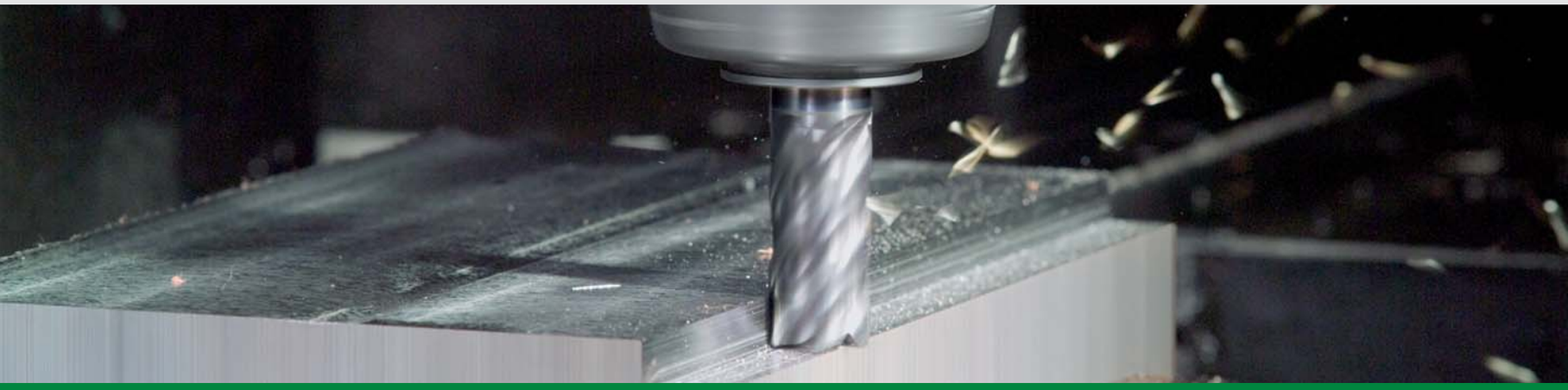
WIDIA HANITA

WIDIA RÜBIG

WIDIA HANITA™

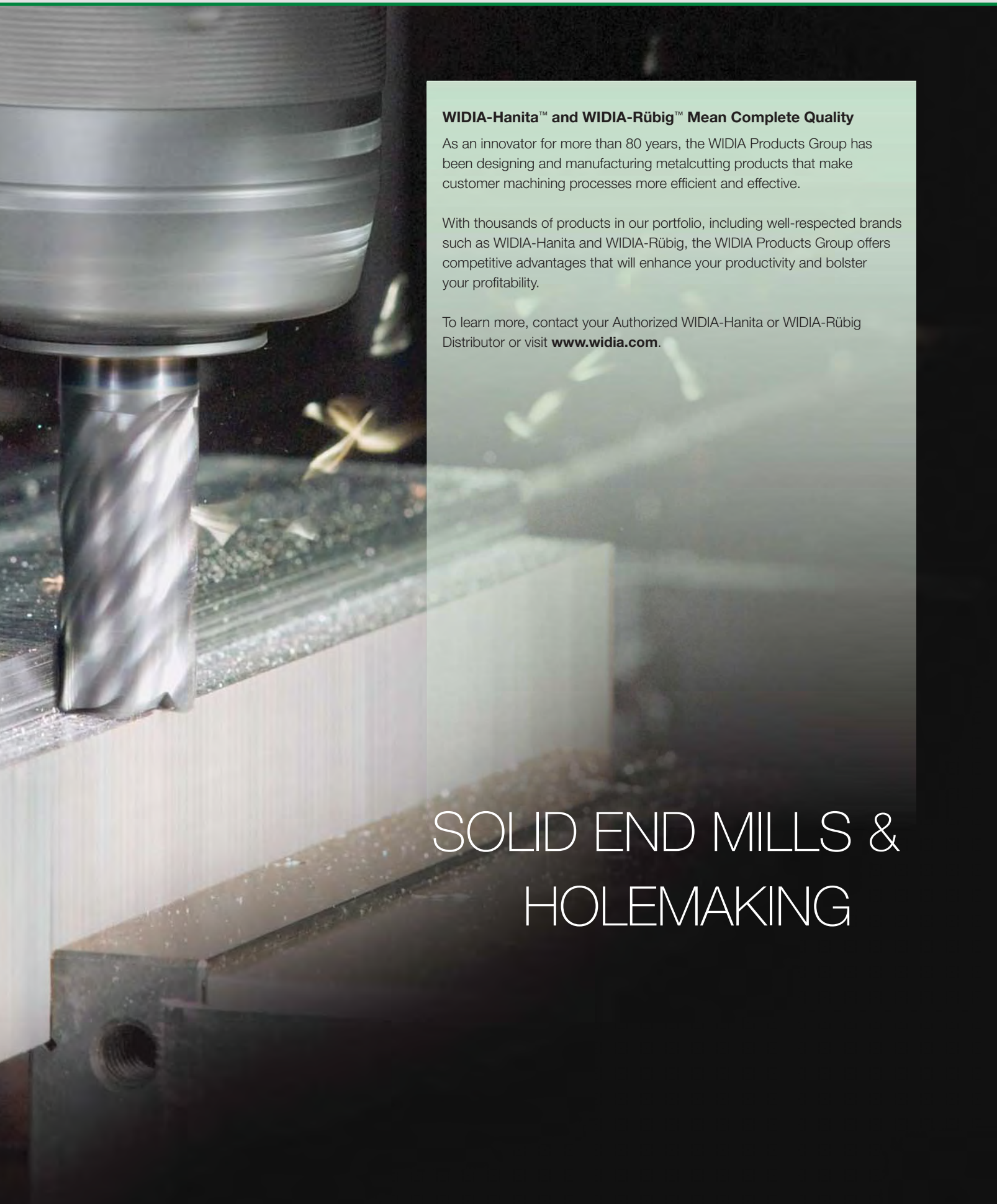
WIDIA RÜBIG™



SOLID END MILLS & HOLEMAKING

SOLID END MILLS & HOLEMAKING

WIDIA
HANITA



WIDIA-Hanita™ and WIDIA-Rübig™ Mean Complete Quality

As an innovator for more than 80 years, the WIDIA Products Group has been designing and manufacturing metalcutting products that make customer machining processes more efficient and effective.

With thousands of products in our portfolio, including well-respected brands such as WIDIA-Hanita and WIDIA-Rübig, the WIDIA Products Group offers competitive advantages that will enhance your productivity and bolster your profitability.

To learn more, contact your Authorized WIDIA-Hanita or WIDIA-Rübig Distributor or visit **www.widia.com**.

SOLID END MILLS & HOLEMAKING

WIDIA
RÜBIG

Solid End Mills and Holemaking

Solid End Mills and Holemaking

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Global Metalworking Sales Offices/Authorized WIDIA Distributors G2–G3

WIDIA-Hanita™ • WIDIA-Rübig™ mean complete quality

When you buy products from the WIDIA family of brands, you're not just buying speed, power, and precision — you're buying complete quality.

As an industry-leading manufacturer of cutting tools, WIDIA brands offer the most complete portfolio of precision-engineered products and custom solution services available today. With thousands of products in our portfolio and a skilled network of Authorized Distributor partners, you'll find everything you need.

80 Years of Quality

1925
Application to register "WIDIA" as a trademark

1926
Tungsten carbide production begins

1952
Ernst Rübig Precision Tool was founded

1955
Hanita was established

1962
First patent granted for coated carbide inserts

1968
Launch of first global coated grade

1972
New Rübig factory opens in Nabburg

1999
WavCut™ is launched globally

2000
QS 9000 TES and VDA 6.4 certification for the WIDIA operations in Essen and Lichtenau

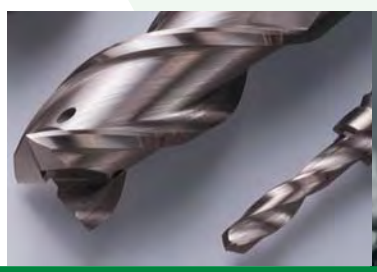
2002
Hanita launches VariMill I™ program

2006
WIDIA celebrates 80 years

2007
Acquisition of Manchester Cutting Tools and ClappDiCO; WIDIA-Manchester and WIDIA-ClappDiCO brands are born

2008
Launch of the new Turning Inserts TN5105 and TN5120

2009
WIDIA-Hanita™ • WIDIA-Rubig™ brands join the WIDIA family



Technical expertise
you can count on

WIDIA brand cutting tools are available exclusively through a specialized network of Authorized Distributor partners whom you can count on to deliver much more than products.

They will show you how to:

- Achieve measurable productivity improvements.
- Significantly reduce cycle time.
- Improve machine tool utilization.
- Take advantage of proven supply chain solutions.
- Access local inventory and best-in-class technical support.
- Request onsite demonstrations of the latest tooling technology.

The most powerful
family of brands in the industry

The WIDIA family of brands is well served by a global network of the finest Authorized Distributors in the industry, selected for their specialized expertise in the areas of:

Turning, Holemaking, Indexable Milling, and Tooling Systems

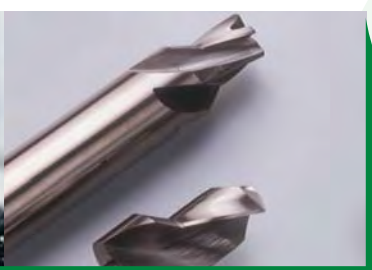
WIDIA | WIDIA MANCHESTER | WIDIA CLAPPDICO | WIDIA CIRCLE

Solid Carbide End Milling and Solid Carbide Drilling and Reaming

WIDIA HANITA | WIDIA RÜBIG

Tapping operations

WIDIA GTD



Easy to order

Finding the right WIDIA-Hanita • WIDIA Rübig products for your machining applications has never been easier. Our engineers and Authorized Distributor partners are experts in high-performance machining. They will work with you to determine the correct product for your application, then order, ship, and deliver the product with the attention to customer service you would expect from a world-leading brand.

Supply chain services

Whether your manufacturing enterprise involves batch processes or mass production, or your metalcutting machines are organized in lines, cells, or as standalone units, our supply chain services program will eliminate unnecessary overhead, ensure tooling availability, shorten setup times, and minimize costs by 30–90%.

In fact, our solutions often quickly pay for themselves by delivering savings that well exceed your annual spend on cutting tools and supplies.

Global manufacturing

WIDIA-Hanita • WIDIA-Rübig products are developed and manufactured at our five centers of excellence:

- Shlomi, Israel
- Nabburg, Germany
- Bangalore, India
- Ashboro, North Carolina, USA
- Vohenstrauss, Germany

Robust training programs

As a WIDIA-Hanita • WIDIA-Rübig customer, you can gain access to our exclusive online training program where you'll find dozens of training courses on our newest products and services.

On the web

Visit our website to read up-to-the-minute information about new products, download electronic copies of product literature, and see a list of industry events in which we are participating. Visit www.widia.com and use the Distributor Finder to locate the Authorized Distributor nearest you.

When you think
speed, power, and precision,
think complete quality —
think WIDIA-Hanita • WIDIA-Rübig.

To find the Authorized WIDIA Distributor nearest you, use the Distributor Finder at **www.widia.com**.

Custom Solutions for
Solid End Mills and Holemaking

We are dedicated to designing and developing special milling and holemaking solutions for demanding operations and focused manufacturing. Our factory engineers, production experts, and field application engineers are available to work with you to design solutions to provide maximum productivity and throughput.

Unique advantages, such as in-house PVD high-quality coating facilities (TiN, TiCN, TiAlN, AlTiN, Z-coat), a wide range of raw materials (HSS, HSS-E, HSS-Powder; Solid Carbide, Brazed Carbide), and capabilities for a wide range of diameters 0,25mm to 75mm, position WIDIA-Hanita • WIDIA-Rübig as the preferred brands for high-quality, application-specific tools.

We specialize in designing and manufacturing blueprint specials in the following tool styles:

- End Mills
- Arbor Style Milling Cutters
- Carbide Drills (straight and step)
- Routers
- Reamers
- Counterbores
- Tapered Tools
- Thread Milling Cutters

Environmental Responsibility

We are deeply committed to offering environmentally responsible products that deliver high performance and proven value. With decades of experience in tooling and manufacturing, combined with the synergies of superior engineering, we offer customers some of the most effective opportunities for sustainable manufacturing in the industry.

Sustainable Engineering

Leading the way with innovation, engineering, and service in standard and custom tooling. A proven methodology and partnership.

Successful project engineering requires planning, teamwork, and disciplined execution. Through our extensive experience in developing and implementing new project engineering strategies, we have pioneered a proven methodology to help you manufacture new products and bring them to market quickly. Service deliverables are carefully outlined and jointly agreed to before the project begins. We formally evaluate progress and results with you throughout the project through our stage-gate management systems.

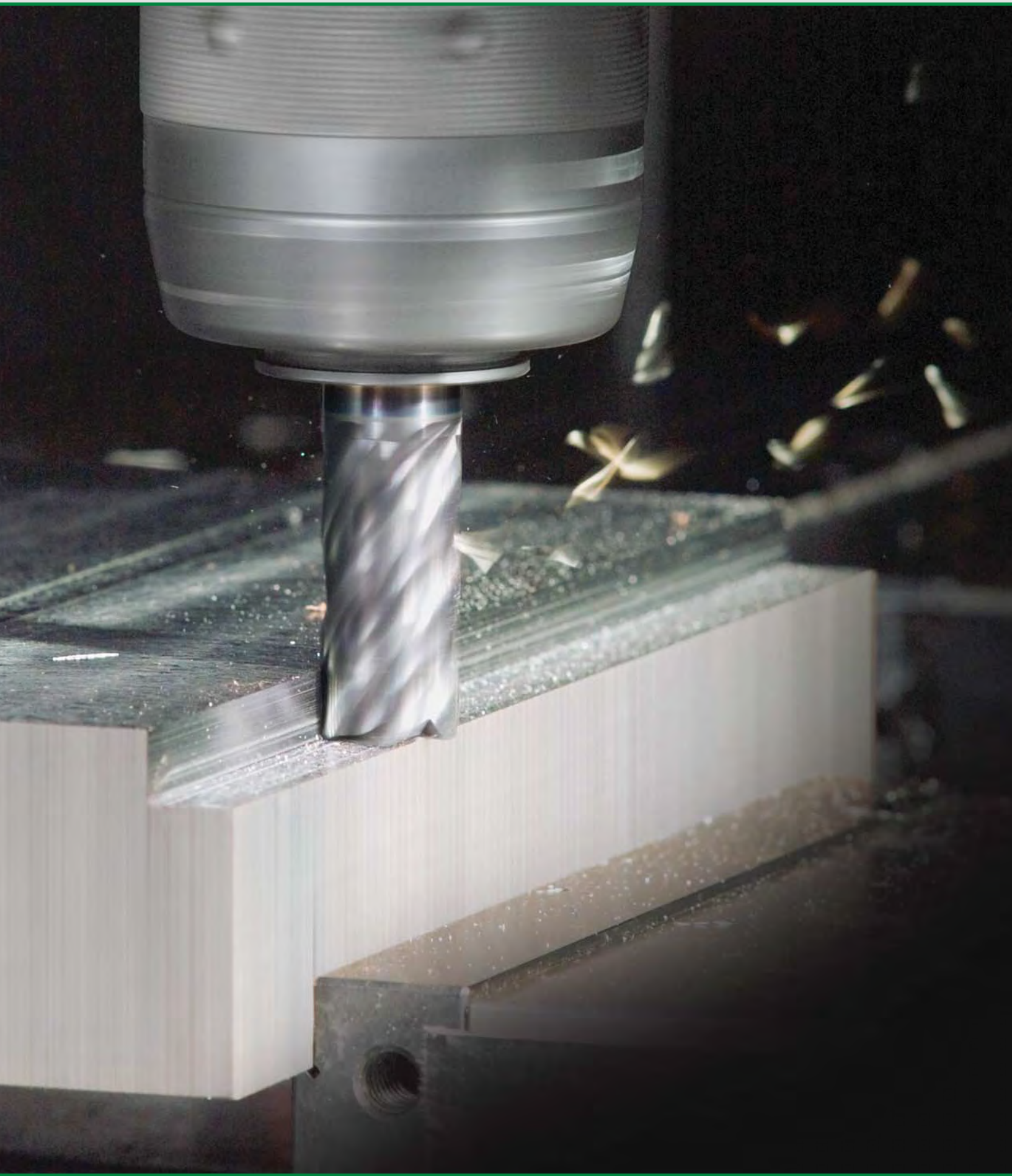
With our best-in-class process, you'll experience accelerated time to market, lower overall costs, and reduced risks to implement new technologies.

Vendor of Choice

We serve every major industrial market throughout the world and are a brand of choice in the most demanding industries, including Aerospace, Die and Mold, Automotive, Heavy Equipment, Medical, and General Engineering. Throughout our 80+ year history, we have achieved a reputation for providing our customers with a constant flow of new and unique products and services, specially designed for maximum efficiency and performance. We have enabled customers to become more competitive and more profitable in their own industries, producing parts in less time, with fewer tool changes and longer tool life.

We are committed to providing you with tools and services that deliver the ultimate in customer satisfaction, and we are pleased to feature some of our latest breakthroughs in this catalog. For more information about how these products can impact your bottom line, please contact your local Authorized WIDIA-Hanita or WIDIA-Rübig Distributor today.

WIDIA
HANITA



Solid End Mills

How to Choose the Correct End Mill **A2**

Recommended Series for Highest Performance **A3**

Tool Reference Guide **A4–A15**

High-Performance Solid Carbide End Mills **A17–A153**
- VariMill™ A17–A29
- Hard Materials A31–A83
- Aluminium A85–A107
- Finishing A111–A134
- Roughing A139–A153

High-Performance Carbide-Tipped End Mills **A155–A163**

High-Performance High-Speed Steel (HSS-E/PM) End Mills **A167–A187**
- Finishing A167–A177
- Roughing A179–A187

General Purpose+ Solid Carbide End Mills • Roughing/Finishing **A189–A274**

General Purpose High-Speed Steel (HSS-E) End Mills • Roughing/Finishing **A277–A312**

Cross Reference Chart for Solid End Milling **A313–A315**

End Mills	fine finishing	finishing	roughing	slot milling	plunging	contour milling
end mill Z = 1	○	○	●	●	●	○
end mill Z = 2	○	○	◑	●	●	○
end mill Z = 3	○	◑	◑	●	◑	○
end mill Z = 4/5	◑	●	●	● VariMill™ only	○	○
multi-flute cutter Z = 6–8	●	●	○	○	○	○
Ball Nose and Torus End Mills						
ball nose end mill Z = 2				●		●
ball nose end mill Z = 4				◑		●

● first choice

◑ suitable with limitations

○ not recommended

Always select a tool with the shortest possible flute length whenever possible. This will increase the stability of the tool and give the best results.

When selecting an end mill, the following machining factors will affect your selection of the correct end mill for your application:

1. Tool overhang.
2. Coolant flow.
3. Machine and setup stability.
4. Machine power and torque.
5. Material to be machined.
6. Machine adapter size (CV40, CV50, HSK63, etc.).
7. See “Tool Reference Guides” on pages A4–A15.

Solid Carbide End Mills

Workpiece Material Group	P	M	K	S1–S3	S4	N	H
	Steels and Alloyed Steels	Stainless Steels (not PH)	Cast Iron	High-Temp Alloys and PH Materials	Titanium	Aluminium	Hard Materials (>40 HRC)
Type of Cut	**Recommended Series**						
Roughing	4906 *See p. A243*		4906 *See p. A243*	4940 +, 4970 **VariMill I™ and II** *See pp. A147, A148*		49G9 + **AluSurf** *See p. A102*	**Vision Plus™** 7670 + X-Feed *See p. A62*
	VariMill I + 4970 *See p. A148*						
Semi-Finishing	**VariMill II** 5777 *See p. A20*				**VariMill II™** 57N8 *See p. A24–A25*	**AluSurf™** 5102, 5103, 51N3, 524152 *See pp. A91, A92–A93, A97, A98*	**Vision Plus** 7505 7585 7595 75N5 7515 7525 *See pp. A45–A49*
Finishing	D507, D517, D518 *See pp. A120, A122*		D518 *See p. A122*			For Graphite 024110 024111 024112 *See pp. A124–A126*	D618 *See p. A57*
	VariMill I DC03 *See p. A115*						
Finishing Pockets and Corners	**VariMill II** 5777 *See p. A20*				**VariMill II** 57N8 *See pp. A24–A25*		
	VariMill I DC03, D507 *See pp. A115, A120*						
Long Side Milling	Carbide tipped 422773, 422779, 422787 *See pp. A157–A159*					Carbide tipped 022761 *See p. A156*	
3D, Ball Nose	**VariMill** 47N0, DC19 *See pp. A21, A211*					DC19 D501 *See pp. A211, A204*	**Vision Plus** 7151, 7061, 70N1 *See pp. A40–A41*

Solid HSS-E/PM End Mills

Workpiece Material Group	P	M	K	S1–S3	S4	N	H
	Steels and Alloyed Steels	Stainless Steels (not PH)	Cast Iron	High-Temp Alloys and PH Materials	Titanium	Aluminium	Hard Materials (>40 HRC)
Type of Cut	**Recommended Series**						
Roughing	6N06, 6N70 *See pp. A181, A182*		6N06 *See p. A181*			6609 6619 *See p. A291*	
Long-Reach, Extended-Neck Roughing	6667 *See p. A299*	6NL6 *See p. A183*					
Roughing on Vertical Machines with Poor Coolant Flows	6606 *See pp. A294–A295*				**WavCut™** 660W, 661W 664W *See p. A184*	6609 *See p. A291*	
Semi-Finishing	1N0M 1N77 *See pp. A170–A172*				**WavCut** 1N77, 660W, 661W 664W, *See pp. A172, A184*	3605 6676 *See p. A284*	
Finishing	1605 1615 *See pp. A285, A286*				1N77 *See p. A172*	3605 6676 *See p. A284*	
Long Axial Depth of Cut							

*See **Inside Back Cover** for legend of specific workpiece materials.*

★ Good
★★ Better
★★★ Best

	Series	Range of Diameter Ø min–Ø max metric	Number of Flutes	Cutting Center	Uncoated	TiCN	TiAlN	AlTiN	
High-Performance Solid Carbide End Mills • VariMill™									
	4777	4–25	4	Yes			X		
	5777	4–26	5	No				X	
	47N0	5–20	4	Yes			X		
	4778	4–25	4	Yes				X	
	57N8	6–25	5	No				X	
	57H8/57I8	16–25	5	No				X	
High-Performance Solid Carbide End Mills • Hard Materials									
	7N02/7N12/7N22	0,3–3	2	Yes			X	X	
	423034	0,5–3	2	Yes				X	
	7N01	1–12	2	Yes			X		
	7N21	0,5–3	2	Yes			X		
	75N2	3–12	2	Yes			X		
	422875	2–12	2	Yes				X	
	7151	1–20	2	Yes			X		
	7061	1–12	2	Yes			X		
	70N1	1–12	2	Yes			X		
	422869/422868	1–16	2	Yes				X	
	422870	2–16	2	Yes				X	
	422873	3–10	2	Yes				X	
	7505/7545/7515/7525	3–25	4/5/6	Yes			X		
	7585/7595	3–25	4/5	Yes			X		
	75N5	3–25	4/5	Yes			X		
	75N8	6–12	6	Yes			X		
	422876/422878	4-12	4	Yes				X	
	7150	2–20	4	Yes			X		
	7050/7060	2–20	4	Yes			X		
	422871	3–10	4	Yes					
	D618	3–18	4/6	Yes			X		
	422837/422831	3–20	6/8	No				X	
	70N7	6–20	6	No				X	
	70N6/71N6	6–20	6	No				X	
	7670	4–25	4/6	Yes			X		

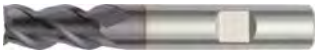
P				M		K		N		S				H			
1 2 3	4	5	6	1 2 3		1 2		1 2 3 4 5	6	1	2	3	4	1 2	3 4		
Steel <35 HRC	Steel 36–48 HRC	PH and Ferritic Stainless Steel <35 HRC	PH and Ferritic Stainless Steel >35 HRC	Stainless Steel		Cast Iron		Non-Ferrous	Graphite	Iron-Based	Nickel-Based	Pure Titanium	Titanium Alloys	Hardened Steels H1 = <48 HRC H2 = 48 ~ 55	H3 = 56 ~ 60 HRC H4 = >60 HRC	Product Information	Cutting Data
High-Performance Solid Carbide End Mills • VariMill™ (continued)																	
★★★	★★★	★★★	★★★	★★★		★★★				★★	★★	★★	★★★	★★/		A18–A19	A27
★★★	★★★	★★★	★★★	★★★		★★★				★★	★★	★★	★★★	★★/		A20	A28
★★★	★★★	★★★	★★★	★★★		★★★				★★	★★	★★	★★★	★★/		A21	A28
		★★	★★								★★★	★★★	★★★			A22	A29
		★★	★★								★★★	★★★	★★★			A24–A25	A29
		★★	★★								★★★	★★★	★★★			A26	A29
High-Performance Solid Carbide End Mills • Hard Materials (continued)																	
★★	★★★	★				★★								★★★	★	A32–A34	A63
★	★★													★★★	★★	A35	A64
★	★★													★★★	★★	A36	A65
★	★★													★★★	★★	A37	A66
★	★★													★★★	★★	A38	A67
★	★★													★★★	★★	A39	A67
★	★★													★★★	★★	A40	A68
★	★★													★★★	★★	A41	A69
★	★★													★★★	★★	A41	A70
★★	★★★													★★	★★	A42	A71
★★	★★★													★★	★★	A43	A72
★★	★★★													★★	★★	A44	A73
★	★★													★★★	★★	A45	A74
★	★★													★★★	★★	A46–A47	A75
★	★★													★★★	★★	A48–A49	A75
★	★★													★★★	★★	A50	A76
★★	★★★													★★	★★	A52–A53	A76
★	★★													★★★	★★	A54	A77
★	★★													★★★	★★	A55	A78
★																A56	A79
★	★★													★★★	★★	A57	A80
★★	★★★													★★	★★	A58	A80
														★★★	★★★	A60	A81
	★★★													★★★		A61	A81
★	★★	★	★★	★★		★				★★	★★	★★★	★★★	★★★	★★/	A62	A82

★ Good
★★ Better
★★★ Best

	Series	Range of Diameter Ø min–Ø max metric	Number of Flutes	Cutting Center	Uncoated	TiCN	TiAlN	AlTiN	DCL	DIA	
High-Performance Solid Carbide End Mills • Aluminium											
	524149	3–12	1	Yes				X			
	022849	2–12	1	Yes	X						
	D502	3–20	2	Yes	X		X				
	422817/022817	4–20	2	Yes	X		X				
	422814/022814	4–20	2	Yes	X						
	4102	1,5–20	2	Yes	X						
	5102	1,5–20	2	Yes	X						
	524152/022852	3–16	2	Yes	X				X		
	024101	6–12	2	Yes						X	
	4103	3–20	3	Yes	X						
	5103	3–20	3	Yes	X						
	51N3	6–20	3	Yes	X						
	4909	6–25	3	Yes	X						
	4979	6–25	3	Yes	X	X					
	49N9	6–20	3	Yes	X						
	49G9	8–25	3	Yes		X					

P				M		K		N		S				H			
1 2 3	4	5	6	1 2 3		1 2		1 2 3 4 5	6	1	2	3	4	1 2	3 4		
Steel <35 HRC	Steel 36–48 HRC	PH and Ferritic Stainless Steel <35 HRC	PH and Ferritic Stainless Steel >35 HRC	Stainless Steel		Cast Iron		Non-Ferrous	Graphite	Iron-Based	Nickel-Based	Pure Titanium	Titanium Alloys	Hardened Steels H1 = <48 HRC H2 = 48 ~ 55	H3 = 56 ~ 60 HRC H4 = >60 HRC	Product Information	Cutting Data
High-Performance Solid Carbide End Mills • Aluminium (continued)																	
								★★★								A86	A103
								★★								A86	A103
								★★								A87	A103
								★★								A88	A104
								★★								A88	A104
								★★								A89	A104
								★★★								A91	A104
								★★★								A92–A93	A105
								★★								A94	A105
								★★								A95	A105
								★★★								A97	A106
								★★★								A98	A106
								★★								A99	A106
								★★★								A100	A107
								★★★								A101	A107
								★★★								A102	A107

★ Good
★★ Better
★★★ Best

	Series	Range of Diameter Ø min–Ø max metric	Number of Flutes	Cutting Center	Uncoated	TiCN	TiAlN	AlTiN	DCL	DIA	PCD	Cermet
High-Performance Solid Carbide End Mills • Finishing												
	423007/023007	0,4–3	2	Yes	X			X				
	4001 JJ	2–20	2	Yes	X		X					
	D503/D513	2–20	3	Yes	X		X					
	DC03	3–20	3	Yes			X					
	4503 JJ	1–20	3	Yes			X					
	422802/322802/022802	2–20	3	Yes	X	X	X					
	422801/322801/022801	2–20	3	Yes	X	X	X					
	422806/322806/022806	2–20	3	Yes	X	X	X					
	422804/322804/022804	2–20	3	Yes	X	X	X					
	4603	3–20	3	Yes			X					
	D507/D517	6–20	6	Yes		X	X					
	422827	6–25	6/8	No				X				
	D518	4–25	4/6/8	Yes			X					
	026621	6–20	4/6/8	No								X
	024112	2–10	2	Yes						X		
	024110	0,5–3	2	Yes						X		
	024111	2–12	2	Yes						X		

P				M		K		N		S				H			
1 2 3	4	5	6	1 2 3		1 2		1 2 3 4 5	6	1	2	3	4	1 2	3 4		
Steel <35 HRC	Steel 36–48 HRC	PH and Ferritic Stainless Steel <35 HRC	PH and Ferritic Stainless Steel >35 HRC	Stainless Steel		Cast Iron		Non-Ferrous	Graphite	Iron-Based	Nickel-Based	Pure Titanium	Titanium Alloys	Hardened Steels H1 = <48 HRC H2 = 48 ~ 55	H3 = 56 ~ 60 HRC H4 = >60 HRC	Product Information	Cutting Data
High-Performance Solid Carbide End Mills • Finishing (continued)																	
★★	★★	★★	★★	★★				★		★★		★★				A112	A127
★★	★★			★★				★								A113	A127
★★	★★	★★	★★	★★		★★				★★	★★	★★	★★	★/		A114	A128
★★	★★	★★	★★	★★		★★				★	★	★	★★	★/		A115	A129
★★	★★	★★	★★	★★		★★				★	★	★	★	★/		A116	A130
★★	★★	★★	★★	★★		★★				★	★	★	★	★/		A117–A118	A130
★★	★★	★★	★★	★★		★★				★	★	★	★	★/		A117–A118	A130
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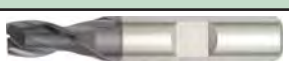
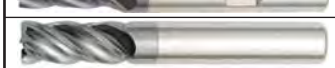
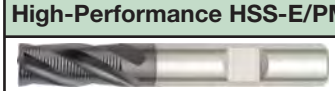
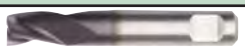
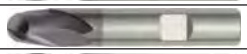
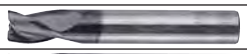
★★	★★	★★	★★	★★		★★				★	★	★	★	★/		A117–A118	A130
★	★★	★★	★★	★★		★★				★	★	★	★	★/		A119	A131
★★	★★	★★	★★	★★		★★				★	★	★	★	★/		A120	A132
★★	★★	★★	★★	★★		★★				★	★	★	★	★/		A121	A133
★★	★★	★★★	★★★	★★★		★★				★★★	★★★	★★★	★★★			A122	A133
★★	★	★★	★			★★										A123	A134
									★★★							A124	A134
									★★★							A125	A134
									★★★							A126	A134

★ Good
★★ Better
★★★ Best

	Series	Range of Diameter Ø min–Ø max metric	Number of Flutes	Cutting Center	Uncoated	TiCN	TiAlN	AlTiN	
High-Performance Solid Carbide End Mills • Roughing									
	DQ13	3–20	3	Yes			X		
	49H6	8–20	3/4	Yes			X		
	422152/422150	6–25	4	Yes				X	
	4976	4–25	3/4/5	Yes				X	
	422824/422820	6–25	4	Yes				X	
	422141/422140/422143/422142	6–20	4	Yes				X	
	4940	6–25	4/6	Yes			X		
	4970	6–25	4/6	Yes		X	X		
High-Performance Carbide-Tipped End Mills									
	022761	25–40	2	Yes	X				
	422773/022773	20–40	3/4/6	No	X		X		
	422779/022779	25–50	4/6	No	X		X		
	422787/022787	40–80	6/8	No	X		X		
High-Performance HSS-E/PM End Mills • Finishing									
	1N02	3–20	2	Yes	X		X		
	1601 JJ	1–20	2	Yes	X	X			
	1N0M	3–25	4	Yes			X		
	1N0M JJ	3–25	4	Yes			X		
	1N77	6–30	4	Yes		X			
	1N05/1N07	6–25	4/6	Yes	X		X		
High-Performance HSS-E/PM End Mills • Roughing									
	6N04	6–25	3/4/5	Yes		X	X		
	6N06	6–30	4/5/6	Yes		X	X		
	6N70	6–32	4/6	Yes			X		
	6NL6	10–25	4/6	Yes			X		
	664W/660W/661W	25–50	5/6	Yes	X				

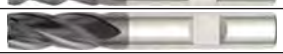
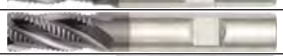
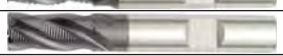
P				M		K		N			S				H			
1 2 3	4	5	6	1 2 3		1 2		1 2 3 4 5	6		1	2	3	4	1 2	3 4		
Steel <35 HRC	Steel 36–48 HRC	PH and Ferritic Stainless Steel <35 HRC	PH and Ferritic Stainless Steel >35 HRC	Stainless Steel		Cast Iron		Non-Ferrous	Graphite		Iron-Based	Nickel-Based	Pure Titanium	Titanium Alloys	Hardened Steels H1 = <48 HRC H2 = 48 ~ 55	H3 = 56 ~ 60 HRC H4 = >60 HRC	Product Information	Cutting Data
High-Performance Solid Carbide End Mills • Roughing (continued)																		
★★	★	★	★	★★★		★					★	★	★★★	★★★	★/		A141	A149
★★★	★★★	★★		★★		★★					★★		★★		★★★		A142	A149
★★★	★★★	★★				★★					★				★/		A143	A150
★★	★	★	★	★		★					★	★	★	★	★/		A144	A150
★★	★★	★	★	★		★					★				★/		A145	A151
★★	★★	★	★	★		★					★				★/		A146	A152
★	★★	★★	★★	★★		★					★★	★★	★★★	★★★	★★★	★★/	A147	A153
★	★★	★★	★★	★★		★					★★	★★	★★★	★★★	★★★	★★/	A148	A153
High-Performance Carbide-Tipped End Mills (continued)																		
								★★★									A156	A160
★★	★	★★	★★	★★				★			★	★	★★	★★			A157	A161
★★	★	★★	★★	★★				★			★	★	★★	★★			A158	A162
★★	★	★★	★★	★★				★			★	★	★★	★★			A159	A163
High-Performance HSS-E/PM End Mills • Finishing (continued)																		
★★	★	★★	★★	★★		★					★★	★★	★★	★★			A168	A174
★★	★	★★	★★	★★		★					★★	★★	★★	★★			A169	A174
★★	★	★★	★★	★★		★					★	★	★	★			A170	A175
★★	★	★★	★★	★★		★					★	★	★	★			A171	A175
★★	★★	★★	★★	★★		★★					★★	★★	★★	★★			A172	A176
★★	★	★★	★★	★★		★					★	★	★	★			A173	A177
High-Performance HSS-E/PM End Mills • Roughing (continued)																		
★		★		★		★					★	★	★	★			A180	A185
★		★		★		★					★	★	★	★			A181	A185
★		★		★		★					★	★	★	★			A182	A186
★		★		★		★					★	★	★	★			A183	A186
		★		★★									★★★	★★★			A184	A187

★ Good
★★ Better
★★★ Best

	Series	Range of Diameter Ø min–Ø max metric	Number of Flutes	Cutting Center	Uncoated	TiCN	TiAlN	AlTiN	
General Purpose+ Solid Carbide End Mills • Roughing/Finishing									
	423002/323002/423001/323001	2–12	3	Yes		X	X		
	423004/423003	4–12	4	Yes				X	
	423048/423047	2–12	2	Yes				X	
	423039/423038	2–12	2	Yes				X	
	423036	6–10	4	No			X		
	423037	6–10	4	No				X	
	D002/D012	2–20	2	Yes	X		X		
	422867/022867/422807	2–20	2	Yes	X		X		
	022807/422860/422808	2–20	2	Yes	X		X		
	422819/022819	2–20	2	Yes	X		X		
	422838/022838	2–20	2	Yes	X			X	
	D001/D011	3–20	2	Yes	X		X		
	D501	1–18	2	Yes			X		
	D003/D013	2–20	3	Yes	X	X	X		
	422861/022861	2–20	3	Yes	X		X		
	422809/022809	2–20	3	Yes	X		X		
	422862/022862/422810/022810	2-20	3	Yes	X		X		
	422821/022821	2–20	3	Yes	X		X		
	D009	3–18	3	Yes			X		
	DC19	3–20	3	Yes			X		
	D004/D014	2–25	4	Yes	X	X	X		
	422863/022863/422811/022811	2–20	4	Yes	X		X		
	422864/022864/422812/022812	2–20	4	Yes	X		X		
	422825/022825	2–20	4	Yes	X		X		
	422848/022848	2–20	4	Yes	X			X	
	D000/D010	3–20	4	Yes	X		X		
	422826/422822	6–25	6/8	No				X	
	4632	0,4–1,5	2	Yes	X	X	X		
	4002/4012/4022	1–25	2	Yes	X	X	X		
	422815/022815	3–20	2	Yes	X		X		
	4651	1,0–2,0	2	Yes	X	X	X		
	4001/4011/4021	1–20	2	Yes	X		X		

P				M	K	N		S				H			
1 2 3	4	5	6	1 2 3	1 2	1 2 3 4 5	6	1	2	3	4	1 2	3 4		
Steel <35 HRC	Steel 36–48 HRC	PH and Ferritic Stainless Steel <35 HRC	PH and Ferritic Stainless Steel >35 HRC	Stainless Steel	Cast Iron	Non-Ferrous	Graphite	Iron-Based	Nickel-Based	Pure Titanium	Titanium Alloys	Hardened Steels H1 = <48 HRC H2 = 48 ~ 55	H3 = 56 ~ 60 HRC H4 = >60 HRC	Product Information	Cutting Data
General Purpose+ Solid Carbide End Mills • Roughing/Finishing (continued)															
★	★			★	★	★								A190	A245
★	★			★	★									A191	A245
★	★			★	★	★								A192	A246
★	★			★	★	★								A193	A246
★	★	★	★	★	★	★		★	★	★	★	★		A194	A247
★	★	★	★	★	★	★		★	★	★	★	★		A194	A247
★	★			★	★	★								A196–A197	A248
★	★			★	★	★								A198–A200	A249
★	★			★	★	★								A198–A200	A249
★	★			★	★	★								A201	A250
★	★			★	★	★								A202	A250
★	★			★	★	★								A203	A251
★	★			★	★	★								A204	A252
★	★			★	★	★								A205–A206	A253
★	★			★	★	★								A207–A208	A254
★	★			★	★	★								A207–A208	A254
★	★			★	★	★								A207–A208	A254
★	★			★	★	★								A209	A255
★	★			★	★	★								A210	A256
★★	★★	★★	★★	★★	★★	★★		★★	★★	★★	★★	★		A211	A256
★	★			★	★									A212–A213	A257
★	★			★	★									A214–A215	A258
★	★			★	★									A214–A215	A258
★	★			★	★									A216	A259
★	★			★	★	★								A217	A259
★	★			★	★	★								A218	A260
★	★			★	★									A219	A261
★	★			★	★	★								A221	A261
★	★			★	★	★								A222–A223	A262–A263
★	★			★	★	★								A224	A264
★	★			★	★	★								A225	A264
★	★			★	★	★								A226–A227	A265–A266

★ Good
★★ Better
★★★ Best

	Series	Range of Diameter Ø min–Ø max metric	Number of Flutes	Cutting Center	Uncoated	TiCN	TiAlN	AlTiN	
General Purpose+ Solid Carbide End Mills • Roughing/Finishing									
	4633	0,4–1,8	3	Yes	X		X		
	4003/4013	1–25	3	Yes	X	X	X		
	422858	3–25	3	Yes				X	
	4004/4014/4024	1–25	4	Yes	X	X	X		
	422816/022816	3–20	4	Y/N	X		X		
	4000/4010	3–20	4	Yes	X	X	X		
	422845/022845	3–16	4	Yes	X			X	
	422813/022813	6–25	3	Yes	X		X		
	422818/022818	6–20	3	Yes	X		X		
	422846/022846	6–25	4/6	Yes	X		X		
	4906	4–25	3/4/5	Yes		X	X		
	4966	5–25	3/4	Yes		X	X		
General Purpose+ HSS-E End Mills • Roughing/Finishing									
	1602/1612	2–32	2	Yes	X	X	X		
	3502	2–25	2	Yes	X				
	1652 JJ/1662 JJ	2–50	2	Yes	X	X			
	1601	2–25	2	Yes	X				
	1603	3–25	3	Yes	X	X	X		
	3605/3615	3–30	3/4	Yes	X	X	X		
	1605/1615	2–20	4	Yes	X	X	X		
	1634 JJ	3–32	4	Yes	X	X	X		
	1625	6–25	4	No	X				
	1600	3–25	4/6	Yes	X	X			
	1606/1616	21–40	6	No	X	X	X		
	6609/6619	6–32	3	Yes	X				
	6645	4–30	4-30	Yes		X	X		
	6605	4–40	4/5/6	No		X	X		
	6606/6616	4–40	4/5/6	Yes		X	X		
	6607/6617	5–32	3/4/5/6	No		X	X		
	6608/6618	5–32	3/4/5/6	Yes		X	X		
	6604	6–25	3/4/5	Yes	X	X	X		
	6667 JJ	8–40	4/6	Yes	X		X		

P				M		K		N			S				H			
1 2 3	4	5	6	1 2 3		1 2		1 2 3 4 5	6		1	2	3	4	1 2	3 4		
Steel <35 HRC	Steel 36–48 HRC	PH and Ferritic Stainless Steel <35 HRC	PH and Ferritic Stainless Steel >35 HRC	Stainless Steel		Cast Iron		Non-Ferrous	Graphite		Iron-Based	Nickel-Based	Pure Titanium	Titanium Alloys	Hardened Steels H1 = <48 HRC H2 = 48 ~ 55	H3 = 56 ~ 60 HRC H4 = >60 HRC	Product Information	Cutting Data
General Purpose+ Solid Carbide End Mills • Roughing/Finishing (continued)																		
★	★			★		★		★									A229	A267
★	★			★		★		★									A230–A231	A267–A268
★	★			★		★		★									A232	A268
★	★			★		★											A234–A235	A269–A270
★	★			★		★											A236	A270
★	★			★		★		★									A237	A271
★	★			★		★											A238	A272
★	★			★		★											A240	A272
★	★			★		★											A241	A273
★	★			★		★											A242	A273
★		★	★	★		★		★			★		★		★/		A243	A274
★		★	★	★		★		★			★		★		★/		A244	A274
General Purpose+ HSS-E End Mills • Roughing/Finishing (continued)																		
★★		★		★		★		★			★	★	★	★			A278–A279	A300
								★★									A280	A301
★★		★		★		★		★			★	★	★	★			A281	A302
★★		★		★		★		★			★	★	★	★			A282	A303
★★		★		★		★		★			★	★	★	★			A283	A303
★★		★		★		★		★			★	★	★	★			A284	A304
★★		★		★		★		★			★	★	★	★			A285–A286	A305
★★		★		★		★		★			★	★	★	★			A287	A306
★★		★		★		★		★			★	★	★	★			A288	A306
★★		★		★		★		★			★	★	★	★			A289	A307
★★		★		★		★		★			★	★	★	★			A290	A307–A308
								★★									A291	A308–A309
★★		★		★		★					★	★	★	★			A292	A309
★★		★		★		★		★			★	★	★	★			A293	A310
★★		★		★		★		★			★	★	★	★			A294–A295	A310
★★		★		★		★		★			★	★	★	★			A296	A311
★★		★		★		★		★			★	★	★	★			A297	A311
★★		★		★		★					★	★	★	★			A298	A312
★★		★		★		★					★	★	★	★			A299	A312

VariMill II™ Solid Carbide End Mills

The next generation high-performance end mill, VariMill II dramatically improves metal removal rates without reducing tool life.

- Best suited for applications in the Aerospace, Medical, Die and Mold, Automotive, and General Engineering markets.
- Outstanding performance in Stainless Steel, Titanium, INCONEL®, and other High-Temperature Alloys and Steels.
- Increased metal removal rates in roughing and finishing operations.
- Excellent performance in both slotting and profiling operations.

