~ 4464	7160 ~ 11940	1122 ~ 2376	
3 x R0.5	14330 ~ 20050	9690 ~ 15732	8280 ~ 12420	4437 ~ 7975	5720 ~ 9550	2232 ~ 4526	4770 ~ 7960	1188 ~ 2409	
4 x R0.5	10750 ~ 15050	10600 ~ 16840	7160 ~ 10740	4800 ~ 8250	4300 ~ 7160	2418 ~ 4588	3580 ~ 5970	1287 ~ 2442	
5 x R0.5	8590 ~ 12030	11111 ~ 17302	7070 ~ 10600	4890 ~ 8190	3430 ~ 5720	2480 ~ 4588	2860 ~ 4770	1320 ~ 2442	
6 x R0.5	7160 ~ 10030	11550 ~ 17766	5880 ~ 8830	4950 ~ 8190	3820 ~ 6360	2542 ~ 4712	2629 ~ 4378	1353 ~ 2508	
6 x R1	7560 ~ 10580	11829 ~ 18189	5890 ~ 8830	5779 ~ 9555	3820 ~ 6360	2542 ~ 4712	2629 ~ 4378	1353 ~ 2508	
8 x R1	5960 ~ 8360	11264 ~ 17424	4420 ~ 6620	6930 ~ 11475	2860 ~ 4770	3120 ~ 5600	1969 ~ 3278	1287 ~ 2310	
8 x R2	6260 ~ 8780	11520 ~ 17820	4420 ~ 6620	6930 ~ 11475	2860 ~ 4770	3120 ~ 5600	1969 ~ 3278	1287 ~ 2310	
10 x R1	5260 ~ 7350	11362 ~ 17388	3530 ~ 5290	6615 ~ 10980	2290 ~ 3820	3515 ~ 6460	1573 ~ 2629	1258 ~ 2312	
10 x R2	5500 ~ 7680	11609 ~ 17766	3530 ~ 5290	6615 ~ 10980	2290 ~ 3820	3515 ~ 6460	1573 ~ 2629	1480 ~ 2720	
12 x R2	4780 ~ 6700	11472 ~ 17664	2940 ~ 4420	6435 ~ 10665	1900 ~ 3180	3780 ~ 6930	1309 ~ 2189	1800 ~ 3300	
12 x R3	4980 ~ 6980	11950 ~ 18400	2940 ~ 4420	6435 ~ 10665	1900 ~ 3180	3780 ~ 6930	1309 ~ 2189	1800 ~ 3300	
SM ap x ae	0.05Dx0.3D		0.05Dx0.3D		0.05Dx0.3D		0.05Dx0.3D		

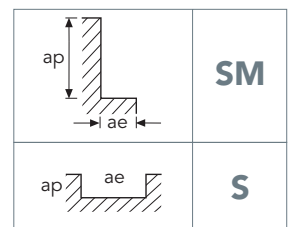
UHM2-N							
MATERIAL GROUPS	8		8		8		
HRC	55~55		55~60		60~65		
N/mm ²					~		
Vc [m/min]	50~70		40~60		40~60		
Ø mm.	n	Vf	n	Vf	n	Vf	
0.1	40000	100	40000	50	40000	50	
0.2	40000	160	40000	80	40000	80	
0.3	40000	160	40000	80	40000	80	
0.4	40000	240	39890	240	39890	240	
0.5	39100	315	35920	264	35920	264	
0.6	35920	336	31830	239	31830	239	
0.7	31830	328	27280	259	27280	259	
0.8	27850	319	23870	227	23870	227	
0.9	24760	304	21220	244	21220	244	
S ap x ae	0.1DxD		0.05DxD		0.05DxD		



UHCS2													
MATERIAL GROUPS	6 7		7 8		8		8		8		8		
HRC	30~40		40~50		50~55		55~60		60~65		65~70		
N/mm ²	1000~1250		1250~										
Vc [m/min]	40~250		40~200		30~130		20~100		20~75		18~70		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	
0.2	50000	130	50000	120	42000	90	35000	60	35000	45	28000	30	
0.3	50000	190	50000	140	42000	110	35000	70	27000	50	22000	35	
0.4	50000	240	50000	180	42000	140	35000	90	27000	55	22000	40	
0.5	50000	370	50000	280	42000	220	35000	140	27000	96	22000	60	
0.6	50000	470	50000	360	42000	280	32000	160	27000	110	22000	75	
0.8	50000	600	45000	440	32000	290	27000	180	21000	110	17000	80	
0.9	50000	660	42000	520	30000	330	24000	200	19000	125	15000	85	
1	50000	750	40000	570	27000	360	22000	210	18000	135	13500	85	
2	35000	850	28000	680	19000	420	16000	260	12000	160	10400	110	
3	23000	850	19000	680	13000	420	10600	260	8000	160	7000	110	
4	18000	880	14500	700	9500	440	8000	270	6000	170	5000	120	
5	15900	1000	12800	810	8300	500	6400	280	4800	180	4500	130	
6	13300	950	10600	770	6900	480	5300	280	4000	180	3700	130	
8	10000	930	8000	720	5200	450	4000	250	3000	165	2800	120	
10	8000	850	6400	680	4200	420	3200	240	2400	155	2200	110	
12	6700	850	5300	680	3500	420	2700	240	2000	155	1900	110	
S ap x ae	0.05DxD		0.05DxD		0.05DxD		0.05DxD		0.05DxD		0.02DxD		

↓ Z axis : Vf = -50%

UHCS2													
MATERIAL GROUPS	6 7		7 8		8		8		8		8		
HRC	30~40		40~50		50~55		55~60		60~65		65~70		
N/mm ²	1000~1250		1250~										
Vc [m/min]	160~250		125~200		85~130		70~100		55~75		45~70		
Ø mm.	n	fn	n	fn	n	fn	n	fn	n	fn	n	fn	
1	50000	1050	40000	820	27000	510	22000	310	18000	190	13500	120	
2	35000	1200	28000	970	19000	600	16000	370	12000	230	10400	170	
3	23000	1200	19000	970	13000	600	10600	370	8000	230	7000	170	
4	18000	1250	14500	1000	9500	625	8000	390	6000	240	5000	170	
5	15900	1450	12800	1150	8300	710	6400	410	4800	260	4500	190	
6	13300	1350	10600	1100	6900	690	5300	400	4000	260	3700	180	
8	10000	1320	8000	1030	5200	640	4000	370	3000	240	2800	170	
10	8000	1200	6400	970	4200	590	3200	340	2400	220	2200	160	
12	6700	1200	5300	970	3500	590	2700	340	2000	220	1900	160	
SM ap x ae	Dx0.03D		Dx0.03D		Dx0.03D		Dx0.03D		Dx0.03D		Dx0.03D		



UHCR2

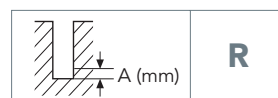
MATERIAL GROUPS	5 6 7			7 8			8		
HRC	30~45			45~55			55~65		
N/mm ²	1000~1480			1480~					
Vc [m/min]	40~70			30~55			20~35		
Ø mm.	n	Vf	ap (mm)	n	Vf	ap (mm)	n	Vf	ap (mm)
0.2 x 1	50000	350	0,011	50000	310	0,009	50000	265	0,008
0.3 x 1.5	50000	420	0,015	46200	310	0,011	32300	185	0,007
0.3 x 3	45000	336	0,006	41580	248	0,004	29070	148	0,003
0.4 x 3	45000	472	0,011	31680	272	0,008	22140	160	0,005
0.4 x 5	40000	384	0,006	28160	221	0,004	19680	130	0,002
0.5 x 2	33000	470	0,035	26000	315	0,025	18000	130	0,015
0.5 x 4	29700	376	0,025	23400	252	0,018	16200	104	0,011
0.5 x 8	26400	306	0,007	18200	205	0,005	12600	85	0,003
0.6 x 2	35200	560	0,030	22000	290	0,021	15500	120	0,013
0.6 x 4	31700	448	0,021	19800	232	0,015	13950	96	0,009
0.6 x 6	31700	448	0,012	19800	232	0,008	13950	96	0,005
0.8 x 6	23800	472	0,016	15030	248	0,011	10530	100	0,007
0.8 x 8	23800	472	0,012	15030	248	0,008	10530	100	0,005
1 x 4	18700	540	0,028	11500	280	0,020	8050	115	0,012
1 x 6	16800	432	0,020	10350	224	0,014	7245	92	0,008
1 x 8	16800	432	0,020	10350	224	0,014	7245	92	0,008
1 x 10	16800	432	0,011	10350	224	0,008	7245	92	0,005
1 x 16	15000	351	0,006	8050	182	0,004	6440	75	0,002
1 x 20	11200	216	0,002	6900	112	0,002	4830	46	0,001
1.2 x 6	17600	590	0,070	10000	280	0,042	7000	115	0,026
1.2 x 10	15800	472	0,028	9000	224	0,017	6300	92	0,010
1.5 x 6	17600	830	0,077	8000	280	0,055	5500	115	0,033
1.5 x 10	15840	664	0,054	7200	224	0,039	4950	92	0,023
1.5 x 16	14080	540	0,023	6400	182	0,017	4400	75	0,010
1.5 x 20	14080	540	0,023	6400	182	0,017	4400	75	0,010
2 x 6	10550	570	0,140	6700	300	0,100	4700	120	0,060
2 x 12	9495	456	0,056	6030	240	0,040	4230	96	0,024
2 x 13	9495	456	0,056	6030	240	0,040	4230	96	0,024
2 x 16	9495	456	0,056	6030	240	0,040	4230	96	0,024
2 x 20	9495	456	0,042	6030	240	0,030	4230	96	0,018
3 x 12	7050	900	0,210	4600	515	0,150	3200	310	0,090
3 x 16	6345	720	0,147	4140	412	0,105	2880	248	0,063
3 x 20	6345	720	0,147	4140	412	0,105	2880	248	0,063
3 x 30	6345	720	0,084	4140	412	0,060	2880	248	0,036
4 x 20	5300	675	0,196	3400	380	0,140	2400	230	0,084
4 x 30	4770	540	0,112	3060	304	0,080	2160	184	0,048
4 x 40	4770	540	0,084	3060	304	0,060	2160	184	0,036

R ap x ae

apxD

apxD

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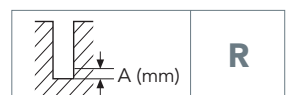
UHLN2 - UH212									
MATERIAL GROUPS	8			8			8		
HRC	50~55			55~60			60~65		
N/mm ²									
Vc [m/min]	50~70			40~60			40~60		
Ø mm.	n	Vf	ap (mm)	n	Vf	ap (mm)	n	Vf	ap (mm)
0.2 x 0.5	40000	160	0,040	40000	160	0,034	40000	160	0,034
0.2 x 1	37400	140	0,016	37400	140	0,014	37400	140	0,014
0.2 x 1.5	34800	121	0,011	34800	121	0,010	34800	121	0,010
0.3 x 1	40000	160	0,040	40000	160	0,034	40000	160	0,034
0.3 x 2	34800	121	0,020	34800	121	0,017	34800	121	0,017
0.3 x 3	29600	88	0,012	29600	88	0,010	29600	88	0,010
0.4 x 2	37400	210	0,032	37400	210	0,027	37400	210	0,027
0.4 x 3	34800	182	0,023	34800	182	0,019	34800	182	0,019
0.4 x 4	29600	131	0,016	29600	131	0,014	29600	131	0,014
0.4 x 5	27000	109	0,013	27000	109	0,011	27000	109	0,011
0.5 x 2	39100	315	0,050	39100	315	0,043	39100	315	0,043
0.5 x 4	31470	204	0,025	31470	204	0,021	31470	204	0,021
0.5 x 6	26390	143	0,017	26390	143	0,014	26390	143	0,014
0.5 x 8	21310	93	0,013	21310	93	0,011	21310	93	0,011
0.6 x 2	35920	336	0,080	35920	336	0,068	35920	336	0,068
0.6 x 4	31250	254	0,040	31250	254	0,034	31250	254	0,034
0.6 x 6	26580	184	0,024	26580	184	0,020	26580	184	0,020
0.6 x 8	24240	153	0,018	24240	153	0,016	24240	153	0,016
0.6 x 10	19570	100	0,015	19570	100	0,013	19570	100	0,013
0.7 x 2	31830	328	0,140	31830	328	0,119	31830	328	0,119
0.7 x 4	29760	286	0,056	29760	286	0,048	29760	286	0,048
0.7 x 6	25620	212	0,035	25620	212	0,030	25620	212	0,030
0.7 x 8	23550	179	0,025	23550	179	0,022	23550	179	0,022
0.7 x 10	19420	122	0,020	19420	122	0,017	19420	122	0,017
0.8 x 4	26040	278	0,064	26040	278	0,054	26040	278	0,054
0.8 x 6	24230	241	0,046	24230	241	0,039	24230	241	0,039
0.8 x 8	20610	174	0,032	20610	174	0,027	20610	174	0,027
0.8 x 10	18800	145	0,027	18800	145	0,023	18800	145	0,023
0.8 x 12	16990	119	0,021	16990	119	0,018	16990	119	0,018
0.9 x 6	21540	230	0,060	21540	230	0,051	21540	230	0,051
0.9 x 8	19930	197	0,045	19930	197	0,038	19930	197	0,038
0.9 x 10	18320	166	0,033	18320	166	0,028	18320	166	0,028
0.9 x 15	13490	90	0,023	13490	90	0,019	13490	90	0,019
1 x 6	19390	226	0,067	19390	226	0,057	19390	226	0,057
1 x 8	17940	194	0,050	17940	194	0,043	17940	194	0,043
1 x 10	16490	164	0,040	16490	164	0,034	16490	164	0,034
1 x 12	15040	136	0,033	15040	136	0,028	15040	136	0,028
1 x 14	13590	111	0,029	13590	111	0,024	13590	111	0,024
1 x 16	12140	89	0,025	12140	89	0,021	12140	89	0,021
1.2 x 6	17360	250	0,096	17360	250	0,082	17360	250	0,082
1.2 x 8	16150	217	0,080	16150	217	0,068	16150	217	0,068
1.2 x 10	14950	186	0,060	14950	186	0,051	14950	186	0,051
1.2 x 12	13740	157	0,048	13740	157	0,041	13740	157	0,041
1.4 x 6	15920	264	0,140	15920	264	0,119	15920	264	0,119
1.4 x 8	14880	231	0,112	14880	231	0,095	14880	231	0,095
1.4 x 10	13850	200	0,080	13850	200	0,068	13850	200	0,068
1.4 x 12	12810	171	0,070	12810	171	0,060	12810	171	0,060
1.4 x 14	11780	145	0,056	11780	145	0,048	11780	145	0,048
1.4 x 16	11780	145	0,051	11780	145	0,043	11780	145	0,043
1.5 x 6	14850	259	0,150	14850	259	0,128	14850	259	0,128
1.5 x 8	13890	226	0,120	13890	226	0,102	13890	226	0,102
1.5 x 10	12920	196	0,100	12920	196	0,085	12920	196	0,085
1.5 x 12	11960	168	0,075	11960	168	0,064	11960	168	0,064

R ap x ae

apxD

apxD

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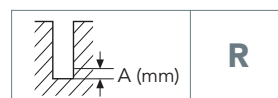
UHLN2 - UH212

UHLN2 - UH212									
MATERIAL GROUPS	8			8			8		
HRC	50~55			55~60			60~65		
N/mm ²									
Vc [m/min]	50~70			40~60			40~60		
Ø mm.	n	Vf	ap (mm)	n	Vf	ap (mm)	n	Vf	ap (mm)
1.5 x 14	11960	168	0,067	11960	168	0,057	11960	168	0,057
1.5 x 16	10990	142	0,060	10990	142	0,051	10990	142	0,051
1.5 x 18	10030	118	0,050	10030	118	0,043	10030	118	0,043
1.5 x 20	10030	118	0,046	10030	118	0,039	10030	118	0,039
1.6 x 6	13930	259	0,213	13930	259	0,181	13930	259	0,181
1.6 x 8	13020	226	0,128	13020	226	0,109	13020	226	0,109
1.6 x 10	12120	196	0,107	12120	196	0,091	12120	196	0,091
1.6 x 14	12120	196	0,091	12120	196	0,078	12120	196	0,078
1.6 x 14	11210	168	0,080	11210	168	0,068	11210	168	0,068
1.6 x 16	10310	142	0,064	10310	142	0,054	10310	142	0,054
1.6 x 18	10310	142	0,058	10310	142	0,049	10310	142	0,049
1.6 x 20	9400	118	0,053	9400	118	0,045	9400	118	0,045
1.8 x 6	12380	255	0,240	12380	255	0,204	12380	255	0,204
1.8 x 8	12380	255	0,180	12380	255	0,153	12380	255	0,153
1.8 x 10	11570	223	0,144	11570	223	0,122	11570	223	0,122
1.8 x 12	10770	193	0,120	10770	193	0,102	10770	193	0,102
1.8 x 14	10770	193	0,103	10770	193	0,087	10770	193	0,087
1.8 x 16	9960	165	0,090	9960	165	0,077	9960	165	0,077
1.8 x 18	9160	140	0,072	9160	140	0,061	9160	140	0,061
1.8 x 20	9160	140	0,065	9160	140	0,056	9160	140	0,056
2 x 6	11140	252	0,267	11140	252	0,227	11140	252	0,227
2 x 8	11140	252	0,200	11140	252	0,170	11140	252	0,170
2 x 10	10420	220	0,160	10420	220	0,136	10420	220	0,136
2 x 12	9690	190	0,133	9690	190	0,113	9690	190	0,113
2 x 14	9690	190	0,114	9690	190	0,097	9690	190	0,097
2 x 16	8970	163	0,100	8970	163	0,085	8970	163	0,085
2 x 18	8970	163	0,089	8970	163	0,076	8970	163	0,076
2 x 20	8240	138	0,080	8240	138	0,068	8240	138	0,068
2 x 25	7520	115	0,067	7520	115	0,057	7520	115	0,057
2 x 30	6800	94	0,053	6800	94	0,045	6800	94	0,045
2.5 x 8	8910	230	0,333	8910	230	0,283	8910	230	0,283
2.5 x 10	8910	230	0,250	8910	230	0,213	8910	230	0,213
2.5 x 12	8910	230	0,250	8910	230	0,213	8910	230	0,213
2.5 x 14	8330	201	0,200	8330	201	0,170	8330	201	0,170
2.5 x 16	7750	174	0,167	7750	174	0,142	7750	174	0,142
2.5 x 18	7750	174	0,143	7750	174	0,121	7750	174	0,121
2.5 x 20	7170	149	0,125	7170	149	0,106	7170	149	0,106
2.5 x 25	6600	126	0,100	6600	126	0,085	6600	126	0,085
2.5 x 30	6020	105	0,083	6020	105	0,071	6020	105	0,071
3 x 8	7430	221	0,600	7430	221	0,510	7430	221	0,510
3 x 10	7430	221	0,400	7430	221	0,340	7430	221	0,340
3 x 12	7430	221	0,300	7430	221	0,255	7430	221	0,255
3 x 14	7430	221	0,300	7430	221	0,255	7430	221	0,255
3 x 16	6940	193	0,240	6940	193	0,204	6940	193	0,204
3 x 18	6460	167	0,200	6460	167	0,170	6460	167	0,170
3 x 20	6460	167	0,200	6460	167	0,170	6460	167	0,170
3 x 25	5980	143	0,150	5980	143	0,128	5980	143	0,128
4 x 10	5570	217	0,800	5570	217	0,680	5570	217	0,680
4 x 15	5570	217	0,533	5570	217	0,453	5570	217	0,453
4 x 20	5210	189	0,320	5210	189	0,272	5210	189	0,272
4 x 25	4850	164	0,267	4850	164	0,227	4850	164	0,227
4 x 30	4850	164	0,229	4850	164	0,194	4850	164	0,194
4 x 40	4120	119	0,160	4120	119	0,136	4120	119	0,136

R ap x ae apxD

apxD

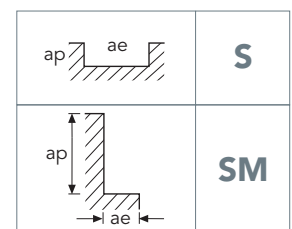
apxD



UH211													
MATERIAL GROUPS	6 7		7 8		8		8		8		8		
HRC	30~40		40~50		50~55		55~60		60~65		65~70		
N/mm ²	1000~1250		1250~										
Vc [m/min]	70~250		70~200		60~130		50~100		40~75		30~70		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	
0.5	50000	290	45000	220	40000	170	33000	110	26000	60	20000	40	
0.6	50000	370	45000	290	40000	220	30000	120	26000	80	20000	50	
0.8	50000	480	45000	350	30000	230	25000	140	19000	90	16000	60	
1	48000	600	38000	450	26000	280	21000	170	16000	110	13000	70	
2	35000	680	26000	550	18000	330	15000	200	12000	130	10000	90	
3	22000	680	18000	550	12000	330	10600	200	8000	130	7000	90	
4	18000	700	13500	560	9000	350	8000	210	6000	140	5000	95	
5	15900	800	12800	650	8300	400	6400	230	4800	140	4500	110	
6	13300	760	10600	620	6900	380	5300	220	4000	140	3700	105	
8	10000	750	8000	580	5200	350	4000	200	3000	130	2800	95	
10	8000	680	6400	550	4200	330	3200	190	2400	120	2200	90	
12	6700	680	5300	550	3500	330	2700	190	2000	120	1900	90	
S ap x ae	0.05DxD		0.05DxD		0.05DxD		0.05DxD		0.05DxD		0.02DxD		

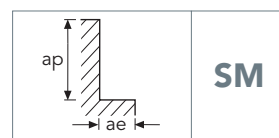
↓ Z axis : Vf = -50%

UH211													
MATERIAL GROUPS	6 7		7 8		8		8		8		8		
HRC	30~40		40~50		50~55		55~60		60~65		65~70		
N/mm ²	1000~1250		1250~										
Vc [m/min]	70~250		70~200		60~130		50~100		40~75		30~70		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	
0.5	50000	200	45000	160	40000	120	33000	80	26000	45	20000	30	
0.6	50000	260	45000	200	40000	160	30000	90	19000	60	20000	35	
0.8	50000	330	45000	250	30000	160	25000	100	16000	65	16000	40	
1	48000	840	38000	650	26000	400	21000	250	23900	150	13000	100	
2	35000	950	26000	750	18000	480	15000	300	12000	180	10000	130	
3	22000	950	18000	750	12000	480	10600	300	8000	180	7000	130	
4	18000	1000	13500	800	9000	500	8000	300	6000	190	5000	135	
5	15900	1150	12800	920	8300	560	6400	320	4800	210	4500	150	
6	13300	1100	10600	880	6900	550	5300	320	4000	200	3700	145	
8	10000	1050	8000	820	5200	500	4000	290	3000	190	2800	135	
10	8000	950	6400	750	4200	460	3200	270	2400	175	2200	130	
12	6700	950	5300	750	3500	460	2700	270	2000	175	1900	130	
SM ap x ae	Dx0.03D		Dx0.03D		Dx0.03D		Dx0.03D		Dx0.03D		Dx0.03D		



UHCS4													
MATERIAL GROUPS	6 7		7 8		8		8		8		8		
HRC	30~40		40~50		50~55		55~60		60~65		65~70		
N/mm ²	1000~1250		1250~										
Vc [m/min]	150~250		120~200		80~130		65~100		50~75		40~70		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	
1	48000	1480	38000	1100	26000	710	21000	430	16000	270	13000	170	
2	33000	1750	26000	1250	17500	850	14500	520	11000	320	9500	230	
3	22000	1750	17000	1250	11500	850	9600	520	7500	320	6500	230	
4	17000	1800	13000	1300	9000	880	7500	540	6000	330	4800	240	
5	15900	2000	12500	1500	8300	1000	6400	580	4800	370	4500	270	
6	13300	1950	10600	1400	6900	950	5300	560	4000	350	3700	260	
8	10000	1900	8000	1350	5200	900	4000	520	3000	330	2800	240	
10	8000	1750	6400	1250	4200	850	3200	480	2400	310	2200	220	
12	6700	1750	5300	1250	3500	850	2700	480	2000	300	1900	220	
16	5000	1500	4000	1100	2600	730	2000	420	1500	270	1400	200	
20	4000	1300	3200	950	2100	650	1600	380	1200	250	1100	180	
SM ap x ae	Dx0.03D		Dx0.03D		Dx0.03D		Dx0.03D		Dx0.03D		Dx0.03D		

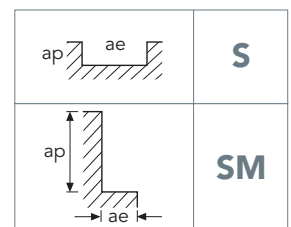
UH411 - UH412													
MATERIAL GROUPS	6 7		7 8		8		8		8		8		
HRC	30~40		40~50		50~55		55~60		60~65		65~70		
N/mm ²	1000~1250		1250~										
Vc [m/min]	150~250		120~200		80~130		65~100		50~75		40~70		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	
3	22000	1400	18000	1000	12000	670	10000	420	8000	260	7000	190	
4	17000	1450	14000	1050	9000	700	8000	430	6000	270	5000	190	
5	15900	1600	12800	1200	8300	800	6400	460	4800	300	4500	220	
6	13300	1550	10600	1150	6900	750	5300	450	4000	280	3700	210	
8	10000	1500	8000	1100	5200	720	4000	420	3000	270	2800	190	
10	8000	1400	6400	1000	4200	650	3200	390	2400	250	2200	180	
12	6700	1400	5300	1000	3500	650	2700	390	2000	240	1900	180	
16	5000	1200	4000	880	2600	580	2000	330	1500	220	1400	160	
20	4000	1050	3200	780	2100	520	1600	300	1200	200	1100	150	
SM ap x ae	Dx0.03D		Dx0.03D		Dx0.03D		Dx0.03D		Dx0.03D		Dx0.03D		



SM

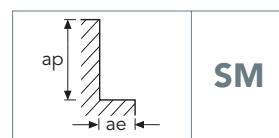
UH412 LONG NECK Ø 2mm ~ Ø 4mm							
MATERIAL GROUPS	8		8		8		
HRC	50-55		55-60		60-65		
N/mm ²							
Vc [m/min]	20-50		15-40		15-40		
Ø mm.	n	Vf	n	Vf	n	Vf	
2 x 30	5090 ~ 7640	140 ~ 310	3820 ~ 6370	30 ~ 80	3820 ~ 6370	30 ~ 80	
2 x 60	3180 ~ 4770	90 ~ 190	2390 ~ 3980	20 ~ 50	2390 ~ 3980	20 ~ 50	
3 x 30	3400 ~ 5090	160 ~ 290	2550 ~ 4240	40 ~ 80	2550 ~ 4240	40 ~ 80	
3 x 60	2120 ~ 3180	100 ~ 180	1590 ~ 2650	30 ~ 50	1590 ~ 2650	30 ~ 50	
3 x 30	3400 ~ 5090	160 ~ 290	2550 ~ 4240	40 ~ 80	2550 ~ 4240	40 ~ 80	
3 x 60	2120 ~ 3180	100 ~ 180	1590 ~ 2650	30 ~ 50	1590 ~ 2650	30 ~ 50	
4 x 32	2550 ~ 3820	170 ~ 290	1910 ~ 3180	40 ~ 80	1910 ~ 3180	40 ~ 80	
4 x 60	1590 ~ 2390	110 ~ 180	1190 ~ 1990	20 ~ 50	1190 ~ 1990	20 ~ 50	
4 x 32	2550 ~ 3820	170 ~ 290	1910 ~ 3180	40 ~ 80	1910 ~ 3180	40 ~ 80	
4 x 60	1590 ~ 2390	110 ~ 180	1190 ~ 1990	20 ~ 50	1190 ~ 1990	20 ~ 50	
S ap x ae	0.05DxD		0.05DxD		0.05DxD		

UH412 LONG NECK Ø 2mm ~ Ø 4mm							
MATERIAL GROUPS	8		8		8		
HRC	50-55		55-60		60-65		
N/mm ²							
Vc [m/min]	20-50		15-40		15-40		
Ø mm.	n	Vf	n	Vf	n	Vf	
2 x 30	5090 ~ 7640	360 ~ 740	3820 ~ 6370	100 ~ 200	3820 ~ 6370	50 ~ 100	
2 x 60	3180 ~ 4770	220 ~ 460	3180 ~ 4770	220 ~ 460	3180 ~ 4770	110 ~ 230	
3 x 30	3400 ~ 5090	400 ~ 740	2550 ~ 4240	100 ~ 200	2550 ~ 4240	50 ~ 100	
3 x 60	2120 ~ 3180	260 ~ 460	2120 ~ 3180	260 ~ 460	2120 ~ 3180	130 ~ 230	
3 x 30	3400 ~ 5090	400 ~ 740	2550 ~ 4240	100 ~ 200	2550 ~ 4240	50 ~ 100	
3 x 60	2120 ~ 3180	260 ~ 460	2120 ~ 3180	260 ~ 460	2120 ~ 3180	130 ~ 230	
4 x 32	2550 ~ 3820	420 ~ 740	1910 ~ 3180	100 ~ 200	1910 ~ 3180	50 ~ 100	
4 x 60	1590 ~ 2390	260 ~ 460	1590 ~ 2390	260 ~ 460	1590 ~ 2390	130 ~ 230	
4 x 32	2550 ~ 3820	420 ~ 740	1910 ~ 3180	100 ~ 200	1910 ~ 3180	50 ~ 100	
4 x 60	1590 ~ 2390	260 ~ 460	1590 ~ 2390	260 ~ 460	1590 ~ 2390	130 ~ 230	
SM ap x ae	Dx0.03D		Dx0.03D		Dx0.03D		



UH600 - UH612							
MATERIAL GROUPS	8		8		8		
HRC	50~55		55~60		60~65		
N/mm ²							
Vc [m/min]	180~220		150~180		120~150		
Ø mm.	n	Vf	n	Vf	n	Vf	
3	19100 ~ 23340	2060 ~ 2940	15920 ~ 19100	1240 ~ 1830	12730 ~ 15920	310 ~ 480	
3 x 30	15280 ~ 18670	1650 ~ 2350	12730 ~ 15280	990 ~ 1470	10190 ~ 12730	240 ~ 380	
4	14320 ~ 17510	2150 ~ 2940	11940 ~ 14320	1360 ~ 1800	9550 ~ 11940	340 ~ 500	
4 x 32	11460 ~ 14010	1720 ~ 2350	9550 ~ 11460	1090 ~ 1440	7640 ~ 9550	280 ~ 400	
5	11460 ~ 14010	2200 ~ 2940	9550 ~ 11460	1380 ~ 1790	7640 ~ 9550	370 ~ 520	
5 x 32	9170 ~ 11200	1760 ~ 2350	7640 ~ 9170	1100 ~ 1430	6110 ~ 7640	290 ~ 410	
6	9550 ~ 11670	2180 ~ 2940	7960 ~ 9550	1390 ~ 1830	6370 ~ 7960	380 ~ 530	
6 x 60	4770 ~ 5840	1090 ~ 1470	3980 ~ 4770	690 ~ 920	3180 ~ 3980	190 ~ 260	
8	7160 ~ 8750	2060 ~ 2780	5970 ~ 7160	1290 ~ 1680	4770 ~ 5970	340 ~ 470	
8 x 60	3580 ~ 4380	1030 ~ 1390	2980 ~ 3580	640 ~ 840	2390 ~ 2980	170 ~ 230	
10	5730 ~ 7000	1960 ~ 2650	4770 ~ 5730	1230 ~ 1620	3820 ~ 4770	320 ~ 460	
10 x 85	2860 ~ 3500	980 ~ 1320	2390 ~ 2860	620 ~ 810	1910 ~ 2390	160 ~ 230	
12	4770 ~ 5840	1920 ~ 2560	3980 ~ 4770	1190 ~ 1570	3180 ~ 3980	320 ~ 430	
12 x 110	2390 ~ 2920	960 ~ 1280	1990 ~ 2390	600 ~ 790	1590 ~ 1990	160 ~ 210	
14	4090 ~ 5000	1870 ~ 2520	3410 ~ 4090	1170 ~ 1550	2730 ~ 3410	310 ~ 430	
16	3580 ~ 4380	1850 ~ 2470	2980 ~ 3580	1140 ~ 1530	2390 ~ 2980	300 ~ 430	
16 x 110	1790 ~ 2190	920 ~ 1240	1490 ~ 1790	570 ~ 760	1190 ~ 1490	150 ~ 210	
20	2860 ~ 3500	1780 ~ 2420	2390 ~ 2860	1120 ~ 1480	1910 ~ 2390	300 ~ 420	
SM ap x ae	Dx0.05D		Dx0.03D		Dx0.03D		

UH610 - UH611													
MATERIAL GROUPS	6 7		7 8		8		8		8		8		
HRC	30~40		40~50		50~55		55~60		60~65		65~70		
N/mm ²	1000~1250		1250~										
Vc [m/min]	450~500		430~480		280~320		230~270		180~210		140~160		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	
6	25000	5300	23500	4900	16000	4900	13500	3300	10500	2100	8000	1450	
8	20000	5500	19000	5000	12000	4600	1000	3100	8000	2000	6000	1400	
10	16000	4900	15500	4500	9500	4100	8000	2900	6400	1800	4800	1300	
12	13000	4500	12500	4100	8000	3800	6600	2500	5300	1600	4000	115	
16	10000	4000	9700	3700	6000	3400	5000	2300	4000	1250	3000	850	
20	8000	3300	7800	3400	4800	3200	4000	2100	3200	1050	2400	700	
SM ap x ae	Dx0.05D		Dx0.05D		Dx0.05D		Dx0.03D		Dx0.03D		Dx0.03D		



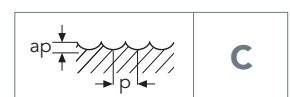
MEXMB2					
MATERIAL GROUPS	6 7		7 8		
HRC	30~45		45~55		
N/mm ²	1000~1480		1480~		
Vc [m/min]	70~80		70~80		
Ø mm.	n	Vf	n	Vf	
0.2	40000	240	40000	160	
0.3	40000	240	40000	160	
0.4	40000	320	40000	160	
0.5	39100	433	39100	315	
0.6	35920	448	35920	336	
0.7	30000	430	30000	316	
0.8	25150	406	25150	295	
0.9	23750	400	23750	288	
1	22300	395	22300	280	
1.5	14850	327	14850	234	
2	11150	315	11150	211	
C ap x p	0.1Dx0.05D		0.05Dx0.05D		

MEXCSB2 - MEXCLSB2 - MEX253**							
MATERIAL GROUPS	3 4 5		6		7		
HRC	~30		30~40		40~65		
N/mm ²	~1000		1000~1250		1250~		
Vc [m/min]	50~250		40~200 (HSC 80~500)		20~70 (HSC 80~200)		
Ø mm.	n	Vf	n	Vf	n	Vf	
1	15800	250	12750	200	5800	90	
1 HSC			30000	1300	25000	800	
1.5	15800	350	12150	270	5350	120	
1.5 HSC			23000	1400	23000	850	
2	14400	750	10700	490	4850	110	
2 HSC			21000	1500	21000	950	
2.5	14400	750	10700	490	4700	150	
2.5 HSC			21000	1800	19000	980	
3	13100	680	10000	460	4550	150	
3 HSC			21000	2000	17000	1050	
4	10500	740	8400	530	4200	180	
4 HSC			21000	2950	13700	1150	
5	9150	820	7300	580	3700	180	
5 HSC			21000	3600	12000	1200	
6	8500	1050	6900	830	3200	190	
6 HSC			21000	4000	10500	1250	
8	7200	1300	5800	1050	2500	220	
8 HSC			16700	4000	7900	1250	
10	6400	1550	5100	1050	2050	230	
10 HSC			14000	3900	6300	1200	
12	5900	1750	4650	1100	1750	250	
12 HSC			12200	3900	5300	1150	
16	4800	1700	3800	1050	1350	250	
16 HSC			9600	3500	3800	1000	
20	4150	1650	3300	1050	1100	250	
20 HSC			8000	3200	2950	950	
C ap x p	0.2Dx0.3mm*		0.2Dx0.3mm*		0.2Dx0.3mm*		
HSC C ap x p	0.05Dx0.3mm*		0.05Dx0.3mm*		0.05x0.03mm*		

HSC = high speed cutting / alta velocità / hoch Geschwindigkeit / grande vitesse / alta velocidad / высокая скорость