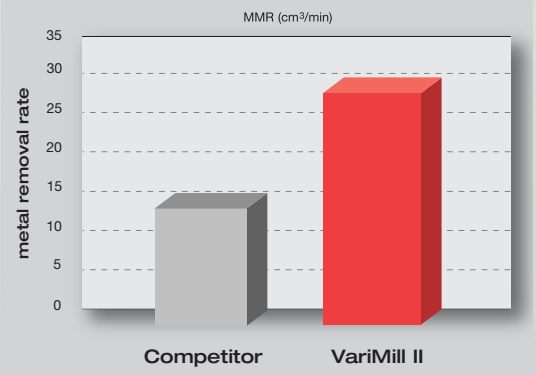
NOTE: Unequal flute spacing.

Featured Application: Slotting an Engine Ring

Operation:	Slotting
Customer:	Aerospace Manufacturer
Workpiece:	Engine Ring
Material:	SST nickel-based alloy EZ3NCT25 (25% nickel, 13% chromium) at 245 HB
Solution:	VariMill II 5-Flute with AlTiN coating
Results:	90% increase in metal removal rate

	COMPETITOR	VariMill II
coating:	TiAlN	AlTiN
end mill:	4-flute 12mm 1mm radius	5-flute 12mm 1mm radius
material:	SST nickel-based alloy	SST nickel-based alloy
depth of cut (ap):	11,15mm	11,15mm
width of cut (ae):	12mm	12mm
speed (Vc):	30 m/min	40 m/min
RPM (N):	800 RPM	1,060 RPM
feed rate (Vf):	112mm/min	212mm/min
chip load per tooth (Fz):	0,035mm/th	0,04mm/th
metal removal rate:	15 cm^3/min	28 cm^3/min

90% Productivity Increase!



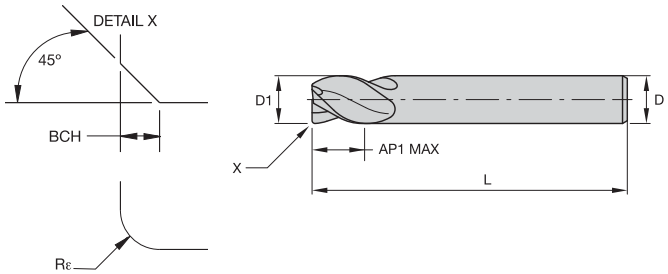
High-Performance Solid Carbide End Mills • VariMill™

VariMill™ **A17–A29**

Application Data

List 4777. . . . . A18–A19 . . . . . A27
List 5777 . . . . . A20 . . . . . A28
List 47N0 . . . . . A21 . . . . . A28
List 4778 . . . . . A22 . . . . . A29
List 57N8 . . . . . A24–A25 . . . . . A29
Lists 57H8 57I8. . . . . A26 . . . . . A29

- Unequal flute spacing.
- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

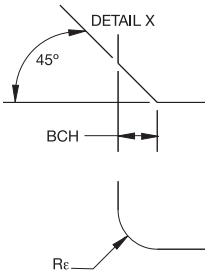
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

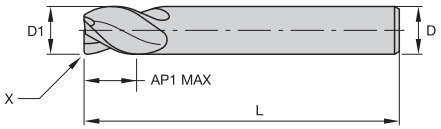
For material descriptions, see Inside Back Cover.
For application data, see page A27.

D1	D	length of cut Ap1 max	length L	Rε	BCH	TiAlN - LT	TiAlN - LW
4,0	6	12,00	55	–	0,40	**477704002LT**	**477704002LW**
4,0	6	12,00	55	0,20	–	**477704012LT**	**–**
4,0	6	12,00	55	–	–	**4777040Z2LT**	**–**
5,0	6	13,00	57	–	0,40	**477705002LT**	**477705002LW**
5,0	6	13,00	57	0,20	–	**477705012LT**	**–**
5,0	6	13,00	57	–	–	**4777050Z2LT**	**–**
6,0	6	13,00	57	–	0,40	**477706002LT**	**477706002LW**
6,0	6	13,00	57	0,20	–	**477706012LT**	**–**
6,0	6	13,00	57	–	–	**4777060Z2LT**	**–**
7,0	8	16,00	63	–	0,40	**477707003LT**	**477707003LW**
7,0	8	16,00	63	0,20	–	**477707013LT**	**–**
7,0	8	16,00	63	–	–	**4777070Z3LT**	**–**
8,0	8	16,00	63	–	0,40	**477708003LT**	**477708003LW**
8,0	8	16,00	63	0,20	–	**477708013LT**	**–**
8,0	8	16,00	63	–	–	**4777080Z3LT**	**–**
9,0	10	19,00	72	–	0,50	**477709004LT**	**477709004LW**
9,0	10	19,00	72	0,20	–	**477709014LT**	**–**
9,0	10	19,00	72	–	–	**4777090Z4LT**	**–**

(continued)

(continued)





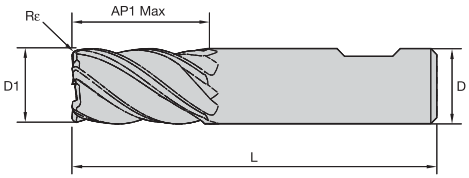
	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A27.

D1	D	length of cut Ap1 max	length L	Rε	BCH	TiAlN - LT	TiAlN - LW
10,0	10	22,00	72	–	0,50	**477710004LT**	**477710004LW**
10,0	10	22,00	72	0,30	–	**477710024LT**	**–**
10,0	10	22,00	72	–	–	**4777100Z4LT**	**–**
11,0	12	26,00	83	–	–	**4777110Z5LT**	**–**
12,0	12	26,00	83	–	0,50	**477712005LT**	**477712005LW**
12,0	12	26,00	83	0,30	–	**477712025LT**	**–**
12,0	12	26,00	83	–	–	**4777120Z5LT**	**–**
14,0	14	26,00	83	–	0,50	**477714014LT**	**477714014LW**
16,0	16	32,00	92	–	0,50	**477716006LT**	**477716006LW**
16,0	16	32,00	92	0,30	–	**477716026LT**	**–**
16,0	16	32,00	92	–	–	**4777160Z6LT**	**–**
18,0	18	32,00	92	–	0,50	**477718018LT**	**477718018LW**
20,0	20	38,00	104	–	0,50	**477720007LT**	**477720007LW**
20,0	20	38,00	104	0,30	–	**477720027LT**	**–**
20,0	20	38,00	104	–	–	**4777200Z7LT**	**–**
25,0	25	45,00	121	–	0,50	**477725008LT**	**477725008LW**

- Unequal flute spacing.
- Non-center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

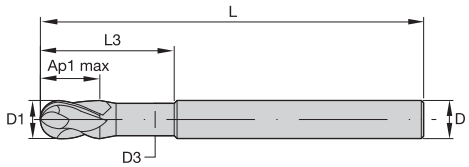
	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
AlTiN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A28.

D1	D	length of cut Ap1 max	length L	Rε	AlTiN - MT	AlTiN - MW
4,0	6	11,00	55	0,25	577704002MT	577704002MW
4,0	6	11,00	55	–	577704012MT	–
5,0	6	13,00	57	0,25	577705002MT	577705002MW
6,0	6	13,00	57	0,40	577706002MT	577706002MW
6,0	6	13,00	57	–	577706012MT	–
7,0	8	16,00	63	0,40	577707003MT	577707003MW
8,0	8	19,00	63	0,50	577708003MT	577708003MW
8,0	8	19,00	63	–	577708013MT	–
9,0	9	19,00	72	0,50	577709004MT	577709004MW
10,0	10	22,00	72	0,50	577710004MT	577710004MW
10,0	10	22,00	72	–	577710014MT	–
12,0	12	26,00	83	0,75	577712005MT	577712005MW
12,0	12	26,00	83	–	577712015MT	
14,0	14	26,00	83	0,75	577714004MT	577714004MW
14,0	14	26,00	83	–	577714014MT	–
16,0	16	32,00	92	0,75	577716006MT	577716006MW
16,0	16	32,00	92	–	577716016MT	–
18,0	18	32,00	92	0,75	577718008MT	577718008MW
20,0	20	38,00	104	0,75	577720007MT	577720007MW
20,0	20	38,00	104	–	577720017MT	–
25,0	25	45,00	121	0,75	577725008MT	577725008MW

- Unequal flute spacing.
- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A28.

D1	D	length of cut Ap1 max	L3	length L	D3	TiAlN - LT
5,0	6	9,00	15,00	57	4,70	**47N005002LT**
6,0	6	10,00	15,00	57	5,64	**47N006002LT**
8,0	8	12,00	20,00	63	7,52	**47N008003LT**
10,0	10	14,00	25,00	72	9,40	**47N010004LT**
12,0	12	16,00	30,00	83	11,28	**47N012005LT**
16,0	16	22,00	38,00	92	15,04	**47N016006LT**
20,0	20	26,00	50,00	104	18,80	**47N020007LT**

- Unequal flute spacing.
- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
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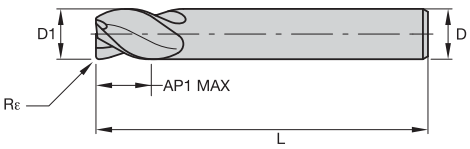
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P		S		
	5	6	2	3	4
AlTiN	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A29.

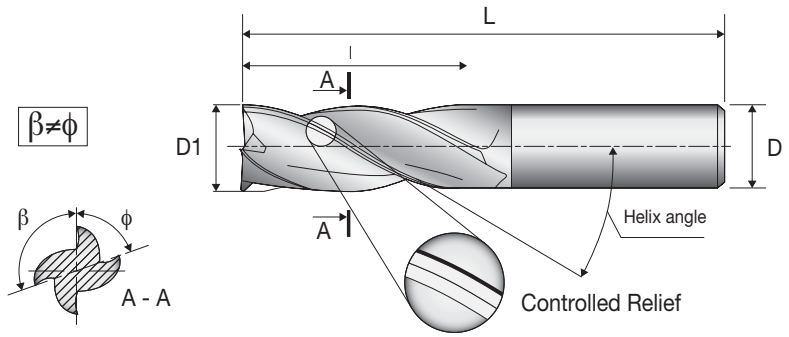
D1	D	length of cut Ap1 max	length L	Rε	AlTiN - MT	AlTiN - MW
4,0	6	12,00	55	0,20	**477804002MT**	**477804002MW**
5,0	6	13,00	57	0,20	**477805002MT**	**477805002MW**
6,0	6	13,00	57	0,20	**477806002MT**	**477806002MW**
7,0	8	16,00	63	0,20	**477807003MT**	**477807003MW**
8,0	8	16,00	63	0,20	**477808003MT**	**477808003MW**
9,0	10	19,00	72	0,30	**477809004MT**	**477809004MW**
10,0	10	22,00	72	0,30	**477810004MT**	**477810004MW**
12,0	12	26,00	83	0,30	**477812005MT**	**477812005MW**
14,0	14	26,00	83	0,30	**477814014MT**	**477814014MW**
16,0	16	32,00	92	0,30	**477816006MT**	**477816006MW**
18,0	18	32,00	92	0,30	**477818018MT**	**477818018MW**
20,0	20	38,00	104	0,30	**477820007MT**	**477820007MW**
25,0	25	45,00	121	0,30	**477825008MT**	**477825008MW**

VariMill™: The Tool of Choice for All Ferrous Applications

VariMill carbide end mills are the proven leader in the field of high-performance, chatter-free machining and the most universal and consistent performer for use in a wide range of workpiece materials and types of operations. Utilizing an innovative and proprietary design with unequal flute spacing, VariMill carbide end mills provide users with the most versatile technology available, capable of outperforming most other high-performance tools.

Outstanding performance in:

- Stainless Steels
- Steels and Alloyed Steels
- Cast Iron
- High-Temperature Alloys
- Low- Carbon Steels <35 HRC
- Titanium

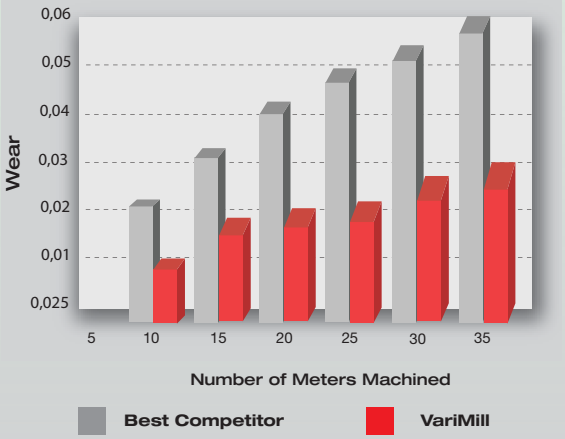


Featured Application: Stainless Steel AISI 316L

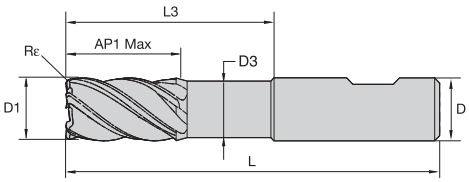
Operation:	Slotting
Customer:	General Manufacturer
Workpiece:	General Machining
Material:	Stainless Steel AISI 316L
Solution:	VariMill 4-Flute
Results:	100% extended tool life

	COMPETITOR	VariMill
end mill:	4-flute 16mm 1mm radius	4-flute 16mm 1mm radius
cutting speed (Vc):	58 m/min	58 m/min
RPM (N):	1,200 RPM	1,200 RPM
feed rate (F):	378mm/min	378mm/min
examined parameter:	wear	wear

VariMill Delivered 100% More Extended Tool Life!



- Unequal flute spacing.
- Non-center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P		S		
	5	6	2	3	4
AlTiN	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A29.

D1	D	length of cut Ap1 max	L3	length L	Rε	D3	AlTiN - MT	AlTiN - MW
6,0	6	13,00	18,00	63	0,50	5,40	57N806022MT	57N806022MW
6,0	6	13,00	18,00	63	1,00	5,40	57N806032MT	57N806032MW
6,0	6	13,00	18,00	63	1,50	5,40	–	57N806042MW
6,0	6	13,00	18,00	63	–	5,40	57N806002MT	–
8,0	8	19,00	24,00	76	0,50	7,20	57N808023MT	57N808023MW
8,0	8	19,00	24,00	76	1,00	7,20	57N808033MT	57N808033MW
8,0	8	19,00	24,00	76	2,00	7,20	–	57N808053MW
8,0	8	19,00	24,00	76	–	7,20	57N808003MT	–
10,0	10	22,00	30,00	76	0,50	9,00	57N810024MT	57N810024MW
10,0	10	22,00	30,00	76	1,00	9,00	57N810034MT	57N810034MW
10,0	10	22,00	30,00	76	2,00	9,00	57N810054MT	57N810054MW
10,0	10	22,00	30,00	76	–	9,00	57N810004MT	–
12,0	12	26,00	36,00	84	0,50	10,80	57N812025MT	57N812025MW
12,0	12	26,00	36,00	84	1,00	10,80	57N812035MT	57N812035MW

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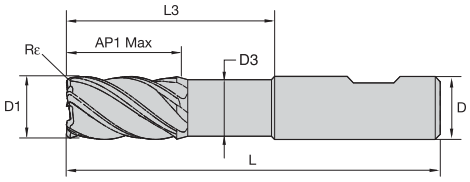


	P		S		
	5	6	2	3	4
AlTiN	●	●	●	●	●

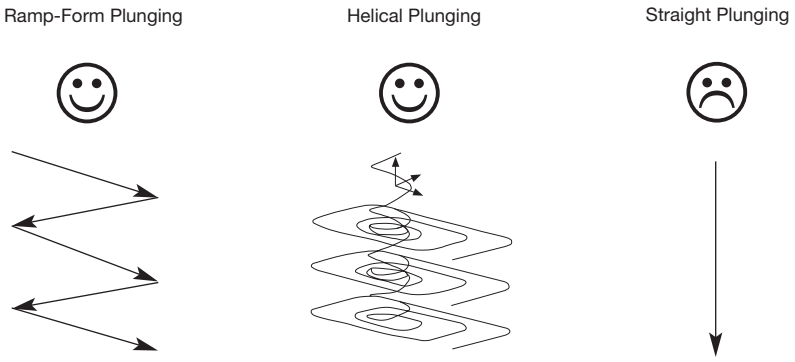
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A29.

D1	D	length of cut Ap1 max	L3	length L	Rε	D3	AlTiN - MT	AlTiN - MW
12,0	12	26,00	36,00	84	2,00	10,80	**57N812055MT**	**57N812055MW**
12,0	12	26,00	36,00	84	–	10,80	**57N812005MT**	**–**
16,0	16	32,00	48,00	100	0,50	14,40	**57N816026MT**	**57N816026MW**
16,0	16	32,00	48,00	100	1,00	14,40	**57N816036MT**	**57N816036MW**
16,0	16	32,00	48,00	100	2,00	14,40	**57N816056MT**	**57N816056MW**
16,0	16	32,00	48,00	100	3,00	14,40	**57N816076MT**	**57N816076MW**
16,0	16	32,00	48,00	100	–	14,40	**57N816006MT**	**–**
20,0	20	38,00	60,00	115	0,50	18,80	**57N820027MT**	**57N820027MW**
20,0	20	38,00	60,00	115	1,00	18,80	**57N820037MT**	**57N820037MW**
20,0	20	38,00	60,00	115	2,00	18,80	**57N820057MT**	**57N820057MW**
20,0	20	38,00	60,00	115	3,00	18,80	**57N820077MT**	**57N820077MW**
20,0	20	38,00	60,00	115	4,00	18,80	**57N820087MT**	**57N820087MW**
20,0	20	38,00	60,00	115	–	18,80	**57N820007MT**	**–**
25,0	25	45,00	75,00	135	0,50	24,00	**57N825028MT**	**57N825028MW**
25,0	25	45,00	75,00	135	1,00	24,00	**57N825038MT**	**57N825038MW**
25,0	25	45,00	75,00	135	2,00	24,00	**57N825058MT**	**57N825058MW**
25,0	25	45,00	75,00	135	3,00	24,00	**57N825078MT**	**57N825078MW**
25,0	25	45,00	75,00	135	4,00	24,00	**57N825088MT**	**57N825088MW**
25,0	25	45,00	75,00	135	–	24,00	**57N825008MT**	**–**

Tech Tip

Plunge Milling Strategies



- Unequal flute spacing.
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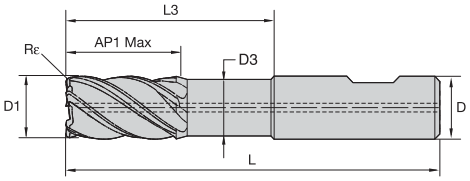
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P		S		
	5	6	2	3	4
AlTiN	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A29.

D1	D	length of cut Ap1 max	L3	length L	Rε	D3	AlTiN - MW
16,0	16	26,00	34,00	82	1,00	15,00	**57I816036MW**
16,0	16	32,00	48,00	100	1,00	15,00	**57H816036MW**
20,0	20	30,00	42,00	92	1,00	18,80	**57I820037MW**
20,0	20	38,00	60,00	115	1,00	18,80	**57H820037MW**
25,0	25	36,00	52,00	108	1,00	23,50	**57I825038MW**
25,0	25	45,00	75,00	135	1,00	23,50	**57H825038MW**

Tech Tip

Chip Congestion

Solution:
- Reduce feed.
- Reduce width and depth of cut.

Flank Wear

Solution:
- Increase feed per tooth.
- Reduce cutting speed.

Nicks on the Cutting Edge

Solution:
- Reduce feed.
- Climb milling.
- Check the clamping of the workpiece.
- Reduce the overhang length.
- Check spindle clearance.

Tool Breakage

Solution:
- Reduce feed.
- Increase cutting speed.
- Reduce the overhang length.
- Reduce width and depth of cut.
- Reduce cutting length.

List 4777 • VariMill™

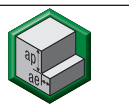
	A		B	TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min			D1 - Diameter							
Group	ap	ae	ap	Min		Max	mm	4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P1	1,5 x D	0,5 x D	1 x D	150	-	200	Fz	0,028	0,044	0,060	0,072	0,083	0,101	0,114	0,124
P2	1,5 x D	0,5 x D	1 x D	140	-	190	Fz	0,028	0,044	0,060	0,072	0,083	0,101	0,114	0,124
P3	1,5 x D	0,5 x D	1 x D	120	-	160	Fz	0,023	0,036	0,050	0,061	0,070	0,087	0,101	0,114
P4	1,5 x D	0,5 x D	0,75 x D	90	-	150	Fz	0,021	0,033	0,045	0,054	0,062	0,077	0,088	0,098
P5	1,5 x D	0,5 x D	1 x D	60	-	100	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
P6	1,5 x D	0,5 x D	0,75 x D	50	-	75	Fz	0,016	0,025	0,034	0,040	0,047	0,057	0,065	0,071
M1	1,5 x D	0,5 x D	1 x D	90	-	115	Fz	0,023	0,036	0,050	0,061	0,070	0,087	0,101	0,114
M2	1,5 x D	0,5 x D	1 x D	60	-	80	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
M3	1,5 x D	0,5 x D	1 x D	60	-	70	Fz	0,016	0,025	0,034	0,040	0,047	0,057	0,065	0,071
K1	1,5 x D	0,5 x D	1 x D	120	-	150	Fz	0,028	0,044	0,060	0,072	0,083	0,101	0,114	0,124
K2	1,5 x D	0,5 x D	1 x D	110	-	130	Fz	0,023	0,036	0,050	0,061	0,070	0,087	0,101	0,114
K3	1,5 x D	0,5 x D	1 x D	100	-	130	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
S1	1,5 x D	0,3 x D	0,3 x D	50	-	90	Fz	0,023	0,036	0,050	0,061	0,070	0,087	0,101	0,114
S2	1,5 x D	0,3 x D	0,3 x D	25	-	40	Fz	0,013	0,019	0,026	0,032	0,037	0,046	0,054	0,061
S3	1,5 x D	0,5 x D	1 x D	60	-	80	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
S4	1,5 x D	0,5 x D	1 x D	50	-	60	Fz	0,016	0,026	0,037	0,045	0,052	0,064	0,074	0,084
H1	1,5 x D	0,5 x D	0,75 x D	80	-	140	Fz	0,021	0,033	0,045	0,054	0,062	0,077	0,088	0,098

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 5777 • VariMill II™



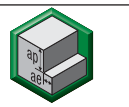
A

B

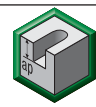
				AlTiN				Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	mm	4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P1	1,5 x D	0,5 x D	1 x D	150	-	200	Fz	0,028	0,044	0,060	0,072	0,083	0,101	0,114	0,124
P2	1,5 x D	0,5 x D	1 x D	140	-	190	Fz	0,028	0,044	0,060	0,072	0,083	0,101	0,114	0,124
P3	1,5 x D	0,5 x D	1 x D	120	-	160	Fz	0,023	0,036	0,050	0,061	0,070	0,087	0,101	0,114
P4	1,5 x D	0,5 x D	0,75 x D	90	-	150	Fz	0,021	0,033	0,045	0,054	0,062	0,077	0,088	0,098
P5	1,5 x D	0,5 x D	1 x D	60	-	100	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
P6	1,5 x D	0,5 x D	0,75 x D	50	-	75	Fz	0,016	0,025	0,034	0,040	0,047	0,057	0,065	0,071
M1	1,5 x D	0,5 x D	1 x D	90	-	115	Fz	0,023	0,036	0,050	0,061	0,070	0,087	0,101	0,114
M2	1,5 x D	0,5 x D	1 x D	60	-	80	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
M3	1,5 x D	0,5 x D	1 x D	60	-	70	Fz	0,016	0,025	0,034	0,040	0,047	0,057	0,065	0,071
K1	1,5 x D	0,5 x D	1 x D	120	-	150	Fz	0,028	0,044	0,060	0,072	0,083	0,101	0,114	0,124
K2	1,5 x D	0,5 x D	1 x D	110	-	130	Fz	0,023	0,036	0,050	0,061	0,070	0,087	0,101	0,114
K3	1,5 x D	0,5 x D	1 x D	100	-	130	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
S1	1,5 x D	0,3 x D	0,3 x D	50	-	90	Fz	0,023	0,036	0,050	0,061	0,070	0,087	0,101	0,114
S2	1,5 x D	0,3 x D	0,3 x D	25	-	40	Fz	0,013	0,019	0,026	0,032	0,037	0,046	0,054	0,061
S3	1,5 x D	0,5 x D	1 x D	60	-	80	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
S4	1,5 x D	0,5 x D	1 x D	50	-	60	Fz	0,016	0,026	0,037	0,045	0,052	0,064	0,074	0,084
H1	1,5 x D	0,5 x D	0,75 x D	80	-	140	Fz	0,021	0,033	0,045	0,054	0,062	0,077	0,088	0,098

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 47N0 • VariMill™



A



B

				TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.						
				Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	mm	5,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	1,5 x D	0,5 x D	1 x D	150	-	200	Fz	0,036	0,044	0,060	0,072	0,083	0,101	0,114
P2	1,5 x D	0,5 x D	1 x D	140	-	190	Fz	0,036	0,044	0,060	0,072	0,083	0,101	0,114
P3	1,5 x D	0,5 x D	1 x D	120	-	160	Fz	0,030	0,036	0,050	0,061	0,070	0,087	0,101
P4	1,5 x D	0,5 x D	0,75 x D	90	-	150	Fz	0,027	0,033	0,045	0,054	0,062	0,077	0,088
P5	1,5 x D	0,5 x D	1 x D	60	-	100	Fz	0,024	0,029	0,040	0,048	0,056	0,070	0,081
P6	1,5 x D	0,5 x D	0,75 x D	50	-	75	Fz	0,020	0,025	0,034	0,040	0,047	0,057	0,065
M1	1,5 x D	0,5 x D	1 x D	90	-	115	Fz	0,030	0,036	0,050	0,061	0,070	0,087	0,101
M2	1,5 x D	0,5 x D	1 x D	60	-	80	Fz	0,024	0,029	0,040	0,048	0,056	0,070	0,081
M3	1,5 x D	0,5 x D	1 x D	60	-	70	Fz	0,020	0,025	0,034	0,040	0,047	0,057	0,065
K1	1,5 x D	0,5 x D	1 x D	120	-	150	Fz	0,036	0,044	0,060	0,072	0,083	0,101	0,114
K2	1,5 x D	0,5 x D	1 x D	110	-	130	Fz	0,030	0,036	0,050	0,061	0,070	0,087	0,101
K3	1,5 x D	0,5 x D	1 x D	100	-	130	Fz	0,024	0,029	0,040	0,048	0,056	0,070	0,081
S1	1,5 x D	0,3 x D	0,3 x D	50	-	90	Fz	0,030	0,036	0,050	0,061	0,070	0,087	0,101
S2	1,5 x D	0,3 x D	0,3 x D	25	-	40	Fz	0,016	0,019	0,026	0,032	0,037	0,046	0,054
S3	1,5 x D	0,5 x D	1 x D	60	-	80	Fz	0,024	0,029	0,040	0,048	0,056	0,070	0,081
S4	1,5 x D	0,5 x D	1 x D	50	-	60	Fz	0,021	0,026	0,037	0,045	0,052	0,064	0,074
H1	1,5 x D	0,5 x D	0,75 x D	80	-	140	Fz	0,027	0,033	0,045	0,054	0,062	0,077	0,088

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4778 • VariMill™

A

B

AlTiN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.

Cutting Speed Vc m/min

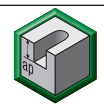
D1 - Diameter

Group	ap	ae	ap	Min		Max	mm	4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P5	1,5 x D	0,5 x D	1 x D	60	-	100	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
P6	1,5 x D	0,5 x D	0,75 x D	50	-	75	Fz	0,016	0,025	0,034	0,040	0,047	0,057	0,065	0,071
S2	1,5 x D	0,3 x D	0,3 x D	25	-	40	Fz	0,013	0,019	0,026	0,032	0,037	0,046	0,054	0,061
S3	1,5 x D	0,5 x D	1 x D	60	-	80	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
S4	1,5 x D	0,5 x D	1 x D	50	-	60	Fz	0,016	0,026	0,037	0,045	0,052	0,064	0,074	0,084

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 57N8 • VariMill II™

A



B

AlTiN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.

Cutting Speed Vc m/min

D1 - Diameter

Group	ap	ae	ap	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P5	1,5 x D	0,5 x D	1 x D	60	-	100	Fz	0,029	0,040	0,048	0,056	0,070	0,081	0,091
P6	1,5 x D	0,5 x D	0,75 x D	50	-	75	Fz	0,025	0,034	0,040	0,047	0,057	0,065	0,071
S2	1,5 x D	0,3 x D	0,3 x D	25	-	40	Fz	0,019	0,026	0,032	0,037	0,046	0,054	0,061
S3	1,5 x D	0,5 x D	1 x D	60	-	80	Fz	0,029	0,040	0,048	0,056	0,070	0,081	0,091
S4	1,5 x D	0,5 x D	1 x D	50	-	60	Fz	0,026	0,037	0,045	0,052	0,064	0,074	0,084

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 57H8 57I8 • VariMill II™

A

B

AlTin

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.

Cutting Speed Vc m/min

D1 - Diameter

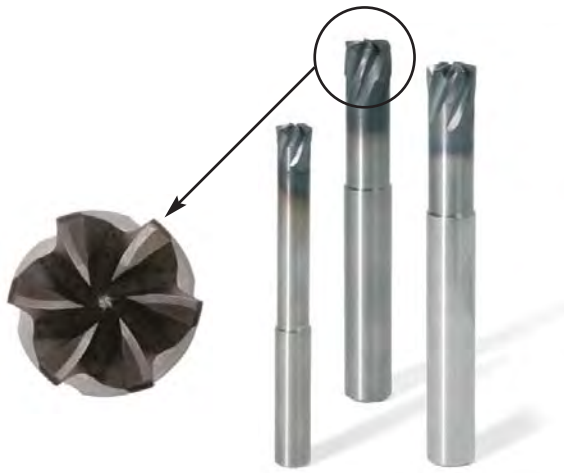
Group	ap	ae	ap	Min		Max	mm	16,0	20,0	25,0
P5	1,5 x D	0,5 x D	1 x D	60	-	100	Fz	0,070	0,081	0,091
P6	1,5 x D	0,5 x D	0,75 x D	50	-	75	Fz	0,057	0,065	0,071
S2	1,5 x D	0,3 x D	0,3 x D	25	-	40	Fz	0,046	0,054	0,061
S3	1,5 x D	0,5 x D	1 x D	60	-	80	Fz	0,070	0,081	0,091
S4	1,5 x D	0,5 x D	1 x D	50	-	60	Fz	0,064	0,074	0,084

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

X-Feed™ End Mills for High-Feed Milling

Specifically engineered to machine hardened steel up to 67 HRC at extreme speeds and feeds.

- Unique tool with new 6-flute style for high productivity.
- Necked shanks provide extended reach in deep cavities.
- High-feed rates, up to 0,6mm per tooth on a 20mm tool.
- Machine hardened materials at 2x to 3x the metal removal rate of competitive end mills.
- Wide range of cutting diameters: down to 6mm for small and medium pocket work.
- Innovative new geometry maximizes metal removal rates.
- High metal removal rates lower manufacturing costs.

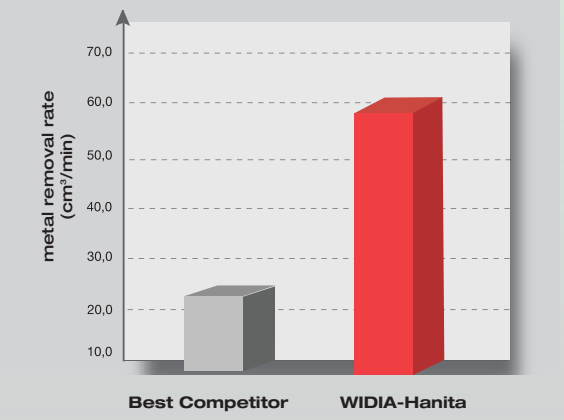


Featured Application: Milling a Mold

Operation:	Pocket Milling
Customer:	Die and Mold Manufacturer
Material:	AISI 4340 hardened steel (52 HRC)
Workpiece:	Mold
Results:	• 3x better metal removal rate than competitive tool! • Machined at more than 3x faster feed!

	COMPETITOR	WIDIA-Hanita
tool:	4-flute H/P for die and mold	70N612005MT
material:	medium-hardened steel	medium-hardened steel
surface speed:	120 m/min	160 m/min
feed per tooth:	0,34mm	0,34mm
depth of cut:	0,8mm	0,6mm
table feed:	4,331mm/min	15,287mm/min
metal removal rate:	22,8 cm^3	60,5 cm^3

Increased Metal Removal Rate by 191%



High-Performance Solid Carbide End Mills • Hard Materials

Hard Materials **A31–A83**

Vision Plus™ Micro — *Application Data*

Lists 7N02 7N12 7N22 . . . . A32–A34 . . . . A63
List 423034 . . . . A35 . . . . A64
List 7N01 . . . . A36 . . . . A65
List 7N21 . . . . A37 . . . . A66

Vision Plus™

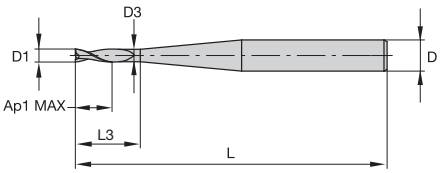
List 75N2 . . . . A38 . . . . A67
List 422875 . . . . A39 . . . . A67
List 7151 . . . . A40 . . . . A68
Lists 7061 70N1 . . . . A41 . . . . A69, A70
Lists 422869 422868 . . . . A42 . . . . A71
List 422870 . . . . A43 . . . . A72
List 422873 . . . . A44 . . . . A73
Lists 7505 7515 7525 7545 . . . . A45 . . . . A74
Lists 7585 7595 . . . . A46–A47 . . . . A75
List 75N5 . . . . A48–A49 . . . . A75
List 75N8 . . . . A50 . . . . A76
Lists 422876 422878 . . . . A52–A53 . . . . A76
List 7150 . . . . A54 . . . . A77
Lists 7050 7060 . . . . A55 . . . . A78
List 422871 . . . . A56 . . . . A79
List D618 . . . . A57 . . . . A80
Lists 422837 422831 . . . . A58 . . . . A80
List 7670 . . . . A62 . . . . A82

Vision Plus™ X-Feed™

List 70N7 . . . . A60 . . . . A81
Lists 70N6 71N6 . . . . A61 . . . . A81

Speed Calculation — Ball Nose **A83**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P				K		H		
	2	3	4	5	1	2	1	2	3
AlTiN	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A63.

D1	D	length of cut Ap1 max	L3	length L	D3	AlTiN - MJ	TiAlN - RJ
0,3	6	0,40	—	50	—	7N0200302MJ	7N0200302RJ
0,4	3	0,60	2,00	38	0,36	7N2200400MJ	7N2200400RJ
0,4	3	0,60	4,00	38	0,36	7N2200410MJ	7N2200410RJ
0,4	6	0,60	—	50	—	7N0200402MJ	7N0200402RJ
0,5	3	0,70	2,00	38	0,45	7N2200500MJ	7N2200500RJ
0,5	3	0,70	4,00	38	0,45	7N2200510MJ	7N2200510RJ
0,5	3	0,70	6,00	38	0,45	7N2200520MJ	7N2200520RJ
0,5	6	0,70	1,50	50	0,45	7N0200502MJ	7N0200502RJ
0,5	6	0,70	2,50	60	0,45	7N1200502MJ	7N1200502RJ
0,6	3	0,90	2,00	38	0,55	7N2200600MJ	7N2200600RJ
0,6	3	0,90	4,00	38	0,55	7N2200610MJ	7N2200610RJ
0,6	3	0,90	6,00	38	0,55	7N2200620MJ	7N2200620RJ
0,6	6	0,90	1,80	50	0,55	7N0200602MJ	7N0200602RJ
0,6	6	0,90	3,00	60	0,55	7N1200602MJ	7N1200602RJ
0,7	4	1,00	2,00	50	0,65	7N2200701MJ	7N2200701RJ
0,7	4	1,00	4,00	50	0,65	7N2200711MJ	7N2200711RJ
0,7	4	1,00	6,00	50	0,65	7N2200721MJ	7N2200721RJ
0,8	4	1,20	4,00	50	0,75	7N2200801MJ	7N2200801RJ
0,8	4	1,20	6,00	50	0,75	7N2200811MJ	7N2200811RJ
0,8	4	1,20	8,00	50	0,75	7N2200821MJ	7N2200821RJ
0,8	6	1,20	2,40	50	0,75	7N0200802MJ	7N0200802RJ
0,8	6	1,20	4,00	60	0,75	7N1200802MJ	7N1200802RJ
0,9	4	1,35	6,00	50	0,85	7N2200901MJ	7N2200901RJ
0,9	4	1,35	8,00	50	0,85	7N2200911MJ	7N2200911RJ
0,9	4	1,35	10,00	50	0,85	7N2200921MJ	7N2200921RJ

(continued)

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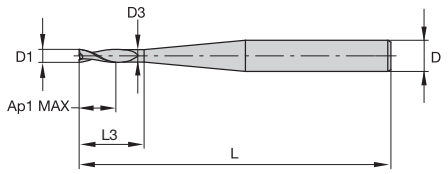


	P				K		H		
	2	3	4	5	1	2	1	2	3
AlTiN	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●

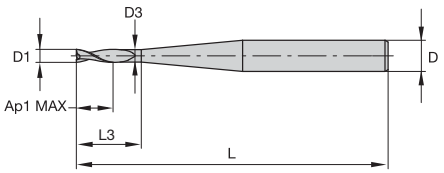
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A63.

D1	D	length of cut Ap1 max	L3	length L	D3	AlTiN - MJ	TiAlN - RJ
1,0	4	1,50	6,00	50	0,97	7N2201001MJ	7N2201001RJ
1,0	4	1,50	8,00	50	0,95	7N2201011MJ	7N2201011RJ
1,0	4	1,50	10,00	50	0,95	7N2201021MJ	7N2201021RJ
1,0	4	1,50	12,00	50	0,93	7N2201031MJ	7N2201031RJ
1,0	6	1,50	2,50	50	0,95	7N0201002MJ	7N0201002RJ
1,0	6	1,50	5,00	60	0,95	7N1201002MJ	7N1201002RJ
1,2	4	1,50	6,00	50	1,17	7N2201201MJ	7N2201201RJ
1,2	4	1,80	8,00	50	1,15	7N2201211MJ	7N2201211RJ
1,2	4	1,80	10,00	50	1,15	7N2201221MJ	7N2201221RJ
1,2	4	1,80	12,00	50	1,13	7N2201231MJ	7N2201231RJ
1,2	6	1,80	3,00	50	1,15	7N0201202MJ	7N0201202RJ
1,2	6	1,80	6,00	60	1,15	7N1201202MJ	7N1201202RJ
1,4	4	2,10	6,00	50	1,37	7N2201401MJ	7N2201401RJ
1,4	4	2,10	8,00	50	1,35	7N2201411MJ	7N2201411RJ
1,4	4	2,10	10,00	50	1,35	7N2201421MJ	7N2201421RJ
1,4	4	2,10	12,00	50	1,33	7N2201431MJ	7N2201431RJ
1,4	4	2,10	16,00	50	1,31	7N2201441MJ	7N2201441RJ
1,4	6	2,10	3,50	50	1,35	7N0201402MJ	7N0201402RJ
1,4	6	2,10	7,00	60	1,35	7N1201402MJ	7N1201402RJ
1,5	4	2,30	5,70	50	1,44	–	7N2201561RJ
1,5	4	2,30	6,00	50	1,47	7N2201501MJ	7N2201501RJ
1,5	4	2,30	10,00	50	1,45	7N2201511MJ	7N2201511RJ
1,5	4	2,30	12,00	50	1,43	7N2201521MJ	7N2201521RJ
1,5	4	2,30	16,00	50	1,41	7N2201531MJ	7N2201531RJ
1,5	4	2,30	18,00	63	1,41	7N2201541MJ	7N2201541RJ
1,5	4	2,30	20,00	63	1,39	7N2201551MJ	7N2201551RJ
1,5	6	2,30	3,80	50	1,45	7N0201502MJ	7N0201502RJ
1,5	6	2,30	7,50	60	1,45	7N1201502MJ	7N1201502RJ
1,6	4	2,80	11,70	50	1,44	–	7N2201571RJ
1,6	4	2,40	6,00	50	1,57	7N2201601MJ	7N2201601RJ
1,6	4	2,40	10,00	50	1,55	7N2201611MJ	7N2201611RJ
1,6	4	2,40	12,00	50	1,53	7N2201621MJ	7N2201621RJ
1,6	4	2,40	16,00	50	1,51	7N2201631MJ	7N2201631RJ
1,6	4	2,40	20,00	63	1,49	7N2201641MJ	7N2201641RJ
1,6	6	2,40	4,00	50	1,55	7N0201602MJ	7N0201602RJ
1,6	6	2,40	8,00	60	1,55	7N1201602MJ	7N1201602RJ
1,7	4	2,60	6,00	50	1,67	7N2201701MJ	7N2201701RJ
1,7	4	2,60	10,00	50	1,65	7N2201711MJ	7N2201711RJ
1,7	4	2,60	12,00	50	1,63	7N2201721MJ	7N2201721RJ

(continued)

(continued)



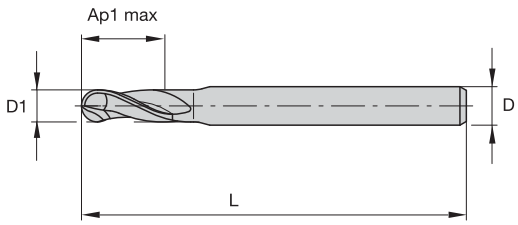
	P				K		H		
	2	3	4	5	1	2	1	2	3
AlTiN	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A63.

D1	D	length of cut Ap1 max	L3	length L	D3	AlTiN - MJ	TiAlN - RJ
1,7	4	2,60	16,00	50	1,61	7N2201731MJ	7N2201731RJ
1,7	4	2,60	20,00	63	1,59	7N2201741MJ	7N2201741RJ
1,8	4	2,70	6,00	50	1,77	7N2201801MJ	7N2201801RJ
1,8	4	2,70	10,00	50	1,75	7N2201811MJ	7N2201811RJ
1,8	4	2,70	12,00	50	1,73	7N2201821MJ	7N2201821RJ
1,8	4	2,70	16,00	50	1,71	7N2201831MJ	7N2201831RJ
1,8	4	2,70	20,00	63	1,69	7N2201841MJ	7N2201841RJ
1,8	6	2,70	4,50	50	1,75	7N0201802MJ	7N0201802RJ
1,8	6	2,70	9,00	60	1,75	7N1201802MJ	7N1201802RJ
1,9	4	2,80	6,00	50	1,87	7N2201901MJ	7N2201901RJ
1,9	4	2,80	10,00	50	1,85	7N2201911MJ	7N2201911RJ
1,9	4	2,80	12,00	50	1,81	–	7N2201921RJ
1,9	4	2,80	12,00	50	1,83	7N2201921MJ	–
1,9	4	2,80	16,00	50	1,81	7N2201931MJ	7N2201931RJ
1,9	4	2,80	20,00	63	1,79	7N2201941MJ	7N2201941RJ
2,0	4	3,00	6,00	50	1,97	7N2202001MJ	7N2202001RJ
2,0	4	3,00	10,00	50	1,95	7N2202011MJ	7N2202011RJ
2,0	4	3,00	16,00	50	1,91	7N2202021MJ	7N2202021RJ
2,0	4	3,00	20,00	63	1,89	7N2202031MJ	7N2202031RJ
2,0	4	3,00	20,00	75	1,89	7N2202041MJ	7N2202041RJ
2,0	6	3,00	5,00	50	1,95	7N0202002MJ	7N0202002RJ
2,0	6	3,00	10,00	60	1,95	7N1202002MJ	7N1202002RJ
2,1	4	3,50	5,00	50	1,94	–	7N2202051RJ
2,1	4	3,50	9,00	50	1,94	–	7N2202061RJ
2,1	4	3,50	11,00	50	1,94	–	7N2202071RJ
2,1	4	3,50	22,00	63	1,94	–	7N2202091RJ
2,5	4	3,70	8,00	50	2,40	7N2202501MJ	7N2202501RJ
2,5	4	3,70	10,00	50	2,40	7N2202511MJ	7N2202511RJ
2,5	4	3,70	16,00	63	2,40	7N2202521MJ	7N2202521RJ
2,5	4	3,70	20,00	63	2,40	7N2202531MJ	7N2202531RJ
2,5	4	3,70	30,00	80	2,40	7N2202541MJ	7N2202541RJ
2,5	6	3,70	3,70	50	2,40	7N0202502MJ	7N0202502RJ
2,5	6	3,70	12,50	60	2,40	7N1202502MJ	7N1202502RJ
3,0	6	4,50	8,00	50	2,85	7N2203002MJ	7N2203002RJ
3,0	6	4,50	10,00	50	2,85	7N2203012MJ	7N2203012RJ
3,0	6	4,50	16,00	63	2,85	7N2203022MJ	7N2203022RJ
3,0	6	4,50	20,00	63	2,85	7N2203032MJ	7N2203032RJ
3,0	6	4,50	20,00	80	2,85	7N2203042MJ	7N2203042RJ
3,1	6	5,00	7,50	50	2,94	–	7N2203052RJ
3,1	6	5,00	20,50	76	2,94	–	7N2203062RJ

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance h8 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,014	≤ 3	0 / 0,006
> 3 to 6	0 / 0,018	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,022	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,027	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,033	> 18 to 30	0 / 0,013

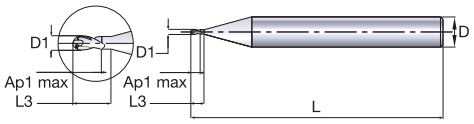
	P		H			
	3	4	1	2	3	4
AlTiN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A64.