*~Ø6 ap=0.2mm

**MEX253: n & Vf = -20%



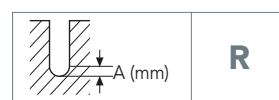
MEXCRB2									
MATERIAL GROUPS	3 4 5 13 14			6 7			7 8		
HRC	~30			30~45			45~55		
N/mm ²	~1000			1000~1480			1480~		
Vc [m/min]	70~110			50~90			35~60		
Ø mm.	n	Vf	A	n	Vf	A	n	Vf	A
0.4 x 3	36000	392	0,014	25650	216	0,014	16200	140	0,003
0.5 x 6	32000	319	0,014	22800	176	0,014	14400	114	0,003
0.5 x 8	28000	245	0,009	19950	135	0,009	12600	88	0,002
0.6 x 6	36000	504	0,022	25650	280	0,022	16200	180	0,004
0.6 x 8	32000	410	0,016	22800	228	0,016	14400	146	0,003
0.8 x 6	36000	504	0,029	25650	280	0,029	16200	180	0,006
0.8 x 8	36000	504	0,022	25650	280	0,022	16200	180	0,004
1 x 6	32850	560	0,036	23400	312	0,036	14670	200	0,007
1 x 8	32850	560	0,036	23400	312	0,036	14670	200	0,007
1 x 12	29200	455	0,018	20800	254	0,018	13040	163	0,004
1 x 16	25550	350	0,007	18200	195	0,007	11410	125	0,001
1 x 20	21900	280	0,005	15600	156	0,005	9780	100	0,001
1.2 x 8	30500	780	0,100	21500	390	0,100	13700	250	0,022
1.2 x 12	27450	624	0,070	19350	312	0,070	12330	200	0,015
1.4 x 12	23400	624	0,088	16200	312	0,088	10530	200	0,018
1.5 x 8	21600	624	0,095	15750	312	0,095	9630	200	0,020
1.5 x 12	21600	624	0,095	15750	312	0,095	9630	200	0,020
1.5 x 16	19200	507	0,041	14000	254	0,041	8560	163	0,008
1.5 x 20	19200	507	0,041	14000	254	0,041	8560	163	0,008
1.6 x 20	18800	507	0,044	13200	254	0,044	8320	163	0,009
1.8 x 16	19350	624	0,064	13500	312	0,064	8460	200	0,013
1.8 x 20	17200	507	0,048	12000	254	0,048	7520	163	0,010
2 x 8	19000	780	0,126	13500	390	0,126	8600	250	0,025
2 x 12	17100	624	0,072	12150	312	0,072	7740	200	0,014
2 x 16	17100	624	0,072	12150	312	0,072	7740	200	0,014
2 x 20	17100	624	0,054	12150	312	0,054	7740	200	0,011
2 x 26	15200	507	0,036	10800	254	0,036	6880	163	0,007
2 x 30	15200	507	0,014	10800	254	0,014	6880	163	0,003
3 x 16	11700	624	0,108	8100	312	0,108	5130	200	0,022
3 x 20	11700	624	0,108	8100	312	0,108	5130	200	0,022
3 x 26	11700	624	0,081	8100	312	0,081	5130	200	0,017
3 x 30	11700	624	0,081	8100	312	0,081	5130	200	0,017
4 x 16	11000	780	0,252	7800	390	0,252	4900	250	0,049
4 x 20	11000	780	0,252	7800	390	0,252	4900	250	0,049
4 x 26	9900	624	0,144	7800	312	0,144	4410	200	0,028
4 x 30	9900	624	0,144	7020	312	0,144	4410	200	0,028
4 x 40	9900	624	0,108	7020	312	0,108	4410	200	0,021
4 x 50	8800	507	0,072	6240	254	0,072	3920	163	0,014
5 x 20	8800	780	0,450	6200	390	0,450	3900	250	0,088
5 x 30	7920	624	0,315	5580	312	0,315	3510	200	0,062
6 x 30	7300	780	0,540	5200	390	0,540	3300	250	0,105
6 x 40	6570	624	0,378	4680	312	0,378	2970	200	0,074
6 x 50	6570	624	0,216	4680	312	0,216	2970	200	0,042

R ap x ae

apxD

apxD

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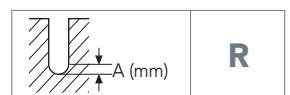
MEXLNB2									
MATERIAL GROUPS	3 4 5 13 14			6 7			7 8		
HRC	~30			30~45			45~55		
N/mm ²	~1000			1000~1480			1480~		
Vc [m/min]	70~90			60~80			60~80		
Ø mm.	n	Vf	ap (mm)	n	Vf	ap (mm)	n	Vf	ap (mm)
0.2 x 0.5	40000	240	0,008	40000	240	0,008	40000	80	0,008
0.2 x 1	40000	240	0,008	40000	240	0,008	40000	80	0,008
0.2 x 1.5	34000	144	0,008	34000	144	0,008	34000	48	0,008
0.3 x 1	40000	240	0,012	40000	240	0,012	40000	80	0,012
0.3 x 2	34000	144	0,012	34000	144	0,012	34000	48	0,012
0.3 x 3	28000	120	0,005	28000	120	0,005	28000	40	0,005
0.4 x 1	40000	320	0,016	40000	320	0,016	40000	160	0,016
0.4 x 2	40000	320	0,016	40000	320	0,016	40000	160	0,016
0.4 x 3	34000	192	0,016	34000	192	0,016	34000	96	0,016
0.4 x 4	28000	160	0,006	28000	160	0,006	28000	80	0,006
0.4 x 5	28000	160	0,006	28000	160	0,006	28000	80	0,006
0.5 x 2	40000	320	0,020	40000	320	0,020	39099	277	0,020
0.5 x 2.5	38000	250	0,020	38000	250	0,020	33234	166	0,020
0.5 x 3	34000	192	0,020	34000	192	0,020	33234	166	0,020
0.5 x 4	34000	192	0,020	34000	192	0,020	33234	166	0,020
0.5 x 5	28000	160	0,008	28000	160	0,008	27369	138	0,008
0.5 x 6	28000	160	0,020	28000	160	0,020	27369	138	0,020
0.5 x 8	24000	128	0,020	24000	128	0,020	23459	111	0,020
0.6 x 2	38568	469	0,024	38568	469	0,024	35916	304	0,024
0.6 x 3	38568	469	0,024	38568	469	0,024	35916	304	0,024
0.6 x 4	327823	281	0,024	327823	281	0,024	30528	182	0,024
0.6 x 5	32783	281	0,024	32783	281	0,024	30528	182	0,024
0.6 x 6	27000	234	0,010	27000	234	0,010	25141	152	0,010
0.6 x 8	26998	235	0,010	26998	235	0,010	25141	152	0,010
0.8 x 2	31831	462	0,032	31831	462	0,032	27852	295	0,032
0.8 x 4	27056	277	0,032	27056	277	0,032	23674	177	0,032
0.8 x 6	27056	277	0,032	27056	277	0,032	23674	177	0,032
0.8 x 8	22281	231	0,013	22281	231	0,013	19496	147	0,013
0.8 x 10	22281	231	0,013	22281	231	0,013	19496	147	0,013
1 x 3	25465	448	0,040	25465	448	0,040	19496	147	0,040
1 x 4	25465	448	0,040	25465	448	0,040	22282	261	0,040
1 x 5	21645	269	0,040	21645	269	0,040	22282	261	0,040
1 x 6	21645	269	0,040	21645	269	0,040	22282	261	0,040
1 x 8	21645	269	0,040	21645	269	0,040	18940	157	0,040
1 x 10	21645	269	0,016	21645	269	0,016	18940	157	0,016
1 x 12	21645	269	0,016	21645	269	0,016	18940	157	0,016
1 x 14	17825	224	0,016	17825	224	0,016	15597	131	0,016
1 x 16	17825	224	0,016	17825	224	0,016	15597	131	0,016
1 x 20	15279	179	0,016	15279	179	0,016	13369	104	0,016
1.2 x 6	21220	398	0,048	21220	398	0,048	18568	234	0,048
1.2 x 8	18037	238	0,048	18037	238	0,048	15783	140	0,048
1.2 x 10	18037	238	0,048	18037	238	0,048	15783	140	0,048
1.2 x 12	14854	199	0,019	14854	199	0,019	12998	117	0,019
1.4 x 8	18189	398	0,056	18189	398	0,056	15783	140	0,056
1.4 x 12	15460	238	0,056	15460	238	0,056	12998	117	0,056
1.4 x 16	12732	199	0,022	12732	199	0,022	12998	117	0,022
1.5 x 8	14430	222	0,060	14430	222	0,060	14855	221	0,060
1.5 x 12	11883	185	0,060	11883	185	0,060	12626	133	0,060
1.5 x 16	11883	185	0,024	11883	185	0,024	10398	111	0,024
1.5 x 18	11883	185	0,060	11883	185	0,060	10398	111	0,060
1.6 x 8	15915	366	0,064	15915	366	0,064	13926	219	0,064
1.6 x 12	13528	219	0,064	13528	219	0,064	11837	131	0,064
1.6 x 16	11140	183	0,026	11140	183	0,026	9748	109	0,026

R ap x ae

apxD

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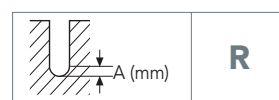
MEXLNB2

MATERIAL GROUPS									
3 4 5 13 14			6 7				7 8		
HRC	~30			30~45			45~55		
N/mm ²	~1000			1000~1480			1480~		
Vc [m/min]	70~90			60~80			60~80		
Ø mm.	n	Vf	ap (mm)	n	Vf	ap (mm)	n	Vf	ap (mm)
1.6 x 20	11140	183	0,026	11140	183	0,026	9748	109	0,026
1.8 x 8	14147	353	0,072	14147	353	0,072	12379	209	0,072
1.8 x 12	12024	212	0,072	12024	212	0,072	10522	125	0,072
1.8 x 16	12024	212	0,072	12024	212	0,072	8665	104	0,072
1.8 x 20	9902	176	0,029	9902	176	0,029	8665	104	0,029
2 x 4	12732	358	0,080	12732	358	0,080	11141	211	0,080
2 x 6	12732	358	0,080	12732	358	0,080	11141	211	0,080
2 x 8	12732	358	0,080	12732	358	0,080	11141	211	0,080
2 x 10	12732	358	0,080	12732	358	0,080	11141	211	0,080
2 x 12	10822	215	0,080	10822	215	0,080	9469	126	0,080
2 x 14	10822	215	0,080	10822	215	0,080	9469	126	0,080
2 x 16	10822	215	0,080	10822	215	0,080	9469	126	0,080
2 x 18	8912	179	0,080	8912	179	0,080	9469	126	0,080
2 x 20	8912	179	0,032	8912	179	0,032	7798	105	0,032
2 x 22	8912	179	0,032	8912	179	0,032	7798	105	0,032
2 x 25	8912	179	0,032	8912	179	0,032	7798	105	0,032
2 x 30	8912	179	0,032	8912	179	0,032	7798	105	0,032
3 x 8	8488	328	0,120	8488	328	0,120	7427	196	0,120
3 x 10	8488	328	0,120	8488	328	0,120	7427	196	0,120
3 x 16	8488	328	0,120	8488	328	0,120	7427	196	0,120
3 x 20	7215	197	0,120	7215	197	0,120	6313	117	0,120
3 x 25	7215	197	0,120	7215	197	0,120	6313	117	0,120
3 x 30	5942	164	0,048	5942	164	0,048	5199	98	0,048
3 x 35	5942	164	0,048	5942	164	0,048	5199	98	0,048
4 x 10	6366	313	0,160	6366	313	0,160	5571	186	0,160
4 x 16	6366	313	0,160	6366	313	0,160	5571	186	0,160
4 x 20	6366	313	0,160	6366	313	0,160	5571	186	0,160
4 x 25	5411	188	0,160	5411	188	0,160	4735	112	0,160
4 x 30	5411	188	0,160	5411	188	0,160	4735	112	0,160
4 x 35	5411	188	0,160	5411	188	0,160	4735	112	0,160
4 x 40	4456	156	0,064	4456	156	0,064	3899	93	0,064
4 x 50	4456	156	0,064	4456	156	0,064	3899	93	0,064

R ap x ae apxD

apxD

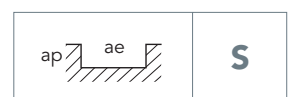
apxD



MEXM2					
MATERIAL GROUPS	6 7		7 8		
HRC	30~45		45~55		
N/mm ²	1000~1480		1480~		
Vc [m/min]	70~80		70~80		
Ø mm.	n	Vf	n	Vf	
0.1	40000	180	40000	100	
0.2	40000	240	40000	160	
0.3	40000	240	40000	160	
0.4	40000	320	40000	240	
0.5	39100	513	39100	315	
0.6	35950	559	35950	336	
0.7	31830	537	31830	328	
0.8	27850	470	27850	319	
0.9	24750	467	24750	304	
1	22300	446	22300	299	
1.1	18560	409	18560	287	
1.2	15920	400	15920	264	
1.3	15400	395	15400	262	
1.4	14850	391	14850	259	
1.5	14390	384	14390	259	
1.6	13930	378	13930	259	
1.7	13150	371	13150	257	
1.8	12380	365	12380	255	
1.9	11760	357	11760	253	
2	11150	350	11150	252	
S ap x ae	0.1Dx0.05D		0.05DxD		

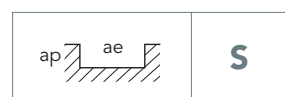
MEXCS2										
MATERIAL GROUPS	3 4 5		6 7		9 10		8		8	
HRC	~30		30~45		30~45		45~55		55~65	
N/mm ²	~1000		1000~1500		30~45		1500~		18~20	
Vc [m/min]	60~90		40~55		30~45		25~35		18~20	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
2	9300	190	6100	120	5100	90	4050	35	2800	35
3	7200	210	4500	140	3700	120	2700	40	1900	40
4	6100	300	3700	180	3100	150	2350	40	1500	40
5	5100	320	3050	190	2550	160	1900	50	1250	40
6	4500	350	2700	220	2300	180	1600	55	1100	40
8	3400	380	2050	200	1700	180	1350	75	850	40
10	2600	330	1600	160	1350	160	1100	60	680	35
12	2200	280	1350	130	1100	130	950	55	550	35
16	1800	220	1100	110	850	110	750	40	450	20
20	1400	170	850	80	700	80	550	30	320	20
25	1100	130	680	70	550	60	450	20	250	15
S ap x ae	0.5D*xD		0.5D*xD		0.5D*xD		0.05DxD		0.05DxD	

*~Ø3 ap=0.2D
 ↓ Z axis : Vf = -50%



MEXCL2						
MATERIAL GROUPS	3 4 5 13 14		6 7		8	
HRC	~30		30~45		45~55	
N/mm ²	~1000		1000~1500		1500~	
Vc [m/min]	45~65		35~55		22~32	
Ø mm.	n	Vf	n	Vf	n	Vf
2	7600	70	6100	60	3800	30
3	5300	85	4300	70	2650	35
4	4300	100	3400	90	2150	40
5	3700	125	2900	100	1900	45
6	3200	150	2500	125	1650	60
8	2400	160	1900	125	1300	60
10	2050	160	1650	125	1000	60
12	1650	125	1400	120	850	45
16	1400	120	1100	90	670	40
20	1000	90	850	60	500	30
S ap x ae	0.3D*xD		0.3D*xD		0.05DxD	

*~Ø3 ap=0.4mm



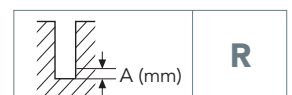
MEXCR2									
MATERIAL GROUPS	3 4 5 13 14			6 7			7 8		
HRC	~30			30~45			45~55		
N/mm ²	~1000			1000~1480			1480~		
Vc [m/min]	50~90			40~65			20~40		
Ø mm.	n	Vf	ap (mm)	n	Vf	ap (mm)	n	Vf	ap (mm)
0.4 x 4	36000	352	0,007	25200	272	0,007	15300	72	0,003
0.5 x 6	32000	286	0,007	22400	221	0,007	13600	59	0,003
0.5 x 8	28000	220	0,004	19600	221	0,004	11900	59	0,002
0.6 x 6	36000	456	0,010	25200	344	0,010	15300	88	0,004
0.6 x 8	32000	371	0,008	22400	280	0,008	13600	72	0,003
0.7 x 6	36000	456	0,009	25200	344	0,009	15300	88	0,004
0.7 x 8	32000	371	0,006	22400	280	0,006	13600	72	0,003
0.8 x 6	31500	504	0,025	22050	384	0,025	13320	100	0,011
0.8 x 10	28000	410	0,011	19600	312	0,011	11840	81	0,005
0.8 x 12	28000	410	0,007	19600	312	0,007	11840	81	0,003
0.9 x 10	25200	468	0,024	18000	351	0,024	10000	85	0,006
0.9 x 15	22050	360	0,012	15750	270	0,012	8750	65	0,003
1 x 6	25200	648	0,063	18000	480	0,063	11250	104	0,013
1 x 8	25200	648	0,063	18000	480	0,063	11250	104	0,013
1 x 12	22400	527	0,027	16000	390	0,027	10000	85	0,005
1 x 16	19600	405	0,018	14000	300	0,018	8750	85	0,004
1 x 20	16800	324	0,007	12000	240	0,007	7500	52	0,001
1.2 x 12	20250	720	0,040	14850	480	0,040	9450	104	0,009
1.2 x 16	18000	585	0,030	13200	390	0,030	8400	85	0,007
1.4 x 12	18000	720	0,050	12600	480	0,050	8100	104	0,010
1.4 x 16	16000	585	0,038	11200	390	0,038	7200	85	0,008
1.4 x 22	14000	450	0,025	9800	300	0,025	6300	85	0,005
1.5 x 8	16650	720	0,095	12150	480	0,095	7380	104	0,020
1.5 x 10	16650	720	0,095	12150	480	0,095	7380	104	0,020
1.5 x 12	16650	720	0,095	12150	480	0,095	7380	104	0,020
1.5 x 16	14800	585	0,041	10800	390	0,041	6560	85	0,008
1.5 x 20	14800	585	0,041	10800	390	0,041	6560	85	0,008
1.6 x 20	14400	585	0,044	10240	390	0,044	6400	85	0,009
1.8 x 12	14850	720	0,112	10350	480	0,112	6480	104	0,022
1.8 x 20	13200	585	0,048	9200	390	0,048	5760	85	0,010
2 x 12	13050	720	0,072	9450	480	0,072	5940	104	0,014
2 x 16	13050	720	0,072	9450	480	0,072	5940	104	0,014
2 x 20	13050	720	0,054	9450	480	0,054	5940	104	0,011
2 x 26	11600	585	0,036	8400	390	0,036	5280	85	0,007
2 x 30	11600	585	0,014	8400	390	0,014	5280	85	0,003
2.5 x 12	12000	900	0,235	8500	600	0,235	5300	130	0,045
2.5 x 20	10800	720	0,165	7650	480	0,165	4770	104	0,032
2.5 x 30	9600	585	0,071	6800	390	0,071	4240	85	0,014
3 x 14	10000	900	0,189	7000	600	0,189	4400	130	0,039
3 x 18	9000	720	0,108	6300	480	0,108	3960	104	0,022
3 x 26	9000	720	0,081	6300	480	0,081	3960	104	0,017
3 x 30	9000	720	0,081	6300	480	0,081	3960	104	0,017
3 x 40	8000	585	0,054	5600	390	0,054	3520	85	0,011
4 x 16	7500	900	0,252	5300	600	0,252	3300	130	0,050
4 x 20	7500	900	0,252	5300	600	0,252	3300	130	0,050
4 x 26	6750	720	0,144	4770	480	0,144	2970	104	0,029
4 x 30	6750	720	0,144	4770	480	0,144	2970	104	0,029
4 x 40	6750	720	0,108	4770	480	0,108	2970	104	0,022
4 x 50	6000	585	0,072	4240	390	0,072	2640	85	0,014
5 x 20	6000	900	0,450	4200	600	0,450	2600	130	0,090
5 x 26	6000	900	0,450	4200	600	0,450	2600	130	0,090
5 x 30	5400	720	0,315	3780	480	0,315	2340	104	0,063
5 x 50	5400	720	0,180	3780	480	0,180	2340	104	0,036
6 x 30	5000	900	0,540	3500	600	0,540	2600	130	0,108
6 x 50	4500	720	0,216	3150	480	0,216	2340	104	0,043

R ap x ae

apxD

apxD

apxD



MEXLN2

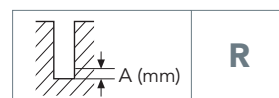
MATERIAL GROUPS	3 4 5 13 14			6 7			7 8		
HRC	~30			30~45			45~55		
N/mm ²	~1000			1000~1480			1480~		
Vc [m/min]	70~90			60~80			60~80		
Ø mm.	n	Vf	ap (mm)	n	Vf	ap (mm)	n	Vf	ap (mm)
0.2 x 0.5	40000	240	0,040	40000	240	0,034	40000	160	0,028
0.2 x 1	37400	210	0,016	37400	210	0,014	37400	140	0,011
0.2 x 1.5	34800	182	0,011	34800	182	0,010	34800	121	0,008
0.3 x 1	40000	240	0,040	40000	240	0,034	40000	160	0,028
0.3 x 2	34800	182	0,020	34800	182	0,017	34800	121	0,014
0.3 x 3	29600	131	0,012	29600	131	0,010	29600	88	0,008
0.4 x 2	37400	280	0,032	37400	280	0,027	37400	210	0,022
0.4 x 3	34800	242	0,023	34800	242	0,019	34800	182	0,016
0.4 x 4	29600	175	0,016	29600	175	0,014	29600	131	0,011
0.4 x 5	27000	146	0,013	27000	146	0,011	27000	109	0,009
0.5 x 2	40000	320	0,050	39100	513	0,043	39100	315	0,035
0.5 x 4	32200	207	0,025	31450	332	0,021	31450	204	0,018
0.5 x 6	27000	146	0,017	26400	234	0,014	26400	143	0,012
0.5 x 8	21800	95	0,013	21300	152	0,011	21300	93	0,009
0.6 x 2	38560	586	0,080	35920	559	0,068	35920	336	0,056
0.6 x 4	33560	443	0,040	31250	423	0,034	31250	254	0,028
0.6 x 6	28540	321	0,024	26580	306	0,020	26580	184	0,017
0.6 x 8	26050	267	0,018	24250	255	0,016	24250	153	0,013
0.6 x 10	21020	174	0,015	19580	166	0,013	19580	100	0,011
0.7 x 2	35920	599	0,140	31850	537	0,119	31850	328	0,098
0.7 x 4	33600	524	0,056	29800	469	0,048	29800	286	0,039
0.7 x 6	28900	388	0,035	25650	348	0,030	25650	212	0,025
0.7 x 8	26600	328	0,025	23550	294	0,022	23550	179	0,018
0.7 x 10	21900	223	0,020	19420	200	0,017	19420	122	0,014
0.8 x 4	29750	466	0,064	26050	410	0,054	26050	278	0,045
0.8 x 6	27700	404	0,046	24250	355	0,039	24250	241	0,032
0.8 x 8	23550	292	0,032	20600	257	0,027	20600	174	0,022
0.8 x 10	21500	243	0,027	18800	214	0,023	18800	145	0,019
0.8 x 12	19420	199	0,021	16990	175	0,018	16990	119	0,015
0.9 x 6	24620	402	0,060	21550	353	0,051	21550	230	0,042
0.9 x 8	22780	344	0,045	19930	303	0,038	19930	197	0,032
0.9 x 10	20940	291	0,033	18350	256	0,028	18350	166	0,023
0.9 x 15	15420	158	0,023	13500	139	0,019	13500	90	0,016
1 x 6	22160	383	0,067	19400	337	0,057	19400	226	0,047
1 x 8	20500	328	0,050	17950	289	0,043	17950	194	0,035
1 x 10	18850	277	0,040	16500	244	0,034	16500	164	0,028
1 x 12	17200	231	0,033	15040	203	0,028	15040	136	0,023
1 x 14	15550	188	0,029	13600	166	0,024	13600	111	0,020
1 x 16	13900	150	0,025	12150	132	0,021	12150	89	0,018
1.2 x 6	19850	406	0,096	17360	357	0,082	17360	250	0,067
1.2 x 8	18450	351	0,080	16150	309	0,068	16150	217	0,056
1.2 x 10	17100	301	0,060	14950	265	0,051	14950	186	0,042
1.2 x 12	15700	254	0,048	13740	224	0,041	13740	157	0,034
1.4 x 6	18200	455	0,140	15920	400	0,119	15920	264	0,098
1.4 x 8	17000	398	0,112	14880	350	0,095	14880	231	0,078
1.4 x 10	15820	344	0,080	13850	303	0,068	13850	200	0,056
1.4 x 12	14650	295	0,070	12810	259	0,060	12810	171	0,049
1.4 x 14	13460	249	0,056	11780	219	0,048	11780	145	0,039
1.4 x 16	13460	249	0,051	11780	219	0,043	11780	145	0,036
1.5 x 6	16980	444	0,150	14850	391	0,128	14850	259	0,105
1.5 x 8	15880	388	0,120	13890	341	0,102	13890	226	0,084
1.5 x 10	14770	336	0,100	12920	296	0,085	12920	196	0,070
1.5 x 12	13660	287	0,075	11960	253	0,064	11960	168	0,053

R ap x ae

apxD

apxD

apxD



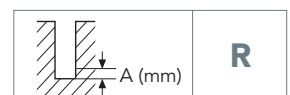
MEXLN2									
MATERIAL GROUPS									
3 4 5 13 14			6 7				7 8		
HRC	~30			30~45			45~55		
N/mm ²	~1000			1000~1480			1480~		
Vc [m/min]	70~90			60~80			60~80		
Ø mm.	n	Vf	ap (mm)	n	Vf	ap (mm)	n	Vf	ap (mm)
1.5 x 14	13660	287	0,067	11960	253	0,057	11960	168	0,047
1.5 x 18	12560	243	0,060	10990	214	0,051	10990	142	0,042
1.5 x 20	11460	202	0,050	10030	178	0,043	10030	118	0,035
1.6 x 6	11460	202	0,046	10030	178	0,039	10030	118	0,032
1.6 x 8	15920	430	0,213	13930	378	0,181	13930	259	0,149
1.6 x 10	14880	376	0,128	13020	330	0,109	13020	226	0,090
1.6 x 12	13850	325	0,107	12120	286	0,091	12120	196	0,075
1.6 x 14	13850	325	0,091	12120	286	0,078	12120	196	0,064
1.6 x 16	12820	279	0,080	11210	245	0,068	11210	168	0,056
1.6 x 18	11780	235	0,064	10310	207	0,054	10310	142	0,045
1.6 x 20	11780	235	0,058	10310	207	0,049	10310	142	0,041
1.8 x 6	14150	414	0,240	12380	365	0,204	12380	255	0,168
1.8 x 8	14150	414	0,180	12380	365	0,153	12380	255	0,126
1.8 x 10	13230	362	0,144	11570	319	0,122	11570	223	0,101
1.8 x 12	12300	313	0,120	10770	276	0,102	10770	193	0,084
1.8 x 14	12300	313	0,103	10770	276	0,087	10770	193	0,072
1.8 x 16	11400	268	0,090	9960	236	0,077	9960	165	0,063
1.8 x 18	10500	227	0,072	9160	200	0,061	9160	140	0,050
1.8 x 20	10500	227	0,065	9160	200	0,056	9160	140	0,046
2 x 6	12750	398	0,267	11140	350	0,227	11140	252	0,187
2 x 8	12750	398	0,200	11140	350	0,170	11140	252	0,140
2 x 10	11900	348	0,160	10420	306	0,136	10420	220	0,112
2 x 12	11100	301	0,133	9690	265	0,113	9690	190	0,093
2 x 14	11100	301	0,114	9690	265	0,097	9690	190	0,080
2 x 16	10250	258	0,100	8970	227	0,085	8970	163	0,070
2 x 18	10250	258	0,089	8970	227	0,076	8970	163	0,062
2 x 20	9420	218	0,080	8240	192	0,068	8240	138	0,056
2 x 25	8600	181	0,067	7520	159	0,057	7520	115	0,047
2 x 30	7780	148	0,053	6800	130	0,045	6800	94	0,037
2.5 x 8	10200	382	0,333	8910	336	0,283	8910	230	0,233
2.5 x 10	10200	382	0,250	8910	336	0,213	8910	230	0,175
2.5 x 12	10200	382	0,250	8910	336	0,213	8910	230	0,175
2.5 x 14	9500	334	0,200	8330	294	0,170	8330	201	0,140
2.5 x 16	8850	289	0,167	7750	254	0,142	7750	174	0,117
2.5 x 18	8850	289	0,143	7750	254	0,121	7750	174	0,100
2.5 x 20	8200	248	0,125	7170	218	0,106	7170	149	0,088
2.5 x 25	7550	209	0,100	6600	184	0,085	6600	126	0,070
2.5 x 30	6880	174	0,083	6020	153	0,071	6020	105	0,058
3 x 8	8500	372	0,600	7430	327	0,510	7430	221	0,420
3 x 10	8500	372	0,400	7430	327	0,340	7430	221	0,280
3 x 12	8500	372	0,300	7430	327	0,255	7430	221	0,210
3 x 14	8500	372	0,300	7430	327	0,255	7430	221	0,210
3 x 16	7950	325	0,240	6940	285	0,204	6940	193	0,168
3 x 18	7400	281	0,200	6460	247	0,170	6460	167	0,140
3 x 20	7400	281	0,200	6460	247	0,170	6460	167	0,140
3 x 25	6850	241	0,150	5980	212	0,128	5980	143	0,105
4 x 10	6350	351	0,800	5570	309	0,680	5570	217	0,560
4 x 15	6350	351	0,533	5570	309	0,453	5570	217	0,373
4 x 20	5950	307	0,320	5210	270	0,272	5210	189	0,224
4 x 25	5550	266	0,267	4850	234	0,227	4850	164	0,187
4 x 30	5550	266	0,229	4850	234	0,194	4850	164	0,160
4 x 40	4720	192	0,160	4120	169	0,136	4120	119	0,112

R ap x ae

apxD

apxD

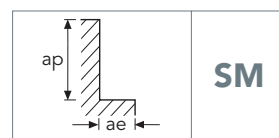
apxD



MEXCS4											
MATERIAL GROUPS	3 4 5 13 14		6 7		9 10		8		8		
HRC	~30		30~45				45~55		55~65		
N/mm ²	~1000		1000~1500				1500~				
Vc [m/min]	75~105		45~65 (HSC140~180)		40~55		30~45 (HSC75~95)		18~20		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	
2	11550	280	7600	170	6300	140	5050	50	2800	50	
2 HSC			22300	450			12000	250			
3	8900	320	5550	200	4600	170	3350	60	1900	60	
3 HSC			16000	640			8500	350			
4	7600	570	4600	350	3900	280	2950	60	1500	60	
4 HSC			12500	750			6800	410			
5	6300	600	3800	360	3150	300	2300	70	1250	60	
5 HSC			11000	880			5800	460			
6	5600	660	3350	410	2850	330	2000	80	1100	60	
6 HSC			9550	960			5100	510			
8	4200	710	2500	380	2100	350	1700	110	850	60	
8 HSC			7200	950			3800	500			
10	3300	610	2000	300	1700	300	1350	90	700	50	
10 HSC			5800	970			3000	510			
12	2750	520	1700	250	1350	240	1150	80	550	50	
12 HSC			4800	950			2500	500			
16	2200	410	1350	200	1100	200	900	60	450	30	
16 HSC			3600	880			1900	470			
20	1700	320	1050	160	850	150	700	40	320	30	
20 HSC			2900	820			1500	430			
25	1350	250	850	130	680	120	550	30	250	20	
25 HSC			2300	660			1200	350			
SM ap x ae	Dx0.05D		Dx0.05D		Dx0.05D		Dx0.05D		Dx0.05D		

HSC = high speed cutting / alta velocità / hoch Geschwindigkeit / grande vitesse / alta velocidad / высокая скорость

MEXCL4											
MATERIAL GROUPS	3 4 5 13 14		6 7		8		8				
HRC	~30		30~45		45~55		55~65				
N/mm ²	~1000		1000~1500		1500~						
Vc [m/min]	55~75		30~45		20~28		16~22				
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	
2	8850	200	5050	80	3150	45	2700	25			
3	6200	230	3600	100	2200	55	1900	30			
4	5000	280	2850	115	1800	60	1500	35			
5	4300	360	2400	140	1600	70	1250	40			
6	3700	430	2100	180	1400	90	1150	50			
8	2800	460	1600	180	1050	90	850	50			
10	2400	460	1350	180	850	90	680	50			
12	1950	360	1150	160	700	70	550	40			
16	1600	320	900	125	550	60	450	35			
20	1200	230	700	90	420	45	350	25			
SM ap x ae	2.5Dx0.05D		2.5Dx0.05D		2Dx0.02D		2Dx0.02D				

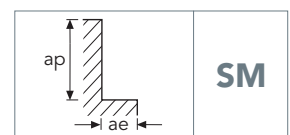


SM

MEXCSHM									
MATERIAL GROUPS	3 4 5 13 14		6 7		8		8		
HRC	~30		30~50		50~60		60~65		
N/mm ²	~1000		1000~1750		1750~				
Vc [m/min]	100~120		70~85 (HSC320~360)		30~35 (HSC160~180)		20~25 (HSC80~90)		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	
6	5600	2000	3900	1370	1600	210	1100	130	
6 HSC			16800	6100	8400	3050	4200	1470	
8	4200	2000	2900	1370	1200	210	850	130	
8 HSC			12600	6100	6300	3050	3200	1470	
10	3400	2000	2300	1370	1000	210	700	130	
10 HSC			10000	6000	5000	3050	2500	1470	
12	2800	1680	2000	1160	850	180	550	110	
12 HSC			8400	5000	4200	2500	2100	1260	
16	2100	1260	1500	880	650	130	420	70	
16 HSC			6300	3800	3200	1900	1600	950	
20	1700	1010	1200	690	500	110	320	60	
20 HSC			5000	3000	2500	1480	1300	760	
25	1500	900	1100	600	420	90	260	50	
25 HSC			4500	2700	2200	1300	1100	670	
SM ap x ae	1.5Dx0.1D		1.5Dx0.05D		Dx0.05D		Dx0.2mm		

HSC = high speed cutting / alta velocità / hoch Geschwindigkeit / grande vitesse / alta velocidad / высокая скорость

MEXCLHM									
MATERIAL GROUPS	5 6		7 8		8		8		
HRC	~40		40~50		50~60		60~65		
N/mm ²	~1250		1250~						
Vc [m/min]	40~45		30~35		25~30		18~22		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	
6	2200	470	1700	350	1400	250	1100	200	
8	1700	450	1250	330	1050	240	850	180	
10	1300	440	1000	300	850	230	700	160	
12	1100	400	850	270	700	210	550	150	
16	850	330	650	230	550	170	420	130	
20	700	280	500	200	420	150	320	120	
25	550	240	400	170	350	130	270	95	
SM ap x ae	3Dx0.01D		3Dx0.01D		3Dx0.005D		3Dx0.005D		

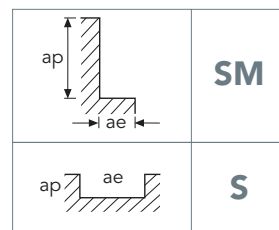


MEX410R									
MATERIAL GROUPS	3 4 5 13 14		6 7		8		8		
HRC	~30		30~45		45~55		55~65		
N/mm ²	~1000		1000~1500		1500~				
Vc [m/min]	90~130		55~85 (HSC180~240)		40~55 (HSC100~125)		20~25 (HSC70~90)		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	
2	13900	340	9100	210	6100	60	3000	50	
2 HSC			29000	590	15500	310	11000	220	
2.5	12300	360	7900	220	5050	65	2600	60	
2.5 HSC			25000	700	13500	380	9500	270	
3	10700	390	6700	240	4050	70	2300	70	
3 HSC			21000	830	11000	440	7500	310	
3.5	9900	540	6100	330	3800	70	2050	70	
3.5 HSC			18500	900	10000	480	7000	340	
4	9100	690	5550	420	3550	70	1800	70	
4 HSC			16500	980	9000	530	6500	370	
5	7600	720	4550	430	2800	85	1500	70	
5 HSC			14500	1150	7500	600	5300	420	
6	6700	790	4050	490	2400	95	1350	70	
6 HSC			12500	1250	6500	650	4600	460	
8	5100	850	3050	460	2050	130	1050	70	
8 HSC			9500	1250	5000	650	3500	460	
10	3900	730	2400	360	1650	110	840	60	
10 HSC			7500	1250	3900	650	2700	460	
12	3300	630	2050	300	1400	95	680	60	
12 HSC			6200	1250	3300	650	2300	460	
16	2650	490	1650	240	1100	70	530	65	
16 HSC			4700	1150	2500	600	1750	420	
SM ap x ae	Dx0.05D		Dx0.05D		Dx0.05D		Dx0.05D		
SM ap x ae	Dx0.02D		Dx0.02D		Dx0.02D		Dx0.02D		

HSC = high speed cutting / alta velocità / hoch Geschwindigkeit / grande vitesse / alta velocidad / высокая скорость

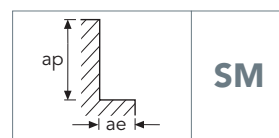
MEXCL2R									
MATERIAL GROUPS	3 4 5 13 14		6 7		8		8		
HRC	~30		30~45		45~55		55~65		
N/mm ²	~1000		1000~1500		1500~				
Vc [m/min]	60~80		40~55		25~35		18~22		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	
3	6600	140	4300	70	2650	35	1900	20	
4	5350	170	3400	85	2150	40	1500	20	
5	4600	210	2900	100	1900	50	1250	25	
6	3950	250	2500	125	1650	60	1150	35	
8	3000	270	1900	125	1250	60	850	35	
10	2500	270	1650	125	1000	60	670	35	
12	2100	210	1400	115	850	50	550	25	
16	1750	190	1100	90	670	40	450	20	
20	1300	140	850	60	500	30	350	15	
S ap x ae	0.3DxD		0.3DxD		0.005DxD		0.005DxD		

↓ Z axis : Vf = -50%



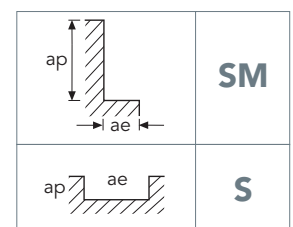
MEXLS2R							
MATERIAL GROUPS	3 4 5 13 14		6 7		7 8		
HRC	~30		30~45		45~55		
N/mm ²	~1000		1000~1480		1480~		
Vc [m/min]	55~70		55~70		40~55		
Ø mm.	n	Vf	n	Vf	n	Vf	
2 x R0.3	8910 ~ 11460	218~375	8910 ~ 11460	218~375	6370 ~ 8910	113~240	
3 x R0.3	5940 ~ 7640	233~368	5940 ~ 7640	233~368	4240 ~ 5940	128~233	
3 x R0.5	5940 ~ 7640	233~368	5940 ~ 7640	233~368	4240 ~ 5940	128~233	
4 x R0.3	4460 ~ 5730	240~360	4460 ~ 5730	240~360	3180 ~ 4460	135~218	
4 x R0.5	4460 ~ 5730	240~360	4460 ~ 5730	240~360	3180 ~ 4460	135~218	
5 x R0.3	3570 ~ 4580	248~345	3570 ~ 4580	248~345	2550 ~ 3570	135~218	
5 x R0.5	3570 ~ 4580	248~345	3570 ~ 4580	248~345	2550 ~ 3570	135~218	
6 x R0.3	2970 ~ 3820	248~345	2970 ~ 3820	248~345	2120 ~ 2970	143~218	
6 x R0.5	2970 ~ 3820	248~345	2970 ~ 3820	248~345	2120 ~ 2970	143~218	
6 x R1.0	2970 ~ 3820	248~345	2970 ~ 3820	248~345	2120 ~ 2970	143~218	
8 x R0.3	2230 ~ 2860	225~323	2230 ~ 2860	225~323	1590 ~ 2230	128~203	
8 x R0.5	2230 ~ 2860	225~323	2230 ~ 2860	225~323	1590 ~ 2230	128~203	
8 x R1.0	2230 ~ 2860	225~323	2230 ~ 2860	225~323	1590 ~ 2230	128~203	
10 x R0.5	1780 ~ 2290	218~308	1780 ~ 2290	218~308	1270 ~ 1780	120~188	
10 x R1.0	1780 ~ 2290	218~308	1780 ~ 2290	218~308	1270 ~ 1780	120~188	
10 x R2.0	1780 ~ 2290	218~308	1780 ~ 2290	218~308	1270 ~ 1780	120~188	
12 x R0.5	1490 ~ 1910	218~300	1490 ~ 1910	218~300	1060 ~ 1490	120~180	
12 x R1.0	1490 ~ 1910	218~300	1490 ~ 1910	218~300	1060 ~ 1490	120~180	
12 x R2.0	1490 ~ 1910	218~300	1490 ~ 1910	218~300	1060 ~ 1490	120~180	
16 x R0.5	1110 ~ 1430	210~293	1110 ~ 1430	210~293	800 ~ 1110	113~180	
16 x R1.0	1110 ~ 1430	210~293	1110 ~ 1430	210~293	800 ~ 1110	113~180	
16 x R2.0	1110 ~ 1430	210~293	1110 ~ 1430	210~293	800 ~ 1110	113~180	
S ap x ae	0.2DxD		0.2DxD		0.1DxD		