D1	D	length of cut Ap1 max	length L	K10UF-DCHP AlTiN - MT
0,5	3	1,50	38	423034-000005
0,6	3	1,60	38	423034-000006
0,8	3	1,80	38	423034-000008
1,0	3	2,00	38	423034-000010
1,2	3	2,20	38	423034-000012
1,5	3	2,50	38	423034-000015
2,0	3	3,00	38	423034-000020
2,5	3	4,00	38	423034-000025
3,0	3	5,00	38	423034-000030

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

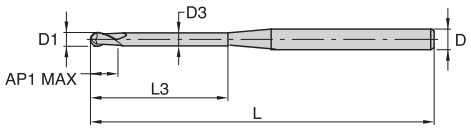
	P		H			
	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A65.

D1	D	length of cut Ap1 max	L3	length L	TiAlN - MJ
0,3	6	0,30	—	50	**7N0100302MJ**
0,4	6	0,40	—	50	**7N0100402MJ**
0,5	6	0,50	1,50	50	**7N0100502MJ**
0,6	6	0,60	1,80	50	**7N0100602MJ**
0,8	6	0,80	2,40	50	**7N0100802MJ**
1,0	6	2,50	2,50	50	**7N0101002MJ**
1,2	6	1,20	3,00	50	**7N0101202MJ**
1,4	6	1,40	3,50	50	**7N0101402MJ**
1,5	6	1,50	3,80	50	**7N0101502MJ**
1,6	6	1,60	4,00	50	**7N0101602MJ**
1,8	6	1,80	4,50	50	**7N0101802MJ**
2,0	6	2,00	5,00	50	**7N0102002MJ**
2,5	6	2,50	5,00	50	**7N0102502MJ**
3,0	6	3,00	6,00	50	**7N0103002MJ**
4,0	6	4,00	6,00	50	**7N0104002MJ**
6,0	6	6,00	9,00	50	**7N0106002MJ**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

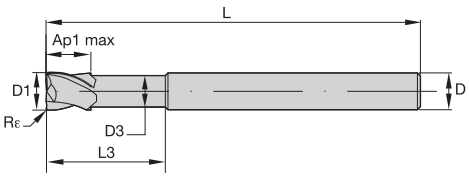
	P		H			
	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A66.

D1	D	length of cut Ap1 max	L3	length L	D3	TiAlN - RT
0,5	4	1,00	5,00	63	0,44	**7N2100501RT**
0,6	4	1,00	6,00	63	0,54	**7N2100601RT**
0,8	4	1,30	8,00	63	0,74	**7N2100801RT**
1,0	4	1,50	10,00	63	0,94	**7N2101001RT**
1,2	4	1,90	12,00	63	1,14	**7N2101201RT**
1,5	4	2,40	16,00	63	1,44	**7N2101501RT**
2,0	4	3,20	20,00	63	1,94	**7N2102001RT**
2,5	4	3,80	25,00	63	2,44	**7N2102501RT**
3,0	4	4,50	30,00	63	2,90	**7N2103001RT**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

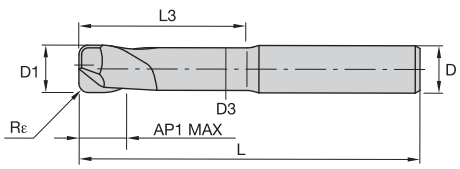
	P		H			
	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A67.

		length of cut		length			
D1	D	Ap1 max	L3	L	Rε	D3	TiAlN - RT
3,0	6	3,00	9,00	75	0,30	2,80	**75N203022RT**
3,0	6	3,00	9,00	75	0,50	2,80	**75N203042RT**
3,0	6	3,00	9,00	75	1,00	2,80	**75N203062RT**
4,0	6	4,00	12,00	75	0,30	3,70	**75N204022RT**
4,0	6	4,00	12,00	75	0,50	3,70	**75N204042RT**
4,0	6	4,00	12,00	75	1,00	3,70	**75N204062RT**
5,0	6	5,00	15,00	75	0,30	4,60	**75N205022RT**
5,0	6	5,00	15,00	75	1,00	4,60	**75N205042RT**
6,0	6	6,00	18,00	75	0,30	5,50	**75N206032RT**
6,0	6	6,00	18,00	75	0,50	5,50	**75N206042RT**
6,0	6	6,00	18,00	75	0,75	5,50	**75N206052RT**
6,0	6	6,00	18,00	75	1,00	5,50	**75N206062RT**
6,0	6	6,00	18,00	75	1,50	5,50	**75N206072RT**
8,0	8	8,00	24,00	100	0,50	7,40	**75N208023RT**
8,0	8	8,00	24,00	100	1,00	7,40	**75N208043RT**
8,0	8	8,00	24,00	100	1,50	7,40	**75N208063RT**
10,0	10	10,00	30,00	100	0,50	9,20	**75N210024RT**
10,0	10	10,00	30,00	100	0,75	9,20	**75N210034RT**
10,0	10	10,00	30,00	100	1,00	9,20	**75N210044RT**
10,0	10	10,00	30,00	100	2,00	9,20	**75N210064RT**
12,0	12	12,00	36,00	125	0,50	11,00	**75N212025RT**
12,0	12	12,00	36,00	125	0,75	11,00	**75N212035RT**
12,0	12	12,00	36,00	125	1,00	11,00	**75N212045RT**
12,0	12	12,00	36,00	125	1,50	11,00	**75N212055RT**
12,0	12	12,00	36,00	125	2,00	11,00	**75N212065RT**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



larger than 4mm

End Mill Tolerances

D1	Tolerance h8 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,014	≤ 3	0 / 0,006
> 3 to 6	0 / 0,018	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,022	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,027	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,033	> 18 to 30	0 / 0,013

NEW!

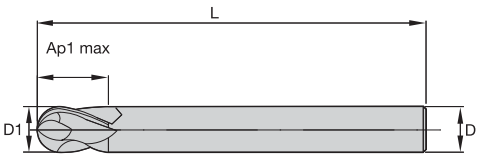
	P		H			
	3	4	1	2	3	4
AlTiN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A67.

D1	D	length of cut Ap1 max	L3	length L	Rε	D3	K10UF-DCHP AlTiN - MT
2,0	6	2,00	17,50	70	0,30	1,90	422875-002003
2,0	6	2,00	17,50	70	0,50	1,90	422875-002005
3,0	6	3,00	18,50	70	0,50	2,90	422875-003005
3,0	6	3,00	18,50	70	1,00	2,90	422875-003010
4,0	6	4,00	19,50	80	0,50	3,80	422875-004005
4,0	6	4,00	19,50	80	1,00	3,80	422875-004010
5,0	6	5,00	42,00	80	0,50	4,80	422875-005005
5,0	6	5,00	42,00	80	1,00	4,80	422875-005010
6,0	6	6,00	42,00	80	0,50	5,80	422875-006005
6,0	6	6,00	42,00	80	1,00	5,80	422875-006010
6,0	6	6,00	42,00	80	1,50	5,80	422875-006015
8,0	8	8,00	51,00	90	0,50	7,80	422875-008005
8,0	8	8,00	51,00	90	1,00	7,80	422875-008010
8,0	8	8,00	51,00	90	1,50	7,80	422875-008015
8,0	8	8,00	51,00	90	2,00	7,80	422875-008020
10,0	10	10,00	57,00	100	0,50	9,70	422875-010005
10,0	10	10,00	57,00	100	1,00	9,70	422875-010010
10,0	10	10,00	57,00	100	1,50	9,70	422875-010015
10,0	10	10,00	57,00	100	2,00	9,70	422875-010020
10,0	10	10,00	57,00	100	3,00	9,70	422875-010030
12,0	12	12,00	62,00	110	0,50	11,70	422875-012005
12,0	12	12,00	62,00	110	1,00	11,70	422875-012010
12,0	12	12,00	62,00	110	3,00	11,70	422875-012030
12,0	12	12,00	62,00	110	4,00	11,70	422875-012040

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

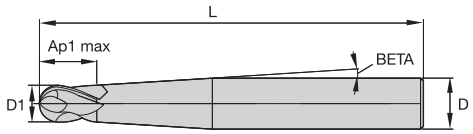
	P		H			
	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A68.

D1	D	length of cut Ap1 max	length L	TiAlN - RT
1,0	3	3,00	38	**715101000RT**
2,0	3	3,00	38	**715102000RT**
2,5	3	3,00	38	**715102500RT**
3,0	3	3,00	38	**715103000RT**
4,0	4	4,00	50	**715104001RT**
5,0	5	5,00	50	**715105001RT**
6,0	6	6,00	50	**715106002RT**
8,0	8	8,00	63	**715108003RT**
10,0	10	10,00	76	**715110004RT**
12,0	12	12,00	76	**715112005RT**
16,0	16	16,00	89	**715116006RT**
20,0	20	20,00	104	**715120007RT**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

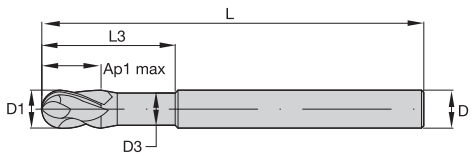
D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P		H			
	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

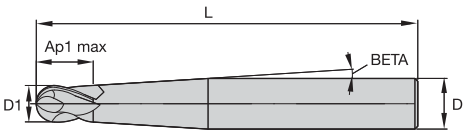
For material descriptions, see Inside Back Cover.
For application data, see page A69.

D1	D	length of cut Ap1 max	length L	BETA	TiAlN - RT
1,0	4	1,00	63	3.5	706101001RT
2,0	4	2,00	63	3.5	706102001RT
2,5	4	2,50	63	3.0	706102501RT
3,0	6	3,00	75	1.5	706103002RT
4,0	6	4,00	75	1.5	706104002RT
5,0	6	5,00	75	1.5	706105002RT
6,0	10	6,00	100	1.5	706106004RT
8,0	10	8,00	100	1.5	706108004RT
10,0	12	10,00	125	1.5	706110005RT
12,0	16	12,00	125	1.5	706112006RT



D1	D	length of cut Ap1 max	L3	L	D3	TiAlN - RT
1,0	4	1,00	3,00	63	0,80	70N101001RT
1,5	4	1,50	4,50	63	1,30	70N101501RT
2,0	6	2,00	6,00	76	1,80	70N102002RT
3,0	6	3,00	9,00	76	2,80	70N103002RT
4,0	6	4,00	12,00	76	3,70	70N104002RT
5,0	6	5,00	15,00	76	4,60	70N105002RT
6,0	6	6,00	18,00	76	5,50	70N106002RT
8,0	8	8,00	24,00	100	7,50	70N108003RT
10,0	10	10,00	30,00	100	9,50	70N110004RT
12,0	12	12,00	36,00	125	11,50	70N112005RT

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance h8 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,014	≤ 3	0 / 0,006
> 3 to 6	0 / 0,018	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,022	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,027	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,033	> 18 to 30	0 / 0,013

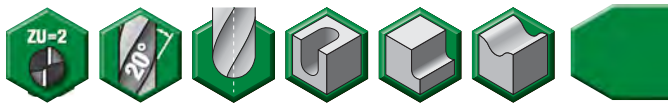
	P		H			
	3	4	1	2	3	4
AlTiN	●	●	●	●	●	●

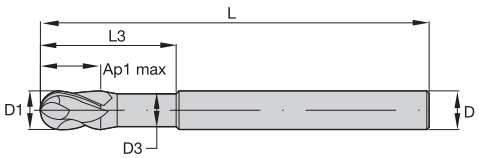
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A71.

D1	D	length of cut Ap1 max	length L	BETA	K10UF-DCHP AlTiN-MT
1,0	4	1,00	40	7.5	422869-000010
1,5	4	1,50	40	7.5	422869-000015
2,0	6	2,00	45	7.5	422869-000020
3,0	6	3,00	45	7.5	422869-000030
4,0	6	4,00	45	7.5	422869-000040
5,0	6	5,00	50	7.5	422869-000050
6,0	6	6,00	50	–	422869-000060
6,0	6	6,00	80	–	422868-000060
8,0	8	8,00	60	–	422869-000080
8,0	8	8,00	90	–	422868-000080
10,0	10	10,00	70	–	422869-000100
10,0	10	10,00	100	–	422868-000100
12,0	12	12,00	75	–	422869-000120
12,0	12	12,00	110	–	422868-000120
16,0	16	16,00	80	–	422869-000160
16,0	16	16,00	140	–	422868-000160

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





NEW!

End Mill Tolerances

D1	Tolerance h8 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,014	≤ 3	0 / 0,006
> 3 to 6	0 / 0,018	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,022	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,027	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,033	> 18 to 30	0 / 0,013

	P		H			
	3	4	1	2	3	4
AlTiN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

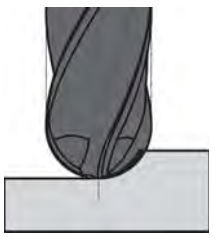
For material descriptions, see Inside Back Cover.
For application data, see page A72.

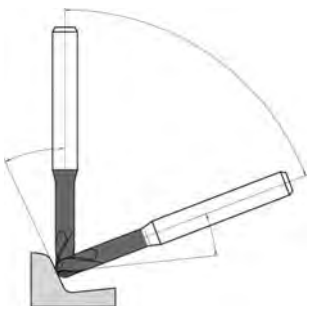
						K10UF-DCHP
		length of cut		length		
D1	D	Ap1 max	L3	L	D3	AlTiN - MT
2,0	6	2,00	17,50	70	1,90	422870-000020
3,0	6	3,00	18,50	70	2,90	422870-000030
4,0	6	4,00	19,50	80	3,80	422870-000040
5,0	6	5,00	39,00	80	4,80	422870-000050
6,0	6	6,00	42,00	80	5,80	422870-000060
8,0	8	8,00	52,00	90	7,80	422870-000080
10,0	10	10,00	58,00	100	9,70	422870-000100
12,0	12	12,00	63,00	110	11,70	422870-000120

Tech Tip

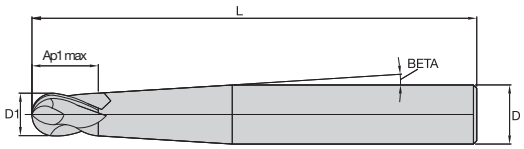
Approach Angles for High-Speed Cutting

Preferred working area, avoid machining where cutting speed = 0





- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

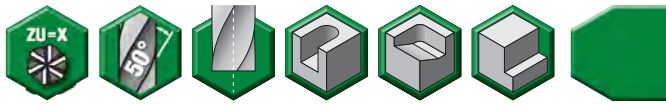
	P		H			
	3	4	1	2	3	4
AlTiN	●	●	●	●	●	●

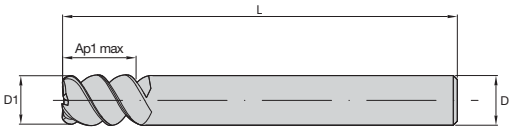
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A73.

D1	D	length of cut Ap1 max	length L	BETA	K10UF-DCHP AlTiN - MT
3,0	6	4,00	75	2.9	**422873-030075**
3,0	6	4,00	100	1.7	**422873-030100**
4,0	6	5,00	75	2.7	**422873-040075**
4,0	6	5,00	100	1.2	**422873-040100**
5,0	6	6,00	75	1.3	**422873-050075**
5,0	8	6,00	100	1.8	**422873-050100**
6,0	8	8,00	75	2.4	**422873-060075**
6,0	10	8,00	100	2.5	**422873-060100**
8,0	10	12,00	100	1.5	**422873-080100**
8,0	12	12,00	150	1.4	**422873-080150**
10,0	12	15,00	100	1.8	**422873-100100**
10,0	12	15,00	150	.8	**422873-100150**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

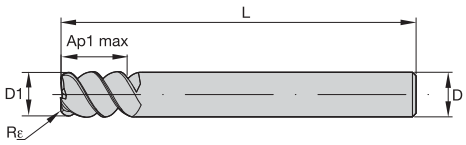
	P		H			
	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A74.

D1	D	length of cut Ap1 max	length L	Z U	TiAlN-LT
3,0	6	4,50	50	4	**754503002LT**
3,0	6	4,50	57	4	**750503002LT**
4,0	6	6,00	50	4	**754504002LT**
4,0	6	6,00	57	4	**750504002LT**
5,0	6	7,50	50	4	**754505002LT**
5,0	6	7,50	76	4	**750505002LT**
6,0	6	9,00	50	4	**754506002LT**
6,0	6	9,00	76	4	**750506002LT**
6,0	6	15,00	76	4	**751506002LT**
6,0	6	21,00	76	4	**752506002LT**
8,0	8	12,00	63	4	**754508003LT**
8,0	8	12,00	100	4	**750508003LT**
8,0	8	20,00	100	4	**751508003LT**
8,0	8	28,00	100	4	**752508003LT**
10,0	10	15,00	76	4	**754510004LT**
10,0	10	15,00	100	4	**750510004LT**
10,0	10	25,00	100	5	**751510004LT**
10,0	10	35,00	100	5	**752510004LT**
12,0	12	18,00	76	4	**754512005LT**
12,0	12	18,00	125	4	**750512005LT**
12,0	12	30,00	125	6	**751512005LT**
12,0	12	42,00	125	6	**752512005LT**
16,0	16	24,00	89	4	**754516006LT**
16,0	16	24,00	125	4	**750516006LT**
16,0	16	40,00	125	6	**751516006LT**
16,0	16	56,00	125	6	**752516006LT**
20,0	20	30,00	104	4	**754520007LT**
20,0	20	30,00	150	4	**750520007LT**
20,0	20	50,00	150	6	**751520007LT**
20,0	20	70,00	150	6	**752520007LT**
25,0	25	38,00	121	5	**754525008LT**
25,0	25	38,00	150	5	**750525008LT**
25,0	25	63,00	150	6	**751525008LT**
25,0	25	88,00	150	6	**752525008LT**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P		H			
	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A75.

D1	D	length of cut Ap1 max	length L	Rε	Z U	TiAlN-LT
3,0	6	4,50	50	0,25	4	**759503002LT**
3,0	6	4,50	50	0,50	4	**759503012LT**
4,0	6	6,00	50	0,25	4	**759504002LT**
4,0	6	6,00	50	0,50	4	**759504012LT**
5,0	6	7,50	50	0,25	4	**759505002LT**
5,0	6	7,50	50	0,50	4	**759505012LT**
6,0	6	9,00	50	0,25	4	**759506002LT**
6,0	6	9,00	50	0,50	4	**759506012LT**
6,0	6	9,00	50	0,75	4	**759506022LT**
6,0	6	9,00	50	1,00	4	**759506032LT**
6,0	6	9,00	76	0,25	4	**758506002LT**
6,0	6	9,00	76	0,50	4	**758506012LT**
8,0	8	12,00	63	0,50	4	**759508003LT**
8,0	8	12,00	63	0,75	4	**759508023LT**
8,0	8	12,00	63	1,00	4	**759508013LT**
8,0	8	12,00	63	1,50	4	**759508033LT**
8,0	8	12,00	100	0,50	4	**758508003LT**
8,0	8	12,00	100	1,00	4	**758508013LT**
10,0	10	15,00	76	0,50	4	**759510004LT**
10,0	10	15,00	76	1,00	4	**759510014LT**
10,0	10	15,00	76	1,50	4	**759510024LT**

(continued)

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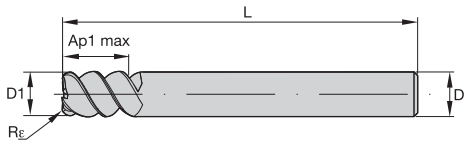


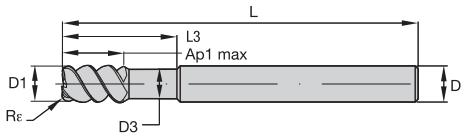
	P		H			
	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A75.

D1	D	length of cut Ap1 max	length L	Rε	Z U	TiAlN-LT
10,0	10	15,00	76	2,00	4	**759510034LT**
10,0	10	15,00	100	0,50	4	**758510004LT**
10,0	10	15,00	100	1,00	4	**758510014LT**
12,0	12	18,00	76	0,50	4	**759512005LT**
12,0	12	18,00	76	1,00	4	**759512025LT**
12,0	12	18,00	76	1,50	4	**759512015LT**
12,0	12	18,00	76	2,00	4	**759512035LT**
12,0	12	18,00	125	0,50	4	**758512005LT**
12,0	12	18,00	125	1,50	4	**758512015LT**
16,0	16	24,00	89	0,50	4	**759516006LT**
16,0	16	24,00	89	1,50	4	**759516016LT**
16,0	16	24,00	89	2,00	4	**759516036LT**
16,0	16	24,00	125	0,50	4	**758516006LT**
16,0	16	24,00	125	1,50	4	**758516016LT**
20,0	20	30,00	104	0,50	4	**759520007LT**
20,0	20	30,00	104	1,00	4	**759520027LT**
20,0	20	30,00	104	2,00	4	**759520017LT**
20,0	20	30,00	150	0,50	4	**758520007LT**
20,0	20	30,00	150	2,00	4	**758520017LT**
25,0	25	38,00	121	0,50	5	**759525008LT**
25,0	25	38,00	121	3,00	5	**759525018LT**
25,0	25	38,00	150	0,50	5	**758525008LT**
25,0	25	38,00	150	3,00	5	**758525018LT**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P		H			
	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A75.

D1	D	length of cut Ap1 max	L3	length L	Rε	D3	Z U	TiAlN - LT
3,0	6	4,50	9,00	57	0,25	2,70	4	**75N503022LT**
3,0	6	4,50	9,00	57	0,50	2,70	4	**75N503042LT**
4,0	6	6,00	12,00	57	0,25	3,70	4	**75N504022LT**
4,0	6	6,00	12,00	57	0,50	3,70	4	**75N504042LT**
5,0	6	7,50	15,00	76	0,25	4,60	4	**75N505022LT**
5,0	6	7,50	15,00	76	0,50	4,60	4	**75N505042LT**
6,0	6	9,00	18,00	76	0,25	5,40	4	**75N506022LT**
6,0	6	9,00	18,00	76	0,50	5,40	4	**75N506042LT**
6,0	6	9,00	18,00	76	0,75	5,40	4	**75N506062LT**
6,0	6	9,00	18,00	76	1,00	5,40	4	**75N506082LT**
6,0	6	9,00	18,00	76	—	5,40	4	**75N506002LT**
8,0	8	12,00	24,00	100	0,50	7,40	4	**75N508023LT**
8,0	8	12,00	24,00	100	1,00	7,40	4	**75N508033LT**
8,0	8	12,00	24,00	100	1,50	7,40	4	**75N508043LT**
8,0	8	12,00	24,00	100	2,00	7,40	4	**75N508053LT**
8,0	8	12,00	24,00	100	—	7,40	4	**75N508003LT**
10,0	10	15,00	30,00	100	0,50	9,20	4	**75N510024LT**

(continued)

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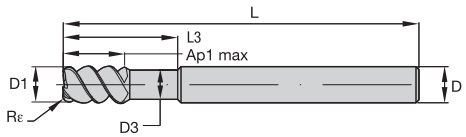


	P		H			
	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A75.

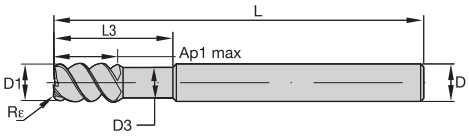
D1	D	length of cut Ap1 max	L3	length L	Rε	D3	Z U	TiAlN - LT
10,0	10	15,00	30,00	100	1,00	9,20	4	**75N510034LT**
10,0	10	15,00	30,00	100	1,50	9,20	4	**75N510044LT**
10,0	10	15,00	30,00	100	2,00	9,20	4	**75N510054LT**
10,0	10	15,00	30,00	100	–	9,40	4	**75N510004LT**
12,0	12	18,00	36,00	125	0,50	11,00	4	**75N512025LT**
12,0	12	18,00	36,00	125	1,00	11,00	4	**75N512035LT**
12,0	12	18,00	36,00	125	1,50	11,00	4	**75N512045LT**
12,0	12	18,00	36,00	125	2,00	11,00	4	**75N512055LT**
12,0	12	18,00	36,00	125	–	11,40	4	**75N512005LT**
16,0	16	24,00	48,00	125	0,50	15,00	4	**75N516026LT**
16,0	16	24,00	48,00	125	1,50	15,00	4	**75N516046LT**
16,0	16	24,00	48,00	125	–	15,40	4	**75N516006LT**
20,0	20	30,00	60,00	150	0,50	19,00	4	**75N520027LT**
20,0	20	30,00	60,00	150	2,00	19,00	4	**75N520047LT**
20,0	20	30,00	60,00	150	–	19,40	4	**75N520007LT**
25,0	25	38,00	75,00	150	0,50	24,00	5	**75N525028LT**
25,0	25	38,00	75,00	150	3,00	24,00	5	**75N525048LT**
25,0	25	38,00	75,00	150	–	24,40	5	**75N525008LT**

Tech Tip

Wear Indicators for Milling Operations

Wear of clearance (flank) and cratering.
The normal criteria for tool life is clearance or flank wear. Flank and crater wear are both caused by abrasion. Excessive flank wear causes poor surface finish and raises cutting forces, ultimately leading to tool failure. The rate of wear depends on the carbide grade, cutting parameters, feed rate per tooth, and the total machining contact time of the tool.

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P		H			
	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A76.

D1	D	length of cut Ap1 max	L3	length L	Rε	D3	TiAlN - RT
6,0	6	6,00	18,00	76	0,50	5,50	**75N806002RT**
8,0	8	8,00	24,00	100	0,50	7,40	**75N808003RT**
10,0	10	10,00	30,00	100	1,00	9,20	**75N810004RT**
12,0	12	12,00	36,00	125	1,00	11,00	**75N812005RT**

Best-in-Class Performance in Machining Hard Materials

Using WIDIA-Hanita Solid End Mills will:

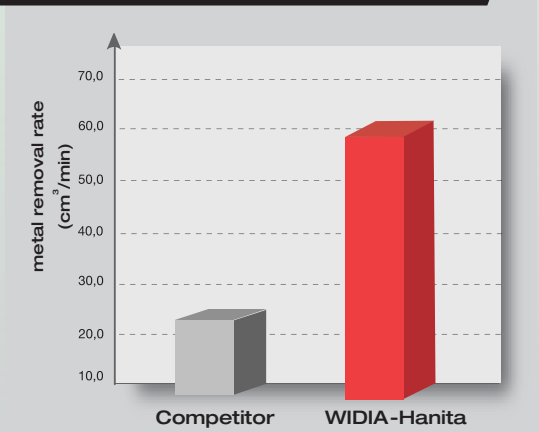
- Reduce the number of tools needed.
- Offer excellent chip evacuation.
- Promote maximum productivity.
- Increase removal rates.
- Enable higher speeds.
- Ensure accuracy.
- Reduce manufacturing costs.
- Provide long tool life.

Featured Application: Milling a Mold

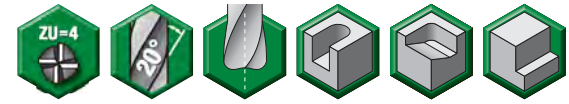
Operation:	Pocket Milling
Customer:	Die and Mold Manufacturer
Material:	AISI 4340 hardened steel (52 HRC)
Workpiece:	Mold
Results:	• 3x better metal removal rate than competitive tool! • Machined at more than 3x faster feed!

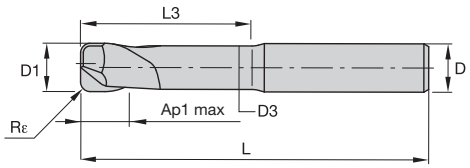
	COMPETITOR	WIDIA-Hanita
tool:	4-flute H/P for die and mold	70N612005MT
material:	medium-hardened steel	medium-hardened steel
surface speed:	120m/min	160m/min
feed per tooth:	0,34mm	0,6mm
depth of cut:	0,8mm	0,6mm
table feed:	4,331mm/min	15,287mm/min
metal removal rate:	22,8 cm^3	60,5 cm^3

Increased Metal Removal Rate by 191%



- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





NEW!

End Mill Tolerances

D1	Tolerance h8 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,014	≤ 3	0 / 0,006
> 3 to 6	0 / 0,018	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,022	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,027	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,033	> 18 to 30	0 / 0,013

	P		H			
	3	4	1	2	3	4
AlTiN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A76.

		length of cut		length			K10UF-DCHP
D1	D	Ap1 max	L3	L	Rε	D3	AlTiN - MT
4,0	6	4,00	10,00	45	0,50	3,80	422876-004005
4,0	6	4,00	10,00	45	1,00	3,80	422876-004010
5,0	6	5,00	12,00	50	0,50	4,80	422876-005005
5,0	6	5,00	12,00	50	1,00	4,80	422876-005010
6,0	6	6,00	12,00	50	0,50	5,80	422876-006005
6,0	6	6,00	12,00	50	1,00	5,80	422876-006010
6,0	6	6,00	42,00	80	0,30	5,80	422878-006003
6,0	6	6,00	42,00	80	0,50	5,80	422878-006005
6,0	6	6,00	42,00	80	1,00	5,80	422878-006010
8,0	8	8,00	20,00	60	0,50	7,80	422876-008005

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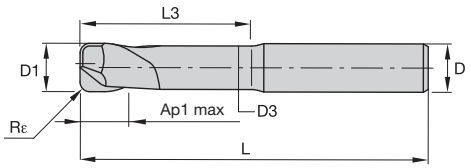


	P		H			
	3	4	1	2	3	4
AlTiN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A76.

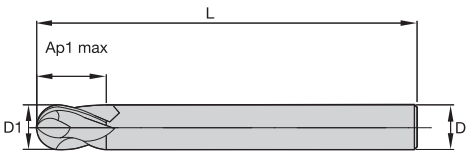
		length of cut		length			K10UF-DCHP
D1	D	Ap1 max	L3	L	Rε	D3	AlTiN - MT
8,0	8	8,00	20,00	60	1,00	7,80	**422876-008010**
8,0	8	8,00	20,00	60	2,00	7,80	**422876-008020**
8,0	8	8,00	51,00	90	0,50	7,80	**422878-008005**
8,0	8	8,00	51,00	90	1,00	7,80	**422878-008010**
8,0	8	8,00	51,00	90	1,50	7,80	**422878-008015**
8,0	8	8,00	51,00	90	2,00	7,80	**422878-008020**
10,0	10	10,00	26,00	70	0,50	9,80	**422876-010005**
10,0	10	10,00	26,00	70	1,00	9,80	**422876-010010**
10,0	10	10,00	26,00	70	2,00	9,80	**422876-010020**
10,0	10	10,00	57,00	100	0,50	9,70	**422878-010005**
10,0	10	10,00	57,00	100	1,00	9,70	**422878-010010**
10,0	10	10,00	57,00	100	1,50	9,70	**422878-010015**
10,0	10	10,00	57,00	100	2,00	9,70	**422878-010020**
12,0	12	12,00	26,00	75	0,50	11,80	**422876-012005**
12,0	12	12,00	26,00	75	1,00	11,80	**422876-012010**
12,0	12	12,00	26,00	75	2,00	11,80	**422876-012020**
12,0	12	12,00	26,00	75	3,00	11,80	**422876-012030**
12,0	12	12,00	62,00	110	1,00	11,70	**422878-012010**
12,0	12	12,00	62,00	110	1,50	11,70	**422878-012015**
12,0	12	12,00	62,00	110	2,00	11,70	**422878-012020**
12,0	12	12,00	62,00	110	3,00	11,70	**422878-012030**

Tech Tip

Wear Indicators for Milling Operations

Formation of hairline cracks and splintering of the cutting edge.
Hairline cracks result from the thermal stress variation of the cutting edges during the milling operation. Excessive contact time can lead to hairline cracks and splintering of the cutting edges. The formation of hairline cracks depends on the cutting speed, the carbide grade, the cutting geometry, and the feed rate per tooth.

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

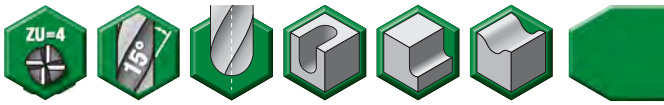
D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P		H			
	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●

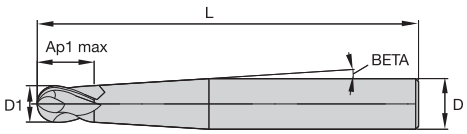
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

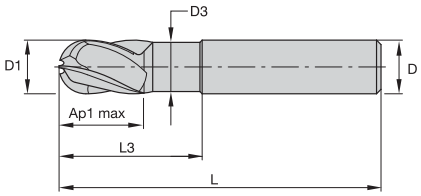
For material descriptions, see Inside Back Cover.
For application data, see page A77.

D1	D	length of cut Ap1 max	length L	TiAlN - RT
2,0	3	2,00	38	**715002000RT**
2,5	3	3,00	38	**715002500RT**
3,0	3	3,00	38	**715003000RT**
4,0	4	4,00	50	**715004001RT**
5,0	5	5,00	50	**715005001RT**
6,0	6	6,00	50	**715006002RT**
8,0	8	8,00	63	**715008003RT**
10,0	10	10,00	76	**715010004RT**
12,0	12	12,00	76	**715012005RT**
16,0	16	16,00	89	**715016006RT**
20,0	20	20,00	104	**715020007RT**



- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

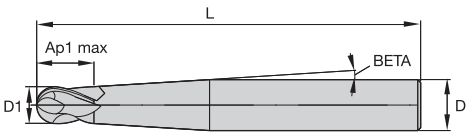
	P		H			
	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A78.

D1	D	length of cut Ap1 max	L3	length L	BETA	D3	TiAlN - RT
2,0	4	2,00	–	63	2.5	–	**705002001RT**
2,0	4	2,00	–	63	3.5	–	**706002001RT**
2,5	4	2,50	–	63	2.5	–	**705002501RT**
2,5	4	2,50	–	63	3.0	–	**706002501RT**
3,0	6	3,00	–	75	2.5	–	**705003002RT**
3,0	6	3,00	–	75	2.5	–	**706003002RT**
4,0	6	4,00	–	75	2.0	–	**706004002RT**
4,0	6	4,00	–	75	2.5	–	**705004002RT**
5,0	6	5,00	–	75	1.5	–	**706005002RT**
5,0	6	5,00	–	75	2.5	–	**705005002RT**
6,0	10	6,00	–	100	1.5	–	**706006004RT**
6,0	10	6,00	–	100	2.5	–	**705006004RT**
8,0	10	8,00	–	100	1.5	–	**706008004RT**
8,0	10	8,00	–	100	2.5	–	**705008004RT**
10,0	12	10,00	–	125	1.5	–	**706010005RT**
10,0	12	10,00	–	125	2.5	–	**705010005RT**
12,0	16	12,00	–	125	1.5	–	**706012006RT**
12,0	16	12,00	–	125	2.5	–	**705012006RT**
16,0	16	16,00	48,00	125	–	15,00	**705016006RT**
20,0	20	20,00	60,00	150	–	19,00	**705020007RT**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance h8 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,014	≤ 3	0 / 0,006
> 3 to 6	0 / 0,018	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,022	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,027	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,033	> 18 to 30	0 / 0,013

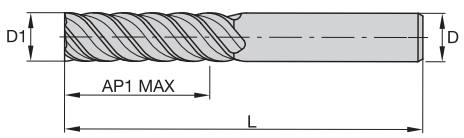
	P		H			
	3	4	1	2	3	4
AlTiN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A79.

D1	D	length of cut Ap1 max	length L	BETA	K10UF-DCHP AlTiN - MT
3,0	6	4,00	75	2.9	**422871-030075**
3,0	6	4,00	100	1.7	**422871-030100**
4,0	6	5,00	75	2.7	**422871-040075**
4,0	6	5,00	100	1.2	**422871-040100**
5,0	6	6,00	75	1.3	**422871-050075**
5,0	8	6,00	100	1.8	**422871-050100**
6,0	8	8,00	75	2.4	**422871-060075**
6,0	10	8,00	100	2.5	**422871-060100**
8,0	10	12,00	100	1.5	**422871-080100**
8,0	12	12,00	150	1.4	**422871-080150**
10,0	12	15,00	100	1.8	**422871-100100**
10,0	12	15,00	150	.8	**422871-100150**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P		H			
	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see pages A79–A80.

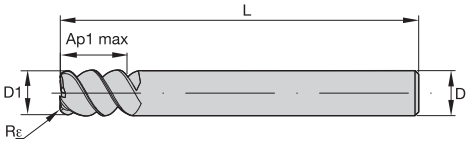
D1	D	length of cut Ap1 max	length L	Z U	TiAlN - RJ
3,0	4	8,00	50	4	**D61803002RJ**
4,0	6	12,00	57	4	**D61804002RJ**
5,0	6	13,00	57	4	**D61805002RJ**
6,0	6	15,00	60	6	**D61806002RJ**
7,0	8	20,00	75	6	**D61807003RJ**
8,0	8	20,00	75	6	**D61808003RJ**
10,0	10	25,00	80	6	**D61810004RJ**
12,0	12	30,00	100	6	**D61812005RJ**
16,0	16	40,00	110	6	**D61816006RJ**
20,0	20	45,00	120	6	**D61820007RJ**

Tech Tip

Wear Indicators for Milling Operations

Built-up edge.
Built-up edges are caused by the welding of the material being machined to the cutting material on the major cutting edge. Built-up edges reduce the surface quality of the part being machined. They are generally caused by low surface speeds on low- tensile materials. Other factors which may influence built-up edges are the carbide grade, coating, and geometry of the cutting edge.

- Non-center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

	P		H			
	3	4	1	2	3	4
AlTiN	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A80.

D1	D	length of cut Ap1 max	length L	Rε	Z U	K10UF-DHCP AlTiN - MT
6,0	6	13,00	57	0,50	6	422837-006005
6,0	6	18,00	62	0,50	6	422831-006005
8,0	8	19,00	63	0,50	6	422837-008005
8,0	8	24,00	68	0,50	6	422831-008005
10,0	10	22,00	72	0,50	6	422837-010005
10,0	10	30,00	80	0,50	6	422831-010005
12,0	12	26,00	83	1,00	6	422837-012010
12,0	12	26,00	83	0,50	6	422837-012005
12,0	12	36,00	93	0,50	6	422831-012005
12,0	12	36,00	93	1,00	6	422831-012010
16,0	16	32,00	92	0,50	6	422837-016005
16,0	16	32,00	92	1,00	6	422837-016010
16,0	16	48,00	108	1,00	6	422831-016010
16,0	16	48,00	108	0,50	6	422831-016005
20,0	20	38,00	104	1,00	8	422837-020010
20,0	20	38,00	104	0,50	8	422837-020005
20,0	20	60,00	126	0,50	8	422831-020005
20,0	20	60,00	126	1,00	8	422831-020010
25,0	25	45,00	121	0,50	8	422837-025005
25,0	25	45,00	121	1,50	8	422837-025015
25,0	25	75,00	150	0,50	8	422831-025005
25,0	25	75,00	150	1,50	8	422831-025015

X-Feed™ End Mills for High-Feed Milling

Specifically engineered to machine hardened steel up to 67 HRC at extreme speeds and feeds.

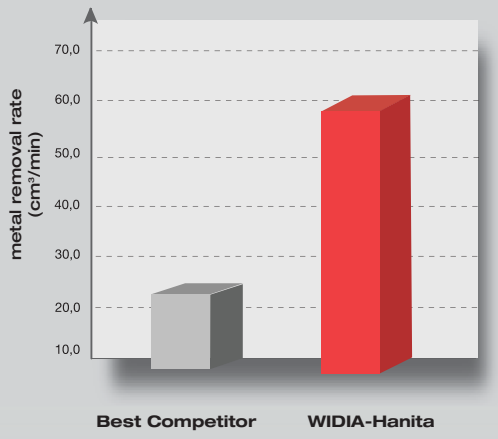
- Unique tool with new 4-flute style for high productivity.
- Necked shanks provide extended reach in deep cavities.
- High-feed rates, up to 0,6mm per tooth on a 20mm tool.
- Machine hardened materials at 2x to 3x the metal removal rate of competitive end mills.
- Wide range of cutting diameters: down to 6mm for small and medium pocket work.
- Innovative new geometry maximizes metal removal rates.
- High metal removal rates lower manufacturing costs.

Featured Application: Milling a Mold

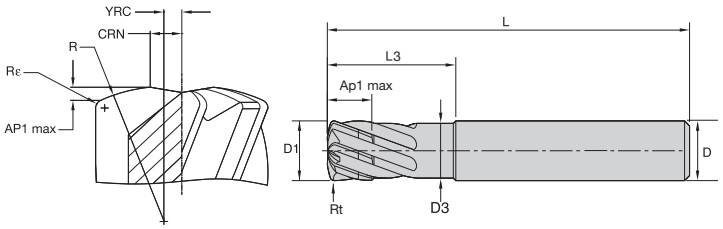
Operation:	Pocket Milling
Customer:	Die & Mold Manufacturer
Material:	AISI 4340 hardened steel (52 HRC)
Workpiece:	Mold
Results:	• 3x better metal removal rate than competitive tool! • Machined at more than 3x faster feed!

	COMPETITOR	WIDIA-Hanita
tool:	4-flute H/P for die & mold	70N612005MT
material:	medium-hardened steel	medium-hardened steel
surface speed:	120 m/min	160 m/min
feed per tooth:	0,34mm	0,34mm
depth of cut:	0,8mm	0,6mm
table feed:	4,331mm/min	15,287mm/min
metal removal rate:	22,8 cm^3	60,5 cm^3

Increased Metal Removal Rate by 191%



- Non-center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	H		
	2	3	4
AlTiN	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see pages A80–A81.

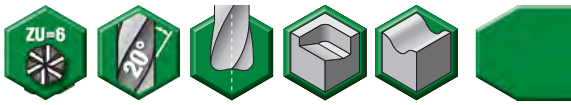
D1	D	length of cut Ap1 max	L3	length L	Rt	D3	AlTiN - MT
6,00	6	0,20	18,00	63	0,58	5,50	**70N706002MT**
8,00	8	0,27	24,00	76	0,77	7,50	**70N708003MT**
10,00	10	0,33	30,00	89	0,96	9,00	**70N710004MT**
12,00	12	0,40	36,00	100	1,15	11,00	**70N712005MT**
16,00	16	0,54	48,00	110	1,54	15,00	**70N716006MT**
20,00	20	0,67	60,00	125	1,92	19,00	**70N720007MT**

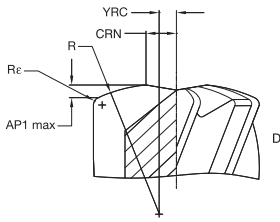
R = the head radius size.
YRC = distance from center line to the crown of the R radius.
RCN = distance from center line to the start of the cutting edge. This dimension can also help determine the minimum circle size when helical ramping.
Rε = the shoulder radius or radius at the corner of the cutter.

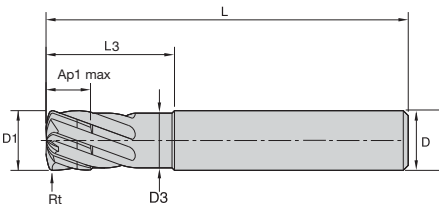
Programming Data

Geometrical Parameters						Ramping Guide for Circular and Linear Ramping						
						Circular Interpolation		Linear Ramping				
						Optimal Range of Circle Diameter for a Single Pass		Calculated Length per Ramp Angle				
D1	Ap1 max	R	Rε	YRC	CRN	Smallest	Largest	1°	2°	3°	4°	5°
6	0,20	9	0,375	0,75	1,26	8,52	12,00	11,51	5,75	3,83	2,87	2,30
8	0,27	12	0,500	1,00	1,68	11,36	16,00	15,34	7,67	5,11	3,83	3,06
10	0,33	15	0,625	1,25	2,10	14,20	20,00	19,18	9,58	6,39	4,79	3,83
12	0,40	18	0,750	1,50	2,52	17,04	24,00	23,01	11,50	7,66	5,74	4,59
16	0,54	24	1,000	2,00	3,36	22,72	32,00	30,68	15,34	10,22	7,66	6,12
20	0,67	30	1,250	2,50	4,20	28,40	40,00	38,35	19,17	12,77	9,57	7,65
						Recommended % of programmed feed rate to use while ramping.		100%	70%	50%	30%	10%

- Non-center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.







End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P	H	
	4	1	2
AlTiN	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A81.