MEXLS2R							
MATERIAL GROUPS	3 4 5 13 14		6 7		7 8		
HRC	~30		30~45		45~55		
N/mm ²	~1000		1000~1480		1480~		
Vc [m/min]	55~70		55~70		40~55		
Ø mm.	n	Vf	n		n	Vf	
2 x R0.3	8910 ~ 11460	293~450	8910 ~ 11460	293~450	6370 ~ 8910	150~293	
3 x R0.3	5940 ~ 7640	300~458	5940 ~ 7640	300~458	4240 ~ 5940	150~285	
3 x R0.5	5940 ~ 7640	300~458	5940 ~ 7640	300~458	4240 ~ 5940	150~285	
4 x R0.3	4460 ~ 5730	308~450	4460 ~ 5730	308~450	3180 ~ 4460	165~270	
4 x R0.5	4460 ~ 5730	308~450	4460 ~ 5730	308~450	3180 ~ 4460	165~270	
5 x R0.3	3570 ~ 4580	308~443	3570 ~ 4580	308~443	2550 ~ 3570	165~270	
5 x R0.5	3570 ~ 4580	308~443	3570 ~ 4580	308~443	2550 ~ 3570	165~270	
6 x R0.3	2970 ~ 3820	315~435	2970 ~ 3820	315~435	2120 ~ 2970	173~270	
6 x R0.5	2970 ~ 3820	315~435	2970 ~ 3820	315~435	2120 ~ 2970	173~270	
6 x R1.0	2970 ~ 3820	315~435	2970 ~ 3820	315~435	2120 ~ 2970	173~270	
8 x R0.3	2230 ~ 2860	285~405	2230 ~ 2860	285~405	1590 ~ 2230	165~248	
8 x R0.5	2230 ~ 2860	285~405	2230 ~ 2860	285~405	1590 ~ 2230	165~248	
8 x R1.0	2230 ~ 2860	285~405	2230 ~ 2860	285~405	1590 ~ 2230	165~248	
10 x R0.5	1780 ~ 2290	278~390	1780 ~ 2290	278~390	1270 ~ 1780	150~233	
10 x R1.0	1780 ~ 2290	278~390	1780 ~ 2290	278~390	1270 ~ 1780	150~233	
10 x R2.0	1780 ~ 2290	278~390	1780 ~ 2290	278~390	1270 ~ 1780	150~233	
12 x R0.5	1490 ~ 1910	270~375	1490 ~ 1910	270~375	1060 ~ 1490	150~233	
12 x R1.0	1490 ~ 1910	270~375	1490 ~ 1910	270~375	1060 ~ 1490	150~233	
12 x R2.0	1490 ~ 1910	270~375	1490 ~ 1910	270~375	1060 ~ 1490	150~233	
16 x R0.5	1110 ~ 1430	255~368	1110 ~ 1430	255~368	800 ~ 1110	143~218	
16 x R1.0	1110 ~ 1430	255~368	1110 ~ 1430	255~368	800 ~ 1110	143~218	
16 x R2.0	1110 ~ 1430	255~368	1110 ~ 1430	255~368	800 ~ 1110	143~218	
SM ap x ae	1.5Dx0.2D		1.5Dx0.2D		Dx0.1D		



MEXCL4R									
MATERIAL GROUPS	3 4 5 13 14		6 7		8		8		
HRC	~30		30~45		45~55		55~65		
N/mm ²	~1000		1000~1500		1500~				
Vc [m/min]	60~20		40~55		25~35		18~22		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	
3	6600	170	4300	130	2650	65	1900	30	
4	5350	210	3400	180	2150	70	1500	35	
5	4600	220	2900	180	1900	85	1250	40	
6	3950	220	2500	180	1650	85	1150	50	
8	3000	230	1900	180	1250	85	850	50	
10	2500	230	1650	180	1000	85	670	50	
12	2100	180	1400	160	850	70	550	40	
16	1750	160	1100	125	670	60	450	35	
20	1300	120	850	90	500	45	350	25	
SM ap x ae	2.5Dx0.05D		2.5Dx0.05D		2Dx0.05D		Dx0.05D		

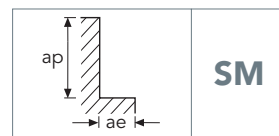
MEXLS4R							
MATERIAL GROUPS	3 4 5 13 14		6 7		7 8		
HRC	~30		30~45		45~55		
N/mm ²	~1000		1000~1480		1480~		
Vc [m/min]	55~70		55~70		40~55		
Ø mm.	n	Vf	n	Vf	n	Vf	
2 x R0.3	8910 ~ 11460	290 ~ 500	8910 ~ 11460	290 ~ 500	6370 ~ 8910	150 ~ 320	
3 x R0.3	5940 ~ 7640	310 ~ 490	5940 ~ 7640	310 ~ 490	4240 ~ 5940	170 ~ 310	
3 x R0.5	5940 ~ 7640	310 ~ 490	5940 ~ 7640	310 ~ 490	4240 ~ 5940	170 ~ 310	
4 x R0.3	4460 ~ 5730	320 ~ 480	4460 ~ 5730	320 ~ 480	3180 ~ 4460	180 ~ 290	
4 x R0.5	4460 ~ 5730	320 ~ 480	4460 ~ 5730	320 ~ 480	3180 ~ 4460	180 ~ 290	
5 x R0.3	3570 ~ 4580	330 ~ 460	3570 ~ 4580	330 ~ 460	2550 ~ 3570	180 ~ 290	
5 x R0.5	3570 ~ 4580	330 ~ 460	3570 ~ 4580	330 ~ 460	2550 ~ 3570	180 ~ 290	
6 x R0.3	2970 ~ 3820	330 ~ 460	2970 ~ 3820	330 ~ 460	2120 ~ 2970	190 ~ 290	
6 x R0.5	2970 ~ 3820	330 ~ 460	2970 ~ 3820	330 ~ 460	2120 ~ 2970	190 ~ 290	
6 x R1.0	2970 ~ 3820	330 ~ 460	2970 ~ 3820	330 ~ 460	2120 ~ 2970	190 ~ 290	
8 x R0.3	2230 ~ 2860	300 ~ 430	2230 ~ 2860	300 ~ 430	1590 ~ 2230	170 ~ 270	
8 x R0.5	2230 ~ 2860	300 ~ 430	2230 ~ 2860	300 ~ 430	1590 ~ 2230	170 ~ 270	
8 x R1.0	2230 ~ 2860	300 ~ 430	2230 ~ 2860	300 ~ 430	1590 ~ 2230	170 ~ 270	
10 x R0.5	1780 ~ 2290	290 ~ 410	1780 ~ 2290	290 ~ 410	1270 ~ 1780	160 ~ 250	
10 x R1.0	1780 ~ 2290	290 ~ 410	1780 ~ 2290	290 ~ 410	1270 ~ 1780	160 ~ 250	
10 x R2.0	1780 ~ 2290	290 ~ 410	1780 ~ 2290	290 ~ 410	1270 ~ 1780	160 ~ 250	
12 x R0.5	1490 ~ 1910	290 ~ 400	1490 ~ 1910	290 ~ 400	1060 ~ 1490	160 ~ 240	
12 x R1.0	1490 ~ 1910	290 ~ 400	1490 ~ 1910	290 ~ 400	1060 ~ 1490	160 ~ 240	
12 x R2.0	1490 ~ 1910	290 ~ 400	1490 ~ 1910	290 ~ 400	1060 ~ 1490	160 ~ 240	
16 x R0.5	1110 ~ 1430	280 ~ 390	1110 ~ 1430	280 ~ 390	800 ~ 1110	150 ~ 240	
16 x R1.0	1110 ~ 1430	280 ~ 390	1110 ~ 1430	280 ~ 390	800 ~ 1110	150 ~ 240	
16 x R2.0	1110 ~ 1430	280 ~ 390	1110 ~ 1430	280 ~ 390	800 ~ 1110	150 ~ 240	
S ap x ae	0.2DxD		0.2DxD		0.1DxD		



MEXLS4R							
MATERIAL GROUPS	3 4 5 13 14		6 7		7 8		
HRC	~30		30~45		45~55		
N/mm ²	~1000		1000~1480		1480~		
Vc [m/min]	55~70		55~70		40~55		
Ø mm.	n	Vf	n	Vf	n	Vf	
2 x R0.3	8910 ~ 11460	390 ~ 600	8910 ~ 11460	390 ~ 600	6370 ~ 8910	200 ~ 390	
3 x R0.3	5940 ~ 7640	400 ~ 610	5940 ~ 7640	400 ~ 610	4240 ~ 5940	200 ~ 380	
3 x R0.5	5940 ~ 7640	400 ~ 610	5940 ~ 7640	400 ~ 610	4240 ~ 5940	200 ~ 380	
4 x R0.3	4460 ~ 5730	410 ~ 600	4460 ~ 5730	410 ~ 600	3180 ~ 4460	220 ~ 360	
4 x R0.5	4460 ~ 5730	410 ~ 600	4460 ~ 5730	410 ~ 600	3180 ~ 4460	220 ~ 360	
5 x R0.3	3570 ~ 4580	410 ~ 590	3570 ~ 4580	410 ~ 590	2550 ~ 3570	220 ~ 360	
5 x R0.5	3570 ~ 4580	410 ~ 590	3570 ~ 4580	410 ~ 590	2550 ~ 3570	220 ~ 360	
6 x R0.3	2970 ~ 3820	420 ~ 580	2970 ~ 3820	420 ~ 580	2120 ~ 2970	230 ~ 360	
6 x R0.5	2970 ~ 3820	420 ~ 580	2970 ~ 3820	420 ~ 580	2120 ~ 2970	230 ~ 360	
6 x R1.0	2970 ~ 3820	420 ~ 580	2970 ~ 3820	420 ~ 580	2120 ~ 2970	230 ~ 360	
8 x R0.3	2230 ~ 2860	380 ~ 540	2230 ~ 2860	380 ~ 540	1590 ~ 2230	220 ~ 330	
8 x R0.5	2230 ~ 2860	380 ~ 540	2230 ~ 2860	380 ~ 540	1590 ~ 2230	220 ~ 330	
8 x R1.0	2230 ~ 2860	380 ~ 540	2230 ~ 2860	380 ~ 540	1590 ~ 2230	220 ~ 330	
10 x R0.5	1780 ~ 2290	370 ~ 520	1780 ~ 2290	370 ~ 520	1270 ~ 1780	200 ~ 310	
10 x R1.0	1780 ~ 2290	370 ~ 520	1780 ~ 2290	370 ~ 520	1270 ~ 1780	200 ~ 310	
10 x R2.0	1780 ~ 2290	370 ~ 520	1780 ~ 2290	370 ~ 520	1270 ~ 1780	200 ~ 310	
12 x R0.5	1490 ~ 1910	360 ~ 500	1490 ~ 1910	360 ~ 500	1060 ~ 1490	200 ~ 310	
12 x R1.0	1490 ~ 1910	360 ~ 500	1490 ~ 1910	360 ~ 500	1060 ~ 1490	200 ~ 310	
12 x R2.0	1490 ~ 1910	360 ~ 500	1490 ~ 1910	360 ~ 500	1060 ~ 1490	200 ~ 310	
16 x R0.5	1110 ~ 1430	340 ~ 490	1110 ~ 1430	340 ~ 490	800 ~ 1110	190 ~ 290	
16 x R1.0	1110 ~ 1430	340 ~ 490	1110 ~ 1430	340 ~ 490	800 ~ 1110	190 ~ 290	
16 x R2.0	1110 ~ 1430	340 ~ 490	1110 ~ 1430	340 ~ 490	800 ~ 1110	190 ~ 290	
SM ap x ae	1.5Dx0.2D		1.5DxD		Dx0.1D		

MEX610R									
MATERIAL GROUPS	3 4 5 13 14		6 7		8		8		
HRC	~30		30~45		45~55		55~65		
N/mm ²	~1000		1000~1500		1500~				
Vc [m/min]	115~130		70~80 (HSC 300~320)		40~50 (HSC 150~170)		22~26 (HSC 75~85)		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	
6	6700	790	4100	490	2400	95	1350	70	
6 HSC			16800	6100	8400	3100	4200	1450	
8	5100	850	3000	450	2000	130	1000	70	
8 HSC			12600	6100	6300	3100	3100	1450	
10	4000	730	2400	360	1650	110	820	60	
10 HSC			10000	6000	5050	3100	2500	1450	
12	3300	630	2000	300	1400	95	670	60	
12 HSC			8400	5050	4200	2500	2100	1250	
SM ap x ae	Dx0.05D		Dx0.05D		Dx0.05D		Dx0.05D		
SM ap x ae	Dx0.03D		Dx0.03D		Dx0.03D		Dx0.3mm		

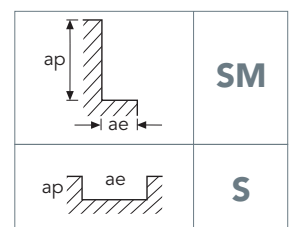
HSC = high speed cutting / alta velocità / hoch Geschwindigkeit / grande vitesse / alta velocidad / высокая скорость



MEX611R										
MATERIAL GROUPS	6 7		8		8					
HRC	~50		50~60		60~65					
N/mm ²										
Vc [m/min]	115~135 (HSC300~320)		70~80 (HSC150~170)		40~50 (HSC75~85)					
Ø mm.	n	Vf	n	Vf	n	Vf				
6	3900	1400	1600	210	1100	130				
6 HSC	16800	6100	8400	3100	4200	1450				
8	2900	1400	1200	210	850	130				
8 HSC	12600	6100	6300	3100	3100	1450				
10	2300	1400	1000	210	700	130				
10 HSC	10000	6000	5050	3100	2500	1450				
12	2000	1200	850	200	600	120				
12 HSC	8400	5050	4200	2500	2100	1250				
16	1500	900	650	150	420	70				
16 HSC	6300	3800	3150	1900	1600	950				
20	1200	700	500	120	320	60				
20 HSC	5050	3050	2500	1500	1300	760				
SM ap x ae	1.5Dx0.05D		Dx0.05D		Dx0.2mm					
HSC SM ap x ae	1.5Dx0.03D		Dx0.03D		Dx0.2mm					

HSC = high speed cutting / alta velocità / hoch Geschwindigkeit / grande vitesse / alta velocidad / высокая скорость

MEXCSFR										
MATERIAL GROUPS	3 4 5 13 14		6		7		8		8	
HRC	~30		30~38		38~45		45~55		55~65	
N/mm ²	~1000		1000~1200		1200~1400		1400~			
Vc [m/min]	280~530		220~260		150~170		60~70		40~50	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
6	15600	2320	12400	840	8400	570	3400	260	2400	190
8	11600	2320	9200	840	6300	570	2400	240	1800	180
10	9200	2320	7600	840	5100	570	2000	290	1300	190
12	8000	2400	6000	800	4200	570	1700	260	1200	190
14	6800	2400	5200	840	3600	570	1400	200	900	130
16	6000	2400	4800	760	3300	510	1200	160	800	110
18	5200	2320	4400	720	2700	420	1100	150	700	100
20	4800	2160	3600	560	2400	360	1000	150	650	100
25	4300	2150	3200	620	2160	410	900	160	600	100
S ap x ae	0.5DxD		0.5DxD		0.5DxD		0.05DxD		0.05DxD	
SM ap x ae	1.5Dx0.30D		1.5Dx0.3D		1.5Dx0.3D		Dx0.05D		Dx0.05D	



HF440* - HF441* - HF442* - HF443* - HF840 - HF842

MATERIAL GROUPS	1 2 3 4		5 6 7		9 10 11		22		26	
	5 13 14									
Vc [m/min]	140~160		90~110		60~80		45~55		60~80	
HRC	~30		30~40				~35		~35	
N/mm ²	~950		950~1250				~1080		~1080	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
3	15900	820	10600	550	7430	300	5300	210	7430	400
4	11900	830	7950	540	5580	310	3980	220	5580	420
5	9550	850	6370	560	4460	330	3185	230	4460	440
6	7950	870	5300	570	3720	350	2655	235	3720	440
8	5950	840	3980	560	2780	350	1990	240	2780	450
10	4780	810	3180	535	2230	330	1590	230	2230	430
12	3980	750	2650	500	1860	330	1330	230	1860	430
14	3420	730	2280	485	1590	320	1140	220	1590	410
16	2990	720	1990	480	1390	310	995	215	1390	410
18	2650	700	1770	465	1240	310	885	210	1240	400
20	2390	690	1590	460	1120	310	795	210	1120	400

S ap x ae DxD DxD DxD 0.5DxD DxD

HF444* - HF445* - HF844

MATERIAL GROUPS	1 2 3 4		5 6 7		9 10 11		22		26	
	5 13 14									
Vc [m/min]	160~170		105~115		70~85		50~60		70~85	
HRC	~30		30~40				~35		~35	
N/mm ²	~950		950~1250				~1080		~1080	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
6	8750	1050	5840	700	4100	410	2920	290	4100	560
8	6550	1030	4380	680	3060	410	2190	295	3060	550
10	5250	970	3500	645	2450	400	1750	295	2450	530
12	4380	920	2920	610	2050	390	1460	275	2050	520
14	3760	890	2500	590	1750	380	1250	265	1750	510
16	3290	870	2190	580	1530	370	1090	265	1530	500
18	2920	850	1950	570	1360	365	970	260	1360	490
20	2630	840	1750	560	1230	360	875	260	1230	480

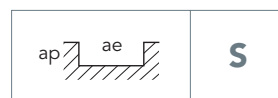
S ap x ae DxD DxD DxD 0.5DxD DxD

HF450* - HF451* - HF452* - HF850 - HF852

MATERIAL GROUPS	6 7		8		12		22		26	
Vc [m/min]	90~110		65~85		55~65		35~45		55~65	
HRC	35~45		45~50		~35		35~		35~	
N/mm ²	1080~1480		1480~		1080~		1080~		1080~	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
3	10600	510	7430	450	6370	130	4250	50	6370	130
4	7950	540	5570	470	4780	135	3190	50	4780	135
5	6370	560	4460	480	3820	150	2560	60	3820	150
6	5300	570	3720	505	3190	155	2120	68	3190	155
8	3980	570	2790	500	2390	160	1590	70	2390	160
10	3180	550	2230	480	1910	155	1270	65	1910	155
12	2650	530	1860	470	1590	155	1060	65	1590	155
14	2280	520	1590	460	1360	145	910	65	1360	145
16	1990	520	1390	450	1190	145	800	65	1190	145
18	1770	510	1240	440	1060	140	710	62	1060	140
20	1590	500	1120	440	960	140	635	60	960	140