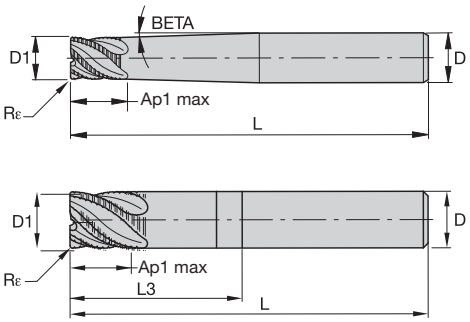
D1	D	length of cut Ap1 max	L3	length L	Rt	D3	AlTiN - MT
6,0	6	0,32	9,00	57	0,62	5,50	**71N606002MT**
6,0	6	0,32	18,00	63	0,62	5,50	**70N606002MT**
8,0	8	0,42	12,00	63	0,83	7,50	**71N608003MT**
8,0	8	0,42	24,00	76	0,83	7,50	**70N608003MT**
10,0	10	0,53	15,00	72	1,04	9,00	**71N610004MT**
10,0	10	0,53	30,00	89	1,04	9,00	**70N610004MT**
12,0	12	0,63	18,00	83	1,24	11,00	**71N612005MT**
12,0	12	0,63	36,00	100	1,24	11,00	**70N612005MT**
16,0	16	0,84	48,00	110	1,66	15,00	**70N616006MT**
20,0	20	1,05	60,00	125	2,07	19,00	**70N620007MT**

R = the head radius size.
YRC = distance from center line to the crown of the R radius.
RCN = distance from center line to the start of the cutting edge. This dimension can also help determine the minimum circle size when helical ramping.
Rε = the shoulder radius or radius at the corner of the cutter.

Programming Data

Geometrical Parameters						Ramping Guide for Circular and Linear Ramping						
						Circular Interpolation		Linear Ramping				
						Optimal Range of Circle Diameter for a Single Pass		Calculated Length per Ramp Angle				
D1	Ap1 max	R	Rε	YRC	CRN	Smallest	Largest	1°	2°	3°	4°	5°
6	0,32	6	0,375	0,75	1,32	8,64	12,00	18,12	9,06	6,03	4,52	3,61
8	0,42	8	0,500	1,00	1,76	11,52	16,00	24,16	12,08	8,05	6,03	4,82
10	0,53	10	0,625	1,25	2,20	14,40	20,00	30,20	15,09	10,06	7,54	6,02
12	0,63	12	0,750	1,50	2,64	17,28	24,00	36,24	18,11	12,07	9,05	7,23
16	0,84	16	1,000	2,00	3,52	23,04	32,00	48,31	24,15	16,09	12,06	9,64
20	1,05	20	1,250	2,50	4,40	28,80	40,00	60,39	30,19	20,11	15,08	12,05
						Recommended % of programmed feed rate to use while ramping.		100%	70%	50%	30%	10%

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance d11	D	Tolerance h6 + / -
≤ 3	-0,020 / -0,080	≤ 3	0 / 0,006
> 3 to 6	-0,030 / -0,105	> 3 to 6	0 / 0,008
> 6 to 10	-0,040 / -0,130	> 6 to 10	0 / 0,009
> 10 to 18	-0,050 / -0,160	> 10 to 18	0 / 0,011
> 18 to 30	-0,065 / -0,195	> 18 to 30	0 / 0,013

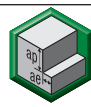
	P				M			K			S				H		
	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A82.

D1	D	length of cut Ap1 max	L3	length L	Rε	BETA	Z U	TiAlN - LT
4,0	6	4,00	—	75	0,75	2.5	3	**767004002LT**
5,0	6	5,00	—	75	0,75	2.5	3	**767005002LT**
6,0	10	6,00	—	100	0,75	2.5	4	**767006004LT**
8,0	10	8,00	—	100	0,75	2.5	4	**767008004LT**
10,0	12	10,00	—	125	0,75	2.5	4	**767010005LT**
12,0	16	12,00	—	125	1,00	2.5	4	**767012006LT**
16,0	16	16,00	48,00	125	1,00	—	6	**767016006LT**
20,0	20	20,00	60,00	150	1,25	—	6	**767020007LT**
25,0	25	25,00	75,00	150	1,25	—	6	**767025008LT**

Lists 7N02 7N12 7N22 • Vision Plus™ Micro



A

B

Group	A ap	A ae	B ap	AlTiN Cutting Speed Vc m/min Min		AlTiN Max	TiAlN Cutting Speed Vc m/min Min		TiAlN Max		Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 0,3	0,5	0,8	1,0	1,5	2,0	2,5	3,0
										mm								
P2	1,25 x D	0,25 x D	0,75 x D	140	-	190	140	-	190	Fz	0,0020	0,0034	0,0054	0,0069	0,0104	0,0138	0,0174	0,0210
P3	1,25 x D	0,25 x D	0,75 x D	120	-	160	120	-	160	Fz	0,0016	0,0028	0,0044	0,0057	0,0085	0,0113	0,0143	0,0173
P4	1,25 x D	0,25 x D	0,5 x D	90	-	150	90	-	150	Fz	0,0015	0,0026	0,0041	0,0052	0,0079	0,0105	0,0132	0,0159
P5	1,25 x D	0,25 x D	0,5 x D	60	-	100	60	-	100	Fz	0,0014	0,0023	0,0037	0,0047	0,0071	0,0094	0,0118	0,0143
K1	1,25 x D	0,25 x D	0,75 x D	120	-	160	120	-	160	Fz	0,0020	0,0034	0,0054	0,0069	0,0104	0,0138	0,0174	0,0210
K2	1,25 x D	0,25 x D	0,5 x D	110	-	140	110	-	140	Fz	0,0016	0,0028	0,0044	0,0057	0,0085	0,0113	0,0143	0,0173
H1	1,25 x D	0,25 x D	0,5 x D	80	-	140	80	-	140	Fz	0,0015	0,0026	0,0041	0,0052	0,0079	0,0105	0,0132	0,0159
H2	1,25 x D	0,25 x D	0,3 x D	70	-	120	70	-	120	Fz	0,0012	0,0020	0,0031	0,0079	0,0100	0,0120	0,0141	0,0162
H3	1,25 x D	0,25 x D	0,25 x D	60	-	90	60	-	90	Fz	0,0009	0,0015	0,0025	0,0062	0,0078	0,0095	0,0111	0,0127

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

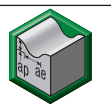
For tools with reach > 3 x D, reduce Fz by 20%.

For tools with reach > 5 x D, reduce Fz by 30%.

For tools with reach > 10 x D, reduce Vc and Fz by 20%–30%.

Finishing

List 423034 • Vision Plus™ Micro



			A				K10UF-DCHP AlTiN							
			Cutting Speed Vc m/min				Recommended Feed per Tooth (Fz=mm/th) for 3D Milling/Profiling – Finishing.							
							D1 - Diameter							
Group	ap	ae	Min		Max	mm	0,5	0,6	0,8	1,0	1,5	2,0	2,5	3,0
P3	0,04 x D	0,04 x D	416	-	468	Fz	0,0127	0,0153	0,0204	0,0256	0,0389	0,0522	0,0659	0,0796
P4	0,04 x D	0,04 x D	364	-	416	Fz	0,0119	0,0143	0,0191	0,0239	0,0361	0,0484	0,0609	0,0734
H1	0,03 x D	0,03 x D	290	-	406	Fz	0,0127	0,0153	0,0204	0,0255	0,0386	0,0517	0,0650	0,0784
H2	0,03 x D	0,03 x D	203	-	348	Fz	0,0096	0,0116	0,0154	0,0193	0,0292	0,0391	0,0491	0,0592
H3	0,02 x D	0,02 x D	216	-	324	Fz	0,0081	0,0097	0,0130	0,0163	0,0245	0,0328	0,0413	0,0497
H4	0,02 x D	0,02 x D	180	-	252	Fz	0,0054	0,0065	0,0087	0,0108	0,0164	0,0219	0,0275	0,0331

Semi-Finishing

List 423034 • Vision Plus™ Micro

			A				K10UF-DCHP AlTiN							
			Cutting Speed Vc m/min				Recommended Feed per Tooth (Fz=mm/th) for 3D Milling/Profiling – Semi-Finishing.							
							D1 - Diameter							
Group	ap	ae	Min		Max	mm	0,5	0,6	0,8	1,0	1,5	2,0	2,5	3,0
P3	0,1 x D	0,05 x D	272	-	306	Fz	0,0083	0,0099	0,0133	0,0167	0,0253	0,0339	0,0428	0,0518
P4	0,1 x D	0,05 x D	238	-	272	Fz	0,0077	0,0093	0,0124	0,0155	0,0235	0,0314	0,0396	0,0477
H1	0,07 x D	0,1 x D	200	-	280	Fz	0,0097	0,0116	0,0155	0,0194	0,0294	0,0393	0,0495	0,0596
H2	0,05 x D	0,04 x D	161	-	276	Fz	0,0084	0,0101	0,0135	0,0169	0,0255	0,0342	0,0430	0,0518
H3	0,03 x D	0,03 x D	174	-	261	Fz	0,0076	0,0091	0,0122	0,0152	0,0230	0,0308	0,0387	0,0466
H4	0,03 x D	0,03 x D	145	-	203	Fz	0,0051	0,0061	0,0081	0,0102	0,0153	0,0205	0,0258	0,0311

Roughing

List 423034 • Vision Plus™ Micro

			A				K10UF-DCHP AlTiN							
			Cutting Speed Vc m/min				Recommended Feed per Tooth (Fz=mm/th) for 3D Milling/Profiling – Roughing.							
							D1 - Diameter							
Group	ap	ae	Min		Max	mm	0,5	0,6	0,8	1,0	1,5	2,0	2,5	3,0
P3	0,2 x D	0,1 x D	208	-	234	Fz	0,0037	0,0044	0,0059	0,0075	0,0113	0,0152	0,0192	0,0232
P4	0,2 x D	0,1 x D	182	-	208	Fz	0,0035	0,0042	0,0056	0,0070	0,0105	0,0141	0,0177	0,0213
H1	0,15 x D	0,1 x D	140	-	196	Fz	0,0052	0,0062	0,0083	0,0104	0,0157	0,0211	0,0265	0,0319
H2	0,1 x D	0,075 x D	119	-	204	Fz	0,0059	0,0070	0,0094	0,0118	0,0178	0,0238	0,0299	0,0360
H3	0,05 x D	0,05 x D	138	-	207	Fz	0,0066	0,0080	0,0106	0,0133	0,0201	0,0269	0,0338	0,0408
H4	0,05 x D	0,05 x D	115	-	161	Fz	0,0044	0,0053	0,0071	0,0089	0,0134	0,0179	0,0226	0,0272

Please use the reference table to optimize your cutting speed based on the average cutting angle of the application. *See page A83.*

Finishing

List 7N01 • Vision Plus™ Micro

A

			TiAlN				Recommended Feed per Tooth (Fz=mm/th) for 3D Milling/Profiling – Finishing.							
			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	Min		Max	mm	0,5	0,6	0,8	1,0	1,5	2,0	2,5	3,0
P3	0,04 x D	0,04 x D	416	-	468	Fz	0,0127	0,0153	0,0204	0,0256	0,0389	0,0522	0,0659	0,0796
P4	0,04 x D	0,04 x D	364	-	416	Fz	0,0119	0,0143	0,0191	0,0239	0,0361	0,0484	0,0609	0,0734
H1	0,03 x D	0,03 x D	290	-	406	Fz	0,0127	0,0153	0,0204	0,0255	0,0386	0,0517	0,0650	0,0784
H2	0,03 x D	0,03 x D	203	-	348	Fz	0,0096	0,0116	0,0154	0,0193	0,0292	0,0391	0,0491	0,0592
H3	0,02 x D	0,02 x D	216	-	324	Fz	0,0081	0,0097	0,0130	0,0163	0,0245	0,0328	0,0413	0,0497
H4	0,02 x D	0,02 x D	180	-	252	Fz	0,0054	0,0065	0,0087	0,0108	0,0164	0,0219	0,0275	0,0331

Semi-Finishing

List 7N01 • Vision Plus™ Micro

A

			TiAlN				Recommended Feed per Tooth (Fz=mm/th) for 3D Milling/Profiling – Semi-Finishing.							
			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	Min		Max	mm	0,5	0,6	0,8	1,0	1,5	2,0	2,5	3,0
P3	0,1 x D	0,05 x D	272	-	306	Fz	0,0083	0,0099	0,0133	0,0167	0,0253	0,0339	0,0428	0,0518
P4	0,1 x D	0,05 x D	238	-	272	Fz	0,0077	0,0093	0,0124	0,0155	0,0235	0,0314	0,0396	0,0477
H1	0,07 x D	0,1 x D	200	-	280	Fz	0,0097	0,0116	0,0155	0,0194	0,0294	0,0393	0,0495	0,0596
H2	0,05 x D	0,04 x D	161	-	276	Fz	0,0084	0,0101	0,0135	0,0169	0,0255	0,0342	0,0430	0,0518
H3	0,03 x D	0,03 x D	174	-	261	Fz	0,0076	0,0091	0,0122	0,0152	0,0230	0,0308	0,0387	0,0466
H4	0,03 x D	0,03 x D	145	-	203	Fz	0,0051	0,0061	0,0081	0,0102	0,0153	0,0205	0,0258	0,0311

Roughing

List 7N01 • Vision Plus™ Micro

A

			TiAlN				Recommended Feed per Tooth (Fz=mm/th) for 3D Milling/Profiling – Roughing.							
			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	Min		Max	mm	0,5	0,6	0,8	1,0	1,5	2,0	2,5	3,0
P3	0,2 x D	0,1 x D	208	-	234	Fz	0,0037	0,0044	0,0059	0,0075	0,0113	0,0152	0,0192	0,0232
P4	0,2 x D	0,1 x D	182	-	208	Fz	0,0035	0,0042	0,0056	0,0070	0,0105	0,0141	0,0177	0,0213
H1	0,15 x D	0,1 x D	140	-	196	Fz	0,0052	0,0062	0,0083	0,0104	0,0157	0,0211	0,0265	0,0319
H2	0,1 x D	0,075 x D	119	-	204	Fz	0,0059	0,0070	0,0094	0,0118	0,0178	0,0238	0,0299	0,0360
H3	0,05 x D	0,05 x D	138	-	207	Fz	0,0066	0,0080	0,0106	0,0133	0,0201	0,0269	0,0338	0,0408
H4	0,05 x D	0,05 x D	115	-	161	Fz	0,0044	0,0053	0,0071	0,0089	0,0134	0,0179	0,0226	0,0272

Please use the reference table to optimize your cutting speed based on the average cutting angle of the application. *See page A83.*

Finishing

List 7N21 • Vision Plus™ Micro

			A			TiAlN		Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Finishing.							
			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min		Max	mm	0,5	0,6	0,8	1,0	1,5	2,0	2,5	3,0
P3	0,04 x D	0,04 x D	416	-	468	Fz	0,0127	0,0153	0,0204	0,0256	0,0389	0,0522	0,0659	0,0796
P4	0,04 x D	0,04 x D	364	-	416	Fz	0,0119	0,0143	0,0191	0,0239	0,0361	0,0484	0,0609	0,0734
H1	0,03 x D	0,03 x D	290	-	406	Fz	0,0127	0,0153	0,0204	0,0255	0,0386	0,0517	0,0650	0,0784
H2	0,03 x D	0,03 x D	203	-	348	Fz	0,0096	0,0116	0,0154	0,0193	0,0292	0,0391	0,0491	0,0592
H3	0,02 x D	0,02 x D	216	-	324	Fz	0,0081	0,0097	0,0130	0,0163	0,0245	0,0328	0,0413	0,0497
H4	0,02 x D	0,02 x D	180	-	252	Fz	0,0054	0,0065	0,0087	0,0108	0,0164	0,0219	0,0275	0,0331

Semi-Finishing

List 7N21 • Vision Plus™ Micro

			A			TiAlN		Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Semi-Finishing.							
			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min		Max	mm	0,5	0,6	0,8	1,0	1,5	2,0	2,5	3,0
P3	0,1 x D	0,05 x D	272	-	306	Fz	0,0083	0,0099	0,0133	0,0167	0,0253	0,0339	0,0428	0,0518
P4	0,1 x D	0,05 x D	238	-	272	Fz	0,0077	0,0093	0,0124	0,0155	0,0235	0,0314	0,0396	0,0477
H1	0,07 x D	0,1 x D	200	-	280	Fz	0,0097	0,0116	0,0155	0,0194	0,0294	0,0393	0,0495	0,0596
H2	0,05 x D	0,04 x D	161	-	276	Fz	0,0084	0,0101	0,0135	0,0169	0,0255	0,0342	0,0430	0,0518
H3	0,03 x D	0,03 x D	174	-	261	Fz	0,0076	0,0091	0,0122	0,0152	0,0230	0,0308	0,0387	0,0466
H4	0,03 x D	0,03 x D	145	-	203	Fz	0,0051	0,0061	0,0081	0,0102	0,0153	0,0205	0,0258	0,0311

Roughing

List 7N21 • Vision Plus™ Micro

			A			TiAlN		Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Roughing.							
			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min		Max	mm	0,5	0,6	0,8	1,0	1,5	2,0	2,5	3,0
P3	0,2 x D	0,1 x D	208	-	234	Fz	0,0037	0,0044	0,0059	0,0075	0,0113	0,0152	0,0192	0,0232
P4	0,2 x D	0,1 x D	182	-	208	Fz	0,0035	0,0042	0,0056	0,0070	0,0105	0,0141	0,0177	0,0213
H1	0,15 x D	0,1 x D	140	-	196	Fz	0,0052	0,0062	0,0083	0,0104	0,0157	0,0211	0,0265	0,0319
H2	0,1 x D	0,075 x D	119	-	204	Fz	0,0059	0,0070	0,0094	0,0118	0,0178	0,0238	0,0299	0,0360
H3	0,05 x D	0,05 x D	138	-	207	Fz	0,0066	0,0080	0,0106	0,0133	0,0201	0,0269	0,0338	0,0408
H4	0,05 x D	0,05 x D	115	-	161	Fz	0,0044	0,0053	0,0071	0,0089	0,0134	0,0179	0,0226	0,0272

Please use the reference table to optimize your cutting speed based on the average cutting angle of the application. *See page A83.*

List 75N2 • Vision Plus™

A

B

TiAlN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.

Group	ap	ae	ap	Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 3,0	4,0	5,0	6,0	8,0	10,0	12,0
P3	0,75 x D	0,1 x D	0,4 x D	160	-	180	Fz	0,017	0,023	0,030	0,036	0,050	0,061	0,070
P4	0,75 x D	0,1 x D	0,4 x D	140	-	160	Fz	0,016	0,021	0,027	0,033	0,045	0,054	0,062
H1	0,75 x D	0,1 x D	0,4 x D	120	-	140	Fz	0,016	0,021	0,027	0,033	0,045	0,054	0,062
H2	0,75 x D	0,05 x D	0,3 x D	100	-	130	Fz	0,016	0,020	0,025	0,029	0,034	0,037	0,040
H3	0,75 x D	0,03 x D	0,2 x D	70	-	100	Fz	0,013	0,016	0,019	0,023	0,026	0,029	0,032
H4	0,75 x D	0,01 x D	0,1 x D	50	-	70	Fz	0,008	0,011	0,013	0,015	0,018	0,019	0,021

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

List 422875 • Vision Plus™

A

B

K10UF-DCHP
AlTiN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.

Group	ap	ae	ap	Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 2,0	3,0	4,0	5,0	6,0	8,0	10,0	12,0
P3	0,5 x D	0,4 x D	0,3 x D	120	-	160	Fz	0,011	0,017	0,026	0,033	0,040	0,055	0,067	0,077
P4	0,5 x D	0,4 x D	0,3 x D	90	-	150	Fz	0,010	0,016	0,024	0,030	0,036	0,049	0,059	0,069
H1	0,5 x D	0,4 x D	0,3 x D	80		140	Fz	0,010	0,016	0,024	0,030	0,036	0,049	0,059	0,069
H2	0,5 x D	0,3 x D	0,2 x D	60	-	80	Fz	0,012	0,016	0,018	0,022	0,027	0,037	0,044	0,051
H3	0,5 x D	0,15 x D	0,15 x D	50	-	70	Fz	0,009	0,013	0,014	0,018	0,021	0,029	0,035	0,041
H4	0,5 x D	0,1 x D	0,1 x D	40	-	60	Fz	0,006	0,008	0,009	0,012	0,014	0,019	0,023	0,027

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
For ap/ae 0,05 x D, increase Fz by 400%.
For better surface finish, reduce feed per tooth.

Finishing

List 7151 • Vision Plus™

			TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Finishing.								
	A		Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min		Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,04 x D	0,04 x D	416	-	468	Fz	0,052	0,080	0,108	0,168	0,231	0,279	0,324	0,403	0,466
P4	0,04 x D	0,04 x D	364	-	416	Fz	0,048	0,073	0,099	0,152	0,207	0,249	0,288	0,355	0,406
H1	0,03 x D	0,03 x D	290	-	406	Fz	0,052	0,078	0,106	0,162	0,221	0,266	0,308	0,379	0,434
H2	0,03 x D	0,03 x D	203	-	348	Fz	0,039	0,059	0,080	0,122	0,166	0,199	0,230	0,281	0,320
H3	0,02 x D	0,02 x D	216	-	324	Fz	0,033	0,050	0,067	0,102	0,139	0,168	0,196	0,244	0,284
H4	0,02 x D	0,02 x D	180	-	252	Fz	0,022	0,033	0,045	0,068	0,093	0,112	0,130	0,162	0,187

Semi-Finishing

List 7151 • Vision Plus™

			TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Semi-Finishing.								
			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min		Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,1 x D	0,05 x D	272	-	306	Fz	0,034	0,052	0,070	0,109	0,150	0,182	0,211	0,262	0,303
P4	0,1 x D	0,05 x D	238	-	272	Fz	0,031	0,048	0,064	0,099	0,134	0,162	0,187	0,230	0,264
H1	0,07 x D	0,1 x D	200	-	280	Fz	0,039	0,060	0,080	0,123	0,168	0,203	0,234	0,288	0,330
H2	0,05 x D	0,04 x D	161	-	276	Fz	0,034	0,052	0,070	0,107	0,145	0,174	0,201	0,246	0,280
H3	0,03 x D	0,03 x D	174	-	261	Fz	0,031	0,047	0,063	0,096	0,130	0,158	0,183	0,229	0,266
H4	0,03 x D	0,03 x D	145	-	203	Fz	0,021	0,031	0,042	0,064	0,087	0,105	0,122	0,151	0,176

Roughing

List 7151 • Vision Plus™

			TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Roughing.								
	A		Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min		Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,2 x D	0,1 x D	208	-	234	Fz	0,015	0,023	0,031	0,049	0,067	0,081	0,094	0,117	0,136
P4	0,2 x D	0,1 x D	182	-	208	Fz	0,014	0,021	0,029	0,044	0,060	0,073	0,084	0,103	0,118
H1	0,15 x D	0,1 x D	140	-	196	Fz	0,021	0,032	0,043	0,066	0,090	0,109	0,125	0,154	0,177
H2	0,1 x D	0,075 x D	119	-	204	Fz	0,024	0,036	0,048	0,074	0,101	0,121	0,140	0,171	0,194
H3	0,05 x D	0,05 x D	138	-	207	Fz	0,027	0,041	0,055	0,084	0,114	0,138	0,161	0,200	0,233
H4	0,05 x D	0,05 x D	115	-	161	Fz	0,018	0,027	0,037	0,056	0,076	0,092	0,107	0,133	0,154

Please use the reference table to optimize your cutting speed based on the average cutting angle of the application. *See page A83.*

Finishing

List 7061 • Vision Plus™

	A		TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Finishing.								
			Cutting Speed Vc m/min			D1 - Diameter								
Group	ap	ae	Min	Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,04 x D	0,04 x D	416	468	Fz	0,052	0,080	0,108	0,168	0,231	0,279	0,324	0,403	0,466
P4	0,04 x D	0,04 x D	364	416	Fz	0,048	0,073	0,099	0,152	0,207	0,249	0,288	0,355	0,406
H1	0,03 x D	0,03 x D	290	406	Fz	0,052	0,078	0,106	0,162	0,221	0,266	0,308	0,379	0,434
H2	0,03 x D	0,03 x D	203	348	Fz	0,039	0,059	0,080	0,122	0,166	0,199	0,230	0,281	0,320
H3	0,02 x D	0,02 x D	216	324	Fz	0,033	0,050	0,067	0,102	0,139	0,168	0,196	0,244	0,284
H4	0,02 x D	0,02 x D	180	252	Fz	0,022	0,033	0,045	0,068	0,093	0,112	0,130	0,162	0,187

Semi-Finishing

List 7061 • Vision Plus™

	A		TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Semi-Finishing.								
			Cutting Speed Vc m/min			D1 - Diameter								
Group	ap	ae	Min	Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,1 x D	0,05 x D	272	306	Fz	0,034	0,052	0,070	0,109	0,150	0,182	0,211	0,262	0,303
P4	0,1 x D	0,05 x D	238	272	Fz	0,031	0,048	0,064	0,099	0,134	0,162	0,187	0,230	0,264
H1	0,07 x D	0,1 x D	200	280	Fz	0,039	0,060	0,080	0,123	0,168	0,203	0,234	0,288	0,330
H2	0,05 x D	0,04 x D	161	276	Fz	0,034	0,052	0,070	0,107	0,145	0,174	0,201	0,246	0,280
H3	0,03 x D	0,03 x D	174	261	Fz	0,031	0,047	0,063	0,096	0,130	0,158	0,183	0,229	0,266
H4	0,03 x D	0,03 x D	145	203	Fz	0,021	0,031	0,042	0,064	0,087	0,105	0,122	0,151	0,176

Roughing

List 7061 • Vision Plus™

	A		TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Roughing.								
			Cutting Speed Vc m/min			D1 - Diameter								
Group	ap	ae	Min	Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,2 x D	0,1 x D	208	234	Fz	0,015	0,023	0,031	0,049	0,067	0,081	0,094	0,117	0,136
P4	0,2 x D	0,1 x D	182	208	Fz	0,014	0,021	0,029	0,044	0,060	0,073	0,084	0,103	0,118
H1	0,15 x D	0,1 x D	140	196	Fz	0,021	0,032	0,043	0,066	0,090	0,109	0,125	0,154	0,177
H2	0,1 x D	0,075 x D	119	204	Fz	0,024	0,036	0,048	0,074	0,101	0,121	0,140	0,171	0,194
H3	0,05 x D	0,05 x D	138	207	Fz	0,027	0,041	0,055	0,084	0,114	0,138	0,161	0,200	0,233
H4	0,05 x D	0,05 x D	115	161	Fz	0,018	0,027	0,037	0,056	0,076	0,092	0,107	0,133	0,154

Please use the reference table to optimize your cutting speed based on the average cutting angle of the application. *See page A83.*

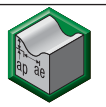
Finishing

List 70N1 • Vision Plus™

	A		TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Finishing.								
			Cutting Speed Vc m/min			D1 - Diameter								
Group	ap	ae	Min	Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,04 x D	0,04 x D	416	468	Fz	0,052	0,080	0,108	0,168	0,231	0,279	0,324	0,403	0,466
P4	0,04 x D	0,04 x D	364	416	Fz	0,048	0,073	0,099	0,152	0,207	0,249	0,288	0,355	0,406
H1	0,03 x D	0,03 x D	290	406	Fz	0,052	0,078	0,106	0,162	0,221	0,266	0,308	0,379	0,434
H2	0,03 x D	0,03 x D	203	348	Fz	0,039	0,059	0,080	0,122	0,166	0,199	0,230	0,281	0,320
H3	0,02 x D	0,02 x D	216	324	Fz	0,033	0,050	0,067	0,102	0,139	0,168	0,196	0,244	0,284
H4	0,02 x D	0,02 x D	180	252	Fz	0,022	0,033	0,045	0,068	0,093	0,112	0,130	0,162	0,187

Semi-Finishing

List 70N1 • Vision Plus™



	A		TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Semi-Finishing.								
			Cutting Speed Vc m/min			D1 - Diameter								
Group	ap	ae	Min	Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,1 x D	0,05 x D	272	306	Fz	0,034	0,052	0,070	0,109	0,150	0,182	0,211	0,262	0,303
P4	0,1 x D	0,05 x D	238	272	Fz	0,031	0,048	0,064	0,099	0,134	0,162	0,187	0,230	0,264
H1	0,07 x D	0,1 x D	200	280	Fz	0,039	0,060	0,080	0,123	0,168	0,203	0,234	0,288	0,330
H2	0,05 x D	0,04 x D	161	276	Fz	0,034	0,052	0,070	0,107	0,145	0,174	0,201	0,246	0,280
H3	0,03 x D	0,03 x D	174	261	Fz	0,031	0,047	0,063	0,096	0,130	0,158	0,183	0,229	0,266
H4	0,03 x D	0,03 x D	145	203	Fz	0,021	0,031	0,042	0,064	0,087	0,105	0,122	0,151	0,176

Roughing

List 70N1 • Vision Plus™

	A		TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Roughing.								
			Cutting Speed Vc m/min			D1 - Diameter								
Group	ap	ae	Min	Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,2 x D	0,1 x D	208	234	Fz	0,015	0,023	0,031	0,049	0,067	0,081	0,094	0,117	0,136
P4	0,2 x D	0,1 x D	182	208	Fz	0,014	0,021	0,029	0,044	0,060	0,073	0,084	0,103	0,118
H1	0,15 x D	0,1 x D	140	196	Fz	0,021	0,032	0,043	0,066	0,090	0,109	0,125	0,154	0,177
H2	0,1 x D	0,075 x D	119	204	Fz	0,024	0,036	0,048	0,074	0,101	0,121	0,140	0,171	0,194
H3	0,05 x D	0,05 x D	138	207	Fz	0,027	0,041	0,055	0,084	0,114	0,138	0,161	0,200	0,233
H4	0,05 x D	0,05 x D	115	161	Fz	0,018	0,027	0,037	0,056	0,076	0,092	0,107	0,133	0,154

Please use the reference table to optimize your cutting speed based on the average cutting angle of the application. *See page A83.*

Finishing

Lists 422869 422868 • Vision Plus™

A

K10UF-DCHP
AlTiN

Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Finishing.

Group	ap	ae	Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 1,0	2,0	4,0	6,0	8,0	10,0	12,0	16,0
P3	0,04 x D	0,04 x D	416	-	468	Fz	0,0256	0,0522	0,108	0,168	0,231	0,279	0,324	0,403
P4	0,04 x D	0,04 x D	364	-	416	Fz	0,0239	0,0484	0,099	0,152	0,207	0,249	0,288	0,355
H1	0,03 x D	0,03 x D	290	-	406	Fz	0,0255	0,0517	0,106	0,162	0,221	0,266	0,308	0,379
H2	0,03 x D	0,03 x D	203	-	348	Fz	0,0193	0,0391	0,080	0,122	0,166	0,199	0,230	0,281
H3	0,02 x D	0,02 x D	216	-	324	Fz	0,0163	0,0328	0,067	0,102	0,139	0,168	0,196	0,244
H4	0,02 x D	0,02 x D	180	-	252	Fz	0,0108	0,0219	0,045	0,068	0,093	0,112	0,130	0,162

Semi-Finishing

Lists 422869 422868 • Vision Plus™

A

K10UF-DCHP
AlTiN

Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Semi-Finishing.

Group	ap	ae	Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 1,0	2,0	4,0	6,0	8,0	10,0	12,0	16,0
P3	0,1 x D	0,05 x D	272	-	306	Fz	0,017	0,034	0,070	0,109	0,150	0,182	0,211	0,262
P4	0,1 x D	0,05 x D	238	-	272	Fz	0,016	0,031	0,064	0,099	0,134	0,162	0,187	0,230
H1	0,07 x D	0,1 x D	200	-	280	Fz	0,019	0,039	0,080	0,123	0,168	0,203	0,234	0,288
H2	0,05 x D	0,04 x D	161	-	276	Fz	0,017	0,034	0,070	0,107	0,145	0,174	0,201	0,246
H3	0,03 x D	0,03 x D	174	-	261	Fz	0,015	0,031	0,063	0,096	0,130	0,158	0,183	0,229
H4	0,03 x D	0,03 x D	145	-	203	Fz	0,010	0,021	0,042	0,064	0,087	0,105	0,122	0,151

Roughing

Lists 422869 422868 • Vision Plus™

A

K10UF-DCHP
AlTiN

Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Roughing.

Group	ap	ae	Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 1,0	2,0	4,0	6,0	8,0	10,0	12,0	16,0
P3	0,2 x D	0,1 x D	208	-	234	Fz	0,007	0,015	0,031	0,049	0,067	0,081	0,094	0,117
P4	0,2 x D	0,1 x D	182	-	208	Fz	0,007	0,014	0,029	0,044	0,060	0,073	0,084	0,103
H1	0,15 x D	0,1 x D	140	-	196	Fz	0,010	0,021	0,043	0,066	0,090	0,109	0,125	0,154
H2	0,1 x D	0,075 x D	119	-	204	Fz	0,012	0,024	0,048	0,074	0,101	0,121	0,140	0,171
H3	0,05 x D	0,05 x D	138	-	207	Fz	0,013	0,027	0,055	0,084	0,114	0,138	0,161	0,200
H4	0,05 x D	0,05 x D	115	-	161	Fz	0,009	0,018	0,037	0,056	0,076	0,092	0,107	0,133

Please use the reference table to optimize your cutting speed based on the average cutting angle of the application. *See page A83.*

Finishing

List 422870 • Vision Plus™

	A		K10UF-DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Finishing.							
			Cutting Speed Vc m/min			D1 - Diameter							
Group	ap	ae	Min - Max		mm	2,0	3,0	4,0	5,0	6,0	8,0	10,0	12,0
P3	0,04 x D	0,04 x D	416 - 468		Fz	0,052	0,080	0,108	0,137	0,168	0,231	0,279	0,324
P4	0,04 x D	0,04 x D	364 - 416		Fz	0,048	0,073	0,099	0,125	0,152	0,207	0,249	0,288
H1	0,03 x D	0,03 x D	290 - 406		Fz	0,052	0,078	0,106	0,134	0,162	0,221	0,266	0,308
H2	0,03 x D	0,03 x D	203 - 348		Fz	0,039	0,059	0,080	0,101	0,122	0,166	0,199	0,230
H3	0,02 x D	0,02 x D	216 - 324		Fz	0,033	0,050	0,067	0,084	0,102	0,139	0,168	0,196
H4	0,02 x D	0,02 x D	180 - 252		Fz	0,022	0,033	0,045	0,056	0,068	0,093	0,112	0,130

Semi-Finishing

List 422870 • Vision Plus™

	A		K10UF-DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Semi-Finishing.							
			Cutting Speed Vc m/min			D1 - Diameter							
Group	ap	ae	Min - Max		mm	2,0	3,0	4,0	5,0	6,0	8,0	10,0	12,0
P3	0,1 x D	0,05 x D	272 - 306		Fz	0,034	0,052	0,070	0,089	0,109	0,150	0,182	0,211
P4	0,1 x D	0,05 x D	238 - 272		Fz	0,031	0,048	0,064	0,081	0,099	0,134	0,162	0,187
H1	0,07 x D	0,1 x D	200 - 280		Fz	0,039	0,060	0,080	0,102	0,123	0,168	0,203	0,234
H2	0,05 x D	0,04 x D	161 - 276		Fz	0,034	0,052	0,070	0,088	0,107	0,145	0,174	0,201
H3	0,03 x D	0,03 x D	174 - 261		Fz	0,031	0,047	0,063	0,079	0,096	0,130	0,158	0,183
H4	0,03 x D	0,03 x D	145 - 203		Fz	0,021	0,031	0,042	0,053	0,064	0,087	0,105	0,122

Roughing

List 422870 • Vision Plus™

	A		K10UF-DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Roughing.							
			Cutting Speed Vc m/min			D1 - Diameter							
Group	ap	ae	Min - Max		mm	2,0	3,0	4,0	5,0	6,0	8,0	10,0	12,0
P3	0,2 x D	0,1 x D	208 - 234		Fz	0,015	0,023	0,031	0,040	0,049	0,067	0,081	0,094
P4	0,2 x D	0,1 x D	182 - 208		Fz	0,014	0,021	0,029	0,036	0,044	0,060	0,073	0,084
H1	0,15 x D	0,1 x D	140 - 196		Fz	0,021	0,032	0,043	0,054	0,066	0,090	0,109	0,125
H2	0,1 x D	0,075 x D	119 - 204		Fz	0,024	0,036	0,048	0,061	0,074	0,101	0,121	0,140
H3	0,05 x D	0,05 x D	138 - 207		Fz	0,027	0,041	0,055	0,069	0,084	0,114	0,138	0,161
H4	0,05 x D	0,05 x D	115 - 161		Fz	0,018	0,027	0,037	0,046	0,056	0,076	0,092	0,107

Please use the reference table to optimize your cutting speed based on the average cutting angle of the application. *See page A83.*

Finishing

List 422873 • Vision Plus™

	A		K10UF-DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Finishing.					
			Cutting Speed Vc m/min			D1 - Diameter					
Group	ap	ae	Min	Max	mm	3,0	4,0	5,0	6,0	8,0	10,0
P3	0,04 x D	0,04 x D	416	468	Fz	0,080	0,108	0,137	0,168	0,231	0,279
P4	0,04 x D	0,04 x D	364	416	Fz	0,073	0,099	0,125	0,152	0,207	0,249
H1	0,03 x D	0,03 x D	290	406	Fz	0,078	0,106	0,134	0,162	0,221	0,266
H2	0,03 x D	0,03 x D	203	348	Fz	0,059	0,080	0,101	0,122	0,166	0,199
H3	0,02 x D	0,02 x D	216	324	Fz	0,050	0,067	0,084	0,102	0,139	0,168
H4	0,02 x D	0,02 x D	180	252	Fz	0,033	0,045	0,056	0,068	0,093	0,112

Semi-Finishing

List 422873 • Vision Plus™

	A		K10UF-DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Semi-Finishing.					
			Cutting Speed Vc m/min			D1 - Diameter					
Group	ap	ae	Min	Max	mm	3,0	4,0	5,0	6,0	8,0	10,0
P3	0,1 x D	0,05 x D	272	306	Fz	0,052	0,070	0,089	0,109	0,150	0,182
P4	0,1 x D	0,05 x D	238	272	Fz	0,048	0,064	0,081	0,099	0,134	0,162
H1	0,07 x D	0,1 x D	200	280	Fz	0,060	0,080	0,102	0,123	0,168	0,203
H2	0,05 x D	0,04 x D	161	276	Fz	0,052	0,070	0,088	0,107	0,145	0,174
H3	0,03 x D	0,03 x D	174	261	Fz	0,047	0,063	0,079	0,096	0,130	0,158
H4	0,03 x D	0,03 x D	145	203	Fz	0,031	0,042	0,053	0,064	0,087	0,105

Roughing

List 422873 • Vision Plus™

	A		K10UF-DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Roughing.					
			Cutting Speed Vc m/min			D1 - Diameter					
Group	ap	ae	Min	Max	mm	3,0	4,0	5,0	6,0	8,0	10,0
P3	0,2 x D	0,1 x D	208	234	Fz	0,023	0,031	0,040	0,049	0,067	0,081
P4	0,2 x D	0,1 x D	182	208	Fz	0,021	0,029	0,036	0,044	0,060	0,073
H1	0,15 x D	0,1 x D	140	196	Fz	0,032	0,043	0,054	0,066	0,090	0,109
H2	0,1 x D	0,075 x D	119	204	Fz	0,036	0,048	0,061	0,074	0,101	0,121
H3	0,05 x D	0,05 x D	138	207	Fz	0,041	0,055	0,069	0,084	0,114	0,138
H4	0,05 x D	0,05 x D	115	161	Fz	0,027	0,037	0,046	0,056	0,076	0,092

Please use the reference table to optimize your cutting speed based on the average cutting angle of the application. *See page A83.*

Lists 7505 7545 • Vision Plus™

A

B

TiAlN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.

Cutting Speed Vc m/min

D1 - Diameter

Group	ap	ae	ap	Min		Max	mm	3,0	4,0	5,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P3	1 x D	0,4 x D	1 x D	160	-	180	Fz	0,019	0,026	0,033	0,040	0,055	0,067	0,077	0,096	0,111	0,125
P4	1 x D	0,4 x D	0,75 x D	140	-	160	Fz	0,017	0,024	0,030	0,036	0,049	0,059	0,069	0,084	0,097	0,107
H1	1 x D	0,4 x D	0,75 x D	120	-	140	Fz	0,017	0,024	0,030	0,036	0,049	0,059	0,069	0,084	0,097	0,107
H2	1 x D	0,3 x D	0,5 x D	80	-	130	Fz	0,013	0,018	0,022	0,027	0,037	0,044	0,051	0,063	0,071	0,078
H3	1 x D	0,15 x D	0,3 x D	70	-	100	Fz	0,010	0,014	0,018	0,021	0,029	0,035	0,041	0,051	0,059	0,067
H4	1 x D	0,1 x D	0,15 x D	50	-	70	Fz	0,007	0,009	0,012	0,014	0,019	0,023	0,027	0,034	0,039	0,044

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
For better surface finish, reduce feed per tooth.

List 7515 • Vision Plus™

A

B

TiAlN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.

Cutting Speed Vc m/min

D1 - Diameter

Group	ap	ae	ap	Min		Max	mm	3,0	4,0	5,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P3	2 x D	0,3 x D	0,75 x D	160	-	180	Fz	0,019	0,026	0,033	0,040	0,055	0,067	0,077	0,096	0,111	0,125
P4	2 x D	0,25 x D	0,5 x D	140	-	160	Fz	0,017	0,024	0,030	0,036	0,049	0,059	0,069	0,084	0,097	0,107
H1	2 x D	0,25 x D	0,5 x D	120	-	140	Fz	0,017	0,024	0,030	0,036	0,049	0,059	0,069	0,084	0,097	0,107
H2	2 x D	0,2 x D	0,4 x D	80	-	130	Fz	0,013	0,018	0,022	0,027	0,037	0,044	0,051	0,063	0,071	0,078
H3	2 x D	0,1 x D	0,2 x D	70	-	100	Fz	0,010	0,014	0,018	0,021	0,029	0,035	0,041	0,051	0,059	0,067
H4	2 x D	0,05 x D	0,05 x D	50	-	70	Fz	0,007	0,009	0,012	0,014	0,019	0,023	0,027	0,034	0,039	0,044

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
For better surface finish, reduce feed per tooth.

List 7525 • Vision Plus™

A

B

TiAlN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.

Cutting Speed Vc m/min

D1 - Diameter

Group	ap	ae	ap	Min		Max	mm	3,0	4,0	5,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P3	3 x D	0,2 x D	0,5 x D	160	-	180	Fz	0,019	0,026	0,033	0,040	0,055	0,067	0,077	0,096	0,111	0,125
P4	3 x D	0,2 x D	0,3 x D	140	-	160	Fz	0,017	0,024	0,030	0,036	0,049	0,059	0,069	0,084	0,097	0,107
H1	3 x D	0,2 x D	0,3 x D	120	-	140	Fz	0,017	0,024	0,030	0,036	0,049	0,059	0,069	0,084	0,097	0,107
H2	3 x D	0,15 x D	0,2 x D	80	-	130	Fz	0,013	0,018	0,022	0,027	0,037	0,044	0,051	0,063	0,071	0,078
H3	3 x D	0,05 x D	—	70	-	100	Fz	0,010	0,014	0,018	0,021	0,029	0,035	0,041	0,051	0,059	0,067
H4	3 x D	0,03 x D	—	50	-	70	Fz	0,007	0,009	0,012	0,014	0,019	0,023	0,027	0,034	0,039	0,044

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
For better surface finish, reduce feed per tooth.

Lists 7585 7595 • Vision Plus™

	A		B	TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.									
				Cutting Speed Vc m/min			D1 - Diameter									
Group	ap	ae	ap	Min		Max	mm	3,0	4,0	5,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P3	1 x D	0,4 x D	1 x D	160	-	180	Fz	0,019	0,026	0,033	0,040	0,055	0,067	0,077	0,096	0,111	0,125
P4	1 x D	0,4 x D	0,75 x D	140	-	160	Fz	0,017	0,024	0,030	0,036	0,049	0,059	0,069	0,084	0,097	0,107
H1	1 x D	0,4 x D	0,75 x D	120	-	140	Fz	0,017	0,024	0,030	0,036	0,049	0,059	0,069	0,084	0,097	0,107
H2	1 x D	0,3 x D	0,5 x D	80	-	130	Fz	0,013	0,018	0,022	0,027	0,037	0,044	0,051	0,063	0,071	0,078
H3	1 x D	0,15 x D	0,3 x D	70	-	100	Fz	0,010	0,014	0,018	0,021	0,029	0,035	0,041	0,051	0,059	0,067
H4	1 x D	0,1 x D	0,15 x D	50	-	70	Fz	0,007	0,009	0,012	0,014	0,019	0,023	0,027	0,034	0,039	0,044

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
For better surface finish, reduce feed per tooth.

List 75N5 • Vision Plus™

	A		B	TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.									
				Cutting Speed Vc m/min			D1 - Diameter									
Group	ap	ae	ap	Min		Max	mm	3,0	4,0	5,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P3	1 x D	0,4 x D	1 x D	160	-	180	Fz	0,019	0,026	0,033	0,040	0,055	0,067	0,077	0,096	0,111	0,125
P4	1 x D	0,4 x D	0,75 x D	140	-	160	Fz	0,017	0,024	0,030	0,036	0,049	0,059	0,069	0,084	0,097	0,107
H1	1 x D	0,4 x D	0,75 x D	120	-	140	Fz	0,017	0,024	0,030	0,036	0,049	0,059	0,069	0,084	0,097	0,107
H2	1 x D	0,3 x D	0,5 x D	80	-	130	Fz	0,013	0,018	0,022	0,027	0,037	0,044	0,051	0,063	0,071	0,078
H3	1 x D	0,15 x D	0,3 x D	70	-	100	Fz	0,010	0,014	0,018	0,021	0,029	0,035	0,041	0,051	0,059	0,067
H4	1 x D	0,1 x D	0,15 x D	50	-	70	Fz	0,007	0,009	0,012	0,014	0,019	0,023	0,027	0,034	0,039	0,044

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
For better surface finish, reduce feed per tooth.