S ap x ae DxD DxD DxD DxD DxD

- ✳ * n = 80%~100% according to application stability
- 🇮🇹 * n = 80%~100% in base alla stabilità della lavorazione
- 🇩🇪 * n = 80%~100% je nach Stabilität der Bearbeitung
- 🇫🇷 * n = 80%~100% sur la base de la stabilité de l'usinage
- 🇪🇸 * n = 80%~100% de acuerdo con las condiciones de mecanizado (poco estables o muy estables)
- 🇷🇺 * n = 80%~100% в зависимости от стабильности рабочих условий

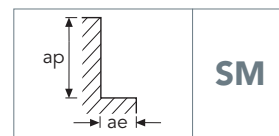


HF440* - HF441* - HF442* - HF443* - HF840 - HF842										
MATERIAL GROUPS	1 2 3 4 5 13 14		5 6 7		9 10 11		22		26	
Vc [m/min]	140~160		90~110		60~80		45~55		60~80	
HRC	~30		30~40				~35		~35	
N/mm ²	~950		950~1250				~1080		~1080	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
3	15900	1020	10600	680	7430	385	5300	275	7430	480
4	11900	1050	7950	700	5580	400	3980	285	5580	510
5	9550	1070	6370	715	4460	420	3185	290	4460	530
6	7950	1080	5300	720	3720	430	2655	295	3720	530
8	5950	1050	3980	700	2780	420	1990	300	2780	540
10	4780	980	3180	650	2230	400	1590	285	2230	520
12	3980	940	2650	625	1860	400	1330	280	1860	520
14	3420	920	2280	610	1590	390	1140	275	1590	490
16	2990	890	1990	590	1390	380	995	270	1390	490
18	2650	870	1770	580	1240	380	885	265	1240	480
20	2390	860	1590	570	1120	370	795	265	1120	480
SM ap x ae	1.5Dx0.5D		1.5Dx0.5D		1.5Dx0.5D		1.5Dx0.25D		1.5Dx0.5D	

HF444* - HF445* - HF844										
MATERIAL GROUPS	1 2 3 4 5 13 14		5 6 7		9 10 11		22		26	
Vc [m/min]	160~170		105~115		70~85		50~60		70~85	
HRC	~30		30~40				~35		~35	
N/mm ²	~950		950~1250				~1080		~1080	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
6	8750	1330	5840	890	4100	510	2920	360	4100	690
8	6550	1290	4380	860	3060	510	2190	365	3060	680
10	5250	1200	3500	800	2450	490	1750	350	2450	660
12	4380	1160	2920	770	2050	480	1460	345	2050	650
14	3760	1130	2500	740	1750	480	1250	335	1750	630
16	3290	1090	2190	730	1530	460	1090	330	1530	620
18	2920	1075	1950	710	1360	460	970	325	1360	610
20	2630	1050	1750	700	1230	450	875	320	1230	600
SM ap x ae	1.5Dx0.5D		1.5Dx0.5D		1.5Dx0.5D		1.5Dx0.25D		1.5Dx0.5D	

HF450* - HF451* - HF452* - HF850 - HF852										
MATERIAL GROUPS	6 7		8		12		22		26	
Vc [m/min]	90~110		65~85		55~65		35~45		55~65	
HRC	35~45		45~50		~35		35~		35~	
N/mm ²	1080~1480		1480~		1080~		1080~		1080~	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
3	10600	680	7430	565	6370	180	4250	70	6370	180
4	7950	700	5570	600	4780	180	3190	75	4780	180
5	6370	715	4460	610	3820	180	2560	80	3820	180
6	5300	720	3720	625	3190	190	2120	85	3190	190
8	3980	715	2790	625	2390	200	1590	80	2390	200
10	3180	690	2230	600	1910	190	1270	80	1910	190
12	2650	670	1860	590	1590	185	1060	85	1590	185
14	2280	660	1590	570	1360	180	910	80	1360	180
16	1990	645	1390	560	1190	180	800	80	1190	180
18	1770	630	1240	555	1060	180	710	80	1060	180
20	1590	620	1120	550	960	175	635	75	960	175
SM ~Ø5 ap x ae	1.5Dx0.2D		1.5Dx0.2D		1.5Dx0.2D		1.5Dx0.2D		1.5Dx0.2D	
SM >Ø5 ap x ae	1.5Dx0.3D		1.5Dx0.3D		1.5Dx0.3D		1.5Dx0.3D		1.5Dx0.3D	

- ⚙ * n = 80%~100% according to application stability
- 🇮🇹 * n = 80%~100% in base alla stabilità della lavorazione
- 🇩🇪 * n = 80%~100% je nach Stabilität der Bearbeitung
- 🇫🇷 * n = 80%~100% sur la base de la stabilité de l'usinage
- 🇪🇸 * n = 80%~100% de acuerdo con las condiciones de mecanizado (poco estables o muy estables)
- 🇷🇺 * n = 80%~100% в зависимости от стабильности рабочих условий



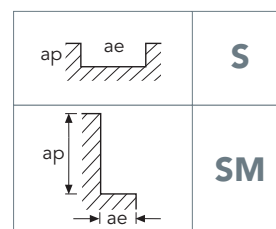
SM

MEFCS2						
MATERIAL GROUPS	1 2 3 4 5 6	6 7	9 10 26			
HRC	~30		30~45			
N/mm ²	~1000		1000~1500			
Vc [m/min]	60~90		40~55		35~45	
Ø mm.	n	Vf	n	Vf	n	Vf
2	9300	190	6100	120	5100	90
3	7200	210	4500	140	3700	120
4	6100	300	3700	180	3100	150
5	5100	320	3000	190	2550	160
6	4500	350	2700	220	2300	180
8	3400	380	2000	200	1700	180
10	2600	330	1600	160	1350	160
12	2200	280	1400	130	1100	130
16	1800	220	1100	110	850	110
20	1400	170	850	80	700	80
25	1100	130	670	70	550	60
S ap x ae	0.5D*xD		0.5*DxD		0.5*DxD	

*≤Ø3 ap=0.2D

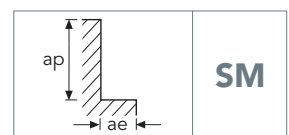
↓ Z axis : Vf = -50%

MEFCS4						
MATERIAL GROUPS	1 2 3 4 5 6	6 7	9 10 26			
HRC	~30		30~45			
N/mm ²	~1000		1000~1500			
Vc [m/min]	60~90		40~55		35~45	
Ø mm.	n	Vf	n	Vf	n	Vf
2	9300	280	6100	170	5100	140
3	7200	320	4500	200	3700	170
4	6100	570	3700	350	3100	280
5	5100	600	3000	360	2550	300
6	4500	660	2700	410	2300	330
8	3400	710	2000	380	1700	350
10	2600	610	1600	200	1350	300
12	2200	520	1400	250	1100	240
16	1800	410	1100	200	850	200
20	1400	320	850	160	700	150
25	1100	250	670	130	550	120
SM ap x ae	Dx0.05D		Dx0.05D		Dx0.05D	



MEFCSH3									
MATERIAL GROUPS	1 2 3 4 5 6		6 7		9 10 26		22 23		
HRC	~30		30~45						
N/mm ²	~1000		1000~1500						
Vc [m/min]	90~110		60~70		50~55		22~26		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	
6	5500	650	3400	510	2850	240	1300	80	
8	4200	710	2500	460	2100	240	920	80	
10	3300	630	2000	360	1700	210	740	80	
12	2750	520	1700	310	1350	180	620	60	
16	2200	420	1350	260	1050	170	460	50	
18	1950	370	1200	240	950	165	410	45	
20	1700	320	1050	210	850	135	350	45	
25	1350	240	850	180	700	120	300	30	
SM ap x ae	1.5Dx0.5D		1.5Dx0.5D		Dx0.05D		Dx0.05D		

MEF600									
MATERIAL GROUPS	1 2 3 4 5 6		6 7		9 10 26		22 23		
HRC	~30		30~45						
N/mm ²	~1000		1000~1500						
Vc [m/min]	90~110 HSC420~470		70~85 HSC320~350		60~70		18~25		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	
6	5500	2000	3900	1400	3400	1100	1350	280	
6 HSC	22200	8000	16800	6100					
8	4200	2000	2950	1400	2500	1100	1000	280	
8 HSC	16800	8000	12600	6100					
10	3300	2000	2300	1400	1900	1100	440	280	
10 HSC	13400	8000	10000	6000					
12	2850	1700	2000	1150	1600	1000	400	250	
12 HSC	11400	6700	8400	5000					
16	2100	1300	1500	900	1150	770	300	190	
16 HSC	8400	5000	6300	3800					
20	1700	1000	1150	700	900	620	250	160	
20 HSC	6700	4000	5000	3000					
25	1500	900	1100	600	850	550	220	130	
25 HSC	6000	3600	4500	2700					
SM ap x ae	1.5Dx0.1D		1.5Dx0.05D		1.5Dx0.05D		Dx0.02D		



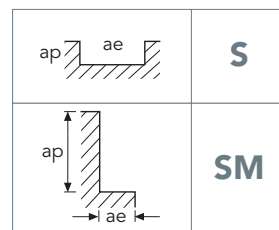
SM

MEF901 - MEF902										
MATERIAL GROUPS	1 2 3 4 5 6			6 7		9 10 26			22 23	
HRC	~30			30~45						
N/mm ²	~1000			1000~1500						
Vc [m/min]	290~330			230~250		155~175				
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf		
4	23400	1260	18700	450	12700	300	3600	110		
5	18700	1870	15000	660	10000	440	2900	170		
6	15600	2300	12400	840	8400	570	2400	190		
8	11600	2300	9200	840	6300	570	1800	180		
10	9200	2300	7600	840	5100	570	1300	190		
12	8000	2400	6000	800	4200	570	1200	190		
14	6800	2400	5200	840	3600	570	900	130		
16	6000	2400	4800	760	3300	510	800	110		
18	5200	2300	4400	720	2700	420	700	100		
20	4800	2160	3600	560	2400	360	650	100		
25	4300	2150	3200	620	2160	410	600	110		
S ap x ae	0.5DxD		0.5DxD		ap*xD		0.05DxD			
SM ap x ae	1.5Dx0.3D		1.5Dx0.3D		1.5Dxae**		Dx0.05D			

* Ø4~Ø10 ap=0.15D
 Ø12~Ø16 ap=0.10D
 Ø18~Ø25 ap=0.05D
 **Ø4~Ø10 ae=0.25D
 Ø12~Ø16 ae=0.15D
 Ø18~Ø25 ae=0.10D

MDCSA1											
MATERIAL GROUPS	15		16		17		18		THERMOPLASTICS		
HRC											
N/mm ²											
Vc [m/min]	300~480		300~330		270~290		190~210		300~800		
Ø mm.	n	fn	n	fn	n	fn	n	fn	n	fn	
2	50000	0.035	50000	0.026	44500	0.035	31800	0.035	50000	0.035	
3	50000	0.055	34000	0.045	29800	0.055	21200	0.055	50000	0.055	
4	38200	0.065	25500	0.050	22400	0.065	16000	0.065	50000	0.065	
5	30500	0.080	20500	0.065	17800	0.080	12800	0.080	50000	0.080	
6	25500	0.095	17000	0.076	15000	0.095	10500	0.095	42500	0.095	
8	19000	0.120	12800	0.095	11000	0.120	8000	0.120	32000	0.120	
10	15400	0.148	10300	0.118	9000	0.148	6500	0.148	25500	0.148	
12	12800	0.185	8500	0.146	7500	0.185	5300	0.185	21000	0.185	
S ap x ae	D*xD		D*xD		D*xD		D*xD		D*xD		

*~Ø3 ap=0.75D

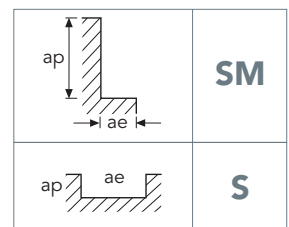


MDCSA1											
MATERIAL GROUPS	15		16		17		18		THERMOPLASTICS		
HRC											
N/mm ²											
Vc [m/min]	300~600		300~400		300~350		230~270		300~1000		
Ø mm.	n	fn	n	fn	n	fn	n	fn	n	fn	
2	50000	0.042	50000	0.035	50000	0.035	40000	0.042	50000	0.042	
3	50000	0.070	42500	0.055	37000	0.055	26500	0.070	50000	0.070	
4	48000	0.080	32000	0.065	28000	0.065	20000	0.080	50000	0.080	
5	38500	0.100	25500	0.080	22400	0.080	16000	0.100	50000	0.100	
6	32000	0.120	21000	0.095	18500	0.095	13200	0.120	50000	0.120	
8	24000	0.150	16000	0.120	14000	0.120	10000	0.150	40000	0.150	
10	19000	0.185	12800	0.148	11000	0.148	8000	0.185	32000	0.185	
12	16000	0.230	10500	0.185	9200	0.185	6500	0.230	26500	0.230	
SM ap x ae	Dx0.5D*		Dx0.5D*		Dx0.5D*		Dx0.5D*		Dx0.5D*		

*~Ø3 ap=0.25D

MDCSA2			
MATERIAL GROUPS	15 16		
HRC			
N/mm ²			
Vc [m/min]	100~250		
Ø mm.	n	Vf	
3	10000	700	
4	10000	900	
5	10000	1000	
6	10000	1200	
8	8000	1400	
10	8000	1700	
12	8000	2100	
14	6000	1800	
16	6000	1900	
18	4000	1400	
20	4000	1600	
S ap x ae	0.5DxD		
SM ap x ae	Dx0.5*D		

*≤Ø10 ae=0.25D
 ↓ Z axis : Vf = -50%



MCA212R

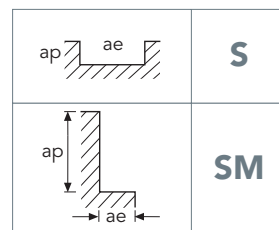
MATERIAL GROUPS			
15 16			
HRC			
N/mm ²			
Vc [m/min]	130~380		
Ø mm.	n	Vf	
3	13000	900	
4	13000	1200	
5	13000	1300	
6	13000	1500	
8	10000	1800	
10	10000	2200	
12	10000	2700	
S ap x ae	0.5DxD		
SM ap x ae	Dx0.5*D		

*≤Ø10 ae=0.25D
 ↓ Z axis : Vf = -50%

MDCSA3 - MDA310* - MDA311** - MDA312**

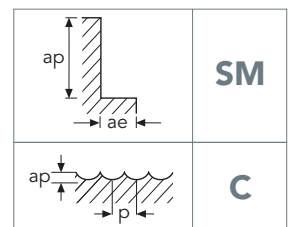
MATERIAL GROUPS			
15 16			
HRC			
N/mm ²			
Vc [m/min]	150~250		
Ø mm.	n	Vf	
3	21200	950	
4	16000	960	
5	12800	960	
6	10600	960	
8	8000	960	
10	6400	1150	
12	5300	1200	
16	4000	1200	
20	3200	1200	
S ap x ae	0.5DxD		
SM ap x ae	1.5Dx0.2D		

*MDA310 n & Vf = -30%; ae = 0.1D
 **MDA311, MDA312 n & Vf = -50%; ap = 0.1D
 ↓ Z axis : Vf = -50%



MDCSAM											
MATERIAL GROUPS	15		16		17		18		THERMOPLASTICS		
HRC											
N/mm ²											
Vc [m/min]	780~820		580~620		540~560		440~460		900~1200		
Ø mm.	n	fn	n	fn	n	fn	n	fn	n	fn	
6	42500	0.052	31500	0.042	29000	0.042	24000	0.036	50000	0.052	
8	31600	0.069	24000	0.055	22000	0.055	18000	0.049	48000	0.069	
10	25500	0.089	19000	0.071	17500	0.071	14200	0.063	38000	0.089	
12	21000	0.105	16000	0.085	14500	0.085	12000	0.075	32000	0.105	
16	16000	0.135	12000	0.107	11000	0.107	9000	0.095	24000	0.135	
20	12600	0.180	9500	0.145	8700	0.145	7100	0.126	19000	0.180	
SM ap x ae	1.5Dx0.05D		1.5Dx0.05D		1.5Dx0.05D		1.5Dx0.05D		1.5Dx0.05D		

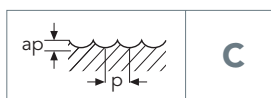
MDCAB2											
MATERIAL GROUPS	15		16								
HRC											
N/mm ²											
Vc [m/min]	200~300										
Ø mm.	n	Vf									
3	26500	1300									
4	20000	1300									
5	16000	1300									
6	13300	1350									
8	10000	1400									
10	8000	1300									
12	6600	1300									
C ap x p	0.2Dx0.5D										



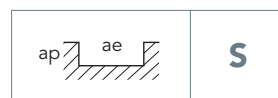
MDC2250 - MDC2251 - MDC2254					
MATERIAL GROUPS	GRAPHITE $\alpha \leq 15^\circ$		GRAPHITE $\alpha > 15^\circ$		
HRC					
N/mm ²					
Vc [m/min]	450~540		450~540		
Ø mm.	n	Vf	n	Vf	
0.5 x 6	40000	80 ~ 240	40000	80 ~ 160	
0.6 x 6	40000	80 ~ 240	40000	80 ~ 160	
0.8 x 8	40000	240 ~ 400	40000	160 ~ 320	
1	40000	400 ~ 560	40000	320 ~ 400	
1 x 10	40000	400 ~ 560	40000	320 ~ 400	
1.5	40000	720 ~ 880	40000	560 ~ 720	
1.5 x 15	40000	720 ~ 880	40000	560 ~ 720	
2	40000	1040 ~ 1280	40000	880 ~ 1040	
2 x 20	40000	1040 ~ 1280	40000	880 ~ 1040	
2.5	40000	1360 ~ 1600	40000	1120 ~ 1280	
2.5 x 25	40000	1360 ~ 1600	40000	1120 ~ 1280	
3	40000	1760 ~ 2000	40000	1360 ~ 1600	
3 x 30	40000	1760 ~ 2000	40000	1360 ~ 1600	
4	35810 ~ 40000	2150 ~ 2720	33420 ~ 40000	1600 ~ 2160	
4 x 40	35810 ~ 40000	2150 ~ 2720	33420 ~ 40000	1600 ~ 2160	
5	28650 ~ 34380	2230 ~ 2960	26740 ~ 32090	1660 ~ 2250	
5 x 50	28650 ~ 34380	2230 ~ 2960	26740 ~ 32090	1660 ~ 2250	
6	23870 ~ 28650	2290 ~ 2980	22280 ~ 26740	1690 ~ 2250	
6 x 60	23870 ~ 28650	2290 ~ 2980	22280 ~ 26740	1690 ~ 2250	
8 x 60	17900 ~ 21490	2110 ~ 2790	16710 ~ 20050	1570 ~ 2090	
10 x 60	14320 ~ 17190	2030 ~ 2680	13370 ~ 16040	1520 ~ 1990	
12 x 60	11940 ~ 14320	1980 ~ 2610	11140 ~ 13370	1470 ~ 1950	
C ap x p	0.1Dx0.25D		0.03Dx0.05D		

MDC2202			
MATERIAL GROUPS	GRAPHITE		
HRC			
N/mm ²			
Vc [m/min]	450~540		
Ø mm.	n	Vf	
0.5	40000	≤ 240	
0.6	40000	160 ~ 320	
0.8	40000	320 ~ 560	
1	40000	560 ~ 800	
1.5	40000	1040 ~ 1280	
2	40000	1520 ~ 1840	
2.5	38200 ~ 40000	1910 ~ 2400	
3	31830 ~ 38200	2040 ~ 2750	
3	31830 ~ 38200	2040 ~ 2750	
4	23870 ~ 28650	2100 ~ 2810	
4	23870 ~ 28650	2100 ~ 2810	
5	19100 ~ 22920	2180 ~ 2890	
5	19100 ~ 22920	2180 ~ 2890	
6	15920 ~ 19100	2200 ~ 2900	
8	11940 ~ 14320	2050 ~ 2720	
10	9550 ~ 11460	1970 ~ 2590	
12	7960 ~ 9550	1910 ~ 2520	
S ap x ae	0.2D*xD		

*<Ø3 ap = 0.1D



C



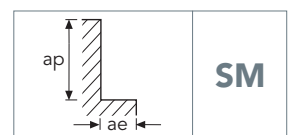
S

MDC2204			
MATERIAL GROUPS	GRAPHITE		
HRC			
N/mm ²			
Vc [m/min]	450~540		
Ø mm.	n	Vf	
0.5	40000	≤ 320	
0.6	40000	160 ~ 480	
0.8	40000	480 ~ 800	
1	40000	800 ~ 1120	
1.5	40000	1600 ~ 1920	
2	40000	2240 ~ 2720	
2.5	38200 ~ 40000	2900 ~ 3520	
3	31830 ~ 38200	3060 ~ 4130	
3	31830 ~ 38200	3060 ~ 4130	
4	23870 ~ 28650	3150 ~ 4240	
4	23870 ~ 28650	3150 ~ 4240	
5	19100 ~ 22920	3210 ~ 4310	
5	19100 ~ 22920	3210 ~ 4310	
6	15920 ~ 19100	3310 ~ 4350	
8	11940 ~ 14320	3100 ~ 4070	
10	9550 ~ 11460	2940 ~ 3900	
12	7960 ~ 9550	2870 ~ 3780	
SM ap x ae	Dx0.2D		

*<Ø3 ae = 0.1D

MDC3311			
MATERIAL GROUPS	GRAPHITE		
HRC			
N/mm ²			
Vc [m/min]	250~750		
Ø mm.	n	Vf	
2	40000	3000	
3	40000	4200	
4	40000	6000	
5	40000	7200	
6	40000	8400	
8	32000	8400	
10	26000	8600	
12	21000	8200	
SM ap x ae	0.3Dx0.3D		

↓ Z axis : Vf = -50%



G2 - MDTA 2FL												
MATERIAL GROUPS	1 2 3 4		5 6		9 10 11		13 14		16		17 18 19	
HRC	~25		25~40									
N/mm ²	~850		850~1250									
Vc [m/min]	70~85		60~75		30~40		55~65		140~150		120~140	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
1	24850	250	21650	170	11150	70	19100	190	47750	480	41400	330
1.5	16550	265	14450	200	7450	75	12750	200	31850	510	27600	390
2	12400	300	10850	220	5550	90	9550	230	23900	580	20700	420
3	8300	330	7200	220	3700	110	6350	250	15900	640	13800	420
4	6200	430	5400	270	2800	120	4800	340	11950	840	10350	520
5	4950	450	4350	290	2250	125	3800	340	9550	860	8300	550
6	4150	500	3600	330	1850	125	3200	380	7950	950	6900	620
8	3100	500	2700	330	1400	130	2400	380	5950	950	5200	620
10	2500	500	2150	330	1100	130	1900	380	4800	960	4150	620
12	2050	450	1800	330	930	120	1600	350	4000	880	3450	620
14	1750	420	1550	280	800	110	1350	325	3400	820	2950	530
16	1550	400	1350	270	700	100	1200	315	3000	780	2600	520
20	1250	350	1100	240	560	90	960	270	2400	680	2050	450
S ap x ae	0.5DxD		0.3DxD		0.5DxD		0.5DxD		0.5DxD		0.5DxD	
SM ap x ae	1.5Dx0.1D		1.5Dx0.05D		1.5Dx0.1D		1.5Dx0.1D		1.5Dx0.1D		1.5Dx0.1D	

G2210 - G2211 - MDTA210 n & Vf = -30%

G2212 - G2213 - MDACL2 n & Vf = -50%

GB205 - G2213 - MDCL2 n & Vf = -30%

↓ Z axis : Vf = -50%

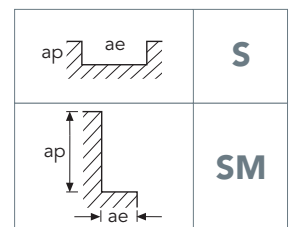
G2 - MDTA 3FL												
MATERIAL GROUPS	1 2 3 4		5 6		9 10 11		13 14		16		17 18 19	
HRC	~25		25~40									
N/mm ²	~850		850~1250									
Vc [m/min]	70~85		60~75		30~40		55~65		140~150		120~140	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
1	24850	370	21650	260	11150	100	19100	290	47750	720	41400	500
1.5	16550	400	14450	260	7450	110	12750	300	31850	760	27600	500
2	12400	450	10850	260	5550	120	9550	340	23900	860	20700	500
3	8300	500	7200	320	3700	130	6350	380	15900	950	13800	620
4	6200	650	5400	410	2800	150	4800	500	11950	1250	10350	780
5	4950	670	4350	430	2250	150	3800	510	9550	1290	8300	820
6	4150	690	3600	430	1850	150	3200	530	7950	1320	6900	830
8	3100	700	2700	450	1400	160	2400	540	5950	1340	5200	860
10	2500	680	2150	430	1100	150	1900	530	4800	1310	4150	840
12	2050	680	1800	430	930	150	1600	530	4000	1300	3450	830
14	1750	630	1550	400	800	140	1350	490	3400	1230	2950	750
16	1550	610	1350	370	700	130	1200	470	3000	1170	2600	700
20	1250	530	1100	330	560	120	960	410	2400	1000	2050	620
S ap x ae	0.5DxD		0.2DxD		0.3DxD		0.5DxD		0.5DxD		0.5DxD	
SM ap x ae	1.5Dx0.1D		1.5Dx0.05D		1.5Dx0.1D		1.5Dx0.1D		1.5Dx0.1D		1.5Dx0.1D	

G2310 - G2311 n & Vf = -30%

G2312 n & Vf = -50%

GB305 n & Vf = -30%

↓ Z axis : Vf = -50%



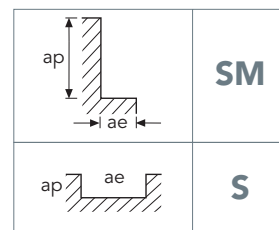
G2 - MDTA 4FL													
MATERIAL GROUPS	1 2 3 4		5 6		9 10 11		13 14		16		17 18 19		
HRC	~25		25~40										
N/mm ²	~850		850~1250										
Vc [m/min]	70~85		60~75		30~40		55~65		140~150		120~140		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	
1	24850	500	21650	340	11150	130	19100	380	47750	950	41400	660	
1.5	16550	530	14450	400	7450	150	12750	410	31850	1000	27600	660	
2	12400	600	10850	430	5550	180	9550	460	23900	1150	20700	660	
3	8300	670	7200	430	3700	220	6350	510	15900	1280	13800	830	
4	6200	860	5400	540	2800	250	4800	670	11950	1670	10350	1030	
5	4950	890	4350	570	2250	250	3800	680	9550	1720	8300	1100	
6	4150	1000	3600	650	1850	250	3200	700	7950	1750	6900	1100	
8	3100	1000	2700	650	1400	260	2400	720	5950	1790	5200	1150	
10	2500	1000	2150	650	1100	260	1900	700	4800	1730	4150	1120	
12	2050	900	1800	650	930	240	1600	700	4000	1750	3450	1100	
14	1750	840	1550	560	800	220	1350	650	3400	1640	2950	1000	
16	1550	810	1350	540	700	200	1200	630	3000	1560	2600	940	
20	1250	700	1100	500	560	170	960	550	2400	1350	2050	820	

SM ap x ae 1.5Dx0.1D 1.5Dx0.05D 1.5Dx0.1D 1.5Dx0.1D 1.5Dx0.1D 1.5Dx0.1D

G2410 - G2411 - MDTA410 n & Vf = -30%
 G2412 - G2413 - MDTACL4 n & Vf = -50%
 GB405 - G2213 - MDCL4 n & Vf = -30%

G2 HR - MDTA NR													
MATERIAL GROUPS	2 3 4		5 6		9 10 11		13 14						
HRC	~25		25~40										
N/mm ²	~850		850~1250										
Vc [m/min]	70~90		75~50		45~55		70~90						
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf					
6	4250	540	3600	330	2650	240	4250	540					
8	3200	540	2700	430	2000	320	3200	540					
10	2550	730	2150	450	1600	330	2550	730					
12	2100	700	1800	440	1350	330	2100	700					
14	1800	650	1550	400	1150	300	1800	650					
16	1600	640	1350	390	1000	290	1600	640					
18	1400	620	1200	370	880	270	1400	620					
20	1250	620	1100	370	800	270	1250	620					
25	1000	600	870	320	640	230	1000	600					

S ap x ae 0.7DxD 0.5DxD 0.3DxD 0.7DxD



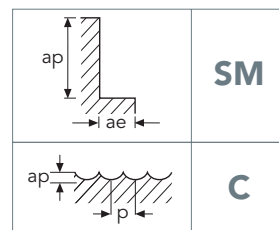
G2 HR - MDTA NR									
MATERIAL GROUPS	2 3 4		5 6		9 10 11		13 14		
HRC	~25		25~40						
N/mm ²	~850		850~1250						
Vc [m/min]	80~100		70~85		55~65		80~100		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	
6	4800	600	4250	380	3200	290	4800	600	
8	3600	600	3200	390	2400	290	3600	600	
10	2850	810	2550	530	1900	400	2850	810	
12	2400	800	2100	510	1600	390	2400	800	
14	2050	740	1800	470	1350	350	2050	740	
16	1800	720	1600	460	1200	350	1800	720	
18	1600	720	1400	420	1050	320	1600	720	
20	1450	720	1250	410	960	320	1450	720	
25	1150	700	1000	360	760	280	1150	700	
SM ap x ae	1.5Dx0.3D		1.5Dx0.2D		1.5Dx0.2D		1.5Dx0.3D		

G2 - MDTA 2FL BALL													
MATERIAL GROUPS	1 2 3 4		5 6		7		9 10 11		13 14		16 17 18 19		
HRC	~25		25~40		40~45								
N/mm ²	~850		850~1250		1250~1500								
Vc [m/min]	90~110		85~105		75~85		55~65		90~110		140~160		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	
1	31850	320	30250	240	25500	150	19100	230	31850	320	47750	380	
1.5	21250	340	20150	280	17000	170	12750	250	21250	340	31850	320	
2	15900	380	15150	300	12750	200	9550	290	15900	380	23900	290	
3	10600	420	10100	300	8500	250	6350	240	10600	420	15900	320	
4	7950	560	7550	380	6350	280	4800	200	7950	560	11950	360	
5	6350	570	6050	400	5100	290	3800	180	6350	570	9550	380	
6	5300	640	5050	450	4250	290	3200	190	5300	640	7950	350	
8	4000	640	3800	460	3200	300	2400	220	4000	640	5950	400	
10	3200	640	3050	460	2550	300	1900	220	3200	640	4800	420	
12	2650	580	2500	450	2100	270	1600	220	2650	580	4000	480	
14	2250	540	2150	390	1800	250	1350	220	2250	540	3400	470	
16	2000	520	1900	380	1600	230	1200	210	2000	520	3000	470	
20	1600	450	1500	330	1250	190	960	210	1600	450	2400	440	
C ap x p	0.2Dx0.05D		0.2Dx0.05D		0.2Dx0.05D		0.2Dx0.05D		0.2Dx0.05D		0.5Dx0.2D		
C ap x p	0.2Dx0.1D		0.2Dx0.1D		0.2Dx0.1D		0.2Dx0.1D		0.2Dx0.1D		0.7Dx0.3D		

G2250 - MDTA250 n & Vf = -30%

G2251 n & Vf = -50%

GB255 n & Vf = -30%

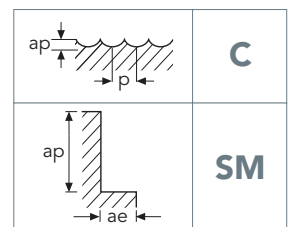


G2CSB4										
MATERIAL GROUPS	1 2 3 4		5 6		7		9 10 11		13 14	
HRC	~25		25~40		40~45					
N/mm ²	~850		850~1250		1200~1500					
Vc [m/min]	90~110		85~105		75~85		55~65		90~110	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
2	15900	1270	15150	1000	12750	760	9550	760	15900	1270
3	10600	1060	10100	850	8500	620	6350	620	10600	1060
4	7950	1100	7550	900	6350	530	4800	530	7950	1100
5	6350	1150	6050	950	5100	490	3800	490	6350	1150
6	5300	1270	5050	970	4250	510	3200	510	5300	1270
8	4000	1440	3800	1000	3200	570	2400	570	4000	1440
10	3200	1400	3050	1150	2550	540	1900	540	3200	1400
12	2650	1380	2500	1100	2100	590	1600	590	2650	1380
14	2250	1260	2150	1070	1800	580	1350	580	2250	1260
16	2000	1400	1900	1070	1600	560	1200	560	2000	1400
20	1600	1220	1500	950	1250	550	960	550	1600	1220

Ø<1	C ap x p	0.2Dx0.05D	0.2Dx0.05D	0.2Dx0.05D	0.2Dx0.05D	0.2Dx0.05D	0.2Dx0.05D
Ø>1	C ap x p	0.2Dx0.1D	0.2Dx0.1D	0.2Dx0.1D	0.2Dx0.1D	0.2Dx0.1D	0.2Dx0.1D

G2CSHM										
MATERIAL GROUPS	1 2 3 4		5 6		7		9 10 11		13 14	
HRC	~25		25~45		40~45					
N/mm ²	~850		850~1250		1250~1500					
Vc [m/min]	90~110		65~90		45~65		35~50		90~110	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
2	15900	1270	15150	1000	12750	760	9550	760	15900	1270
3	10600	1060	10100	850	8500	620	6350	620	10600	1060
4	7950	1100	7550	900	6350	530	4800	530	7950	1100
5	6350	1150	6050	950	5100	490	3800	490	6350	1150
6	5300	1270	5050	970	4250	510	3200	510	5300	1270
8	4000	1440	3800	1000	3200	570	2400	570	4000	1440
10	3200	1400	3050	1150	2550	540	1900	540	3200	1400
12	2650	1380	2500	1100	2100	590	1600	590	2650	1380
14	2250	1260	2150	1070	1800	580	1350	580	2250	1260
16	2000	1400	1900	1070	1600	560	1200	560	2000	1400
20	1600	1220	1500	950	1250	550	960	550	1600	1220

SM ap x ae	1.5Dx0.1D	1.5Dx0.1D	1.5Dx0.1D	1.5Dx0.1D	1.5Dx0.1D
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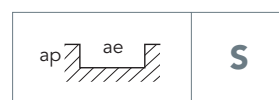


UMWS2											
MATERIAL GROUPS	1 2		2 3 4 13 14		4 5		6		9 10		
HRC			~20		20~30		30~35				
N/mm ²	~500		500~800		800~1000		1000~1100				
Vc [m/min]	45~60		35~50		30~40		20~28		12~20		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	
2	7000	120	5900	90	4900	80	3200	70	2000	40	
3	5000	160	4100	140	3400	120	2300	80	1800	65	
4	4300	230	3600	180	3200	160	2000	95	1600	80	
5	3900	260	3300	200	2600	190	1700	100	1400	80	
6	3500	270	2900	210	2300	190	1500	110	1200	90	
8	2600	280	2200	240	1800	200	1200	120	900	90	
10	2100	300	1800	270	1500	230	900	130	700	100	
12	1800	280	1500	240	1200	200	750	120	600	90	
14	1600	270	1300	200	1000	200	650	110	500	80	
16	1400	270	1200	200	900	180	550	100	450	80	
18	1200	240	1000	200	800	160	500	100	400	80	
20	1000	220	800	170	700	150	450	90	360	70	
22	850	190	700	150	600	130	400	80	320	60	
25	750	160	650	140	500	120	350	70	250	50	
S ap x ae	0.5DxD		0.5DxD		0.5DxD		0.5DxD		0.5DxD		

↓ Z axis : Vf = -50%

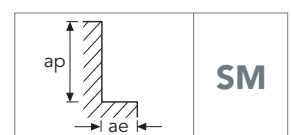
UMWS3											
MATERIAL GROUPS	1 2		2 3 4 13 14		4 5		6		9 10		
HRC			~20		20~30		30~35				
N/mm ²	~500		500~800		800~1000		1000~1100				
Vc [m/min]	45~60		35~50		30~40		20~28		12~20		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf	
2	7000	70	5900	60	4900	50	3200	40	2000	30	
3	5000	100	4100	90	3400	50	2300	45	1800	45	
4	4300	140	3600	120	3200	80	2000	50	1600	55	
5	3900	160	3300	130	2600	90	1700	60	1400	55	
6	3500	230	2900	200	2300	140	1500	90	1200	75	
8	2600	240	2200	200	1800	150	1200	100	900	85	
10	2100	250	1800	200	1500	160	900	110	700	90	
12	1800	280	1500	230	1200	170	750	110	600	90	
14	1600	250	1300	220	1000	160	650	110	500	85	
16	1400	240	1200	200	900	150	550	100	450	85	
18	1200	240	1000	200	800	150	500	100	400	85	
20	1000	240	800	200	700	150	450	100	360	85	
22	850	240	700	200	600	150	400	100	320	85	
25	750	240	650	200	500	150	350	100	250	85	
S ap x ae	0.5DxD		0.5DxD		0.5DxD		0.5DxD		0.5DxD		

↓ Z axis : Vf = -50%



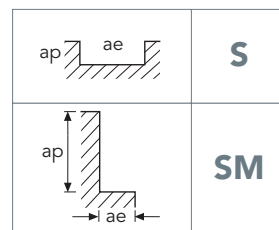
UMWS3										
MATERIAL GROUPS	1 2		2 3 4 13 14		4 5		6		9 10	
HRC			~20		20~30		30~35			
N/mm ²	~500		500~800		800~1000		1000~1100			
Vc [m/min]	55~75		40~60		35~50		25~35		15~25	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
2	8000	100	7000	80	5500	70	3800	50	2400	40
3	5800	150	4800	120	3800	80	2700	70	2200	70
4	5200	190	4500	160	3500	110	2300	80	1900	80
5	4700	210	4000	180	3000	130	2000	90	1700	80
6	4200	300	3600	250	2600	200	1800	130	1500	100
8	3200	330	2600	270	2000	200	1300	140	1100	120
10	2500	350	2100	300	1600	200	1000	150	900	130
12	2100	350	1800	300	1400	230	900	150	750	130
14	1800	350	1500	290	1200	210	800	140	650	120
16	1600	330	1300	280	1000	200	650	150	550	120
18	1400	300	1200	270	900	200	600	130	500	110
20	1300	300	1100	260	800	200	550	130	450	110
22	1200	300	1000	260	750	200	500	130	400	110
25	1000	310	850	270	630	200	420	130	360	120
SM ap x ae	1.5Dx0.1D		1.5Dx0.1D		1.5Dx0.1D		1.5Dx0.1D		1.5Dx0.1D	