List 75N8 • Vision Plus™

	A		B	TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.				
				Cutting Speed Vc m/min				D1 - Diameter			
Group	ap	ae	ap	Min		Max	mm	6,0	8,0	10,0	12,0
P3	0,75 x D	0,2 x D	0,3 x D	160	-	180	Fz	0,040	0,055	0,067	0,077
P4	0,75 x D	0,2 x D	0,3 x D	140	-	160	Fz	0,036	0,049	0,059	0,069
H1	0,75 x D	0,2 x D	0,3 x D	120	-	140	Fz	0,036	0,049	0,059	0,069
H2	0,75 x D	0,2 x D	0,3 x D	80	-	130	Fz	0,027	0,037	0,044	0,051
H3	0,75 x D	0,1 x D	0,2 x D	70	-	100	Fz	0,021	0,029	0,035	0,041
H4	0,75 x D	0,05 x D	0,05 x D	50	-	70	Fz	0,014	0,019	0,023	0,027

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

For better surface finish, reduce feed per tooth.

Lists 422876 422878 • Vision Plus™

	A		B	K10UF-DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.					
				Cutting Speed Vc m/min				D1 - Diameter				
Group	ap	ae	ap	Min		Max	mm	4,0	5,0	6,0	8,0	10,0	12,0
P3	0,5 x D	0,4 x D	0,3 x D	120	-	160	Fz	0,026	0,033	0,040	0,055	0,067	0,077
P4	0,5 x D	0,4 x D	0,3 x D	90	-	150	Fz	0,024	0,030	0,036	0,049	0,059	0,069
H1	0,5 x D	0,4 x D	0,3 x D	80	-	140	Fz	0,024	0,030	0,036	0,049	0,059	0,069
H2	0,5 x D	0,3 x D	0,2 x D	60	-	80	Fz	0,018	0,022	0,027	0,037	0,044	0,051
H3	0,5 x D	0,15 x D	0,15 x D	50	-	70	Fz	0,014	0,018	0,021	0,029	0,035	0,041
H4	0,5 x D	0,1 x D	0,1 x D	40	-	60	Fz	0,009	0,012	0,014	0,019	0,023	0,027

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

For ap/ae 0,05 x D, increase Fz by 400%.

For better surface finish, reduce feed per tooth.

Finishing

List 7150 • Vision Plus™

A

			TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Finishing.								
			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min		Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,04 x D	0,04 x D	416	-	468	Fz	0,052	0,080	0,108	0,168	0,231	0,279	0,324	0,403	0,466
P4	0,04 x D	0,04 x D	364	-	416	Fz	0,048	0,073	0,099	0,152	0,207	0,249	0,288	0,355	0,406
H1	0,03 x D	0,03 x D	290	-	406	Fz	0,052	0,078	0,106	0,162	0,221	0,266	0,308	0,379	0,434
H2	0,03 x D	0,03 x D	203	-	348	Fz	0,039	0,059	0,080	0,122	0,166	0,199	0,230	0,281	0,320
H3	0,02 x D	0,02 x D	216	-	324	Fz	0,033	0,050	0,067	0,102	0,139	0,168	0,196	0,244	0,284
H4	0,02 x D	0,02 x D	180	-	252	Fz	0,022	0,033	0,045	0,068	0,093	0,112	0,130	0,162	0,187

Semi-Finishing

List 7150 • Vision Plus™

A

			TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Semi-Finishing.								
			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min		Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,1 x D	0,05 x D	272	-	306	Fz	0,034	0,052	0,070	0,109	0,150	0,182	0,211	0,262	0,303
P4	0,1 x D	0,05 x D	238	-	272	Fz	0,031	0,048	0,064	0,099	0,134	0,162	0,187	0,230	0,264
H1	0,07 x D	0,1 x D	200	-	280	Fz	0,039	0,060	0,080	0,123	0,168	0,203	0,234	0,288	0,330
H2	0,05 x D	0,04 x D	161	-	276	Fz	0,034	0,052	0,070	0,107	0,145	0,174	0,201	0,246	0,280
H3	0,03 x D	0,03 x D	174	-	261	Fz	0,031	0,047	0,063	0,096	0,130	0,158	0,183	0,229	0,266
H4	0,03 x D	0,03 x D	145	-	203	Fz	0,021	0,031	0,042	0,064	0,087	0,105	0,122	0,151	0,176

Roughing

List 7150 • Vision Plus™

A

			TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Roughing.								
			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min		Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,2 x D	0,1 x D	208	-	234	Fz	0,015	0,023	0,031	0,049	0,067	0,081	0,094	0,117	0,136
P4	0,2 x D	0,1 x D	182	-	208	Fz	0,014	0,021	0,029	0,044	0,060	0,073	0,084	0,103	0,118
H1	0,15 x D	0,1 x D	140	-	196	Fz	0,021	0,032	0,043	0,066	0,090	0,109	0,125	0,154	0,177
H2	0,1 x D	0,075 x D	119	-	204	Fz	0,024	0,036	0,048	0,074	0,101	0,121	0,140	0,171	0,194
H3	0,05 x D	0,05 x D	138	-	207	Fz	0,027	0,041	0,055	0,084	0,114	0,138	0,161	0,200	0,233
H4	0,05 x D	0,05 x D	115	-	161	Fz	0,018	0,027	0,037	0,056	0,076	0,092	0,107	0,133	0,154

Please use the reference table to optimize your cutting speed based on the average cutting angle of the application. *See page A83.*

Finishing

Lists 7050 7060 • Vision Plus™

A

			TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Finishing.								
			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min		Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,04 x D	0,04 x D	416	-	468	Fz	0,052	0,080	0,108	0,168	0,231	0,279	0,324	0,403	0,466
P4	0,04 x D	0,04 x D	364	-	416	Fz	0,048	0,073	0,099	0,152	0,207	0,249	0,288	0,355	0,406
H1	0,03 x D	0,03 x D	290	-	406	Fz	0,052	0,078	0,106	0,162	0,221	0,266	0,308	0,379	0,434
H2	0,03 x D	0,03 x D	203	-	348	Fz	0,039	0,059	0,080	0,122	0,166	0,199	0,230	0,281	0,320
H3	0,02 x D	0,02 x D	216	-	324	Fz	0,033	0,050	0,067	0,102	0,139	0,168	0,196	0,244	0,284
H4	0,02 x D	0,02 x D	180	-	252	Fz	0,022	0,033	0,045	0,068	0,093	0,112	0,130	0,162	0,187

Semi-Finishing

Lists 7050 7060 • Vision Plus™

A

			TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Semi-Finishing.								
			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min		Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,1 x D	0,05 x D	272	-	306	Fz	0,034	0,052	0,070	0,109	0,150	0,182	0,211	0,262	0,303
P4	0,1 x D	0,05 x D	238	-	272	Fz	0,031	0,048	0,064	0,099	0,134	0,162	0,187	0,230	0,264
H1	0,07 x D	0,1 x D	200	-	280	Fz	0,039	0,060	0,080	0,123	0,168	0,203	0,234	0,288	0,330
H2	0,05 x D	0,04 x D	161	-	276	Fz	0,034	0,052	0,070	0,107	0,145	0,174	0,201	0,246	0,280
H3	0,03 x D	0,03 x D	174	-	261	Fz	0,031	0,047	0,063	0,096	0,130	0,158	0,183	0,229	0,266
H4	0,03 x D	0,03 x D	145	-	203	Fz	0,021	0,031	0,042	0,064	0,087	0,105	0,122	0,151	0,176

Roughing

Lists 7050 7060 • Vision Plus™

A

			TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Roughing.								
			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min		Max	mm	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	0,2 x D	0,1 x D	208	-	234	Fz	0,015	0,023	0,031	0,049	0,067	0,081	0,094	0,117	0,136
P4	0,2 x D	0,1 x D	182	-	208	Fz	0,014	0,021	0,029	0,044	0,060	0,073	0,084	0,103	0,118
H1	0,15 x D	0,1 x D	140	-	196	Fz	0,021	0,032	0,043	0,066	0,090	0,109	0,125	0,154	0,177
H2	0,1 x D	0,075 x D	119	-	204	Fz	0,024	0,036	0,048	0,074	0,101	0,121	0,140	0,171	0,194
H3	0,05 x D	0,05 x D	138	-	207	Fz	0,027	0,041	0,055	0,084	0,114	0,138	0,161	0,200	0,233
H4	0,05 x D	0,05 x D	115	-	161	Fz	0,018	0,027	0,037	0,056	0,076	0,092	0,107	0,133	0,154

Please use the reference table to optimize your cutting speed based on the average cutting angle of the application. *See page A83.*

Finishing

List 422871 • Vision Plus™

A

K10UF-DCHP
AlTiN

Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Finishing.

Group	ap	ae	Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 3,0	4,0	5,0	6,0	8,0	10,0
P3	0,04 x D	0,04 x D	416	-	468	Fz	0,080	0,108	0,137	0,168	0,231	0,279
P4	0,04 x D	0,04 x D	364	-	416	Fz	0,073	0,099	0,125	0,152	0,207	0,249
H1	0,03 x D	0,03 x D	290	-	406	Fz	0,078	0,106	0,134	0,162	0,221	0,266
H2	0,03 x D	0,03 x D	203	-	348	Fz	0,059	0,080	0,101	0,122	0,166	0,199
H3	0,02 x D	0,02 x D	216	-	324	Fz	0,050	0,067	0,084	0,102	0,139	0,168
H4	0,02 x D	0,02 x D	180	-	252	Fz	0,033	0,045	0,056	0,068	0,093	0,112

Semi-Finishing

List 422871 • Vision Plus™

A

K10UF-DCHP
AlTiN

Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Semi-Finishing.

Group	ap	ae	Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 3,0	4,0	5,0	6,0	8,0	10,0
P3	0,1 x D	0,05 x D	272	-	306	Fz	0,052	0,070	0,089	0,109	0,150	0,182
P4	0,1 x D	0,05 x D	238	-	272	Fz	0,048	0,064	0,081	0,099	0,134	0,162
H1	0,07 x D	0,1 x D	200	-	280	Fz	0,060	0,080	0,102	0,123	0,168	0,203
H2	0,05 x D	0,04 x D	161	-	276	Fz	0,052	0,070	0,088	0,107	0,145	0,174
H3	0,03 x D	0,03 x D	174	-	261	Fz	0,047	0,063	0,079	0,096	0,130	0,158
H4	0,03 x D	0,03 x D	145	-	203	Fz	0,031	0,042	0,053	0,064	0,087	0,105

Roughing

List 422871 • Vision Plus™

A

K10UF-DCHP
AlTiN

Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling (A) - Roughing.

Group	ap	ae	Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 3,0	4,0	5,0	6,0	8,0	10,0
P3	0,2 x D	0,1 x D	208	-	234	Fz	0,023	0,031	0,040	0,049	0,067	0,081
P4	0,2 x D	0,1 x D	182	-	208	Fz	0,021	0,029	0,036	0,044	0,060	0,073
H1	0,15 x D	0,1 x D	140	-	196	Fz	0,032	0,043	0,054	0,066	0,090	0,109
H2	0,1 x D	0,075 x D	119	-	204	Fz	0,036	0,048	0,061	0,074	0,101	0,121
H3	0,05 x D	0,05 x D	138	-	207	Fz	0,041	0,055	0,069	0,084	0,114	0,138
H4	0,05 x D	0,05 x D	115	-	161	Fz	0,027	0,037	0,046	0,056	0,076	0,092

Please use the reference table to optimize your cutting speed based on the average cutting angle of the application. *See page A83.*

List D618 • Vision Plus™

A

			TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for Side Milling.							
			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	Min		Max	mm	3,0	5,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	2 x D	0,15 x D	160	-	180	Fz	0,019	0,033	0,040	0,055	0,067	0,077	0,096	0,125
P4	2 x D	0,15 x D	140	-	160	Fz	0,017	0,030	0,036	0,049	0,059	0,069	0,084	0,107
H1	2 x D	0,15 x D	120	-	140	Fz	0,017	0,030	0,036	0,049	0,059	0,069	0,084	0,107
H2	2 x D	0,15 x D	80	-	130	Fz	0,013	0,022	0,027	0,037	0,044	0,051	0,063	0,078
H3	2 x D	0,1 x D	70	-	100	Fz	0,010	0,018	0,021	0,029	0,035	0,041	0,051	0,067
H4	2 x D	0,05 x D	50	-	70	Fz	0,007	0,012	0,014	0,019	0,023	0,027	0,034	0,044

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

For better surface finish, reduce feed per tooth.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422837 422831 • Vision Plus™

A

			K10UF-DCHP AlTiN				Recommended Feed Per Tooth (Fz=mm/th) for Side Milling.						
			Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P3	1,5 x D	0,2 x D	120	-	160	Fz	0,040	0,055	0,067	0,077	0,096	0,111	0,125
P4	1,5 x D	0,2 x D	90	-	150	Fz	0,036	0,049	0,059	0,069	0,084	0,097	0,107
H1	1,5 x D	0,2 x D	80	-	140	Fz	0,036	0,049	0,059	0,069	0,084	0,097	0,107
H2	1,5 x D	0,15 x D	60	-	80	Fz	0,027	0,037	0,044	0,051	0,063	0,071	0,078
H3	1,5 x D	0,1 x D	50	-	70	Fz	0,021	0,029	0,035	0,041	0,051	0,059	0,067
H4	1,5 x D	0,05 x D	40	-	60	Fz	0,014	0,019	0,023	0,027	0,034	0,039	0,044

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

For better surface finish, reduce feed per tooth.

For List 422831, ap max = 2,5 x D by 50% ae.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 70N7 • Vision Plus™ X-Feed™

	A		AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling.					
			Cutting Speed Vc m/min				D1 - Diameter					
Group	ap	ae	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	20,0
H2	0,03 x D	0,55 x D	100	-	120	Fz	0,200	0,300	0,300	0,400	0,500	0,600
H3	0,03 x D	0,55 x D	80	-	100	Fz	0,200	0,300	0,300	0,400	0,500	0,600
H4	0,03 x D	0,55 x D	50	-	70	Fz	0,150	0,200	0,250	0,300	0,400	0,500

Tool List 70N7

Geometrical Parameters										Ramping Guide for Circular and Linear Interpolation						
										Circular Interpolation		Linear Interpolation				
										Allowed Range of Hole Diameter		Calculated Length (mm) per Ramp Angle				
Tool	Diameter	ap max	Rfm	Rt	Rc	Xfm	Yfm	YD	Number			Ramp Angle (degree)				
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	Flutes	Smallest	Largest	1	2	3	4	5
70N706003MT	6	0,20	9	0,58	0,375	0,20	0,75	1,26	6	8,52	12	11,51	5,75	3,83	2,87	2,30
70N708003MT	8	0,27	12	0,77	0,500	0,27	1,00	1,68	6	11,36	16	15,34	7,67	5,11	3,83	3,06
70N710004MT	10	0,33	15	0,96	0,625	0,33	1,25	2,10	6	14,20	20	19,18	9,58	6,39	4,79	3,83
70N712005MT	12	0,40	18	1,15	0,750	0,40	1,50	2,52	6	17,04	24	23,01	11,50	7,66	5,74	4,59
70N716006MT	16	0,54	24	1,54	1,000	0,54	2,00	3,36	6	22,72	32	30,68	15,34	10,22	7,66	6,12
70N720007MT	20	0,67	30	1,92	1,250	0,67	2,50	4,20	6	28,40	40	38,35	19,17	12,77	9,57	7,65
										Recommended Feed		100%	70%	50%	30%	10%

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 70N6 71N6 • Vision Plus™ X-Feed™

	A		AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling.					
			Cutting Speed Vc m/min				D1 - Diameter					
Group	ap	ae	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	20,0
P4	0,05 x D	0,55 x D	160	-	180	Fz	0,300	0,500	0,500	0,500	0,600	0,700
H1	0,05 x D	0,55 x D	140	-	160	Fz	0,300	0,500	0,500	0,500	0,600	0,700
H2	0,05 x D	0,55 x D	100	-	120	Fz	0,200	0,300	0,300	0,400	0,500	0,600

Tool List 70N7

Geometrical Parameters										Ramping Guide for Circular and Linear Interpolation						
										Circular Interpolation		Linear Interpolation				
										Allowed Range of Hole Diameter		Calculated Length (mm) per Ramp Angle				
Tool	Diameter	ap max	Rfm	Rt	Rc	Xfm	Yfm	YD	Number			Ramp Angle (degree)				
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	Flutes	Smallest	Largest	1	2	3	4	5
70N606003MT	6	0,32	6	0,62	0,375	0,32	0,75	1,32	6	8,64	12	18,12	9,06	6,03	4,52	3,61
70N608003MT	8	0,42	8	0,83	0,500	0,42	1,00	1,76	6	11,52	16	24,16	12,08	8,05	6,03	4,82
70N610004MT	10	0,53	10	1,04	0,625	0,53	1,25	2,20	6	14,40	20	30,20	15,09	10,06	7,54	6,02
70N612005MT	12	0,63	12	1,24	0,750	0,63	1,50	2,64	6	17,28	24	36,24	18,11	12,07	9,05	7,23
70N616006MT	16	0,84	16	1,66	1,000	0,84	2,00	3,52	6	23,04	32	48,31	24,15	16,09	12,06	9,64
70N620007MT	20	1,05	20	2,07	1,250	1,05	2,50	4,40	6	28,80	40	60,39	30,19	20,11	15,08	12,05
										Recommended Feed		100%	70%	50%	30%	10%

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 7670 • Vision Plus™

	A		B	TiAlN Cutting Speed Vc m/min			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 10%.								
							D1 - Diameter								
Group	ap	ae	ap	Min		Max	mm	4,0	5,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P3	0,8 x D	0,5 x D	0,75 x D	160	-	180	Fz	0,020	0,025	0,031	0,043	0,051	0,063	0,078	0,101	0,114
P4	0,8 x D	0,4 x D	0,5 x D	140	-	160	Fz	0,018	0,023	0,028	0,038	0,046	0,056	0,069	0,088	0,098
P5	0,8 x D	0,5 x D	0,75 x D	60	-	100	Fz	0,016	0,021	0,025	0,034	0,041	0,051	0,063	0,081	0,091
P6	0,8 x D	0,4 x D	0,5 x D	50	-	80	Fz	0,014	0,017	0,021	0,029	0,034	0,042	0,051	0,065	0,071
M1	0,8 x D	0,5 x D	0,75 x D	80	-	100	Fz	0,020	0,025	0,031	0,043	0,051	0,063	0,078	0,101	0,114
M2	0,8 x D	0,4 x D	0,75 x D	60	-	80	Fz	0,016	0,021	0,025	0,034	0,041	0,051	0,063	0,081	0,091
M3	0,8 x D	0,4 x D	0,75 x D	60	-	80	Fz	0,014	0,017	0,021	0,029	0,034	0,042	0,051	0,065	0,071
K1	0,8 x D	0,5 x D	0,75 x D	120	-	160	Fz	0,024	0,031	0,037	0,051	0,061	0,075	0,091	0,114	0,124
K2	0,8 x D	0,5 x D	0,75 x D	110	-	140	Fz	0,020	0,025	0,031	0,043	0,051	0,063	0,078	0,101	0,114
K3	0,8 x D	0,4 x D	0,75 x D	100	-	130	Fz	0,016	0,021	0,025	0,034	0,041	0,051	0,063	0,081	0,091
S1	0,8 x D	0,4 x D	0,75 x D	90	-	115	Fz	0,020	0,025	0,031	0,043	0,051	0,063	0,078	0,101	0,114
S2	0,8 x D	0,25 x D	0,3 x D	20	-	40	Fz	0,011	0,014	0,017	0,022	0,027	0,033	0,042	0,054	0,061
S3	0,8 x D	0,4 x D	0,75 x D	50	-	80	Fz	0,016	0,021	0,025	0,034	0,041	0,051	0,063	0,081	0,091
S4	0,8 x D	0,3 x D	0,5 x D	45	-	65	Fz	0,013	0,018	0,022	0,031	0,038	0,046	0,058	0,074	0,084
H1	0,8 x D	0,5 x D	0,5 x D	120	-	140	Fz	0,018	0,023	0,028	0,038	0,046	0,056	0,069	0,088	0,098
H2	0,8 x D	0,2 x D	0,3 x D	80	-	130	Fz	0,014	0,017	0,021	0,029	0,034	0,042	0,051	0,065	0,071
H3	0,8 x D	0,15 x D	0,2 x D	70	-	100	Fz	0,011	0,014	0,017	0,023	0,027	0,034	0,041	0,052	0,057

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

For rougher tool with 6 flutes, use ap in slotting 60% of table value.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Calculation Examples

Table of Factors for Speed Calculation Ball Nose

Average Wall Angle	ap/D						
	0.003	0.006	0.010	0.016	0.020	0.025	0.030
0.0°	9.1	6.5	5.0	4.0	3.6	3.2	2.9
3.0°	6.2	4.9	4.0	3.3	3.0	2.8	2.6
5.0°	5.1	4.2	3.5	3.0	2.8	2.5	2.4
8.0°	4.1	3.4	3.0	2.6	2.4	2.3	2.1
10.0°	3.6	3.1	2.7	2.4	2.3	2.1	2.0
15.0°	2.8	2.5	2.2	2.0	1.9	1.8	1.7
20.0°	2.3	2.1	1.9	1.8	1.7	1.6	1.6
30.0°	1.7	1.6	1.5	1.4	1.4	1.3	1.3
40.0°	1.4	1.3	1.3	1.2	1.2	1.2	1.2
50.0°	1.2	1.2	1.1	1.1	1.1	1.1	1.1
55.0°	1.1	1.1	1.1	1.1	1.1	1.0	1.0

*For calculating real cutting speed, use formula: = Basic cutting speed * Factor.*

Choose the coefficient according to the ap/D and average wall angle.

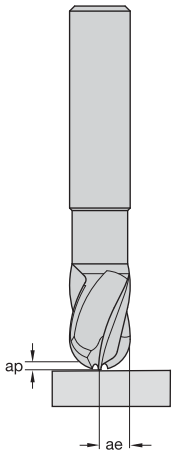
Example 1: For Tool = 10mm and ap = 0,2mm for average wall angle 0°, ap/D ratio equal 0,2/10 = 0,02. Factor equal 3,6.

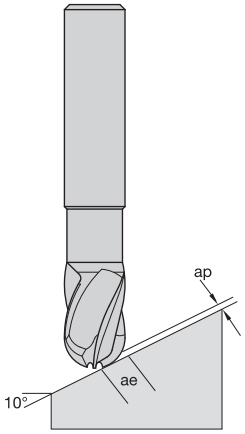
Example 2: For Tool = 8mm and ap = 0,1mm for average wall angle 10°, ap/D ratio equal 0,1/8 = 0,0125. Factor will be between 2,7 and 2,4, choose 2,6.

Keep in mind shank diameter and length effect.

If tool length out of the chuck is more than 2 x D, please decrease feed per tooth by 15% each 1 x D.

Material Group	TiAlN or AlTiN Basic Cutting Speed Vc m/min		
	Min		Max
P3	160	–	180
P4	140	–	160
H1	100	–	140
H2	70	–	120
H3	60	–	90
H4	50	–	70





Application example #1 = face milling a flat surface

D = 10mm
ap = 0,2mm
Average wall angle = 0°
Finishing H2
Starting Vc from chart = 100
ap/D = 0,02
Factor from table = 3,6
Vc to program into machine = 100 * 3,6 = 360 m/min
RPM = 360* 1000/3,14/10 = 11460 RPM

Application example #2 = face milling a 10° average wall angle

D = 8mm
ap = 0,1mm
Average wall angle = 10°
Finishing H2
Starting Vc from chart = 100
ap/D = 0,1/8 = 0,0125
Factor from table = 2,6
Vc to program into machine = 100 * 2,6 = 260 m/min
RPM = 260* 1000/3,14/10 = 7640 RPM

WIDIA HANITA

High-Performance Solid Carbide End Mills for Aluminium

The widest selection of styles available so you can choose the best tool for the job at hand.

- For roughing, semi-finishing, finishing, and super-finishing applications.
- Two- and three-flute finishing end mills in 30°, 38°, and 45° helix angles.
- Three-flute roughing end mills in 30° and 40° helix angles.
- PCD-tipped end mills.
- AluSurf™ geometries.
- Extended neck-style tools for step down milling.

High-Performance Solid Carbide End Mills • Aluminium

Aluminium **A85–A107**

Application Data

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List D502 . . . . . A87
Lists 022814 022817 422814 422817 . . . . . A88
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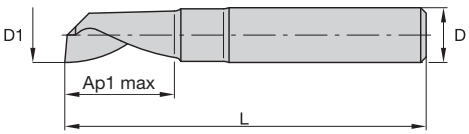
- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

	N				
	1	2	3	4	6
DLC	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A103.

D1	D	length of cut Ap1 max	length L	K10F - DCL DLC - DT
3,0	6	12,00	50	524149-000030
4,0	6	15,00	60	524149-000040
5,0	6	17,00	60	524149-000050
6,0	6	20,00	60	524149-000060
8,0	10	25,00	75	524149-000080
10,0	8	25,00	75	524149-000100
12,0	12	25,00	75	524149-000120

End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

	N	
	1	2
Uncoated	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A103.

D1	D	length of cut Ap1 max	length L	K10F UNCOATED - ..
2,0	2	10,00	40	022849-000020
3,0	3	10,00	40	022849-000030
4,0	4	14,00	50	022849-000040
5,0	5	16,00	60	022849-000050
6,0	6	20,00	60	022849-000060
8,0	8	25,00	75	022849-000080
10,0	10	25,00	75	022849-000100
12,0	12	25,00	75	022849-000120

- Center cutting.
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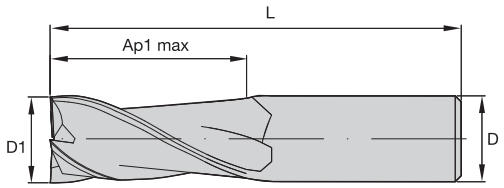
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	N	
	1	2
Uncoated	●	●
TiAlN	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A103.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiAlN - RT
3,0	6	4,00	50	D50203002..	D50203002RT
4,0	6	5,00	54	D50204002..	D50204002RT
5,0	6	6,00	54	D50205002..	D50205002RT
6,0	6	7,00	54	D50206002..	D50206002RT
8,0	8	9,00	58	D50208003..	D50208003RT
10,0	10	11,00	66	D50210004..	D50210004RT
12,0	12	12,00	73	D50212005..	D50212005RT
14,0	14	14,00	75	D50214014..	–
16,0	16	16,00	82	D50216006..	D50216006RT
20,0	20	20,00	92	D50220007..	–

- Center cutting.
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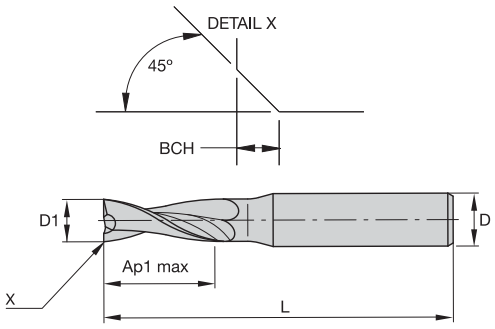
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

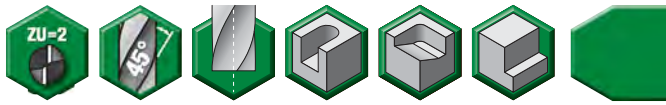
	N	
	1	2
Uncoated	●	●
TiAlN	●	●

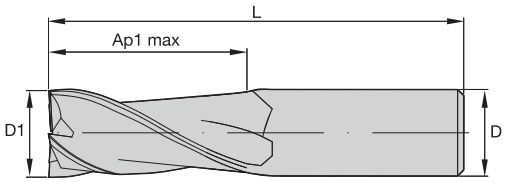
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A104.

D1	D	length of cut Ap1 max	length L	BCH	K10F UNCOATED - ..	K10F-TiAlN TiAlN - LT	K10F UNCOATED - WW	K10F-TiAlN TiAlN - LW
4	6	8,00	57	0,10	022814-000040	422814-000040	022817-000040	422817-000040
5	6	10,00	57	0,10	022814-000050	422814-000050	022817-000050	422817-000050
6	6	10,00	57	0,10	022814-000060	422814-000060	022817-000060	422817-000060
8	8	16,00	63	0,10	022814-000080	422814-000080	022817-000080	422817-000080
10	10	19,00	72	0,10	022814-000100	422814-000100	022817-000100	422817-000100
12	12	22,00	83	0,20	022814-000120	422814-000120	022817-000120	422817-000120
14	14	22,00	83	0,20	022814-000140	422814-000140	022817-000140	422817-000140
16	16	26,00	92	0,20	022814-000160	422814-000160	022817-000160	422817-000160
18	18	26,00	92	0,20	022814-000180	422814-000180	022817-000180	422817-000180
20	20	32,00	104	0,20	022814-000200	422814-000200	022817-000200	422817-000200

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	N	
	1	2
Uncoated	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A104.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..
1,5	3	6,00	38	**410201500..**
2,0	3	8,00	38	**410202000..**
2,5	3	9,00	38	**410202500..**
3,0	3	12,00	38	**410203000..**
4,0	4	12,00	50	**410204001..**
5,0	5	14,00	50	**410205001..**
5,0	6	14,00	50	**410205002..**
6,0	6	16,00	50	**410206002..**
8,0	8	20,00	63	**410208003..**
10,0	10	22,00	76	**410210004..**
12,0	12	25,00	76	**410212005..**
14,0	14	32,00	83	**410214014..**
16,0	16	32,00	89	**410216006..**
18,0	18	38,00	100	**410218018..**
20,0	20	38,00	104	**410220007..**

AluSurf™ Carbide End Mills for High Metal Removal Rates and Superior Surface Finishes

Designed to significantly reduce machining time in Aluminium!

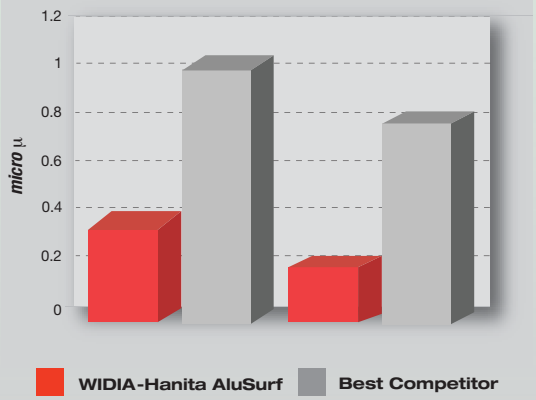
- Use only one tool for roughing and finishing operations.
- Slotting is effective up to full, 1 x D axial depth; side milling (profiling) is effective up to 0,5 x D, radial by 1,5 x D axial depth.
- Three-flute series uses unequal flute spacing for chatter-free performance.
- Effective in a full range of machine speeds.
- Multiple corner radii and extended neck configurations are available as standard.

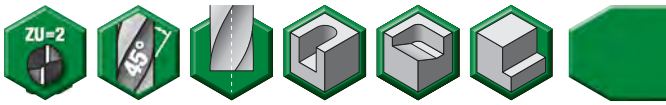
Featured Application: Machining a Block

Operation:	Slotting
Workpiece:	Aluminium block
Material:	6061 Aluminium
Solution:	AluSurf solid carbide end mill
Results:	100% better surface finish on walls and floor

	COMPETITOR	WIDIA-Hanita
grade:	uncoated tools	uncoated tools
end mill:	16mm 3-flute	16mm 3-flute AluSurf
material:	aluminium	aluminium
depth of cut (ap):	8mm	8mm
width of cut (ae):	8mm	8mm
speed (Vc):	610 m/min	610 m/min
RPM (N):	12,000 RPM	12,000 RPM
feed rate (Vf):	3,600mm/min	3,600 mm/min
chip load per tooth (Fz):	0,1mm/th	0,1mm/th
metal removal rate:	230 cm^3/min	230 cm^3/min

AluSurf Delivered 100% Better Surface Finish!





- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
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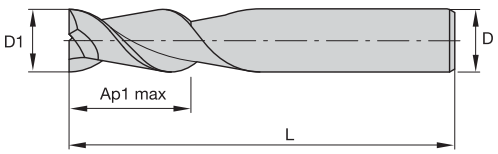
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

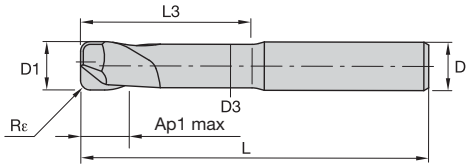
	N	
	1	2
Uncoated	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A104.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..
1,5	3	6,00	38	**510201500..**
2,0	3	8,00	38	**510202000..**
2,5	3	9,00	38	**510202500..**
3,0	3	12,00	38	**510203000..**
4,0	4	12,00	50	**510204001..**
5,0	5	14,00	50	**510205001..**
5,1	6	14,00	50	**510205002..**
6,0	6	16,00	50	**510206002..**
8,0	8	20,00	63	**510208003..**
10,0	10	22,00	76	**510210004..**
12,0	12	25,00	76	**510212005..**
14,0	14	32,00	83	**510214014..**
16,0	16	32,00	89	**510216006..**
18,0	18	38,00	100	**510218018..**
20,0	20	38,00	104	**510220007..**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

	N				
	1	2	3	4	6
Uncoated	●	●			
DLC	●	●	●	●	●

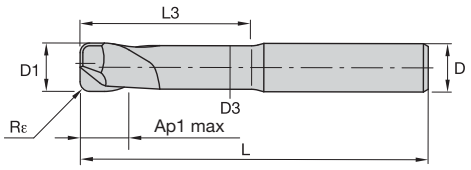
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A105.

D1	D	length of cut Ap1 max	L3	length L	Rε	D3	K10F UNCOATED - ..	K10F-DCL DLC - DT
3,0	6	7,00	16,00	57	0,50	2,80	022852-003005	524152-003005
4,0	6	8,00	16,00	57	0,50	3,80	022852-004005	524152-004005
4,0	6	8,00	16,00	57	1,00	3,80	022852-004010	524152-004010
5,0	6	10,00	16,00	57	0,50	4,70	022852-005005	524152-005005
5,0	6	10,00	16,00	57	1,00	4,70	022852-005010	524152-005010
6,0	6	10,00	19,00	57	0,50	5,70	022852-006005	524152-006005

(continued)

(continued)



	N				
	1	2	3	4	6
Uncoated	●	●			
DLC	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

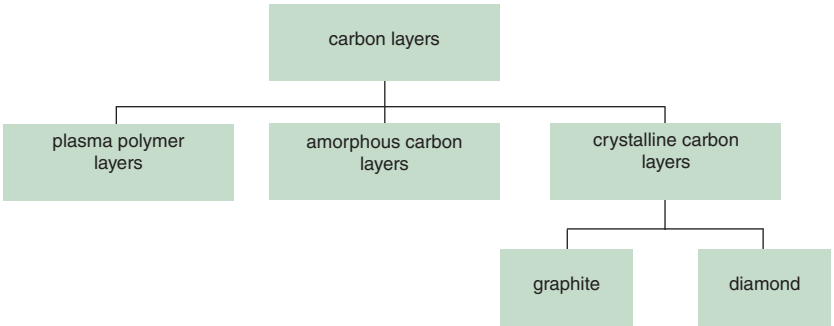
For material descriptions, see Inside Back Cover.
For application data, see page A105.

D1	D	length of cut Ap1 max	L3	length L	Rε	D3	K10F UNCOATED - ..	K10F-DCL DLC - DT
6,0	6	10,00	19,00	57	1,00	5,70	**022852-006010**	**524152-006010**
6,0	6	10,00	19,00	57	2,00	5,70	**022852-006020**	**524152-006020**
8,0	8	16,00	25,00	63	0,50	7,70	**022852-008005**	**524152-008005**
8,0	8	16,00	25,00	63	1,00	7,70	**022852-008010**	**524152-008010**
8,0	8	16,00	25,00	63	2,00	7,70	**022852-008020**	**524152-008020**
10,0	10	19,00	30,00	72	0,50	9,70	**022852-010005**	**524152-010005**
10,0	10	19,00	30,00	72	1,00	9,70	**022852-010010**	**524152-010010**
10,0	10	19,00	30,00	72	2,00	9,70	**022852-010020**	**524152-010020**
12,0	12	22,00	36,00	83	0,50	11,70	**022852-012005**	**524152-012005**
12,0	12	22,00	36,00	83	1,00	11,70	**022852-012010**	**524152-012010**
12,0	12	22,00	36,00	83	2,00	11,70	**022852-012020**	**524152-012020**
16,0	16	26,00	42,00	92	0,50	15,70	**022852-016005**	**524152-016005**
16,0	16	26,00	42,00	92	1,00	15,70	**022852-016010**	**524152-016010**
16,0	16	26,00	42,00	92	2,00	15,70	**022852-016020**	**524152-016020**
16,0	16	26,00	42,00	92	3,00	15,70	**022852-016030**	**524152-016030**

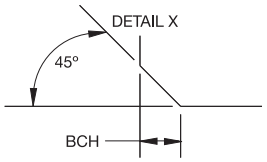
Tech Tip

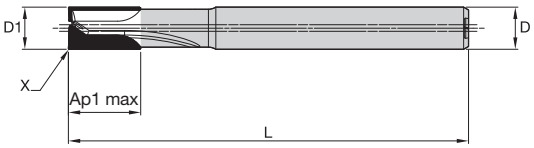
Features of DCL:

- Best anti-friction and build-up resistance when machining aluminium are amorphous carbon layers (DCL).
- Hardness of 2,500 HV.
- High wear resistance.
- Minimum adhesion of aluminium.
- Temperature resistant up to 350°.
- Thin coating with best adhesion.



- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





NEW!

End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
All	+0,03 / -0,03	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

	N				
	2	3	4	5	6
PCD	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A105.

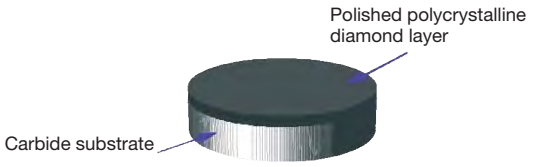
D1	D	length of cut Ap1 max	length L	BCH	PCD PCD - PT
6,0	6	10,00	57	0,08	**024101-000060**
8,0	8	15,00	63	0,10	**024101-000080**
10,0	10	15,00	72	0,12	**024101-000100**
12,0	12	20,00	83	0,15	**024101-000120**

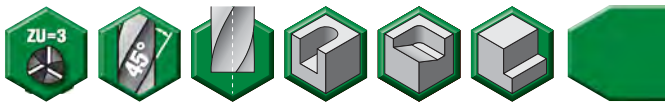
Tech Tip

Manufacturing of polycrystalline diamond (PCD)

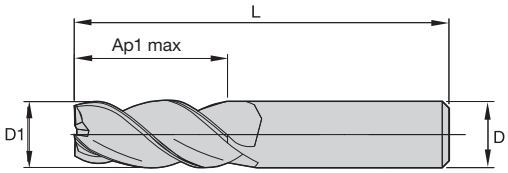
Polycrystalline diamond (PCD) is pure carbon compressed under high pressure. During this press process (50–60 kbar), a diamond layer is combined with a solderable carbide component (ISO K40). The main advantages are high hardness and excellent wear resistance.

General composition of PCD:





- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	N	
	1	2
Uncoated	●	●
TiCN	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A105.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiCN - CT
3,0	3	12,00	38	**410303000..**	**410303000CT**
4,0	4	12,00	50	**410304001..**	**410304001CT**
4,0	6	12,00	50	**410304002..**	**–**
5,0	5	14,00	50	**410305001..**	**410305001CT**
6,0	6	16,00	50	**410306002..**	**410306002CT**
8,0	8	20,00	63	**410308003..**	**410308003CT**
10,0	10	22,00	76	**410310004..**	**410310004CT**
12,0	12	25,00	76	**410312005..**	**410312005CT**
14,0	14	32,00	83	**410314014..**	**410314014CT**
16,0	16	32,00	89	**410316006..**	**410316006CT**
18,0	18	38,00	100	**410318018..**	**410318018CT**
20,0	20	38,00	104	**410320007..**	**410320007CT**

AluSurf™ Carbide End Mills for High Metal Removal Rates and Superior Surface Finishes

Designed to significantly reduce machining time in Aluminium!

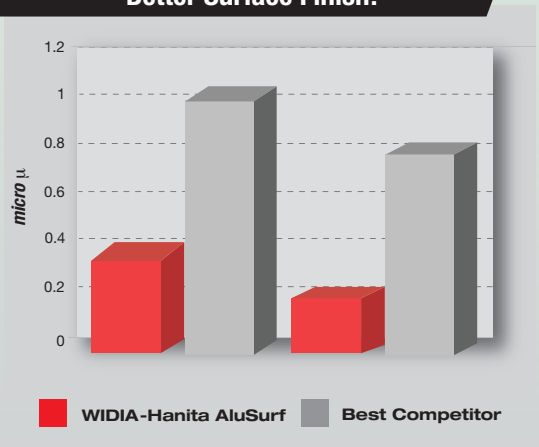
- Use only one tool for roughing and finishing operations.
- Slotting is effective up to full, 1 x D axial depth; side milling (profiling) is effective up to 0,5 x D, radial by 1,5 x D axial depth.
- Three-flute series uses unequal flute spacing for chatter-free performance.
- Effective in a full range of machine speeds.
- Multiple corner radii and extended neck configurations are available as standard.

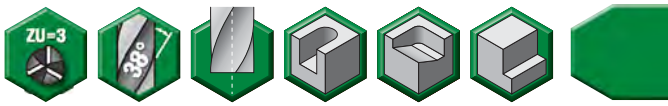
Featured Application: Machining a Block

Operation:	Slotting
Workpiece:	Aluminium block
Material:	6061 Aluminium
Solution:	AluSurf solid carbide end mill
Results:	100% better surface finish on walls and floor

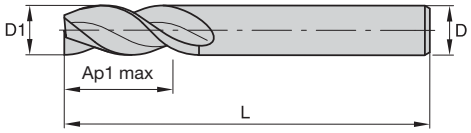
	COMPETITOR	WIDIA-Hanita
grade:	uncoated tools	uncoated tools
end mill:	16mm 3-flute	16mm 3-flute AluSurf
material:	aluminium	aluminium
depth of cut (ap):	8mm	8mm
width of cut (ae):	8mm	8mm
speed (Vc):	610m/min	610m/min
RPM (N):	12,000 RPM	12,000 RPM
feed rate (Vf):	3,600mm/min	3,600mm/min
chip load per tooth (Fz):	0,1mm/th	0,1mm/th
metal removal rate:	230 cm^3/min	230 cm^3/min

AluSurf Delivered 100% Better Surface Finish!





- Center cutting.
- Unequal flute spacing.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

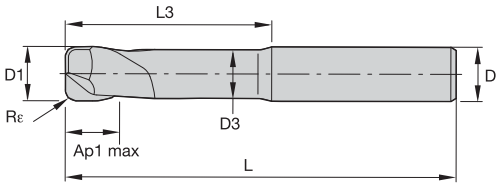
	N	
	1	2
Uncoated	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A106.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..
3,0	3	12,00	38	**510303000..**
4,0	4	12,00	50	**510304001..**
5,0	5	14,00	50	**510305001..**
6,0	6	16,00	50	**510306002..**
8,0	8	20,00	63	**510308003..**
10,0	10	22,00	76	**510310004..**
12,0	12	25,00	76	**510312005..**
14,0	14	32,00	83	**510314014..**
16,0	16	32,00	89	**510316006..**
18,0	18	38,00	100	**510318018..**
20,0	20	38,00	104	**510320007..**

- Center cutting.
- Unequal flute spacing.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

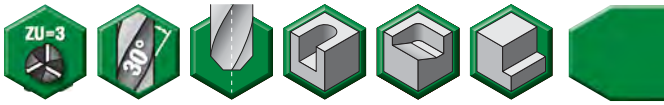
D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	N	
	1	2
Uncoated	●	●

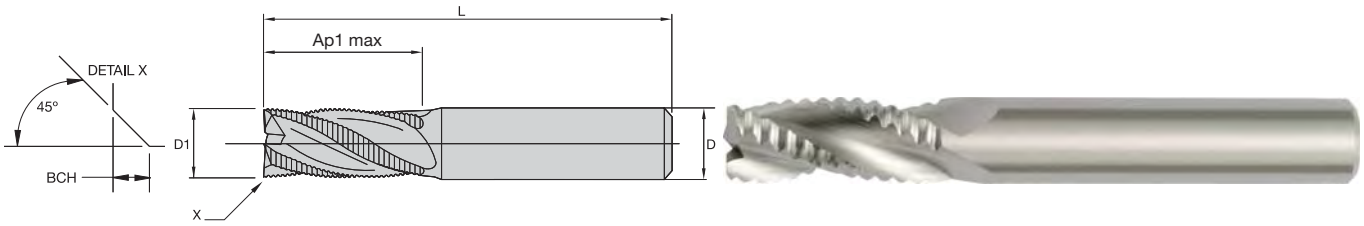
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A106.

D1	D	length of cut Ap1 max	L3	length L	Rε	D3	UNCOATED - ..
6,0	6	9,00	18,00	63	0,20	5,40	**51N306022..**
6,0	6	9,00	18,00	63	0,50	5,40	**51N306002..**
6,0	6	9,00	18,00	63	1,00	5,40	**51N306012..**
8,0	8	12,00	24,00	76	0,20	7,20	**51N308023..**
8,0	8	12,00	24,00	76	0,50	7,20	**51N308003..**
8,0	8	12,00	24,00	76	1,00	7,20	**51N308013..**
10,0	10	15,00	30,00	89	0,20	9,00	**51N310024..**
10,0	10	15,00	30,00	89	0,50	9,00	**51N310004..**
10,0	10	15,00	30,00	89	1,50	9,00	**51N310014..**
12,0	12	18,00	36,00	100	0,20	10,80	**51N312025..**
12,0	12	18,00	36,00	100	0,50	10,80	**51N312005..**
12,0	12	18,00	36,00	100	1,50	10,80	**51N312015..**
16,0	16	24,00	48,00	110	0,20	14,40	**51N316036..**
16,0	16	24,00	48,00	110	0,50	14,40	**51N316006..**
16,0	16	24,00	48,00	110	1,00	14,40	**51N316016..**
16,0	16	24,00	48,00	110	2,00	14,40	**51N316026..**
20,0	20	30,00	60,00	125	0,20	18,80	**51N320037..**
20,0	20	30,00	60,00	125	0,50	18,80	**51N320007..**
20,0	20	30,00	60,00	125	1,50	18,80	**51N320017..**
20,0	20	30,00	60,00	125	4,00	18,80	**51N320027..**



- Center cutting.
- Coarse pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance d11	D	Tolerance h6 + / -
≤ 3	-0,020 / -0,080	≤ 3	0 / 0,006
> 3 to 6	-0,030 / -0,105	> 3 to 6	0 / 0,008
> 6 to 10	-0,040 / -0,130	> 6 to 10	0 / 0,009
> 10 to 18	-0,050 / -0,160	> 10 to 18	0 / 0,011
> 18 to 30	-0,065 / -0,195	> 18 to 30	0 / 0,013

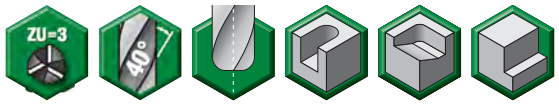
	N	
	1	2
Uncoated	●	●

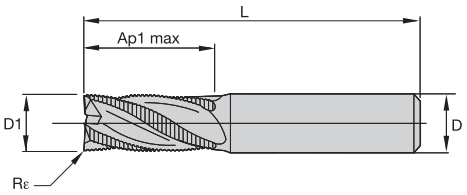
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A106.

D1	D	length of cut Ap1 max	length L	BCH	UNCOATED - ..	UNCOATED - WW
6,0	6	13,00	57	0,06	490906002..	490906002WW
8,0	8	16,00	63	0,25	490908003..	490908003WW
10,0	10	22,00	72	0,25	490910004..	490910004WW
12,0	12	26,00	83	0,35	490912005..	490912005WW
14,0	14	26,00	83	0,35	490914014..	490914014WW
16,0	16	32,00	92	1,00	490916006..	490916006WW
18,0	18	32,00	92	0,35	490918018..	490918018WW
20,0	20	38,00	104	1,00	490920007..	490920007WW
25,0	25	45,00	121	0,50	490925008..	490925008WW

- Center cutting.
- Chamfered pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





End Mill Tolerances

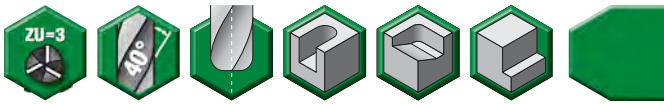
D1	Tolerance d11	D	Tolerance h6 + / -
≤ 3	-0,020 / -0,080	≤ 3	0 / 0,006
> 3 to 6	-0,030 / -0,105	> 3 to 6	0 / 0,008
> 6 to 10	-0,040 / -0,130	> 6 to 10	0 / 0,009
> 10 to 18	-0,050 / -0,160	> 10 to 18	0 / 0,011
> 18 to 30	-0,065 / -0,195	> 18 to 30	0 / 0,013

	N	
	1	2
Uncoated	●	●
TiCN	●	●

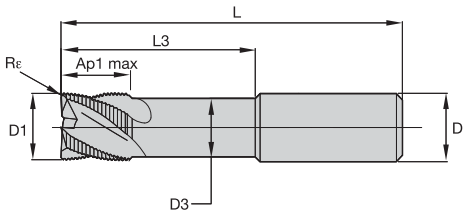
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A107.

D1	D	length of cut Ap1 max	length L	Rε	UNCOATED - ..	TiCN - CT
6,0	6	13,00	57	0,25	**497906002..**	**497906002CT**
8,0	8	16,00	63	0,25	**497908003..**	**497908003CT**
10,0	10	22,00	72	0,50	**497910004..**	**497910004CT**
12,0	12	26,00	83	0,50	**497912005..**	**497912005CT**
16,0	16	32,00	92	1,00	**497916006..**	**497916006CT**
20,0	20	38,00	104	1,00	**497920007..**	**497920007CT**
25,0	25	45,00	121	1,50	**497925008..**	**497925008CT**



- Center cutting.
- Chamfered pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance d11	D	Tolerance h6 + / -
≤ 3	-0,020 / -0,080	≤ 3	0 / 0,006
> 3 to 6	-0,030 / -0,105	> 3 to 6	0 / 0,008
> 6 to 10	-0,040 / -0,130	> 6 to 10	0 / 0,009
> 10 to 18	-0,050 / -0,160	> 10 to 18	0 / 0,011
> 18 to 30	-0,065 / -0,195	> 18 to 30	0 / 0,013

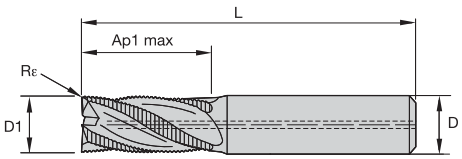
	N	
	1	2
Uncoated	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A107.

D1	D	length of cut Ap1 max	L3	length L	Rε	D3	UNCOATED - ..
6,0	6	8,00	18,00	57	0,25	5,00	**49N906002..**
8,0	8	10,00	24,00	63	0,25	7,00	**49N908003..**
10,0	10	12,00	30,00	72	0,50	9,00	**49N910004..**
12,0	12	15,00	36,00	83	0,50	11,00	**49N912005..**
16,0	16	20,00	48,00	92	1,00	15,00	**49N916006..**
20,0	20	24,00	60,00	104	1,00	19,00	**49N920007..**

- Center cutting.
- Chamfered pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance d11	D	Tolerance h6 + / -
≤ 3	-0,020 / -0,080	≤ 3	0 / 0,006
> 3 to 6	-0,030 / -0,105	> 3 to 6	0 / 0,008
> 6 to 10	-0,040 / -0,130	> 6 to 10	0 / 0,009
> 10 to 18	-0,050 / -0,160	> 10 to 18	0 / 0,011
> 18 to 30	-0,065 / -0,195	> 18 to 30	0 / 0,013

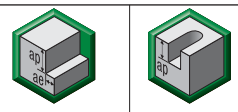
	N	
	1	2
Uncoated	●	●
TiCN	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A107.

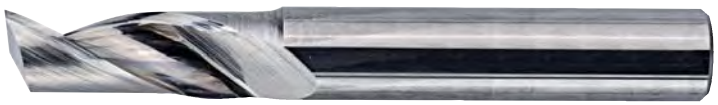
D1	D	length of cut Ap1 max	length L	Rε	TiCN - CT	TiCN - CW
8,0	8	16,00	63	0,25	**49G908003CT**	**49G908003CW**
10,0	10	22,00	72	0,50	**49G910004CT**	**49G910004CW**
12,0	12	26,00	83	0,50	**49G912005CT**	**49G912005CW**
16,0	16	32,00	92	1,00	**49G916006CT**	**49G916006CW**
20,0	20	38,00	104	1,00	**49G920007CT**	**49G920007CW**
25,0	25	45,00	121	1,50	**49G925008CT**	**49G925008CW**

List 524149



A

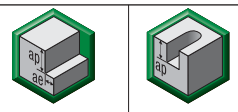
B



				K10F-DCL DLC				Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.						
				Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	mm	3,0	4,0	5,0	6,0	8,0	10,0	12,0
N1	1,2 x D	0,5 x D	1 x D	500	-	2000	Fz	0,021	0,028	0,035	0,042	0,056	0,070	0,084
N2	1,2 x D	0,5 x D	1 x D	500	-	1500	Fz	0,019	0,025	0,032	0,038	0,050	0,063	0,076
N3	1,2 x D	0,5 x D	1 x D	500	-	1500	Fz	0,017	0,022	0,028	0,034	0,045	0,056	0,067
N4	1,2 x D	0,5 x D	1 x D	250	-	750	Fz	0,015	0,020	0,025	0,029	0,039	0,049	0,059
N6	1,2 x D	0,5 x D	1 x D	100	-	500	Fz	0,021	0,028	0,035	0,042	0,056	0,070	0,084

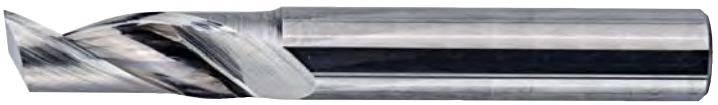
For better surface finish, reduce feed per tooth.

List 022849



A

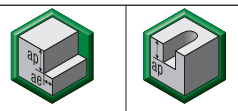
B



				K10F Uncoated				Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	mm	2,0	3,0	4,0	5,0	6,0	8,0	10,0	12,0
N1	1,2 x D	0,5 x D	1 x D	500	-	2000	Fz	0,014	0,021	0,028	0,035	0,042	0,056	0,070	0,084
N2	1,2 x D	0,5 x D	1 x D	500	-	1500	Fz	0,011	0,017	0,022	0,028	0,034	0,045	0,056	0,067

For better surface finish, reduce feed per tooth.

List D502



A

B

				Uncoated			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	Min		Max	mm	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
N1	1,2 x D	0,5 x D	1 x D	500	-	2000	500	-	2000	Fz	0,021	0,028	0,042	0,056	0,070	0,084	0,112	0,140
N2	1,2 x D	0,5 x D	1 x D	500	-	1500	500	-	1500	Fz	0,019	0,025	0,038	0,050	0,063	0,076	0,101	0,126

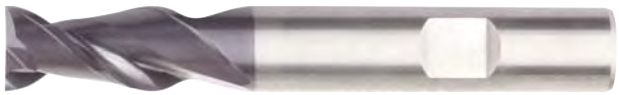
For cutting Aluminium with high silicon, TiAlN coating is recommended.

Multiply ap for milling machine spindle with ceramic bearings by 0,5.

For better surface finish, reduce feed per tooth.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422817 022817 422814 022814



	A		B	K10F Uncoated			K10F-TiAlN TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	Min		Max	mm	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
N1	1,2 x D	0,5 x D	1 x D	500	-	2000	500	-	2000	Fz	0,028	0,042	0,056	0,070	0,084	0,098	0,112	0,140
N2	1,2 x D	0,5 x D	1 x D	500	-	1500	500	-	1500	Fz	0,025	0,038	0,050	0,063	0,076	0,088	0,101	0,126

Multiply ap for milling machine spindle with ceramic bearings by 0,5.

For better surface finish, reduce feed per tooth.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4102

	A		B	Uncoated			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	mm	1,5	2,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
N1	1 x D	0,5 x D	1 x D	500	-	2000	Fz	0,014	0,018	0,036	0,054	0,072	0,090	0,108	0,144	0,180
N2	1 x D	0,5 x D	1 x D	500	-	1500	Fz	0,012	0,016	0,032	0,049	0,065	0,081	0,097	0,130	0,162

Multiply ap for milling machine spindle with ceramic bearings by 0,5.

For better surface finish, reduce feed per tooth.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 5102 • AluSurf™

	A		B	Uncoated			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	mm	1,5	2,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
N1	1,5 x D	0,5 x D	1 x D	500	-	2000	Fz	0,014	0,018	0,036	0,054	0,072	0,090	0,108	0,144	0,180
N2	1,5 x D	0,5 x D	1 x D	500	-	1500	Fz	0,012	0,016	0,032	0,049	0,065	0,081	0,097	0,130	0,162

Multiply ap for milling machine spindle with ceramic bearings by 0,5.

For better surface finish, reduce feed per tooth.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 524152 022852

	A		B	K10F Uncoated			K10F-DCL DLC			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	Min		Max	mm	3,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0
N1	1,2 x D	0,5 x D	1 x D	500	-	2000	500	-	2000	Fz	0,021	0,028	0,042	0,056	0,070	0,084	0,098	0,112
N2	1,2 x D	0,5 x D	1 x D	500	-	1500	500	-	1500	Fz	0,019	0,025	0,038	0,050	0,063	0,076	0,088	0,101
N3	1,2 x D	0,5 x D	1 x D				500	-	1500	Fz	0,017	0,022	0,034	0,045	0,056	0,067	0,078	0,090
N4	1,2 x D	0,5 x D	1 x D				400	-	750	Fz	0,015	0,020	0,029	0,039	0,049	0,059	0,069	0,078
N6	1,2 x D	0,5 x D	1 x D				750	-	1200	Fz	0,021	0,028	0,042	0,056	0,070	0,084	0,098	0,112

For cutting Aluminium with high silicon, DLC coating is recommended.

Multiply ap for milling machine spindle with ceramic bearings by 0,5.

For better surface finish, reduce feed per tooth.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 024101

	A		B	PCD PCD - PT			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.				
				Cutting Speed Vc m/min				D1 - Diameter			
Group	ap	ae	ap	Min		Max	mm	6,0	8,0	10,0	12,0
N2	1 x D	0,5 x D	0,7 x D	400	-	2500	Fz	0,055	0,075	0,095	0,100
N3	1 x D	0,5 x D	0,7 x D	300	-	1500	Fz	0,055	0,075	0,095	0,100
N4	1 x D	0,5 x D	0,7 x D	500	-	3000	Fz	0,055	0,075	0,095	0,100
N5	1 x D	0,5 x D	0,7 x D	200	-	1000	Fz	0,055	0,075	0,095	0,100
N6	1 x D	0,5 x D	0,7 x D	400	-	800	Fz	0,055	0,075	0,095	0,100

List 4103

	A		B	Uncoated			TiCN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	Min		Max	mm	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
N1	1 x D	0,5 x D	0,7 x D	500	-	2000	500	-	2000	Fz	0,027	0,036	0,054	0,072	0,090	0,108	0,144	0,180
N2	1 x D	0,5 x D	0,7 x D	500	-	1500	500	-	1500	Fz	0,024	0,032	0,049	0,065	0,081	0,097	0,130	0,162

For cutting Aluminium with high silicon, TiCN coating is recommended.

Multiply ap for milling machine spindle with ceramic bearings by 0,5.

For better surface finish, reduce feed per tooth.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 5103 • AluSurf™

A

B

Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 3,0	6,0	8,0	10,0	12,0	16,0	20,0
N1	1,5 x D	0,5 x D	1 x D	500	-	2000	Fz	0,027	0,054	0,072	0,090	0,108	0,144	0,180
N2	1,5 x D	0,5 x D	1 x D	500	-	1500	Fz	0,024	0,049	0,065	0,081	0,097	0,130	0,162

Multiply ap for milling machine spindle with ceramic bearings by 0,5.

For better surface finish, reduce feed per tooth.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 51N3 • AluSurf™

A

B

Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 6,0	8,0	10,0	12,0	16,0	20,0
N1	1 x D	0,5 x D	1 x D	500	-	2000	Fz	0,060	0,080	0,100	0,120	0,160	0,200
N2	1 x D	0,5 x D	1 x D	500	-	1500	Fz	0,054	0,072	0,090	0,108	0,144	0,180

Multiply ap for milling machine spindle with ceramic bearings by 0,5.

For better surface finish, reduce feed per tooth.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4909

A

B

Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 6,0	8,0	10,0	12,0	16,0	20,0	25,0
N1	1,5 x D	0,5 x D	1 x D	500	-	2000	Fz	0,066	0,088	0,110	0,132	0,176	0,220	0,275
N2	1,5 x D	0,5 x D	1 x D	500	-	1500	Fz	0,059	0,079	0,099	0,119	0,158	0,198	0,248

For cutting Aluminium with high silicon, TiCN coating is recommended.

Multiply ap for milling machine spindle with ceramic bearings by 0,5.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4979

A

B

				Uncoated			TiCN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	20,0	25,0
N1	1,5 x D	0,5 x D	1 x D	500	-	2000	500	-	2000	Fz	0,072	0,096	0,120	0,144	0,192	0,240	0,300
N2	1,5 x D	0,5 x D	1 x D	500	-	1500	500	-	1500	Fz	0,065	0,086	0,108	0,130	0,173	0,216	0,270

For cutting Aluminium with high silicon, TiCN coating is recommended.

Multiply ap for milling machine spindle with ceramic bearings by 0,5.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 49N9

A

B

				Uncoated			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	20,0	25,0
N1	1 x D	0,5 x D	1 x D	500	-	2000	Fz	0,078	0,104	0,130	0,156	0,208	0,260	0,325
N2	1 x D	0,5 x D	1 x D	500	-	1500	Fz	0,070	0,094	0,117	0,140	0,187	0,234	0,293

For cutting Aluminium with high silicon, TiCN coating is recommended.

Multiply ap for milling machine spindle with ceramic bearings by 0,5.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 49G9

A

B

				TiCN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.						
				Cutting Speed Vc m/min				D1 - Diameter					
Group	ap	ae	ap	Min		Max	mm	8,0	10,0	12,0	16,0	20,0	25,0
N1	1,5 x D	0,5 x D	1,25 x D	500	-	2000	Fz	0,096	0,120	0,144	0,192	0,240	0,300
N2	1,5 x D	0,5 x D	1,25 x D	500	-	1500	Fz	0,086	0,108	0,130	0,173	0,216	0,270

Multiply ap for milling machine spindle with ceramic bearings by 0,5.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

PCD-Tipped Custom Solutions

Increase tool life 30 times to 300 times part per tool with PCD solutions!

Our PCD-tipped tools are ideal for machining aluminium and magnesium alloys, copper, and brass, as well as glass-fiber and carbon-fiber reinforced plastics — with a cutting speed between 250 and 3.000 m/min.

The utilization of Polycrystalline Diamond (PCD) tipped tooling has expanded rapidly over the past 10 years within multiple industries. These tools have displaced traditional carbide and High-Speed Steel (HSS) tooling. The economic savings of utilizing PCD tooling for machining Non-Ferrous materials can be categorized in five key areas:

- Longer tool life enabling increased machine utilization and overall increased production.
- Higher productivity through increased metal removal rates.
- Superior surface finishes.
- Precise tolerance control.
- Strong resistance to abrasive wear, even when cutting speeds are extremely high.

In most cases where PCD tools have been evaluated against carbide tooling, customers have realized significant increases in tool life in the range of 30 times to 300 times parts per tool. This dramatic increase in tool life significantly decreases machine downtime, thereby increasing production throughput and lowering overall manufacturing costs per unit.

Global Capabilities and Local Service

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PCD Tooling Is Making a Big Impact in Technical Markets

Automotive

An industry segment which utilizes PCD and PCBN tooling in the machining of Aluminium, Powdered Metals, and Hardened Steel and Iron materials.

Telecommunications

A swiftly growing industry which incorporates the usage of PCD in the machining of Plastics, Fiberboard, Bronze, Brass, and Zinc materials.

Electronics

A growing and competitive industry which incorporates the usage of PCD in the machining of Plastics, Aluminium, Glass, and Copper materials.

Aerospace

An industry that has just begun to unlock the economic potential of PCD and PCBN tooling in the machining of target materials such as Phenolics, Graphite Composites, and Aluminiums.

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High-Performance Solid Carbide Finishers

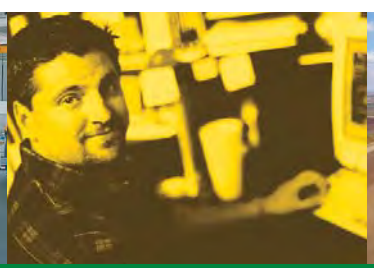
Choose WIDIA-Hanita for productivity that makes the difference.

The wide range of WIDIA-Hanita carbide finishing end mills provides our customers with precisely the right tool for the job at hand. Our standard offering includes high-performance styles for very specific and demanding applications. Whether you require higher metal removal rates, improved surface finishes, fewer passes, or simply longer tool life, WIDIA-Hanita offers an outstanding selection of tools for you.

Only the finest carbide substrate materials with the proper microstructure are used to ensure appropriate hardness, toughness, and stability. These tools are designed with focused geometries, are fully compliant with DIN, JIS, or NAS specifications, and are targeted at delivering superior productivity for the specific applications they were meant to serve. Enhancing the performance of these tools are our high-quality, in-house PVD coatings, including TiCN, TiAlN, and AlTiN, making WIDIA-Hanita products the finest, most consistent performers in the world.

WIDIA-Hanita carbide end mills deliver superior performance, reliably and consistently, from tool to tool and batch to batch.

- Specific geometries targeted for Steels, Stainless Steels, High-Temperature Alloys, and Titanium.
- Stub, regular, long, and extra-long lengths.
- Special designs with higher number of flutes for super finishing applications.
- Latest coating technology.



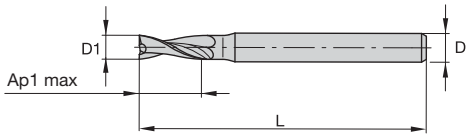
High-Performance Solid Carbide End Mills • Finishing

Finishing **A111–A134**

Application Data

Lists 423007 023007 . . . . . A112 . . . . . A127
List 4001 JJ . . . . . A113 . . . . . A127
Lists D503 D513 . . . . . A114 . . . . . A128
List DC03 . . . . . A115 . . . . . A129
List 4503 JJ . . . . . A116 . . . . . A130
Lists 022801 022804 322801 322804 422801 422804 022806 022802 322806 322802 422806 422802 . . . . . A117–A118 . . . . . A130
List 4603 . . . . . A119 . . . . . A131
Lists D507 D517 . . . . . A120 . . . . . A132
List 422827 . . . . . A121 . . . . . A133
List D518 . . . . . A122 . . . . . A133
List 026621 . . . . . A123 . . . . . A134
List 024112 . . . . . A124 . . . . . A134
List 024110 . . . . . A125 . . . . . A134
List 024111 . . . . . A126 . . . . . A134

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

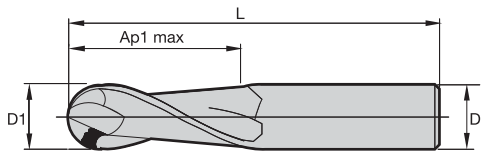
	P					M		K		N			S		H
	1	2	3	4	5	1	2	1	2	1	2	5	1	3	1
Uncoated	●	●	●			●		●							
AlTiN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A127.

D1	D	length of cut Ap1 max	length L	K30F UNCOATED - ..	K30F-DCHP AlTiN - MT
0,4	3	0,80	38	023007-000004	423007-000004
0,5	3	1,00	38	023007-000005	423007-000005
0,6	3	1,20	38	023007-000006	423007-000006
0,8	3	1,60	38	023007-000008	423007-000008
1,0	3	2,00	38	023007-000010	423007-000010
1,2	3	2,40	38	023007-000012	423007-000012
1,5	3	3,00	38	023007-000015	423007-000015
1,8	3	3,60	38	023007-000018	423007-000018
2,0	3	6,00	38	023007-000020	423007-000020
2,5	3	7,00	38	023007-000025	423007-000025
3,0	3	7,00	38	023007-000030	423007-000030

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8 + / -	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

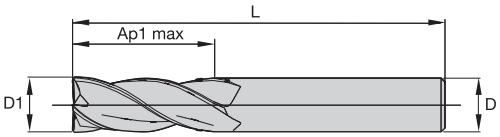
	P					M		K		N				S		H
	1	2	3	4	5	1	2	1	2	1	2	5	6	1	3	1
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A130.

D1	D	length of cut Ap1 max	length L	UNCOATED - JJ	TiAlN - RJ
2,0	4	3,00	50	—	400102001RJ
3,0	6	9,50	58	400103002JJ	400103002RJ
4,0	6	12,00	76	400104002JJ	400104002RJ
5,0	6	14,00	76	—	400105002RJ
6,0	6	16,00	100	400106002JJ	400106002RJ
8,0	8	20,00	100	400108003JJ	400108003RJ
10,0	10	22,00	100	400110004JJ	400110004RJ
12,0	12	25,00	125	400112005JJ	400112005RJ
14,0	14	32,00	125	400114005JJ	400114005RJ
16,0	16	32,00	150	400116006JJ	400116006RJ
18,0	16	38,00	150	400118006JJ	400118006RJ
20,0	20	38,00	150	400120007JJ	400120007RJ

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8 + / -	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

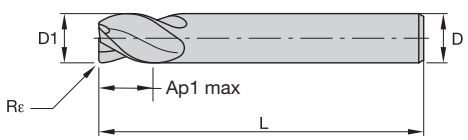
	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
Uncoated	●	●	●				●			●							
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A130.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiAlN - RW
2,0	6	3,00	50	D50302002WW	D50302002RW
3,0	6	4,00	50	D50303002WW	D50303002RW
3,0	6	7,00	57	D51303002WW	D51303002RW
4,0	6	5,00	54	D50304002WW	D50304002RW
4,0	6	8,00	57	D51304002WW	D51304002RW
5,0	6	6,00	54	D50305002WW	D50305002RW
5,0	6	10,00	57	D51305002WW	D51305002RW
6,0	6	7,00	54	D50306002WW	D50306002RW
6,0	6	10,00	57	D51306002WW	D51306002RW
8,0	8	9,00	58	D50308003WW	D50308003RW
8,0	8	16,00	63	D51308003WW	D51308003RW
10,0	10	11,00	66	D50310004WW	D50310004RW
10,0	10	19,00	72	D51310004WW	D51310004RW
12,0	12	12,00	73	D50312005WW	D50312005RW
12,0	12	22,00	83	D51312005WW	D51312005RW
14,0	14	14,00	75	–	D50314014RW
14,0	14	22,00	83	–	D51314014RW
16,0	16	16,00	82	D50316006WW	D50316006RW
16,0	16	26,00	92	D51316006WW	D51316006RW
18,0	18	26,00	92	D51318018WW	D51318018RW
20,0	20	20,00	92	–	D50320007RW
20,0	20	32,00	104	D51320007WW	D51320007RW

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

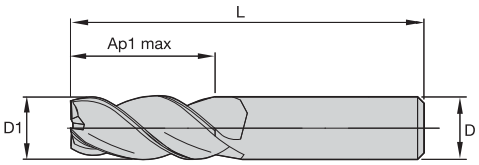
	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A129.

D1	D	length of cut Ap1 max	length L	Rε	TiAlN - LW
3,0	6	4,00	50	0,25	**DC0303002LW**
4,0	6	5,00	54	0,25	**DC0304002LW**
5,0	6	6,00	54	0,25	**DC0305002LW**
6,0	6	7,00	54	0,45	**DC0306002LW**
8,0	8	9,00	58	0,45	**DC0308003LW**
10,0	10	11,00	66	0,45	**DC0310004LW**
12,0	12	12,00	73	0,45	**DC0312005LW**
14,0	14	14,00	75	0,45	**DC0314014LW**
16,0	16	16,00	82	0,45	**DC0316006LW**
18,0	18	18,00	84	0,45	**DC0318018LW**
20,0	20	20,00	92	0,45	**DC0320007LW**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8 + / -	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

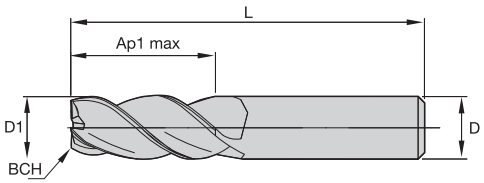
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A130.

D1	D	length of cut Ap1 max	length L	TiAlN - RJ
1,0	4	3,00	50	**450301001RJ**
1,5	4	3,00	50	**450301501RJ**
2,0	4	3,00	50	**450302001RJ**
2,5	4	4,00	50	**450302501RJ**
2,5	4	5,00	50	**450302511RJ**
3,0	6	8,00	50	**450303002RJ**
3,5	6	12,00	50	**450303502RJ**
4,0	6	12,00	50	**450304002RJ**
4,5	6	14,00	50	**450304502RJ**
5,0	6	14,00	50	**450305002RJ**
6,0	6	16,00	50	**450306002RJ**
8,0	8	20,00	63	**450308003RJ**
10,0	10	22,00	76	**450310004RJ**
12,0	12	25,00	76	**450312005RJ**
16,0	16	32,00	89	**450316006RJ**
20,0	20	38,00	104	**450320007RJ**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.

Chamfer Data		
	Corner Chamfer	
D1 h10	BCH	Tolerance
2 - 6,99	0,1	-0,05
7 - 9,99	0,2	-0,10
10 - 15,99	0,3	-0,10
16 - 20,00	0,4	-0,20



End Mill Tolerances			
D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
Uncoated	●	●	●				●			●							
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A130.

				K30F	K30F-TiCN	K30F-DCF	K30F	K30F-TiCN	K30F-DCF
		length of cut	length						
D1	D	Ap1 max	L	UNCOATED - ..	TiCN - CT	TiAlN - LT	UNCOATED - WW	TiCN - CW	TiAlN - LW
2,0	6	3,00	50	022801-000020	322801-000020	422801-000020	022802-000020	322802-000020	422802-000020
2,0	6	6,00	57	022804-000020	322804-000020	422804-000020	022806-000020	322806-000020	422806-000020
2,5	6	3,00	50	022801-000025	322801-000025	422801-000025	022802-000025	322802-000025	422802-000025
2,5	6	7,00	57	022804-000025	322804-000025	422804-000025	022806-000025	322806-000025	422806-000025
3,0	6	4,00	50	022801-000030	322801-000030	422801-000030	022802-000030	322802-000030	422802-000030
3,0	6	7,00	57	022804-000030	322804-000030	422804-000030	022806-000030	322806-000030	422806-000030
3,5	6	4,00	50	022801-000035	322801-000035	422801-000035	022802-000035	322802-000035	422802-000035
3,5	6	7,00	57	022804-000035	322804-000035	422804-000035	022806-000035	322806-000035	422806-000035
4,0	6	5,00	54	022801-000040	322801-000040	422801-000040	022802-000040	322802-000040	422802-000040
4,0	6	8,00	57	022804-000040	322804-000040	422804-000040	022806-000040	322806-000040	422806-000040
4,5	6	5,00	54	–	322801-000045	422801-000045	022802-000045	322802-000045	422802-000045
4,5	6	8,00	57	022804-000045	322804-000045	422804-000045	022806-000045	322806-000045	422806-000045
5,0	6	6,00	54	022801-000050	322801-000050	422801-000050	022802-000050	322802-000050	422802-000050
5,0	6	10,00	57	022804-000050	322804-000050	422804-000050	022806-000050	322806-000050	422806-000050
6,0	6	7,00	54	022801-000060	322801-000060	422801-000060	022802-000060	322802-000060	422802-000060
6,0	6	10,00	57	022804-000060	322804-000060	422804-000060	022806-000060	322806-000060	422806-000060

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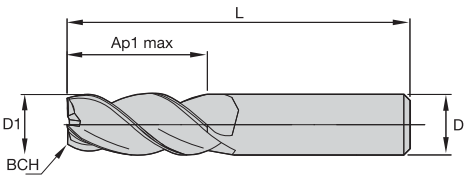


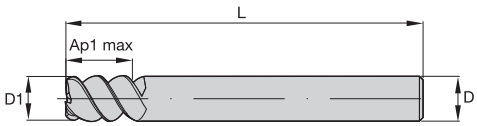
	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
Uncoated	●	●	●				●			●							
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A130.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiCN - CT	TiAlN - LT	UNCOATED - WW	TiCN - CW	TiAlN - LW
7,0	8	8,00	58	022801-000070	322801-000070	422801-000070	–	322802-000070	422802-000070
7,0	8	13,00	63	022804-000070	322804-000070	422804-000070	022806-000070	322806-000070	422806-000070
8,0	8	9,00	58	022801-000080	322801-000080	422801-000080	–	322802-000080	422802-000080
8,0	8	16,00	63	022804-000080	322804-000080	422804-000080	022806-000080	322806-000080	422806-000080
9,0	10	10,00	66	022801-000090	322801-000090	422801-000090	022802-000090	322802-000090	422802-000090
9,0	10	16,00	72	022804-000090	322804-000090	422804-000090	022806-000090	322806-000090	422806-000090
10,0	10	11,00	66	–	322801-000100	422801-000100	022802-000100	322802-000100	422802-000100
10,0	10	19,00	72	022804-000100	322804-000100	422804-000100	022806-000100	322806-000100	422806-000100
12,0	12	12,00	73	022801-000120	322801-000120	422801-000120	–	322802-000120	422802-000120
12,0	12	22,00	83	022804-000120	322804-000120	422804-000120	022806-000120	322806-000120	422806-000120
14,0	14	14,00	75	–	322801-000140	422801-000140	022802-000140	322802-000140	422802-000140
14,0	14	22,00	83	022804-000140	322804-000140	422804-000140	022806-000140	322806-000140	422806-000140
16,0	16	16,00	82	–	322801-000160	422801-000160	–	322802-000160	422802-000160
16,0	16	26,00	92	022804-000160	322804-000160	422804-000160	022806-000160	322806-000160	422806-000160
18,0	18	18,00	84	–	322801-000180	422801-000180	–	322802-000180	422802-000180
18,0	18	26,00	92	–	322804-000180	422804-000180	022806-000180	322806-000180	422806-000180
20,0	20	20,00	92	022801-000200	322801-000200	422801-000200	022802-000200	322802-000200	422802-000200
20,0	20	32,00	104	022804-000200	322804-000200	422804-000200	022806-000200	322806-000200	422806-000200

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

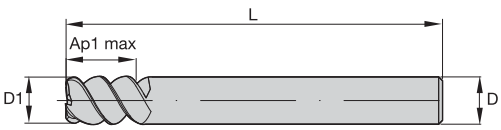
	P				M			K			S				H
	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A131.

D1	D	length of cut Ap1 max	length L	TiAlN - RT
3,0	6	8,00	57	**460303002RT**
4,0	6	11,00	57	**460304002RT**
5,0	6	13,00	57	**460305002RT**
6,0	6	13,00	57	**460306002RT**
8,0	8	19,00	63	**460308003RT**
10,0	10	22,00	72	**460310004RT**
12,0	12	26,00	83	**460312005RT**
16,0	16	32,00	92	**460316006RT**
20,0	20	38,00	104	**460320007RT**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

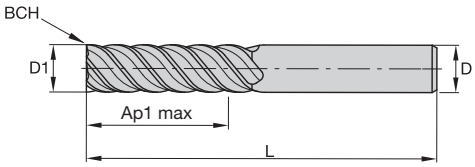
	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A132.

D1	D	length of cut Ap1 max	length L	TiCN - CW	TiAlN - RW
6,0	6	10,00	54	D50706002CW	D50706002RW
6,0	6	13,00	57	D51706002CW	D51706002RW
8,0	8	12,00	58	D50708003CW	D50708003RW
8,0	8	19,00	63	D51708003CW	D51708003RW
10,0	10	14,00	66	D50710004CW	D50710004RW
10,0	10	22,00	72	D51710004CW	D51710004RW
12,0	12	16,00	73	D50712005CW	D50712005RW
12,0	12	26,00	83	D51712005CW	D51712005RW
14,0	14	18,00	75	–	D50714014RW
14,0	14	26,00	83	D51714014CW	D51714014RW
16,0	16	22,00	82	D50716006CW	D50716006RW
16,0	16	32,00	92	D51716006CW	D51716006RW
18,0	18	24,00	84	D50718018CW	D50718018RW
18,0	18	32,00	92	D51718018CW	D51718018RW
20,0	20	26,00	92	D50720007CW	D50720007RW
20,0	20	38,00	104	D51720007CW	D51720007RW

- Non-center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

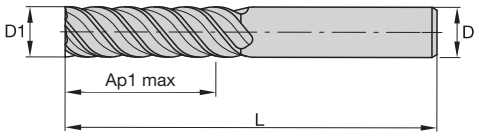
	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
AlTiN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A133.

D1	D	length of cut Ap1 max	length L	BCH	Z U	K30F-DCHP AlTiN - MT
6,0	6	18,00	62	0,10	6	**422827-000060**
8,0	8	24,00	68	0,20	6	**422827-000080**
10,0	10	30,00	80	0,30	6	**422827-000100**
12,0	12	36,00	93	0,30	6	**422827-000120**
16,0	16	48,00	108	0,30	6	**422827-000160**
20,0	20	60,00	126	0,40	8	**422827-000200**
25,0	25	75,00	150	0,40	8	**422827-000250**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

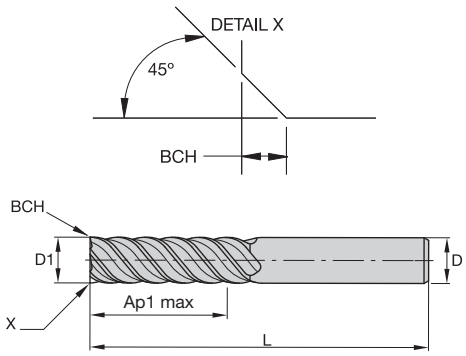
	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A132.

D1	D	length of cut Ap1 max	length L	Z U	TiAlN - RT	TiAlN - RW
4,0	6	11,00	57	4	D51804002RT	D51804002RW
5,0	6	13,00	57	4	D51805002RT	D51805002RW
6,0	6	13,00	57	6	D51806002RT	D51806002RW
7,0	8	16,00	63	6	D51807003RT	D51807003RW
8,0	8	19,00	63	6	D51808003RT	D51808003RW
9,0	10	19,00	72	6	D51809004RT	D51809004RW
10,0	10	22,00	72	6	D51810004RT	D51810004RW
12,0	12	26,00	83	6	D51812005RT	D51812005RW
14,0	14	26,00	83	6	D51814014RT	D51814014RW
16,0	16	32,00	92	8	D51816006RT	D51816006RW
18,0	18	32,00	92	8	D51818018RT	D51818018RW
20,0	20	38,00	104	8	D51820007RT	D51820007RW
25,0	25	45,00	121	8	D51825008RT	D51825008RW

- Non-center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

	P					K	
	1	2	3	4	5	2	3
Cermet	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A134.

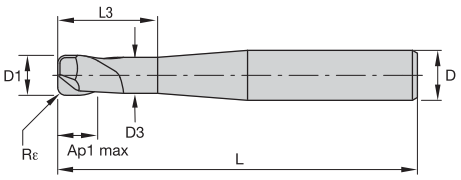
D1	D	length of cut Ap1 max	length L	BCH	Z U	CERMET UNCOATED - ET
6,0	6	13,00	57	0,10	4	026621-000060
8,0	8	19,00	63	0,20	4	026621-000080
10,0	10	22,00	72	0,30	4	026621-000100
12,0	12	26,00	83	0,30	6	026621-000120
14,0	14	26,00	83	0,30	6	026621-000140
16,0	16	32,00	92	0,40	8	026621-000160
18,0	18	32,00	92	0,40	8	026621-000180
20,0	20	38,00	104	0,40	8	026621-000200

Tech Tip

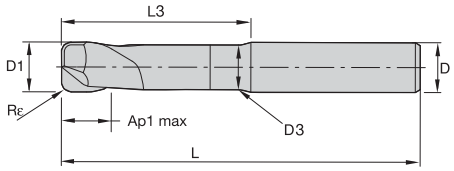
Cermet (Cer = ceramic, met = metal)

Cermet materials have been used for some time for turning and milling inserts. It is also possible to produce solid round tools from Cermet materials. The grades are made from hard materials such as TiN and TiC combined with Co and Ni. Closely monitored powder metallurgy and sintering are essential in the production of Cermet tools.

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



< 5mm



≥ 5mm

NEW!

End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

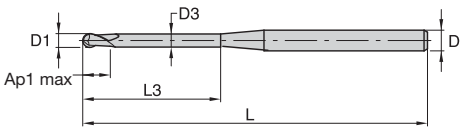
	N
	6
DIA	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A135.

D1	D	length of cut Ap1 max	L3	length L	Rε	D3	K10F-DIA DIAMOND - AT
2,0	6	2,00	17,50	70	0,20	1,90	**024112-002002**
2,0	6	2,00	17,50	70	0,50	1,90	**024112-002005**
3,0	6	3,00	18,50	70	0,50	2,90	**024112-003005**
4,0	6	4,00	19,50	80	0,50	3,80	**024112-004005**
5,0	6	5,00	40,00	80	0,50	4,80	**024112-005005**
6,0	6	6,00	42,00	80	0,50	5,80	**024112-006005**
8,0	8	8,00	50,00	90	1,00	7,80	**024112-008010**
10,0	10	10,00	56,00	100	2,00	9,70	**024112-010020**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

	N
DIA	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A135.

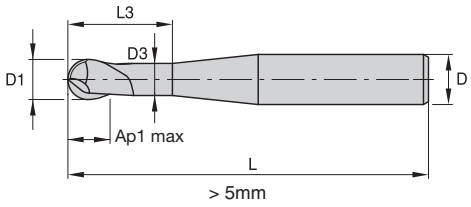
D1	D	length of cut Ap1 max	L3	length L	D3	K10F-DIA DIAMOND - AT
0,5	3	0,70	4,00	40	0,47	**024110-000405**
1,0	3	1,50	15,00	40	0,97	**024110-015010**
1,0	3	1,50	20,00	40	0,97	**024110-020010**
1,5	3	3,00	15,00	50	1,47	**024110-015015**
1,5	3	3,00	30,00	50	1,47	**024110-030015**
2,0	3	4,00	20,00	55	1,95	**024110-020020**
2,0	3	4,00	30,00	55	1,95	**024110-030020**
3,0	3	5,00	30,00	60	2,90	**024110-030030**
3,0	3	5,00	40,00	60	2,90	**024110-040030**

Tech Tip

High-Speed Milling of Workpieces Made Out of Graphite

Because of our DIA-coated HSC end mills, it is possible to machine components made out of graphite faster and in a considerably better quality than with conventional machining methods. This is achieved with our carbide grade K10F — higher wear resistance and longer tool life. The applied diamond coating increases the tool life 10 times compared to normal solid carbide end mills. Complex components are machined with one end mill in one clamping. Machining this way increases the quality of graphite electrodes and eliminates the need for extensive reworking.

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

	N
	6
DIA	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A135.