UMWS4										
MATERIAL GROUPS	1 2		2 3 4 13 14		4 5		6		9 10	
HRC			~20		20~30		30~35			
N/mm ²	~500		500~800		800~1000		1000~1100			
Vc [m/min]	60~75		50~65		35~50		25~35		20~30	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
2	9200	300	8500	250	6000	170	4000	120	3300	90
3	6500	400	6000	350	4500	250	2700	180	2400	120
4	5500	480	4700	400	3600	300	2300	200	2000	150
5	4500	500	4000	420	3000	330	2000	220	1700	160
6	4000	550	3600	450	2600	330	1800	230	1500	180
8	3000	560	2600	480	2000	370	1400	240	1200	190
10	2300	630	2100	530	1600	380	1000	270	900	200
12	2000	570	1800	480	1400	370	900	240	720	190
14	1800	550	1600	450	1100	350	800	230	650	170
16	1600	500	1500	440	1000	350	700	220	550	170
18	1500	460	1300	400	900	300	630	200	500	150
20	1300	450	1100	380	800	280	550	180	450	150
22	1100	420	1000	330	700	260	470	160	400	130
25	1000	370	850	300	630	230	420	150	360	130
SM ap x ae	1.5Dx0.1D		1.5Dx0.1D		1.5Dx0.1D		1.5Dx0.1D		1.5Dx0.1D	



UMWSFR									
MATERIAL GROUPS	1 4	2 13	3 14	4 5	6	9	10		
HRC	~20		20~30		30~35				
N/mm ²	~800		800~1000		1000~1100				
Vc [m/min]	50~60		40~50		30~35		25~30		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	
6	2700	150	2100	120	1500	80	1300	70	
8	2300	190	1800	150	1300	110	1000	80	
10	1800	270	1400	210	1000	130	850	110	
12	1500	270	1200	220	850	150	700	120	
14	1300	270	1000	220	720	150	600	120	
16	1200	270	900	220	630	150	520	120	
18	1000	270	850	220	580	150	470	120	
20	950	280	720	220	500	150	420	120	
22	850	280	620	220	450	150	380	120	
25	750	270	570	210	400	140	340	120	
S ap x ae	0.5DxD		0.5DxD		0.5DxD		0.5DxD		

UMWSFR									
MATERIAL GROUPS	1 4	2 13	3 14	4 5	6	9	10		
HRC	~20		20~30		30~35				
N/mm ²	~800		800~1000		1000~1100				
Vc [m/min]	50~60		40~50		30~35		25~30		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	
6	2800	230	2200	180	1600	120	1300	110	
8	2400	290	1900	230	1400	160	1100	130	
10	2000	420	1500	320	1100	200	900	160	
12	1600	420	1200	330	900	230	750	180	
14	1400	420	1100	330	760	230	650	180	
16	1200	420	950	330	650	230	550	180	
18	1100	420	900	330	600	230	500	180	
20	1000	430	750	330	530	230	450	180	
22	900	430	650	330	470	230	400	180	
25	800	420	600	320	420	220	360	180	
SM ap x ae	1.5Dx0.5D		1.5Dx0.5D		1.5Dx0.5D		1.5Dx0.5D		

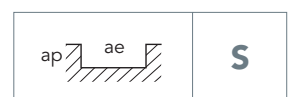


WS2 (TAWS2**) - WL2* (TAWL2**)										
MATERIAL GROUPS	1 13		2 3 4 13 14		4 5		6 9 10		15 16 17	
HRC	~20		20~30		30~40					
N/mm ²	~500		500~800		800~1000		1000~1300			
Vc [m/min]	30~40		25~35		20~30		10~15		70~100	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
2	5600	40	4500	30	4000	30	2200	15	12000	160
3	3500	55	3200	45	2500	40	1600	20	11000	250
4	2800	70	2200	55	1800	45	1100	30	8000	290
5	2200	90	1800	70	1600	60	900	35	6300	310
6	1800	90	1600	80	1200	60	800	40	5600	310
8	1400	100	1100	90	900	70	560	45	4000	390
10	1100	100	900	90	800	80	450	45	3100	400
12	900	110	800	100	630	80	400	50	2500	380
14	800	110	700	90	560	80	350	50	2200	350
16	700	110	560	90	450	70	280	45	2000	350
18	630	100	500	90	400	70	250	45	1800	350
20	550	100	450	90	400	70	220	45	1600	320
22	500	100	450	90	350	70	220	45	1400	300
25	450	90	400	80	310	60	180	35	1200	280
28	400	80	350	70	280	55	160	30	1100	270
30	350	70	310	60	250	50	160	30	1100	270
32	350	70	280	55	220	45	140	30	1000	240
36	310	60	250	50	200	40	120	25	900	220
40	280	60	220	50	180	40	110	25	800	200
S ap x ae	0.5DxD		0.5DxD		0.5DxD		0.5DxD		0.5DxD	

*WL2: Vf=-50%;
 **TAW... : n & Vf = +30%~+50%
 ↓ Z axis : Vf = -50%

WS3 (TAWS3**) - WL3* (TAWL3**)										
MATERIAL GROUPS	1 13		2 3 4 13 14		4 5		6 9 10		15 16 17	
HRC	~20		20~30		30~40					
N/mm ²	~500		500~800		800~1000		1000~1300			
Vc [m/min]	30~40		25~35		20~30		10~15		70~100	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
2	5600	60	4500	40	4000	35	2200	15	12000	180
3	3500	80	3200	60	2500	45	1600	20	11000	280
4	2800	105	2200	75	1800	50	1100	30	8000	330
5	2200	135	1800	95	1600	65	900	35	6300	350
6	1800	135	1600	110	1200	65	800	45	5600	350
8	1400	150	1100	120	900	80	560	50	4000	440
10	1100	150	900	120	800	90	450	50	3100	450
12	900	165	800	135	630	90	400	55	2500	430
14	800	165	700	120	560	90	350	55	2200	400
16	700	165	560	120	450	80	280	50	2000	400
18	630	150	500	120	400	80	250	50	1800	400
20	550	150	450	120	400	80	220	50	1600	360
22	500	150	450	120	350	80	220	50	1400	340
25	450	135	400	110	310	65	180	35	1200	320
28	400	120	350	95	280	60	160	30	1100	300
30	350	105	310	80	250	55	160	30	1100	300
S ap x ae	1.5Dx0.1D		1.5Dx0.1D		1.5Dx0.1D		1.5Dx0.1D		1.5Dx0.1D	

*WL3: Vf=-50%;
 **TAW... : n & Vf = +30%~+50%



WS3 (TAW53**) - WL3* (TAWL3**)										
MATERIAL GROUPS	1 13		2 3 4 13 14		4 5		6 9 10		15 16 17	
HRC	~500		~20		20~30		30~40			
N/mm ²	~500		500~800		800~1000		1000~1300			
Vc [m/min]	30~40		25~35		20~30		10~15		70~100	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
2	5600	60	4500	45	4000	45	2200	20	12000	240
3	3500	80	3200	65	2500	60	1600	30	11000	380
4	2800	105	2200	80	1800	65	1100	45	8000	440
5	2200	135	1800	105	1600	90	900	50	6300	470
6	1800	135	1600	120	1200	90	800	60	5600	470
8	1400	150	1100	135	900	105	560	65	4000	580
10	1100	150	900	135	800	120	450	65	3100	600
12	900	165	800	150	630	120	400	75	2500	570
14	800	165	700	135	560	120	350	75	2200	530
16	700	165	560	135	450	105	280	65	2000	530
18	630	150	500	135	400	105	250	65	1800	530
20	550	150	450	135	400	105	220	65	1600	480
22	500	150	450	135	350	105	220	65	1400	450
25	450	135	400	120	310	90	180	50	1200	420
28	400	120	350	105	280	80	160	45	1100	400
30	350	105	310	90	250	75	160	45	1100	400

SM ap x ae 0.5DxD 0.5DxD 0.5DxD 0.5DxD

*WL3: Vf=-50%;

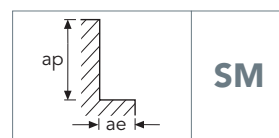
**TAW... : n & Vf = +30%~+50%

↓ Z axis : Vf = -50%

WSH3 (TAWSH3*)										
MATERIAL GROUPS	2 3 13 14		4 5 13 14		6 9 10					
HRC	~20		20~30		30~40					
N/mm ²	500~800		800~1000		1000~1300					
Vc [m/min]	30~40		25~35		20~30					
Ø mm.	n	Vf	n	Vf	n	Vf				
6	1800	85	1300	55	900	35				
8	1200	95	1000	65	600	40				
10	1000	95	900	70	500	40				
12	900	110	700	70	450	45				
14	800	95	600	70	400	45				
16	600	95	500	65	300	40				
18	550	95	450	65	280	40				
20	500	95	450	65	250	40				
25	450	85	350	55	200	30				
30	350	65	280	45	180	25				

SM ap x ae 1.5Dx0.1D 1.5Dx0.1D 1.5Dx0.1D

*TAWSH3: n & Vf = +30%~+50%



WS4 (TAWS4**) - WL4* (TAWL4**)										
MATERIAL GROUPS	1 13		2 3 4 13 14		4 5		6 9 10		15 16 17	
HRC			~20		20~30		30~40			
N/mm ²	~500		500~800		800~1000		1000~1300			
Vc [m/min]	30~40		25~35		20~30		10~15		70~100	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
2	5600	80	4500	55	4000	45	2200	20	12000	240
3	3500	110	3200	80	2500	60	1600	30	11000	380
4	2800	140	2200	100	1800	65	1100	45	8000	440
5	2200	180	1800	125	1600	90	900	50	6300	470
6	1800	180	1600	145	1200	90	800	60	5600	470
8	1400	200	1100	160	900	105	560	65	4000	580
10	1100	200	900	160	800	120	450	65	3100	600
12	900	220	800	180	630	120	400	75	2500	570
14	800	220	700	160	560	120	350	75	2200	530
16	700	220	560	160	450	105	280	65	2000	530
18	630	200	500	160	400	105	250	65	1800	530
20	550	200	450	160	400	105	220	65	1600	480
22	500	200	450	160	350	105	220	65	1400	450
25	450	180	400	145	310	90	180	50	1200	420
28	400	160	350	125	280	80	160	45	1100	400
30	350	140	310	110	250	75	160	45	1100	400
32	350	140	280	100	220	65	140	45	1000	360
36	310	120	250	90	200	60	120	35	900	330
40	280	120	220	90	180	60	110	35	800	300

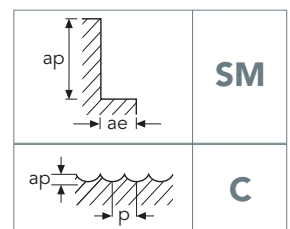
SM ap x ae 0.5Dx1.5D 0.5Dx1.5D 0.5Dx1.5D 0.5Dx1.5D 0.5Dx1.5D

*WL4: Vf=-50%;
**TAW... : n & Vf = +30%~+50%

WSB2 (TAWSB2**) - WLB2* (TAWLB2**)										
MATERIAL GROUPS	1 13		2 3 4 13 14		4 5		6 9 10		15 16 17	
HRC			~20		20~30		30~40			
N/mm ²	~500		500~800		800~1000		1000~1300		90~110	
Vc [m/min]	35~45		30~40		15~20		10~15		90~110	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
3	4500	95	3400	70	2000	30	1400	20	11000	230
4	3200	115	2400	80	1400	35	1000	25	8000	260
6	2200	135	1700	90	1000	45	700	25	5600	280
8	1600	160	1200	105	700	50	500	30	4000	350
10	1300	180	1000	120	560	60	400	35	3200	360
12	1000	170	800	105	450	55	320	35	2500	340
16	800	150	600	100	350	55	250	35	2000	300
20	600	140	500	85	300	50	200	35	1600	280
25	500	130	400	70	220	40	160	30	1300	250

C ap x p 0.7Dx0.3D 0.7Dx0.3D 0.7Dx0.3D 0.7Dx0.3D 0.7Dx0.3D

*WLB2: Vf=-50%;
**TAW... : n & Vf = +30%~+50%



WSA2

MATERIAL GROUPS			15 16	
HRC				
N/mm ²				
Vc [m/min]	80~150			
Ø mm.	n	Vf		
3	8000	560		
6	7000	700		
8	6000	850		
10	5000	1200		
12	5000	1200		
14	3500	1250		
16	3500	1250		
18	2300	1300		
20	2300	1300		

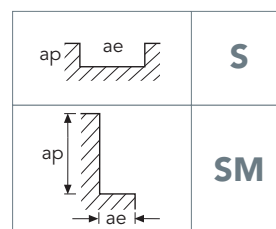
S ap x ae	0.5DxD
SM ap x ae	Dx0.5*D

*≤Ø10 ae=0.25D
 ↓ Z axis : Vf = -50%

WSAR

MATERIAL GROUPS			15 16	
HRC				
N/mm ²	~500			
Vc [m/min]	70~90			
Ø mm.	n	Vf		
6	4500	200		
8	3100	230		
10	2500	350		
12	2000	400		
14	1800	420		
16	1600	450		
18	1400	470		
20	1200	500		

S ap x ae	DxD
SM ap x ae	1.5Dx0.5D

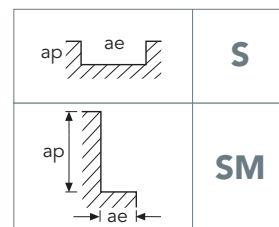


WSR (TAWSR**) - WSFR (TAWSFR**) - WLFR* (TAWLFR**)										
MATERIAL GROUPS	1 13		2 3 4 13 14		4 5		6 9 10		15 16 17	
HRC			~20		20~30		30~40			
N/mm ²	~500		500~800		800~1000		1000~1300			
Vc [m/min]	30~40		25~35		20~30		15~20		70~80	
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
6	1800	80	1600	60	1200	55	800	30	4500	200
8	1400	105	1100	75	900	65	560	35	3100	230
10	1100	150	900	120	800	110	450	60	2500	350
12	900	180	800	140	630	110	400	70	2000	400
14	800	180	700	140	560	110	350	70	1800	420
16	700	180	560	140	450	110	280	70	1600	450
18	630	180	500	140	400	110	250	70	1400	470
20	550	180	450	140	400	110	220	70	1200	500
22	500	220	450	170	350	140	220	85	1100	470
25	450	220	400	170	310	140	180	85	1000	450
28	400	210	350	160	280	130	160	85	900	510
30	350	210	310	160	250	130	160	85	900	530
32	350	210	280	160	220	130	140	85	800	500
36	310	210	250	160	200	130	120	85	700	470
40	280	200	220	150	180	120	110	80	630	450
50	220	200	180	170	160	140	90	80	500	370
***S ap x ae	0.5DxD		0.5DxD		0.5DxD		0.5DxD		0.5DxD	
SM ap x ae	1.5Dx0.5D		1.5Dx0.5D		1.5Dx0.5D		1.5Dx0.5D		1.5Dx0.5D	

*WLFR: Vf=-50%;
 **TAW... : n & Vf = +50%~+30%;
 ***S: Vf=-25%

FM (TAFM*)										
MATERIAL GROUPS	1 13		2 3 4 13 14		4 5		6 9 10			
HRC			~20		20~30		30~40			
N/mm ²	~500		500~800		800~1000		1000~1300			
Vc [m/min]	28~32		23~27		15~19		9~11			
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf		
40	240	135	200	120	140	80	80	50		
50	200	125	170	105	120	75	70	45		
63	150	110	130	95	90	65	50	40		
80	120	120	100	100	80	75	40	40		
100	100	115	80	95	60	70	30	35		
125	80	115	70	95	50	65	20	35		
SM ap x ae	0.25Dx0.75D		0.25Dx0.75D		0.25Dx0.75D		0.25Dx0.75D			

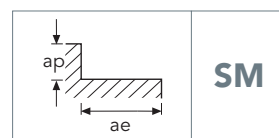
*TAFM: n & Vf = +30%~+50%



FFR (TAFFR*)									
MATERIAL GROUPS	1 13		2 3 4 13 14		4 5		6 9 10		
HRC	~20		20~30		30~40				
N/mm ²	~500		500~800		800~1000		1000~1300		
Vc [m/min]	28~32		23~27		15~19		15~19		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	
40	240	100	200	85	140	60	80	35	
50	200	125	170	105	120	75	70	45	
63	150	110	130	95	90	65	50	40	
80	120	120	100	100	80	75	40	40	
100	100	115	80	95	60	70	30	35	
125	80	115	70	95	50	65	20	35	
160	60	110	60	100	40	65	20	35	
SM ap x ae	0.25Dx0.75D		0.25Dx0.75D		0.25Dx0.75D		0.25Dx0.75D		

*TAFFR: n & Vf = +30%~+50%

WCR									
MATERIAL GROUPS	1 13		2 3 4 13 14		4 5		15 16		
HRC	~20		20~35						
N/mm ²	~550		550~800		800~1100				
Vc [m/min]	18~22		14~16		11~13		85~95		
Ø mm.	n		n		n		n		
8	800		600		480		3580		
10	640		480		380		2870		
12	530		400		320		2390		
14	450		340		270		2050		
16	400		300		240		1800		
20	320		240		190		1430		
25	250		190		150		1150		
30	210		160		130		950		
34	190		140		110		840		
42	150		115		90		690		
48	130		100		80		600		
56	115		85		70		510		



WTM - WWK							
MATERIAL GROUPS	1 2 3 13 14		4 5 14		15 16 17		
HRC	~20		20~30		30~40		
N/mm ²	~800		800~1000		1000~1300		
Vc [m/min]	16~20		12~14		90~110		
Ø mm.	n	Vf	n	Vf	n	Vf	
12.5	460	20	320	10	2800	130	
16	360	20	250	10	2200	170	
18	320	25	230	15	2000	180	
19	300	25	220	20	1800	190	
21	280	25	190	20	1700	200	
22	260	30	180	20	1600	200	
25	230	35	160	20	1400	220	
28	200	45	140	25	1250	250	
32	180	50	120	25	1100	300	
36	160	50	110	25	960	280	
40	140	45	100	25	880	250	

WDC - WDD									
MATERIAL GROUPS	1 2 3 13 14		4 5 14		6 9 10		15 16 17		
HRC	~20		20~30		30~40				
N/mm ²	~800		800~1000		1000~1300				
Vc [m/min]	16~20		12~14		8~10		90~110		
Ø mm.	n	Vf	n	Vf	n	Vf	n	Vf	
16	370	70	260	50	190	25	2200	400	
20	310	65	220	45	150	20	1600	390	
25	230	55	160	35	120	15	1400	320	
32	190	75	120	50	100	20	1100	450	
38	150	75	110	55	70	20	920	460	