D1	D	length of cut Ap1 max	L3	length L	D3	K10F-DIA DIAMOND - AT
2,0	6	2,00	17,50	70	1,90	**024111-000020**
3,0	6	3,00	18,50	70	2,90	**024111-000030**
4,0	6	4,00	19,50	80	3,80	**024111-000040**
5,0	6	5,00	39,00	80	4,80	**024111-000050**
6,0	6	6,00	42,00	80	5,80	**024111-000060**
8,0	8	8,00	52,00	90	7,80	**024111-000080**
10,0	10	10,00	58,00	100	9,70	**024111-000100**
12,0	12	12,00	63,00	110	11,70	**024111-000120**

Lists 423007 023007

A

B

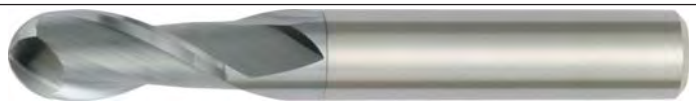
				Uncoated			K30F - DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	Min		Max	mm	0,4	0,6	0,8	1,0	1,2	1,5	2,0	3,0
P1	1 x D	0,1 x D	0,25 x D	72	-	88	150	-	200	Fz	0,003	0,004	0,005	0,007	0,008	0,010	0,014	0,020
P2	1 x D	0,1 x D	0,25 x D	64	-	80	140	-	190	Fz	0,003	0,004	0,005	0,007	0,008	0,010	0,014	0,020
P3	1 x D	0,1 x D	0,25 x D	48	-	64	120	-	160	Fz	0,002	0,003	0,004	0,006	0,007	0,008	0,011	0,017
P4	1 x D	0,1 x D	0,25 x D				90	-	150	Fz	0,002	0,003	0,004	0,005	0,006	0,008	0,010	0,016
P5	1 x D	0,1 x D	0,25 x D				60	-	100	Fz	0,002	0,003	0,004	0,005	0,006	0,007	0,009	0,014
M1	1 x D	0,1 x D	0,25 x D	80	-	100	90	-	115	Fz	0,002	0,003	0,004	0,006	0,007	0,008	0,011	0,017
M2	1 x D	0,1 x D	0,25 x D				60	-	80	Fz	0,002	0,003	0,004	0,005	0,006	0,007	0,009	0,014
K1	1 x D	0,1 x D	0,25 x D	48	-	60	120	-	150	Fz	0,003	0,004	0,005	0,007	0,008	0,010	0,014	0,020
K2	1 x D	0,1 x D	0,25 x D				110	-	130	Fz	0,002	0,003	0,004	0,006	0,007	0,008	0,011	0,017
N1	1 x D	0,1 x D	0,25 x D				500	-	2000	Fz	0,004	0,006	0,008	0,010	0,012	0,015	0,020	0,030
N2	1 x D	0,1 x D	0,25 x D				500	-	1500	Fz	0,003	0,005	0,006	0,008	0,010	0,012	0,016	0,024
N5	1 x D	0,1 x D	0,25 x D				500	-	1000	Fz	0,004	0,005	0,007	0,009	0,011	0,014	0,018	0,027
S1	1 x D	0,1 x D	0,25 x D				50	-	90	Fz	0,002	0,003	0,004	0,006	0,007	0,008	0,011	0,017
S3	1 x D	0,1 x D	0,25 x D				60	-	80	Fz	0,002	0,003	0,004	0,005	0,006	0,007	0,009	0,014
H1	1 x D	0,1 x D	0,25 x D				80	-	140	Fz	0,002	0,003	0,004	0,005	0,006	0,008	0,010	0,016

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4001 JJ • JIS

A

B



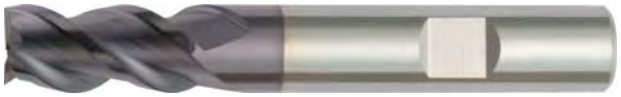
				Uncoated			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	Min		Max	mm	3,0	6,0	8,0	10,0	12,0	16,0	18,0	20,0
P1	1,25 x D	0,25 x D	0,5 x D	60	-	80	150	-	200	Fz	0,021	0,044	0,060	0,072	0,083	0,101	0,107	0,114
P2	1,25 x D	0,25 x D	0,5 x D	56	-	76	140	-	190	Fz	0,021	0,044	0,060	0,072	0,083	0,101	0,107	0,114
P3	1,25 x D	0,25 x D	0,5 x D				120	-	160	Fz	0,017	0,036	0,050	0,061	0,070	0,087	0,094	0,101
P4	1,25 x D	0,25 x D	0,5 x D				90	-	150	Fz	0,016	0,033	0,045	0,054	0,062	0,077	0,082	0,088
M1	1,25 x D	0,25 x D	0,5 x D				90	-	115	Fz	0,017	0,036	0,050	0,061	0,070	0,087	0,094	0,101
M2	1,25 x D	0,25 x D	0,5 x D				60	-	80	Fz	0,014	0,029	0,040	0,048	0,056	0,070	0,075	0,081
K1	1,25 x D	0,25 x D	0,5 x D				120	-	150	Fz	0,021	0,044	0,060	0,072	0,083	0,101	0,107	0,114
K2	1,25 x D	0,25 x D	0,5 x D				110	-	130	Fz	0,017	0,036	0,050	0,061	0,070	0,087	0,094	0,101
N1	1,25 x D	0,25 x D	0,5 x D	200	-	800	500	-	2000	Fz	0,030	0,060	0,080	0,100	0,120	0,160	0,180	0,200
N2	1,25 x D	0,25 x D	0,5 x D	200	-	600	500	-	1500	Fz	0,024	0,048	0,064	0,080	0,096	0,128	0,144	0,160
N5	1,25 x D	0,25 x D	0,5 x D	100	-	300	250	-	750	Fz	0,027	0,054	0,072	0,090	0,108	0,144	0,162	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D503

A

B



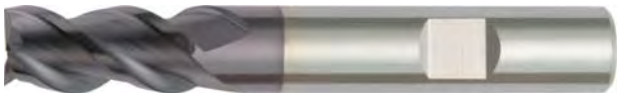
Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Max	TiAlN Cutting Speed Vc m/min Min	Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 2,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	0,75 x D	0,4 x D	0,5 x D	60	80	150	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	0,75 x D	0,4 x D	0,5 x D	56	76	140	190	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	0,75 x D	0,4 x D	0,5 x D	48	64	120	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	0,75 x D	0,4 x D	0,3 x D			90	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,077	0,088
P5	0,75 x D	0,4 x D	0,5 x D			60	100	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,081
P6	0,75 x D	0,4 x D	0,3 x D			50	75	Fz	0,008	0,016	0,025	0,034	0,040	0,047	0,057	0,065
M1	0,75 x D	0,4 x D	0,5 x D	32	40	80	100	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	0,75 x D	0,4 x D	0,5 x D			60	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,081
M3	0,75 x D	0,4 x D	0,5 x D			60	80	Fz	0,008	0,016	0,025	0,034	0,040	0,047	0,057	0,065
K1	0,75 x D	0,4 x D	0,5 x D	48	64	120	160	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	0,75 x D	0,4 x D	0,5 x D			110	140	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
K3	0,75 x D	0,4 x D	0,5 x D			100	130	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,081
S1	0,75 x D	0,4 x D	0,3 x D			90	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
S2	0,75 x D	0,4 x D	0,3 x D			20	40	Fz	0,006	0,013	0,019	0,026	0,032	0,037	0,046	0,054
S3	0,75 x D	0,4 x D	0,5 x D			50	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,081
S4	0,75 x D	0,4 x D	0,5 x D			45	65	Fz	0,007	0,016	0,026	0,037	0,045	0,052	0,064	0,074
H1	0,75 x D	0,4 x D	0,3 x D			100	140	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,077	0,088

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D513

A

B



Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Max	TiAlN Cutting Speed Vc m/min Min	Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 2,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	1,25 x D	0,2 x D	0,25 x D	60	80	150	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	1,25 x D	0,2 x D	0,25 x D	56	76	140	190	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	1,25 x D	0,2 x D	0,25 x D	48	64	120	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	1,25 x D	0,2 x D	0,25 x D			90	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,077	0,088
P5	1,25 x D	0,2 x D	0,25 x D			60	100	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,081
P6	1,25 x D	0,2 x D	0,25 x D			50	75	Fz	0,008	0,016	0,025	0,034	0,040	0,047	0,057	0,065
M1	1,25 x D	0,2 x D	0,25 x D	32	40	80	100	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	1,25 x D	0,2 x D	0,25 x D			60	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,081
M3	1,25 x D	0,2 x D	0,25 x D			60	80	Fz	0,008	0,016	0,025	0,034	0,040	0,047	0,057	0,065
K1	1,25 x D	0,2 x D	0,25 x D	48	64	120	160	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	1,25 x D	0,2 x D	0,25 x D			110	140	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
K3	1,25 x D	0,2 x D	0,25 x D			100	130	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,081
S1	1,25 x D	0,2 x D	0,25 x D			90	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
S2	1,25 x D	0,2 x D	0,25 x D			20	40	Fz	0,006	0,013	0,019	0,026	0,032	0,037	0,046	0,054
S3	1,25 x D	0,2 x D	0,25 x D			50	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,081
S4	1,25 x D	0,2 x D	0,25 x D			45	65	Fz	0,007	0,016	0,026	0,037	0,045	0,052	0,064	0,074
H1	1,25 x D	0,2 x D	0,25 x D			100	140	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,077	0,088

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List DC03

A

B

Group	A ap	A ae	B ap	TiAlN Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	0,75 x D	0,4 x D	0,5 x D	150	-	200	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	0,75 x D	0,4 x D	0,5 x D	140	-	190	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	0,75 x D	0,4 x D	0,5 x D	120	-	160	Fz	0,018	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	0,75 x D	0,4 x D	0,3 x D	90	-	150	Fz	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088
P5	0,75 x D	0,4 x D	0,5 x D	60	-	100	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
P6	0,75 x D	0,4 x D	0,3 x D	50	-	75	Fz	0,012	0,016	0,025	0,034	0,040	0,047	0,057	0,065
M1	0,75 x D	0,4 x D	0,5 x D	80	-	100	Fz	0,018	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	0,75 x D	0,4 x D	0,5 x D	60	-	80	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
M3	0,75 x D	0,4 x D	0,5 x D	60	-	80	Fz	0,012	0,016	0,025	0,034	0,040	0,047	0,057	0,065
K1	0,75 x D	0,4 x D	0,5 x D	120	-	160	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	0,75 x D	0,4 x D	0,5 x D	110	-	140	Fz	0,018	0,023	0,036	0,050	0,061	0,070	0,087	0,101
K3	0,75 x D	0,4 x D	0,5 x D	100	-	130	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
S1	0,75 x D	0,4 x D	0,3 x D	90	-	115	Fz	0,018	0,023	0,036	0,050	0,061	0,070	0,087	0,101
S2	0,75 x D	0,4 x D	0,3 x D	20	-	40	Fz	0,010	0,013	0,019	0,026	0,032	0,037	0,046	0,054
S3	0,75 x D	0,4 x D	0,5 x D	50	-	80	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
S4	0,75 x D	0,4 x D	0,5 x D	45	-	65	Fz	0,012	0,016	0,026	0,037	0,045	0,052	0,064	0,074
H1	0,75 x D	0,4 x D	0,3 x D	100	-	140	Fz	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 4503 JJ • JIS

A

B

Group	A ap	A ae	B ap	TiAlN Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 1,0	2,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	1,5 x D	0,3 x D	0,5 x D	150	-	200	Fz	0,007	0,014	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	1,5 x D	0,3 x D	0,5 x D	140	-	190	Fz	0,007	0,014	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	1,5 x D	0,3 x D	0,5 x D	160	-	180	Fz	0,006	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	1,5 x D	0,3 x D	0,3 x D	140	-	160	Fz	0,005	0,010	0,021	0,033	0,045	0,054	0,062	0,077	0,088
P5	1,5 x D	0,3 x D	0,5 x D	60	-	100	Fz	0,005	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,081
P6	1,5 x D	0,3 x D	0,3 x D	50	-	80	Fz	0,004	0,008	0,016	0,025	0,034	0,040	0,047	0,057	0,065
M1	1,5 x D	0,3 x D	0,5 x D	80	-	100	Fz	0,006	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	1,5 x D	0,3 x D	0,5 x D	60	-	80	Fz	0,005	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,081
M3	1,5 x D	0,3 x D	0,5 x D	60	-	80	Fz	0,004	0,008	0,016	0,025	0,034	0,040	0,047	0,057	0,065
K1	1,5 x D	0,3 x D	0,5 x D	120	-	160	Fz	0,007	0,014	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	1,5 x D	0,3 x D	0,5 x D	110	-	140	Fz	0,006	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
K3	1,5 x D	0,3 x D	0,5 x D	100	-	130	Fz	0,005	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,081
S1	1,5 x D	0,3 x D	0,5 x D	90	-	115	Fz	0,006	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
S2	1,5 x D	0,3 x D	0,5 x D	20	-	40	Fz	0,003	0,006	0,013	0,019	0,026	0,032	0,037	0,046	0,054
S3	1,5 x D	0,3 x D	0,5 x D	50	-	80	Fz	0,005	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,081
S4	1,5 x D	0,3 x D	0,5 x D	45	-	65	Fz	0,004	0,007	0,016	0,026	0,037	0,045	0,052	0,064	0,074
H1	1,5 x D	0,3 x D	0,3 x D	100	-	140	Fz	0,005	0,010	0,021	0,033	0,045	0,054	0,062	0,077	0,088

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 022801 022804 322801 322804 422801 422804 022806 022802 322806 322802 422806 422802

A

B

Group	A ap	A ae	B ap	K30F Uncoated Cutting Speed Vc m/min Min		Max	K30F-TiCN TiCN Cutting Speed Vc m/min Min		Max	K30F-DCF TiAlN Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P1	0,75 x D	0,4 x D	0,5 x D	48	-	64	96	-	128	120	-	160	Fz	—	—	—	—	—	—	—	—
P2	0,75 x D	0,4 x D	0,5 x D	48	-	64	96	-	128	120	-	160	Fz	—	—	—	—	—	—	—	—
P3	0,75 x D	0,4 x D	0,5 x D	48	-	64	96	-	128	120	-	160	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
P4	0,75 x D	0,4 x D	0,3 x D				72	-	120	90	-	150	Fz	0,017	0,026	0,036	0,043	0,050	0,061	0,070	0,078
P5	0,75 x D	0,4 x D	0,5 x D				48	-	80	60	-	100	Fz	0,015	0,024	0,032	0,039	0,045	0,056	0,065	0,073
P6	0,75 x D	0,4 x D	0,3 x D				40	-	60	50	-	75	Fz	0,013	0,020	0,027	0,032	0,037	0,046	0,052	0,057
M1	0,75 x D	0,4 x D	0,5 x D	32	-	40	64	-	80	80	-	100	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
M2	0,75 x D	0,4 x D	0,5 x D				48	-	64	60	-	80	Fz	0,015	0,024	0,032	0,039	0,045	0,056	0,065	0,073
M3	0,75 x D	0,4 x D	0,5 x D				48	-	64	60	-	80	Fz	0,013	0,020	0,027	0,032	0,037	0,046	0,052	0,057
K1	0,75 x D	0,4 x D	0,5 x D	48	-	64	96	-	128	120	-	160	Fz	0,023	0,035	0,048	0,058	0,066	0,081	0,091	0,099
K2	0,75 x D	0,4 x D	0,5 x D				88	-	112	110	-	140	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
K3	0,75 x D	0,4 x D	0,5 x D				80	-	104	100	-	130	Fz	0,015	0,024	0,032	0,039	0,045	0,056	0,065	0,073
S1	0,75 x D	0,4 x D	0,3 x D				40	-	72	50	-	90	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
S2	0,75 x D	0,4 x D	0,3 x D				16	-	32	20	-	40	Fz	0,010	0,016	0,021	0,026	0,030	0,037	0,043	0,049
S3	0,75 x D	0,4 x D	0,5 x D				40	-	64	50	-	80	Fz	0,015	0,024	0,032	0,039	0,045	0,056	0,065	0,073
S4	0,75 x D	0,4 x D	0,5 x D				36	-	52	45	-	65	Fz	0,013	0,021	0,029	0,036	0,041	0,051	0,059	0,067
H1	0,75 x D	0,4 x D	0,3 x D				64	-	112	80		140	Fz	0,017	0,026	0,036	0,043	0,050	0,061	0,070	0,078

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4603

A

B

Group	A ap	A ae	B ap	TiAlN Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), Reduce Fz by 20%. D1 - Diameter 3,0	4,0	5,0	6,0	8,0	10,0	12,0	16,0	20,0
P3	1,5 x D	0,3 x D	0,5 x D	120	-	160	Fz	0,015	0,019	0,024	0,029	0,040	0,048	0,056	0,070	0,081
P4	1,5 x D	0,3 x D	0,3 x D	90	-	150	Fz	0,013	0,017	0,022	0,026	0,036	0,043	0,050	0,061	0,070
P5	1,5 x D	0,3 x D	0,5 x D	60	-	100	Fz	0,012	0,015	0,019	0,024	0,032	0,039	0,045	0,056	0,065
P6	1,5 x D	0,3 x D	0,3 x D	50	-	75	Fz	0,010	0,013	0,016	0,020	0,027	0,032	0,037	0,046	0,052
M1	1,5 x D	0,3 x D	0,5 x D	80	-	100	Fz	0,015	0,019	0,024	0,029	0,040	0,048	0,056	0,070	0,081
M2	1,5 x D	0,3 x D	0,5 x D	60	-	80	Fz	0,012	0,015	0,019	0,024	0,032	0,039	0,045	0,056	0,065
M3	1,5 x D	0,3 x D	0,5 x D	60	-	80	Fz	0,010	0,013	0,016	0,020	0,027	0,032	0,037	0,046	0,052
K1	1,5 x D	0,3 x D	0,5 x D	120	-	160	Fz	0,018	0,023	0,029	0,035	0,048	0,058	0,066	0,081	0,091
K2	1,5 x D	0,3 x D	0,5 x D	110	-	140	Fz	0,015	0,019	0,024	0,029	0,040	0,048	0,056	0,070	0,081
K3	1,5 x D	0,3 x D	0,5 x D	100	-	130	Fz	0,012	0,015	0,019	0,024	0,032	0,039	0,045	0,056	0,065
S1	1,5 x D	0,3 x D	0,3 x D	50	-	90	Fz	0,015	0,019	0,024	0,029	0,040	0,048	0,056	0,070	0,081
S2	1,5 x D	0,3 x D	0,3 x D	20	-	40	Fz	0,008	0,010	0,013	0,016	0,021	0,026	0,030	0,037	0,043
S3	1,5 x D	0,3 x D	0,5 x D	50	-	80	Fz	0,012	0,015	0,019	0,024	0,032	0,039	0,045	0,056	0,065
S4	1,5 x D	0,3 x D	0,3 x D	45	-	65	Fz	0,010	0,013	0,017	0,021	0,029	0,036	0,041	0,051	0,059
H1	1,5 x D	0,3 x D	0,5 x D	80	-	140	Fz	0,013	0,017	0,022	0,026	0,036	0,043	0,050	0,061	0,070

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D507

A

			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).								
			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	Min		Max	Min		Max	mm	6,0	8,0	10,0	12,0	14,0	16,0	18,0	20,0
P1	1,0 x D	0,1 x D	120	-	160	150	-	200	Fz	0,044	0,060	0,072	0,083	0,092	0,101	0,108	0,114
P2	1,0 x D	0,1 x D	112	-	152	140	-	190	Fz	0,044	0,060	0,072	0,083	0,092	0,101	0,108	0,114
P3	1,0 x D	0,1 x D	96	-	128	120	-	160	Fz	0,036	0,050	0,061	0,070	0,079	0,087	0,095	0,101
P4	1,0 x D	0,1 x D	72	-	120	90	-	150	Fz	0,033	0,045	0,054	0,062	0,070	0,077	0,083	0,088
P5	1,0 x D	0,1 x D	48	-	80	60	-	100	Fz	0,029	0,040	0,048	0,056	0,063	0,070	0,076	0,081
P6	1,0 x D	0,1 x D	40	-	60	50	-	75	Fz	0,025	0,034	0,040	0,047	0,052	0,057	0,061	0,065
M1	1,0 x D	0,1 x D	64	-	80	80	-	100	Fz	0,036	0,050	0,061	0,070	0,079	0,087	0,095	0,101
M2	1,0 x D	0,1 x D	48	-	64	60	-	80	Fz	0,029	0,040	0,048	0,056	0,063	0,070	0,076	0,081
M3	1,0 x D	0,1 x D	48	-	64	60	-	80	Fz	0,025	0,034	0,040	0,047	0,052	0,057	0,061	0,065
K1	1,0 x D	0,1 x D	96	-	128	120	-	160	Fz	0,044	0,060	0,072	0,083	0,092	0,101	0,108	0,114
K2	1,0 x D	0,1 x D	88	-	112	110	-	140	Fz	0,036	0,050	0,061	0,070	0,079	0,087	0,095	0,101
K3	1,0 x D	0,1 x D	80	-	104	100	-	130	Fz	0,029	0,040	0,048	0,056	0,063	0,070	0,076	0,081
S1	1,0 x D	0,1 x D	40	-	72	50	-	90	Fz	0,036	0,050	0,061	0,070	0,079	0,087	0,095	0,101
S2	1,0 x D	0,1 x D	16	-	32	20	-	40	Fz	0,019	0,026	0,032	0,037	0,042	0,046	0,050	0,054
S3	1,0 x D	0,1 x D	40	-	64	50	-	80	Fz	0,029	0,040	0,048	0,056	0,063	0,070	0,076	0,081
S4	1,0 x D	0,1 x D	36	-	52	45	-	65	Fz	0,026	0,037	0,045	0,052	0,058	0,064	0,069	0,074
H1	1,0 x D	0,1 x D	64	-	112	80		140	Fz	0,033	0,045	0,054	0,062	0,070	0,077	0,083	0,088

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
For better surface finish, reduce feed per tooth.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D517

A

			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).								
			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	Min		Max	Min		Max	mm	6,0	8,0	10,0	12,0	14,0	16,0	18,0	20,0
P1	1,5 x D	0,05 x D	120	-	160	150	-	200	Fz	0,044	0,060	0,072	0,083	0,092	0,101	0,108	0,114
P2	1,5 x D	0,05 x D	112	-	152	140	-	190	Fz	0,044	0,060	0,072	0,083	0,092	0,101	0,108	0,114
P3	1,5 x D	0,05 x D	96	-	128	120	-	160	Fz	0,036	0,050	0,061	0,070	0,079	0,087	0,095	0,101
P4	1,5 x D	0,04 x D	72	-	120	90	-	150	Fz	0,033	0,045	0,054	0,062	0,070	0,077	0,083	0,088
P5	1,5 x D	0,05 x D	48	-	80	60	-	100	Fz	0,029	0,040	0,048	0,056	0,063	0,070	0,076	0,081
P6	1,5 x D	0,04 x D	40	-	60	50	-	75	Fz	0,025	0,034	0,040	0,047	0,052	0,057	0,061	0,065
M1	1,5 x D	0,05 x D	64	-	80	80	-	100	Fz	0,036	0,050	0,061	0,070	0,079	0,087	0,095	0,101
M2	1,5 x D	0,05 x D	48	-	64	60	-	80	Fz	0,029	0,040	0,048	0,056	0,063	0,070	0,076	0,081
M3	1,5 x D	0,05 x D	48	-	64	60	-	80	Fz	0,025	0,034	0,040	0,047	0,052	0,057	0,061	0,065
K1	1,5 x D	0,05 x D	96	-	128	120	-	160	Fz	0,044	0,060	0,072	0,083	0,092	0,101	0,108	0,114
K2	1,5 x D	0,05 x D	88	-	112	110	-	140	Fz	0,036	0,050	0,061	0,070	0,079	0,087	0,095	0,101
K3	1,5 x D	0,05 x D	80	-	104	100	-	130	Fz	0,029	0,040	0,048	0,056	0,063	0,070	0,076	0,081
S1	1,5 x D	0,04 x D	40	-	72	50	-	90	Fz	0,036	0,050	0,061	0,070	0,079	0,087	0,095	0,101
S2	1,5 x D	0,04 x D	16	-	32	20	-	40	Fz	0,019	0,026	0,032	0,037	0,042	0,046	0,050	0,054
S3	1,5 x D	0,05 x D	40	-	64	50	-	80	Fz	0,029	0,040	0,048	0,056	0,063	0,070	0,076	0,081
S4	1,5 x D	0,05 x D	36	-	52	45	-	65	Fz	0,026	0,037	0,045	0,052	0,058	0,064	0,069	0,074
H1	1,5 x D	0,04 x D	64	-	112	80	-	140	Fz	0,033	0,045	0,054	0,062	0,070	0,077	0,083	0,088

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
For better surface finish, reduce feed per tooth.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 422827

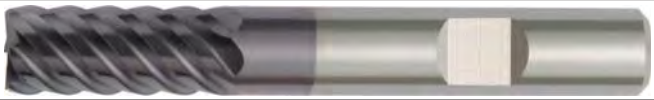
A

			K30F-DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).						
			Cutting Speed Vc m/min			D1 - Diameter						
Group	ap	ae	Min	Max	mm	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P1	3 x D	0,1 x D	150	200	Fz	0,044	0,060	0,072	0,083	0,101	0,114	0,124
P2	3 x D	0,1 x D	140	190	Fz	0,044	0,060	0,072	0,083	0,101	0,114	0,124
P3	3 x D	0,1 x D	120	160	Fz	0,036	0,050	0,061	0,070	0,087	0,101	0,114
P4	3 x D	0,1 x D	90	150	Fz	0,033	0,045	0,054	0,062	0,077	0,088	0,098
P5	3 x D	0,1 x D	60	100	Fz	0,029	0,040	0,048	0,056	0,070	0,081	0,091
P6	3 x D	0,1 x D	50	75	Fz	0,025	0,034	0,040	0,047	0,057	0,065	0,071
M1	3 x D	0,1 x D	80	100	Fz	0,036	0,050	0,061	0,070	0,087	0,101	0,114
M2	3 x D	0,1 x D	60	80	Fz	0,029	0,040	0,048	0,056	0,070	0,081	0,091
M3	3 x D	0,1 x D	60	80	Fz	0,025	0,034	0,040	0,047	0,057	0,065	0,071
K1	3 x D	0,1 x D	120	160	Fz	0,044	0,060	0,072	0,083	0,101	0,114	0,124
K2	3 x D	0,1 x D	110	140	Fz	0,036	0,050	0,061	0,070	0,087	0,101	0,114
K3	3 x D	0,1 x D	100	130	Fz	0,029	0,040	0,048	0,056	0,070	0,081	0,091
S1	3 x D	0,1 x D	90	115	Fz	0,036	0,050	0,061	0,070	0,087	0,101	0,114
S2	3 x D	0,1 x D	20	40	Fz	0,019	0,026	0,032	0,037	0,046	0,054	0,061
S3	3 x D	0,1 x D	50	80	Fz	0,029	0,040	0,048	0,056	0,070	0,081	0,091
S4	3 x D	0,1 x D	45	65	Fz	0,026	0,037	0,045	0,052	0,064	0,074	0,084
H1	3 x D	0,1 x D	100	140	Fz	0,033	0,045	0,054	0,062	0,077	0,088	0,098

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
For better surface finish, reduce feed per tooth.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D518 • Vision Plus™

A

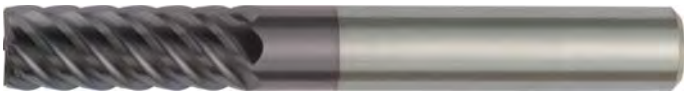


			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).							
			Cutting Speed Vc m/min			D1 - Diameter							
Group	ap	ae	Min	Max	mm	4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P1	1,5 x D	0,05 x D	150	200	Fz	0,028	0,044	0,060	0,072	0,083	0,101	0,114	0,124
P2	1,5 x D	0,05 x D	140	190	Fz	0,028	0,044	0,060	0,072	0,083	0,101	0,114	0,124
P3	1,5 x D	0,05 x D	120	160	Fz	0,023	0,036	0,050	0,061	0,070	0,087	0,101	0,114
P4	1,5 x D	0,05 x D	90	150	Fz	0,021	0,033	0,045	0,054	0,062	0,077	0,088	0,098
P5	1,5 x D	0,05 x D	60	100	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
P6	1,5 x D	0,05 x D	50	75	Fz	0,016	0,025	0,034	0,040	0,047	0,057	0,065	0,071
M1	1,5 x D	0,05 x D	80	100	Fz	0,023	0,036	0,050	0,061	0,070	0,087	0,101	0,114
M2	1,5 x D	0,05 x D	60	80	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
M3	1,5 x D	0,05 x D	60	80	Fz	0,016	0,025	0,034	0,040	0,047	0,057	0,065	0,071
K1	1,5 x D	0,05 x D	120	160	Fz	0,028	0,044	0,060	0,072	0,083	0,101	0,114	0,124
K2	1,5 x D	0,05 x D	110	140	Fz	0,023	0,036	0,050	0,061	0,070	0,087	0,101	0,114
K3	1,5 x D	0,05 x D	100	130	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
S1	1,5 x D	0,05 x D	50	90	Fz	0,023	0,036	0,050	0,061	0,070	0,087	0,101	0,114
S2	1,5 x D	0,05 x D	20	40	Fz	0,013	0,019	0,026	0,032	0,037	0,046	0,054	0,061
S3	1,5 x D	0,05 x D	50	80	Fz	0,019	0,029	0,040	0,048	0,056	0,070	0,081	0,091
S4	1,5 x D	0,05 x D	45	65	Fz	0,016	0,026	0,037	0,045	0,052	0,064	0,074	0,084
H1	1,5 x D	0,05 x D	80	140	Fz	0,021	0,033	0,045	0,054	0,062	0,077	0,088	0,098

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
For better surface finish, reduce feed per tooth.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

WIDIA HANITA

List 026621 • Cermet End Mill



	A		B	Cermet			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	mm	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	1,2 x D	0,25 x D	0,3 x D	170	-	190	Fz	0,037	0,045	0,062	0,070	0,075	0,080	0,110
P2	1,2 x D	0,25 x D	0,3 x D	150	-	170	Fz	0,037	0,045	0,062	0,070	0,075	0,080	0,110
P3	1,2 x D	0,25 x D	0,3 x D	145	-	160	Fz	0,037	0,045	0,062	0,070	0,075	0,080	0,110
P4	1,2 x D	0,25 x D	0,3 x D	125	-	135	Fz	0,037	0,045	0,062	0,070	0,075	0,080	0,110
P5	1,2 x D	0,25 x D	0,3 x D	100	-	120	Fz	0,028	0,035	0,048	0,050	0,060	0,070	0,085
K2	1,2 x D	0,25 x D	0,3 x D	180	-	215	Fz	0,037	0,045	0,062	0,070	0,075	0,080	0,110
K3	1,2 x D	0,25 x D	0,3 x D	150	-	180	Fz	0,037	0,045	0,062	0,070	0,075	0,080	0,110

No slotting for tools with 8 flutes; for 6 flutes ap 0,15 x D.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 024110

	A		B	K10F-DIA DIA			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.					
				Cutting Speed Vc m/min				D1 - Diameter				
Group	ap	ae	ap	Min		Max	mm	0,5	1,0	1,5	2,0	3,0
N6	0,7 x D	0,5 x D	0,5 x D	100	-	500	Fz	0,0050	0,0100	0,0150	0,0200	0,0300

List 024111

	A		B	K10F-DIA DIA			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling.						
				Cutting Speed Vc m/min				D1 - Diameter					
Group	ap	ae	ap	Min		Max	mm	2,0	4,0	6,0	8,0	10,0	12,0
N6	0,7 x D	0,5 x D	0,5 x D	100	-	500	Fz	0,020	0,040	0,060	0,080	0,100	0,120

List 024112

	A		B	K10F-DIA DIA			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	mm	2,0	3,0	4,0	5,0	6,0	8,0	10,0
N6	0,7 x D	0,5 x D	0,5 x D	100	-	500	Fz	0,020	0,030	0,040	0,050	0,060	0,080	0,100

Material Group	Description	Content	Tensile Strength RM (MPa)*	Hardness (HB)	Hardness (HRC)	DIN Standards
P1	Low-Carbon Steels, Long Chipping	C <.25%	<530	<125	—	P St 37-3, C 15, GS-38 Cq10
P2	Low-Carbon Steels, Free Machining, Short Chipping	C <.25%	<650	<220	<25	33 Mn 6, 9 SMn 28, 20 Mn 5, 17 Cr 3
P3	Medium-, High-Plain Carbon Steels, Low-Alloyed	C >.25%	600–850	<330	<35	C 75, Ck 45, C 70 W1, 90 MnCrV 8, 42 CrMo 4 16MnCr5, ST52
P4	Alloyed, Tempered Carbon Steels, Tool	C >.25 %	800–1100	350–450	35–48	100 Cr 6, 105 MnCr4, 51 CrMnV 4, 105 WCr 6, 100 Cr 2
P5	Ferritic, Martensitic, PH Stainless Steels	C = 0–.4%	600–850	<330	<35	X 6 Cr 13, X 10 Cr 13, X 20 Cr 13, X 12 CrMoS 17, X 20 CrMo 13
P6	High-Strength Ferritic, Martensitic, PH Stainless Steels	C = .1–.6%	900–1350	350–450	35–48	X 40 CrMoV 5 1, H1, X 155 CrVMo 12 1, S 6-5-2-5, X 45 Cr 13, X 120 Mn12
M1	Austenitic Stainless Steel	C = .05–.15%	<650	130–200	—	X 5 CrNi 18 10, GX 6 CrNiMo 18 10, X 6 CrNiMoTi 17 12 2, X 8 CrNiMoAl 15 7 2
M2	High-Strength Austenitic Stainless, Cast Stainless Steels	C = .05–.15%	500–700	150–230	<25	X 2 CrNiMo 13 4, X 10 CrNi18 9, X 5 CrNiCuNb 17 4 4
M3	Duplex Steel	C = .05–.2%	<900	135–275	<30	X 2 CrNiMoN 23 15, X 20 CrNiSi 25 4, GX 40 CrNiSi 27 4, X 2 CrNiMoN 22 5 3
K1	Gray Cast, Low-Strength Ductile Irons	—	150–400	120–290	<32	GG-10, GG-15, GG-20, GG -25, GG- 40
K2	Low-, Medium-Strength CGI, Ductile Irons	—	400–600	130–260	<28	GGG-35.3, GGG- 40.3, GGG-70
K3	High-Strength Ductile, Austempered Ductile Iron	—	600–900	180–350	<38	GTW-35-04, GTW-65, GTS-35-10, GTS-45-06
N1	Wrought Aluminium Alloys	—	<520	60–90	—	Al99.5, AlCuMgPb, AlMg 1, SG-AlMg 5
N2	Cast Aluminium	Si <12.2%	<350	70–100	—	G-AlSi 9 Mg, G-AlSi 10 Mg, G-AlSi 10 Mg(Cu), SG-AlSi 12, G-AlSi 7 Mg
N3	Cast Aluminiums	Si >12.2%	200–320	60–120	—	G-AlSi17Cu4Mg, GK-AlSi18CuNiMg, GK-AlSi21CuNiMg
N4	MMCs (Aluminium-Based Metal Matrix)	—	<700	210	—	GFK, CFK
N5	Copper, Copper Alloys	—	200–650	60–200	—	CuZn 20, CuSn 2, CuNi 18 Zn 19 Pb
N6	Carbon, Graphite Composites	—	600–1500	—	—	Graphite, CFK, CFRP
S1	Iron-Based, Heat-Resistant Alloys	—	500–1200	160–260	—	X 2 NiCrAlTi 32 20, X 1 NiCrMoCu 32 28 7, X 12 NiCr 36 18, x 12 NiCrSi 35 16
S2	Nickel-Based or Cobalt-Based, Heat-Resistant Alloys	—	1000–1450	250–450	25–48	X 12 CrNiMn 18 88, Alloy 222 (Ni99,7Mg0,07), NiCr 20 Mo, NiCr 19 FeNbMo
S3	Titanium	—	900–1600	300–400	33–43	Ti 3, Ti 4, TiAl 3 V2.5
S4	Titanium Alloys	—	900–1600	300–400	33–43	TiAl 5 Fe 2,5, TiAl 6 V 4, TiAl 4 Mo 4 Sn 2
H1	Hardened Steels, Irons	—	—	<460	<48	—
H2	Hardened Steels, Irons	—	—	460–560	48–55	—
H3	Hardened Steels, Irons	—	—	560–650	56–60	—
H4	Hardened Steels, Irons	—	—	>650	>60	—

* 1 MPa = 145 psi

Solid End Mill Custom Solutions

Fast response and superior performance when you need it.

Our Custom Solutions provide exceptional application and design engineering services. Whether you need tools produced according to a blueprint, a finished part, or a drawing; assistance in process development; or expertise in optimizing an application, our world renowned Advanced Engineering Team is available.

Our engineering departments are fully integrated with specialized production cells located in our focused factories throughout the world. ISO Certified manufacturing facilities, with state-of-the-art CNC equipment, simulation capability, CAD/CAM production, and inspection processes, ensure that customers receive the highest quality product with accurate compliance to specifications and repeatability for future production.

Custom Solution Services:

- Blueprint Specials
- Complex Geometries
- Form Tools
- Modified Standards
- Application Engineering and Optimization
- Tool Design
- Project Development

Contact your local Distributor for more information.

On the Web

Fast, Free, and Easy Registration

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Our world-class products and services make us a premier tooling manufacturer globally. Our distributors know us, and more importantly, they know you. They know better than anyone in the industry how to put the global power of WIDIA to work for you — in your industry, in your region, and for your business.

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Our customers are important to us. We want to provide you the best customer service in the industry.
If you have a comment or question, please send it to us. We strive to respond to all inquiries within 24 hours.

WIDIA Products

Whether your operation is turning, milling, or holemaking, WIDIA brand products provide the high-performance tooling you need. We offer standard and custom solutions for the general engineering market.

Customer Application Support:

Austria	**Phone:**	**0800 291630**
	Fax:	0800 291631
Belgium	**Phone:**	**0800 80410**
	Fax:	0800 80411
Denmark	**Phone:**	**80889295**
	Fax:	80889297
Finland	**Phone:**	**0800919413**
	Fax:	0800919415
France	**Phone:**	**0805540379**
	Fax:	0805540029
Germany	**Phone:**	**0800 1015774**
	Fax:	0800 0007531
Italy	**Phone:**	**800 916568**
	Fax:	800 917749
Netherlands	**Phone:**	**0800 0201131**
	Fax:	0800 0201135
North America	**Phone:**	**877 724 4040**
Norway	**Phone:**	**80010081**
	Fax:	800 10001
Poland	**Phone:**	**00800 4411943**
	Fax:	00800 4411940
South Africa	**Phone:**	**0800 981644**
	Fax:	0800 981645
Sweden	**Phone:**	**020798794**
	Fax:	020790477
United Kingdom	**Phone:**	**0800 028 2996**
	Fax:	0800 028 5721

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High-Performance Solid Carbide Roughers

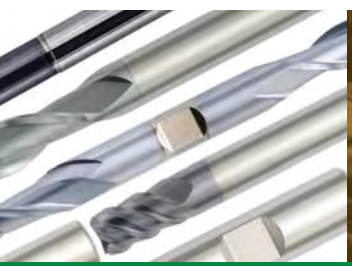
Carbide Roughers and Semi-Finishers designed for high metal removal rates.

WIDIA-Hanita brand roughers provide the unique sinusoidal profiles and chipbreaker forms required to attain the objective of maximum metal removal capability. Far more than just a given pitch size, WIDIA-Hanita profile designs are uniquely formed and fine–tuned to optimize chip form, size, and speed of evacuation generated by a given workpiece material.

Special proprietary carbide substrate materials and in-house, high-quality PVD coatings combine with these unique geometries to provide WIDIA-Hanita users with the capability to significantly reduce machining time with heavier and deeper cuts, fewer passes, and faster surface speed.

Reduce machine time with deeper, heavier cuts:

- For all Ferrous materials.
- Low power consumption at high speeds with long tool life.
- Provide maximum metal removal rates in both slotting and profiling operations.
- Available in:
  - Stub, regular, and long lengths.
  - TiCN and TiAlN coatings.



High-Performance Solid Carbide End Mills • Roughing

Roughing **A139–A153**

Application Data

List DQ13 . . . . . A141
List 49H6 . . . . . A142
Lists 422152 422150 . . . . . A143
List 4976 . . . . . A144
Lists 422824 422820 . . . . . A145
Lists 422141 442140 422143 422142 . . . . . A146
List 4940 . . . . . A147
List 4970 . . . . . A148

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Rougher Profiles

For maximum metal removal

Roughing end mills come in a variety of profiles — coarse, fine, extra-fine, and specifically designed profiles for specific materials. Choosing the right profile enables you to remove the largest amount of material in a given amount of time with the longest tool life. Roughers require less horsepower than finishers, but provide higher metal removal rates and more wear resistance. In general, the finer the profile, the less horsepower required. The specific material and depth of cut will help you determine the most efficient profile for your application.

Finishing End Mill	Fine-Profile Rougher	Semi-Finishing End Mill	Coarse Profile Rougher
Straight cutting edge Ra = 0,5–0,8 Rz = 4–6	Cord profile Ra = 12–14 Rz = 90–110	Flat profile Ra = 2,5–3,5 Rz = 20–25	Roughing profile Ra = 2,5–3,5 Rz = 20–25

Coarse profile
For slotting pocketing and heavy profile cuts in Ferrous materials.

Fine profile
For profile cuts and shallow slots (less than 1,27) in Ferrous materials.

WavCut™ profile
For for heavy machining of Titanium.

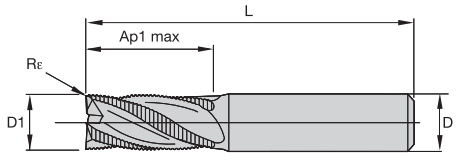
Extra-Fine profile
For profiling cuts in medium to hard Steels.

Chamfered profile
For machining Non-Ferrous materials.

Flat Shallow profile
For machining Alloyed Steels, Stainless Steels, High-Temp Alloys, Titanium, and Hard Materials.

Chipbreaker profile
For roughing and semi-finishing.

- Center cutting.
- Chipbreaker pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h11 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,060	≤ 3	0 / 0,006
> 3 to 6	0 / 0,075	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,09	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,11	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,13	> 18 to 30	0 / 0,013

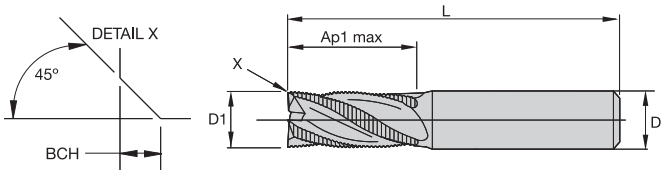
	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

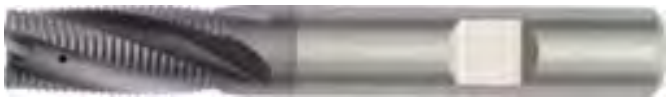
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A149.

D1	D	length of cut Ap1 max	length L	Rε	TiAlN - LW
3,0	6	7,00	54	0,25	**DQ1303002LW**
4,0	6	8,00	57	0,25	**DQ1304002LW**
5,0	6	10,00	57	0,25	**DQ1305002LW**
6,0	6	10,00	57	0,45	**DQ1306002LW**
7,0	8	13,00	63	0,45	**DQ1307003LW**
8,0	8	16,00	63	0,45	**DQ1308003LW**
10,0	10	19,00	72	0,45	**DQ1310004LW**
12,0	12	22,00	83	0,45	**DQ1312005LW**
14,0	14	22,00	83	0,45	**DQ1314014LW**
16,0	16	32,00	92	0,45	**DQ1316006LW**
18,0	18	32,00	92	0,45	**DQ1318018LW**
20,0	20	38,00	104	0,45	**DQ1320007LW**

- Center cutting.
- Fine pitch.
- TiAlN-LW = Multi-Layer.
- TiAlN-RW = Mono-Layer.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





End Mill Tolerances

D1	Tolerance h11 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,060	≤ 3	0 / 0,006
> 3 to 6	0 / 0,075	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,09	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,11	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,13	> 18 to 30	0 / 0,013

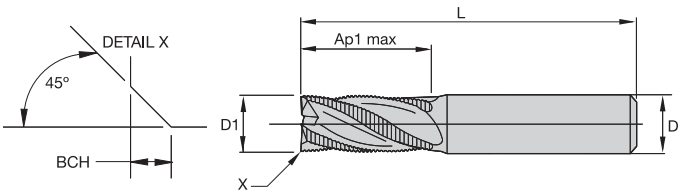
	P					M			K			S		H	
	1	2	3	4	5	1	2	3	1	2	3	1	3	1	2
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A149.

D1	D	length of cut Ap1 max	length L	BCH	TiAlN - LW	TiAlN - RW
8,0	8	16,00	63	0,25	**49H608003LW**	**49H608003RW**
10,0	10	22,00	72	0,25	**49H610004LW**	**49H610004RW**
12,0	12	26,00	83	0,35	–	**49H612005RW**
14,0	14	26,00	83	0,35	**49H614014LW**	**49H614014RW**
16,0	16	32,00	92	0,35	**49H616006LW**	**49H616006RW**
18,0	18	32,00	92	0,35	**49H618018LW**	**49H618018RW**
20,0	20	38,00	104	0,35	**49H620007LW**	**49H620007RW**

- Center cutting.
- Cord profile.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

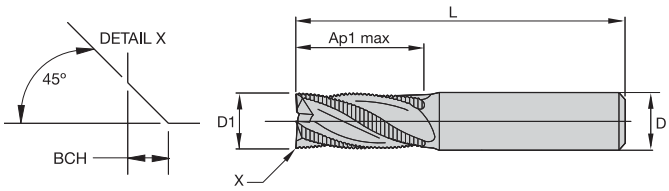
	P					K			S	H
	1	2	3	4	5	1	2	3	1	1
AlTiN	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A150.

D1	D	length of cut Ap1 max	length L	BCH	K30F-DCHP AlTiN - MT	K30F-DCHP AlTiN - MW
6,0	6	13,00	57	0,10	422150-000060	422152-000060
8,0	8	19,00	63	0,20	422150-000080	422152-000080
10,0	10	22,00	72	0,30	422150-000100	422152-000100
12,0	12	26,00	83	0,30	422150-000120	422152-000120
16,0	16	32,00	92	0,40	422150-000160	422152-000160
20,0	20	38,00	104	0,40	422150-000200	422152-000200
25,0	25	45,00	121	0,40	422150-000250	422152-000250

- Center cutting.
- Flat shallow pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

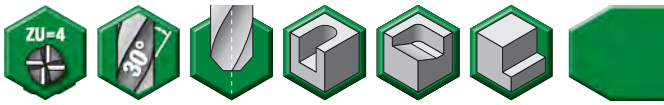
D1	Tolerance d11	D	Tolerance h6 + / -
≤ 3	-0,020 / -0,080	≤ 3	0 / 0,006
> 3 to 6	-0,030 / -0,105	> 3 to 6	0 / 0,008
> 6 to 10	-0,040 / -0,130	> 6 to 10	0 / 0,009
> 10 to 18	-0,050 / -0,160	> 10 to 18	0 / 0,011
> 18 to 30	-0,065 / -0,195	> 18 to 30	0 / 0,013

	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
AlTiN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

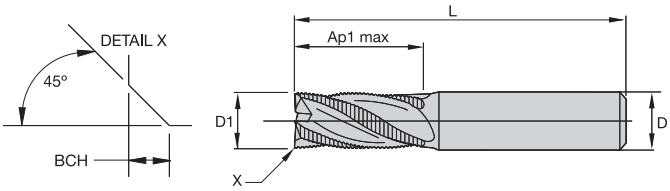
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A150.

D1	D	length of cut Ap1 max	length L	BCH	Z U	AlTiN - MT
4,0	6	8,00	57	0,25	3	**497604002MT**
5,0	6	13,00	57	0,25	3	**497605002MT**
6,0	6	13,00	57	0,25	3	**497606002MT**
8,0	8	16,00	63	0,25	3	**497608003MT**
10,0	10	22,00	72	0,25	4	**497610004MT**
12,0	12	26,00	83	0,35	4	**497612005MT**
14,0	14	26,00	83	0,35	4	**497614014MT**
16,0	16	32,00	92	0,35	4	**497616006MT**
18,0	18	32,00	92	0,35	4	**497618018MT**
20,0	20	38,00	104	0,35	4	**497620007MT**
25,0	25	45,00	121	0,50	5	**497625008MT**



- Center cutting.
- Flat shallow pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,040	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

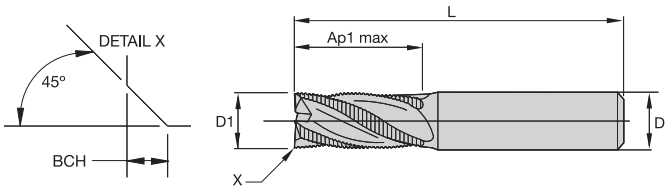
	P						M		K			S	H
	1	2	3	4	5	6	1	3	1	2	3	1	1
AlTiN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A151.

D1	D	length of cut Ap1 max	length L	BCH	K30F-DCHP AlTiN - MT	K30F-DCHP AlTiN - MW
6,0	6	18,00	62	0,10	422820-000060	422824-000060
8,0	8	24,00	68	0,20	422820-000080	422824-000080
10,0	10	30,00	80	0,30	422820-000100	422824-000100
12,0	12	36,00	93	0,30	422820-000120	422824-000120
16,0	16	48,00	108	0,40	422820-000160	422824-000160
20,0	20	60,00	126	0,40	422820-000200	422824-000200
25,0	25	75,00	150	0,40	422820-000250	422824-000250

- Center cutting.
- Coarse pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance k12	D	Tolerance h6 + / -
≤ 3	+0,100 / -0,0	≤ 3	0 / 0,006
> 3 to 6	+0,120 / -0,0	> 3 to 6	0 / 0,008
> 6 to 10	+0,150 / -0,0	> 6 to 10	0 / 0,009
> 10 to 18	+0,180 / -0,0	> 10 to 18	0 / 0,011
> 18 to 30	+0,210 / -0,0	> 18 to 30	0 / 0,013

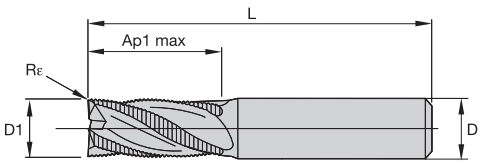
	P						M		K			S	H
	1	2	3	4	5	6	1	3	1	2	3	1	1
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A152.

D1	D	length of cut Ap1 max	length L	BCH	K30F-DCF TiAlN - LT	K30F-DCF TiAlN - LW
6,0	6	13,00	57	0,40	422140-000060	422141-000060
6,0	6	24,00	68	0,40	422142-000060	422143-000060
8,0	8	19,00	63	0,40	422140-000080	422141-000080
8,0	8	38,00	88	0,40	422142-000080	422143-000080
10,0	10	22,00	72	0,53	422140-000100	422141-000100
10,0	10	45,00	95	0,53	422142-000100	422143-000100
12,0	12	26,00	83	0,67	422140-000120	422141-000120
12,0	12	53,00	110	0,67	422142-000120	422143-000120
16,0	16	32,00	92	0,83	422140-000160	422141-000160
16,0	16	63,00	123	0,83	422142-000160	422143-000160
20,0	20	38,00	104	0,83	422140-000200	422141-000200
20,0	20	75,00	141	0,83	422142-000200	422143-000200

- Center cutting.
- Flat shallow pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance d11	D	Tolerance h6 + / -
≤ 3	-0,020 / -0,080	≤ 3	0 / 0,006
> 3 to 6	-0,030 / -0,105	> 3 to 6	0 / 0,008
> 6 to 10	-0,040 / -0,130	> 6 to 10	0 / 0,009
> 10 to 18	-0,050 / -0,160	> 10 to 18	0 / 0,011
> 18 to 30	-0,065 / -0,195	> 18 to 30	0 / 0,013

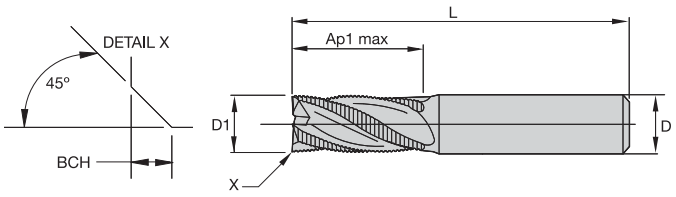
	P				M			K			S				H		
	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

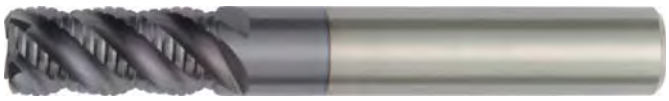
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A153.

D1	D	length of cut Ap1 max	length L	Rε	Z U	TiAlN - LT
6,0	6	6,00	57	0,75	4	**494006002LT**
8,0	8	8,00	63	0,75	4	**494008003LT**
10,0	10	10,00	72	0,75	4	**494010004LT**
12,0	12	12,00	83	1,00	4	**494012005LT**
16,0	16	16,00	92	1,00	6	**494016006LT**
20,0	20	20,00	104	1,25	6	**494020007LT**
25,0	25	25,00	121	1,25	6	**494025008LT**

- Center cutting.
- Flat shallow pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





End Mill Tolerances

D1	Tolerance d11	D	Tolerance h6 + / -
≤ 3	-0,020 / -0,080	≤ 3	0 / 0,006
> 3 to 6	-0,030 / -0,105	> 3 to 6	0 / 0,008
> 6 to 10	-0,040 / -0,130	> 6 to 10	0 / 0,009
> 10 to 18	-0,050 / -0,160	> 10 to 18	0 / 0,011
> 18 to 30	-0,065 / -0,195	> 18 to 30	0 / 0,013

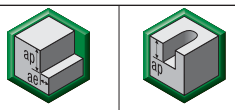
	P				M			K			S				H		
	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1	2	3
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A153.

D1	D	length of cut Ap1 max	length L	BCH	Z U	TiCN - CT	TiAlN - LT	TiAlN - LW
6,0	6	13,00	57	0,25	4	**497006002CT**	**497006002LT**	**497006002LW**
8,0	8	16,00	63	0,25	4	**497008003CT**	**497008003LT**	**497008003LW**
10,0	10	22,00	72	0,25	4	**497010004CT**	**497010004LT**	**497010004LW**
12,0	12	26,00	83	0,35	4	**497012005CT**	**497012005LT**	**497012005LW**
16,0	16	32,00	92	0,35	4	**497016006CT**	**497016006LT**	**497016006LW**
20,0	20	38,00	104	0,35	6	**497020007CT**	**497020047LT**	**497020007LW**
25,0	25	45,00	121	0,50	4	**497025008CT**	**497025008LT**	**497025008LW**

List DQ13



A

B

TiAlN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.

Cutting Speed Vc m/min

D1 - Diameter

Group	ap	ae	ap	Min		Max	mm	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	1 x D	0,4 x D	0,75 x D	150	-	200	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	1 x D	0,4 x D	0,75 x D	140	-	190	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	1 x D	0,4 x D	0,75 x D	120	-	160	Fz	0,018	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	1 x D	0,3 x D	0,3 x D	90	-	150	Fz	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088
P5	1 x D	0,4 x D	0,75 x D	60	-	100	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
P6	1 x D	0,3 x D	0,3 x D	50	-	75	Fz	0,012	0,016	0,025	0,034	0,040	0,047	0,057	0,065
M1	1 x D	0,4 x D	0,75 x D	80	-	100	Fz	0,018	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	1 x D	0,4 x D	0,75 x D	60	-	80	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
M3	1 x D	0,4 x D	0,75 x D	60	-	80	Fz	0,012	0,016	0,025	0,034	0,040	0,047	0,057	0,065
K1	1 x D	0,4 x D	0,75 x D	120	-	160	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	1 x D	0,4 x D	0,75 x D	110	-	140	Fz	0,018	0,023	0,036	0,050	0,061	0,070	0,087	0,101
K3	1 x D	0,4 x D	0,75 x D	100	-	130	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
S1	1 x D	0,3 x D	0,3 x D	90	-	115	Fz	0,018	0,023	0,036	0,050	0,061	0,070	0,087	0,101
S2	1 x D	0,3 x D	0,3 x D	20	-	40	Fz	0,010	0,013	0,019	0,026	0,032	0,037	0,046	0,054
S3	1 x D	0,4 x D	0,75 x D	50	-	80	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
S4	1 x D	0,4 x D	0,75 x D	45	-	65	Fz	0,012	0,016	0,026	0,037	0,045	0,052	0,064	0,074
H1	1 x D	0,3 x D	0,3 x D	100	-	140	Fz	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 49H6

A

B

TiAlN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.

Cutting Speed Vc m/min

D1 - Diameter

Group	ap	ae	ap	Min		Max	mm	8,0	10,0	12,0	14,0	16,0	18,0	20,0
P1	1,5 x D	0,5 x D	1 x D	150	-	200	Fz	0,049	0,059	0,072	0,080	0,087	0,093	0,098
P2	1,5 x D	0,5 x D	1 x D	140	-	190	Fz	0,049	0,059	0,072	0,080	0,087	0,093	0,098
P3	1,5 x D	0,4 x D	0,75 x D	120	-	160	Fz	0,041	0,049	0,061	0,068	0,075	0,082	0,087
P4	1 x D	0,3 x D	0,5 x D	90	-	150	Fz	0,037	0,044	0,054	0,060	0,066	0,072	0,076
P5	1,5 x D	0,4 x D	0,75 x D	60	-	100	Fz	0,033	0,039	0,049	0,055	0,060	0,065	0,070
M1	1 x D	0,4 x D	0,75 x D	80	-	100	Fz	0,041	0,049	0,061	0,068	0,075	0,082	0,087
M2	1 x D	0,4 x D	0,75 x D	60	-	80	Fz	0,033	0,039	0,049	0,055	0,060	0,065	0,070
M3	1 x D	0,4 x D	0,75 x D	60	-	80	Fz	0,026	0,032	0,039	0,044	0,048	0,052	0,056
K1	1,5 x D	0,5 x D	1 x D	120	-	160	Fz	0,049	0,059	0,072	0,080	0,087	0,093	0,098
K2	1,5 x D	0,4 x D	1 x D	110	-	140	Fz	0,041	0,049	0,061	0,068	0,075	0,082	0,087
K3	1,5 x D	0,4 x D	1 x D	100	-	130	Fz	0,033	0,039	0,049	0,055	0,060	0,065	0,070
S1	1,5 x D	0,5 x D	0,75 x D	50	-	90	Fz	0,041	0,049	0,061	0,068	0,075	0,082	0,087
S3	1,5 x D	0,5 x D	0,75 x D	50	-	80	Fz	0,033	0,039	0,049	0,055	0,060	0,065	0,070
H1	1,0 x D	0,3 x D	0,5 x D	80	-	140	Fz	0,037	0,044	0,054	0,060	0,066	0,072	0,076

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422152 422150

A

B

K30F-DCHP
AlTiN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).
For Slotting (B), reduce Fz by 20%.

Cutting Speed Vc m/min

D1 - Diameter

Group	ap	ae	ap	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P1	1,5 x D	0,5 x D	1 x D	150	-	200	Fz	0,031	0,041	0,049	0,060	0,073	0,082	0,087
P2	1,5 x D	0,5 x D	1 x D	140	-	190	Fz	0,031	0,041	0,049	0,060	0,073	0,082	0,087
P3	1,5 x D	0,4 x D	1 x D	120	-	160	Fz	0,025	0,034	0,041	0,051	0,063	0,073	0,080
P4	1,5 x D	0,4 x D	0,75 x D	90	-	150	Fz	0,023	0,030	0,037	0,045	0,055	0,063	0,068
P5	1,5 x D	0,4 x D	0,75 x D	60	-	100	Fz	0,021	0,027	0,033	0,040	0,050	0,058	0,064
K1	1,5 x D	0,5 x D	1 x D	120	-	160	Fz	0,031	0,041	0,049	0,060	0,073	0,082	0,087
K2	1,5 x D	0,4 x D	1 x D	110	-	140	Fz	0,025	0,034	0,041	0,051	0,063	0,073	0,080
K3	1,5 x D	0,4 x D	1 x D	100	-	130	Fz	0,021	0,027	0,033	0,040	0,050	0,058	0,064
S1	1,5 x D	0,5 x D	1 x D	50	-	90	Fz	0,025	0,034	0,041	0,051	0,063	0,073	0,080
H1	1,5 x D	0,3 x D	0,75 x D	80	-	140	Fz	0,023	0,030	0,037	0,045	0,055	0,063	0,068

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Low cutting force through chipbreaker for use with unstable clamping and components.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4976

A

B

AlTiN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).
For Slotting (B), reduce Fz by 20%.

Cutting Speed Vc m/min

D1 - Diameter

Group	ap	ae	ap	Min		Max	mm	4,0	5,0	6,0	8,0	10,0	12,0	14,0	16,0	18,0	20,0	25,0
P1	1,5 x D	0,4 x D	1 x D	150	-	200	Fz	0,028	0,036	0,044	0,060	0,072	0,083	0,092	0,101	0,107	0,114	0,143
P2	1,5 x D	0,4 x D	1 x D	140	-	190	Fz	0,028	0,036	0,044	0,060	0,072	0,083	0,092	0,101	0,107	0,114	0,143
P3	1,5 x D	0,4 x D	0,75 x D	120	-	160	Fz	0,023	0,030	0,036	0,050	0,061	0,070	0,079	0,087	0,094	0,101	0,126
P4	1,5 x D	0,3 x D	0,3 x D	90	-	150	Fz	0,021	0,027	0,033	0,045	0,054	0,062	0,070	0,077	0,082	0,088	0,110
P5	1,5 x D	0,4 x D	0,75 x D	60	-	100	Fz	0,019	0,024	0,029	0,040	0,048	0,056	0,063	0,070	0,075	0,081	0,101
P6	1,5 x D	0,3 x D	0,3 x D	50	-	75	Fz	0,016	0,020	0,025	0,034	0,040	0,047	0,052	0,057	0,061	0,065	0,081
M1	1,5 x D	0,4 x D	0,75 x D	80	-	100	Fz	0,023	0,030	0,036	0,050	0,061	0,070	0,079	0,087	0,094	0,101	0,126
M2	1,5 x D	0,4 x D	0,75 x D	60	-	80	Fz	0,019	0,024	0,029	0,040	0,048	0,056	0,063	0,070	0,075	0,081	0,101
M3	1,5 x D	0,4 x D	0,75 x D	60	-	80	Fz	0,016	0,020	0,025	0,034	0,040	0,047	0,052	0,057	0,061	0,065	0,081
K1	1,5 x D	0,4 x D	1 x D	120	-	160	Fz	0,028	0,036	0,044	0,060	0,072	0,083	0,092	0,101	0,107	0,114	0,143
K2	1,5 x D	0,4 x D	1 x D	110	-	140	Fz	0,023	0,030	0,036	0,050	0,061	0,070	0,079	0,087	0,094	0,101	0,126
K3	1,5 x D	0,4 x D	1 x D	100	-	130	Fz	0,019	0,024	0,029	0,040	0,048	0,056	0,063	0,070	0,075	0,081	0,101
S1	1,5 x D	0,3 x D	0,75 x D	90	-	115	Fz	0,023	0,030	0,036	0,050	0,061	0,070	0,079	0,087	0,094	0,101	0,126
S2	1,5 x D	0,3 x D	0,3 x D	20	-	40	Fz	0,013	0,016	0,019	0,026	0,032	0,037	0,042	0,046	0,050	0,054	0,068
S3	1,5 x D	0,4 x D	0,75 x D	50	-	80	Fz	0,019	0,024	0,029	0,040	0,048	0,056	0,063	0,070	0,075	0,081	0,101
S4	1,5 x D	0,3 x D	0,75 x D	45	-	65	Fz	0,016	0,021	0,026	0,037	0,045	0,052	0,058	0,064	0,069	0,074	0,093
H1	1,5 x D	0,3 x D	0,3 x D	100	-	140	Fz	0,021	0,027	0,033	0,045	0,054	0,062	0,070	0,077	0,082	0,088	0,110

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422824 422820														
	A		B	K30F-DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P1	3 x D	0,25 x D	0,7 x D	150	-	200	Fz	0,032	0,043	0,052	0,063	0,077	0,087	0,095
P2	3 x D	0,25 x D	0,5 x D	140	-	190	Fz	0,032	0,043	0,052	0,063	0,077	0,087	0,095
P3	3 x D	0,25 x D	0,5 x D	120	-	160	Fz	0,026	0,036	0,044	0,054	0,067	0,077	0,087
P4	3 x D	0,25 x D	0,25 x D	90	-	150	Fz	0,024	0,032	0,039	0,048	0,059	0,067	0,075
P5	3 x D	0,25 x D	0,25 x D	60	-	100	Fz	0,021	0,029	0,035	0,043	0,053	0,062	0,070
P6	3 x D	0,25 x D	0,25 x D	50	-	75	Fz	0,018	0,024	0,029	0,036	0,044	0,050	0,054
M1	3 x D	0,25 x D	0,5 x D	80	-	100	Fz	0,026	0,036	0,044	0,054	0,067	0,077	0,087
M3	3 x D	0,25 x D	0,5 x D	60	-	80	Fz	0,018	0,024	0,029	0,036	0,044	0,050	0,054
K1	3 x D	0,25 x D	0,5 x D	120	-	160	Fz	0,032	0,043	0,052	0,063	0,077	0,087	0,095
K2	3 x D	0,25 x D	0,5 x D	110	-	140	Fz	0,026	0,036	0,044	0,054	0,067	0,077	0,087
K3	3 x D	0,25 x D	0,5 x D	100	-	130	Fz	0,021	0,029	0,035	0,043	0,053	0,062	0,070
S1	3 x D	0,25 x D	0,5 x D	50	-	90	Fz	0,026	0,036	0,044	0,054	0,067	0,077	0,087
H1	3 x D	0,25 x D	0,5 x D	80	-	140	Fz	0,024	0,032	0,039	0,048	0,059	0,067	0,075

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422141 422140 422143 422142

A

B

K30F-DCF
TiAlN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).
For Slotting (B), reduce Fz by 20%.

Group	ap	ae	ap	Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 6,0	8,0	10,0	12,0	16,0	20,0
P1	1,5 x D	0,5 x D	1 x D	180	-	220	Fz	0,032	0,043	0,052	0,063	0,077	0,087
P2	1,5 x D	0,5 x D	1 x D	160	-	200	Fz	0,032	0,043	0,052	0,063	0,077	0,087
P3	1,5 x D	0,5 x D	1 x D	160	-	180	Fz	0,026	0,036	0,044	0,054	0,067	0,077
P4	1,5 x D	0,4 x D	0,75 x D	140	-	160	Fz	0,024	0,032	0,039	0,048	0,059	0,067
P5	1,5 x D	0,4 x D	1 x D	60	-	100	Fz	0,021	0,029	0,035	0,043	0,053	0,062
P6	1,5 x D	0,4 x D	0,75 x D	50	-	80	Fz	0,018	0,024	0,029	0,036	0,044	0,050
M1	1,5 x D	0,4 x D	1 x D	80	-	100	Fz	0,026	0,036	0,044	0,054	0,067	0,077
M3	1,5 x D	0,4 x D	1 x D	60	-	80	Fz	0,018	0,024	0,029	0,036	0,044	0,050
K1	1,5 x D	0,5 x D	1 x D	120	-	160	Fz	0,032	0,043	0,052	0,063	0,077	0,087
K2	1,5 x D	0,4 x D	1 x D	110	-	140	Fz	0,026	0,036	0,044	0,054	0,067	0,077
K3	1,5 x D	0,4 x D	1 x D	100	-	130	Fz	0,021	0,029	0,035	0,043	0,053	0,062
S1	1,5 x D	0,4 x D	1 x D	90	-	115	Fz	0,026	0,036	0,044	0,054	0,067	0,077
H1	1,5 x D	0,3 x D	0,75 x D	100	-	140	Fz	0,024	0,032	0,039	0,048	0,059	0,067

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4940

	A		B	TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.						
				Cutting Speed Vc m/min			D1 - Diameter						
Group	ap	ae	ap	Min	Max	mm	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P3	0,8 x D	0,5 x D	0,75 x D	120	160	Fz	0,031	0,043	0,051	0,063	0,078	0,101	0,114
P4	0,8 x D	0,4 x D	0,5 x D	90	150	Fz	0,028	0,038	0,046	0,056	0,069	0,088	0,098
P5	0,8 x D	0,5 x D	0,75 x D	60	100	Fz	0,025	0,034	0,041	0,051	0,063	0,081	0,091
P6	0,8 x D	0,4 x D	0,5 x D	50	75	Fz	0,021	0,029	0,034	0,042	0,051	0,065	0,071
M1	0,8 x D	0,5 x D	0,75 x D	80	100	Fz	0,031	0,043	0,051	0,063	0,078	0,101	0,114
M2	0,8 x D	0,4 x D	0,75 x D	60	80	Fz	0,025	0,034	0,041	0,051	0,063	0,081	0,091
M3	0,8 x D	0,4 x D	0,75 x D	60	80	Fz	0,021	0,029	0,034	0,042	0,051	0,065	0,071
K1	0,8 x D	0,5 x D	0,75 x D	120	160	Fz	0,037	0,051	0,061	0,075	0,091	0,114	0,124
K2	0,8 x D	0,5 x D	0,75 x D	110	140	Fz	0,031	0,043	0,051	0,063	0,078	0,101	0,114
K3	0,8 x D	0,4 x D	0,75 x D	100	130	Fz	0,025	0,034	0,041	0,051	0,063	0,081	0,091
S1	0,8 x D	0,4 x D	0,75 x D	50	90	Fz	0,031	0,043	0,051	0,063	0,078	0,101	0,114
S2	0,8 x D	0,25 x D	0,3 x D	20	40	Fz	0,017	0,022	0,027	0,033	0,042	0,054	0,061
S3	0,8 x D	0,4 x D	0,75 x D	50	80	Fz	0,025	0,034	0,041	0,051	0,063	0,081	0,091
S4	0,8 x D	0,3 x D	0,5 x D	45	65	Fz	0,022	0,031	0,038	0,046	0,058	0,074	0,084
H1	0,8 x D	0,5 x D	0,5 x D	80	140	Fz	0,028	0,038	0,046	0,056	0,069	0,088	0,098
H2	0,8 x D	0,2 x D	0,3 x D	70	120	Fz	0,021	0,029	0,034	0,042	0,051	0,065	0,071
H3	0,8 x D	0,2 x D	0,2 x D	60	90	Fz	0,017	0,023	0,027	0,034	0,041	0,052	0,057

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
For rougher tool with 6 flutes, use ap in slotting 60% of table value.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4970

	A		B	TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P3	1 x D	0,5 x D	0,5 x D	96	-	128	120	-	160	Fz	0,031	0,043	0,051	0,063	0,078	0,101	0,114
P4	1 x D	0,3 x D	0,4 x D	72	-	120	90	-	150	Fz	0,028	0,038	0,046	0,056	0,069	0,088	0,098
P5	1 x D	0,5 x D	0,5 x D	48	-	80	60	-	100	Fz	0,025	0,034	0,041	0,051	0,063	0,081	0,091
P6	1 x D	0,3 x D	0,4 x D	40	-	60	50	-	75	Fz	0,021	0,029	0,034	0,042	0,051	0,065	0,071
M1	1 x D	0,5 x D	0,5 x D	64	-	80	80	-	100	Fz	0,031	0,043	0,051	0,063	0,078	0,101	0,114
M2	1 x D	0,5 x D	0,5 x D	48	-	64	60	-	80	Fz	0,025	0,034	0,041	0,051	0,063	0,081	0,091
M3	1 x D	0,5 x D	0,5 x D	48	-	64	60	-	80	Fz	0,021	0,029	0,034	0,042	0,051	0,065	0,071
K1	1 x D	0,5 x D	0,5 x D	96	-	128	120	-	160	Fz	0,037	0,051	0,061	0,075	0,091	0,114	0,124
K2	1 x D	0,5 x D	0,5 x D	88	-	112	110	-	140	Fz	0,031	0,043	0,051	0,063	0,078	0,101	0,114
K3	1 x D	0,5 x D	0,5 x D	80	-	104	100	-	130	Fz	0,025	0,034	0,041	0,051	0,063	0,081	0,091
S1	1 x D	0,3 x D	0,3 x D	40	-	72	50	-	90	Fz	0,031	0,043	0,051	0,063	0,078	0,101	0,114
S2	1 x D	0,3 x D	0,3 x D	16	-	32	20	-	40	Fz	0,017	0,022	0,027	0,033	0,042	0,054	0,061
S3	1 x D	0,4 x D	0,4 x D	40	-	64	50	-	80	Fz	0,025	0,034	0,041	0,051	0,063	0,081	0,091
S4	1 x D	0,4 x D	0,4 x D	36	-	52	45	-	65	Fz	0,022	0,031	0,038	0,046	0,058	0,074	0,084
H1	1 x D	0,3 x D	0,3 x D	64	-	112	80	-	140	Fz	0,028	0,038	0,046	0,056	0,069	0,088	0,098
H2	1 x D	0,2 x D	0,2 x D	56	-	96	70	-	120	Fz	0,021	0,029	0,034	0,042	0,051	0,065	0,071
H3	1 x D	0,2 x D	0,2 x D	48	-	72	60	-	90	Fz	0,017	0,023	0,027	0,034	0,041	0,052	0,057

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
For rougher tool with 6 flutes, use ap in slotting 60% of table value.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

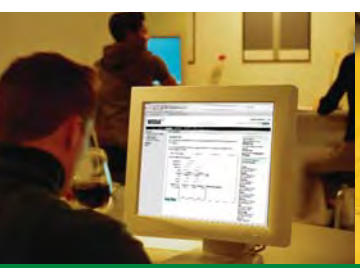
Solid Carbide-Tipped End Mills

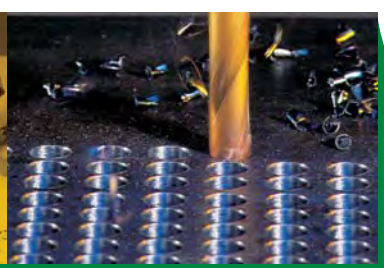
Increase productivity while minimizing tool costs.

Our carbide-tipped end mills can provide unique advantages over solid tools, especially in large diameter sizes. They can be run at the same high cutting speeds of solid carbide but are usually less costly because of their steel body. The tougher body also absorbs shock, which enables it to perform well in conventional machines with less-than-rigid setups.

Our in-house brazing capabilities and expertise provide our customers with flexibility in using carbide-tipped cutting edges on many styles, geometries, and sizes of standard and custom solution tooling.

- Available up to a diameter of 250mm.
- Continuous edge carbide diameter of up to 300mm.
- Center cutting geometries available.
- Maximum helix angle is 45°.
- Available in multiple spindle connections.
- Outstanding custom solutions capabilities.





High-Performance Carbide-Tipped End Mills

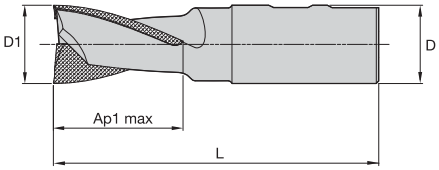
Carbide-Tipped **A155–A163**

Application Data

List 022761 . . . . . A156
Lists 422773 022773 . . . . . A157
Lists 422779 022779 . . . . . A158
Lists 422787 022787 . . . . . A159

. . . . . A160
. . . . . A161
. . . . . A162
. . . . . A163

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013
> 30 to 50	0 / 0,100	> 30 to 50	0 / 0,016

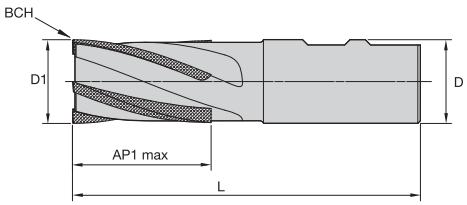
	N				
	1	2	3	4	5
Uncoated	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A160.

D1	D	length of cut Ap1 max	length L	K10F UNCOATED - WW
25,0	25	45,00	121	**022761-000250**
32,0	32	53,00	133	**022761-000320**
40,0	32	63,00	145	**022761-000400**

- Non-center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



NEW!

End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013
> 30 to 50	0 / 0,100	> 30 to 50	0 / 0,016

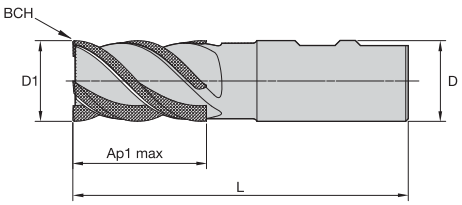
	P						M		K			N						S			
	1	2	3	4	5	6	1	2	1	2	3	1	2	3	4	5	6	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A161.

D1	D	length of cut Ap1 max	length L	BCH	Z U	K30F UNCOATED - WW	K30F-DCF TiAlN - LW
20,0	20	38,00	104	0,40	3	022773-000200	422773-000200
25,0	25	45,00	121	0,40	4	022773-000250	422773-000250
32,0	32	53,00	133	0,40	4	022773-000320	422773-000320
40,0	32	63,00	145	0,40	6	022773-000400	422773-000400

- Non-center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

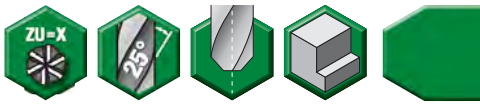
D1	Tolerance h10 + / -	D	Tolerance h6 + / -
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013
> 30 to 50	0 / 0,100	> 30 to 50	0 / 0,016

	P						M		K			N						S			
	1	2	3	4	5	6	1	2	1	2	3	1	2	3	4	5	6	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

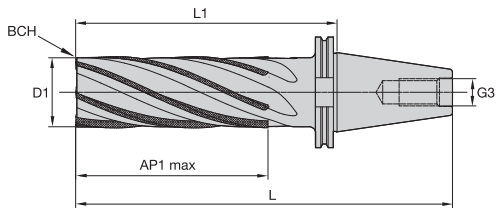
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A162.

D1	D	length of cut Ap1 max	length L	BCH	Z U	K30F UNCOATED - WW	K30F-DCF TiAlN - LW
25,0	25	45,00	121	0,60	4	022779-000250	422779-000250
32,0	32	53,00	133	0,60	4	022779-000320	422779-000320
40,0	32	63,00	145	0,70	6	022779-000400	422779-000400
50,0	32	75,00	157	0,70	6	022779-000500	422779-000500



- Non-center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -
≤ 30 to 50	0 / 0,100
> 50 to 80	0 / 0,120

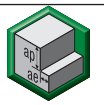
	P						M		K			N						S			
	1	2	3	4	5	6	1	2	1	2	3	1	2	3	4	5	6	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A163.

D1	length of cut Ap1 max	L1	length L	BCH	Z U	G3	DIN 69871	K30F UNCOATED - VV	K30F-DCF TiAlN - LV
40,0	63,00	114	183	0,40	6	M16	ISO 40	022787-004040	422787-004040
40,0	63,00	114	216	0,40	6	M24	ISO 50	022787-004050	422787-004050
50,0	80,00	137	206	0,40	6	M16	ISO 40	022787-005040	422787-005040
50,0	80,00	137	239	0,40	6	M24	ISO 50	022787-005050	422787-005050
50,0	150,00	207	309	0,40	6	M24	ISO 50	022787-050150	422787-050150
63,0	100,00	157	259	0,50	6	M24	ISO 50	022787-006350	422787-006350
63,0	200,00	257	359	0,50	6	M24	ISO 50	022787-063200	422787-063200
63,0	250,00	307	409	0,50	6	M24	ISO 50	022787-063250	422787-063250
80,0	200,00	257	359	0,50	8	M24	ISO 50	022787-080200	422787-080200
80,0	250,00	307	409	0,50	8	M24	ISO 50	022787-080250	422787-080250
80,0	300,00	357	459	0,50	8	M24	ISO 50	022787-800300	422787-800300

List 022761



A

B

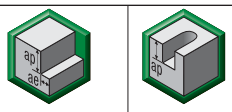
K10F

Uncoated

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).
For Slotting (B), reduce Fz by 20%.

Group	ap	ae	ap	Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 25,0	32,0	40,0
N1	1,2 x D	0,5 x D	0,7 x D	400	-	425	Fz	0,080	0,100	0,120
N2	1,2 x D	0,5 x D	0,7 x D	430	-	460	Fz	0,080	0,100	0,120
N3	1,2 x D	0,5 x D	0,7 x D	390	-	420	Fz	0,080	0,100	0,120
N4	1,2 x D	0,5 x D	0,7 x D	80	-	100	Fz	0,080	0,100	0,120
N5	1,2 x D	0,5 x D	0,7 x D	135	-	160	Fz	0,080	0,100	0,120

Lists 422773 022773



A

B

				K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.				
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter			
Group	ap	ae	ap	Min		Max	Min		Max	mm	20,0	25,0	32,0	40,0
P1	1 x D	0,25 x D	0,5 x D				85	-	95	Fz	0,050	0,065	0,080	0,100
P2	1 x D	0,25 x D	0,5 x D				75	-	90	Fz	0,050	0,065	0,080	0,100
P3	1 x D	0,25 x D	0,5 x D				70	-	85	Fz	0,050	0,065	0,080	0,100
P4	1 x D	0,25 x D	0,5 x D				60	-	70	Fz	0,050	0,065	0,080	0,100
P5	1 x D	0,25 x D	0,5 x D				50	-	60	Fz	0,050	0,065	0,080	0,100
P6	1 x D	0,25 x D	0,5 x D				45	-	55	Fz	0,050	0,065	0,080	0,100
M1	1 x D	0,25 x D	0,5 x D				40	-	50	Fz	0,040	0,050	0,065	0,080
M2	1 x D	0,25 x D	0,5 x D				40	-	50	Fz	0,040	0,050	0,065	0,080
K1	1 x D	0,25 x D	0,5 x D	80	-	100	105	-	125	Fz	0,050	0,065	0,080	0,100
K2	1 x D	0,25 x D	0,5 x D	70	-	85	90	-	110	Fz	0,050	0,065	0,080	0,100
K3	1 x D	0,25 x D	0,5 x D	60	-	70	80	-	90	Fz	0,050	0,065	0,080	0,100
N1	1,2 x D	0,25 x D	0,5 x D	310	-	330	420	-	440	Fz	0,060	0,080	0,100	0,120
N2	1,2 x D	0,25 x D	0,5 x D	335	-	365	435	-	475	Fz	0,060	0,080	0,100	0,120
N3	1,2 x D	0,25 x D	0,5 x D	300	-	335	400	-	440	Fz	0,060	0,080	0,100	0,120
N4	1,2 x D	0,25 x D	0,5 x D	60	-	75	80	-	100	Fz	0,060	0,080	0,100	0,120
N5	1,2 x D	0,25 x D	0,5 x D	100	-	125	135	-	165	Fz	0,060	0,080	0,100	0,120
S1	1 x D	0,25 x D	0,5 x D				40	-	50	Fz	0,040	0,050	0,065	0,080
S2	1 x D	0,25 x D	0,5 x D				35	-	45	Fz	0,040	0,050	0,065	0,080
S3	1 x D	0,25 x D	0,5 x D				45	-	55	Fz	0,040	0,050	0,065	0,080
S4	1 x D	0,25 x D	0,5 x D				35	-	45	Fz	0,040	0,050	0,065	0,080

Lists 422779 022779

A

B

				K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.				
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter			
Group	ap	ae	ap	Min		Max	Min		Max	mm	25,0	32,0	40,0	50,0
P1	1 x D	0,25 x D	0,5 x D				90	-	110	Fz	0,050	0,065	0,080	0,100
P2	1 x D	0,25 x D	0,5 x D					-	100	Fz	0,050	0,065	0,080	0,100
P3	1 x D	0,25 x D	0,5 x D				80	-	100	Fz	0,050	0,065	0,080	0,100
P4	1 x D	0,25 x D	0,5 x D				70	-	80	Fz	0,050	0,065	0,080	0,100
P5	1 x D	0,25 x D	0,5 x D				60	-	70	Fz	0,050	0,065	0,080	0,100
P6	1 x D	0,25 x D	0,5 x D				55	-	65	Fz	0,050	0,065	0,080	0,100
M1	1 x D	0,25 x D	0,5 x D				50	-	60	Fz	0,040	0,050	0,065	0,080
M2	1 x D	0,25 x D	0,5 x D				50	-	60	Fz	0,040	0,050	0,065	0,080
K1	1 x D	0,25 x D	0,5 x D	95	-	115	130	-	145	Fz	0,050	0,065	0,080	0,100
K2	1 x D	0,25 x D	0,5 x D	80	-	100	105	-	130	Fz	0,050	0,065	0,080	0,100
K3	1 x D	0,25 x D	0,5 x D	70	-	80	90	-	105	Fz	0,050	0,065	0,080	0,100
N1	1,2 x D	0,25 x D	0,5 x D	350	-	385	460	-	505	Fz	0,060	0,080	0,100	0,120
N2	1,2 x D	0,25 x D	0,5 x D	380	-	420	500	-	545	Fz	0,060	0,080	0,100	0,120
N3	1,2 x D	0,25 x D	0,5 x D	370	-	410	490	-	530	Fz	0,060	0,080	0,100	0,120
N4	1,2 x D	0,25 x D	0,5 x D	70	-	85	95	-	115	Fz	0,060	0,080	0,100	0,120
N5	1,2 x D	0,25 x D	0,5 x D	120	-	145	155	-	190	Fz	0,060	0,080	0,100	0,120
S1	1 x D	0,25 x D	0,5 x D				50	-	60	Fz	0,040	0,050	0,065	0,080
S2	1 x D	0,25 x D	0,5 x D				40	-	50	Fz	0,040	0,050	0,065	0,080
S3	1 x D	0,25 x D	0,5 x D				55	-	65	Fz	0,040	0,050	0,065	0,080
S4	1 x D	0,25 x D	0,5 x D				40	-	50	Fz	0,040	0,050	0,065	0,080

Lists 422787 022787

A

			K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.				
			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter			
Group	ap	ae	Min		Max	Min		Max	mm	40,0	50,0	63,0	80,0
P1	1 x D	0,1 x D				85	-	95	Fz	0,080	0,100	0,120	0,150
P2	1 x D	0,1 x D				75	-	90	Fz	0,080	0,100	0,120	0,150
P3	1 x D	0,1 x D				70	-	85	Fz	0,080	0,100	0,120	0,150
P4	1 x D	0,1 x D				60	-	70	Fz	0,080	0,100	0,120	0,150
P5	1 x D	0,1 x D				50	-	60	Fz	0,080	0,100	0,120	0,150
P6	1 x D	0,1 x D				45	-	55	Fz	0,080	0,100	0,120	0,150
M1	1 x D	0,1 x D				40	-	50	Fz	0,065	0,080	0,100	0,120
M2	1 x D	0,1 x D				40	-	50	Fz	0,065	0,080	0,100	0,120
K1	1 x D	0,1 x D	80	-	100	105	-	125	Fz	0,080	0,100	0,120	0,150
K2	1 x D	0,1 x D	70	-	85	90	-	110	Fz	0,080	0,100	0,120	0,150
K3	1 x D	0,1 x D	60	-	70	80	-	90	Fz	0,080	0,100	0,120	0,150
N1	1,2 x D	0,1 x D	310	-	330	420	-	440	Fz	0,100	0,120	0,150	0,180
N2	1,2 x D	0,1 x D	335	-	365	435	-	475	Fz	0,100	0,120	0,150	0,180
N3	1,2 x D	0,1 x D	300	-	335	400	-	440	Fz	0,100	0,120	0,150	0,180
N4	1,2 x D	0,1 x D	60	-	75	80	-	100	Fz	0,100	0,120	0,150	0,180
N5	1,2 x D	0,1 x D	100	-	125	135	-	165	Fz	0,100	0,120	0,150	0,180
S1	1 x D	0,1 x D				40	-	50	Fz	0,065	0,080	0,100	0,120
S2	1 x D	0,1 x D				35	-	45	Fz	0,065	0,080	0,100	0,120
S3	1 x D	0,1 x D				45	-	55	Fz	0,065	0,080	0,100	0,120
S4	1 x D	0,1 x D				35	-	45	Fz	0,065	0,080	0,100	0,120

For ap 2 x D, ae=0,05 x D; for ap 3 x D, ae=0,03 x D.

Solid End Mill Custom Solutions

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	Fax:	80889297
Finland	**Phone:**	**0800919413**
	Fax:	0800919415
France	**Phone:**	**0805540379**
	Fax:	0805540029
Germany	**Phone:**	**0800 1015774**
	Fax:	0800 0007531
Italy	**Phone:**	**800 916568**
	Fax:	800 917749
Netherlands	**Phone:**	**0800 0201131**
	Fax:	0800 0201135
North America	**Phone:**	**877 724 4040**
Norway	**Phone:**	**80010081**
	Fax:	800 10001
Poland	**Phone:**	**00800 4411943**
	Fax:	00800 4411940
South Africa	**Phone:**	**0800 981644**
	Fax:	0800 981645
Sweden	**Phone:**	**020798794**
	Fax:	020790477
United Kingdom	**Phone:**	**0800 028 2996**
	Fax:	0800 028 5721

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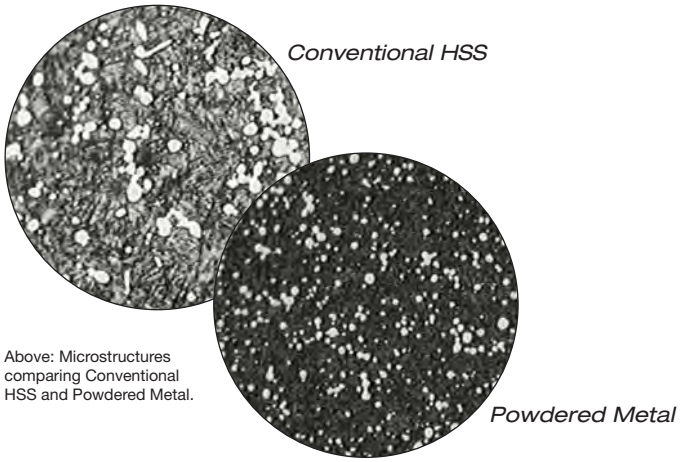
Powdered Metal End Mills Provide Superior Performance

With their performance advantages, powdered metal end mills bridge the gap between regular high-speed steel and solid carbide. In production tests, users have documented feed rate increases of up to 700%, resulting in faster throughput.

Our ISO 9002 certified manufacturing facility's process controls, advanced CNC grinding technology, and proprietary heat treatment provide you with a powdered metal product that is unmatched by competitors.

Experience the superior performance of powdered metal in your toughest applications. Powdered metal is made from molten steel, atomized into powder, screened for size, heated, compacted under high pressure, and worked into the final shape. The result is a very fine, uniformly dispersed structure, especially suited for machining work-hardening and gummy materials.



Above: Microstructures comparing Conventional HSS and Powdered Metal.

Benefits of powdered metal end mills:

- Exceptional toughness and shock resistance.
- Superior heat and wear resistance.
- Run at high cutting speeds.
- Large-diameter tools are less costly than carbide.
- Available in roughing- and finishing-style end mills.

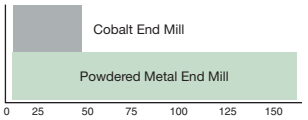
PH Stainless Steels

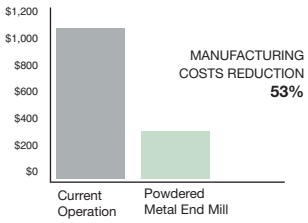
Current Operation: Speed: 140 RPM Feed: 38mm/min

Powdered Metal Operation: Speed:140 RPM Feed: 150mm/min.

MACHINING TIME REDUCTION **75%**

FEED RATE (mm per minute)





MANUFACTURING COSTS REDUCTION **53%**

Roughing cut in 15-5 PH Stainless with a 38mm diameter finisher for 30 pieces.

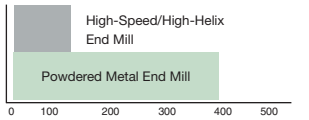
Aluminium Alloys

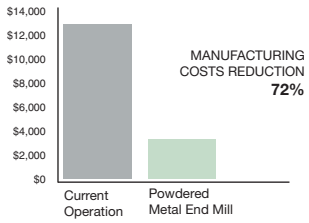
Current Operation: Speed: 2,500 RPM Feed: 500mm/min

Powdered Metal Operation: Speed: 6000 RPM Feed: 2200mm/min.

MACHINING TIME REDUCTION **70%**

FEED RATE (mm per minute)





MANUFACTURING COSTS REDUCTION **72%**

Profile milling in Cast Aluminium with a 12mm diameter finisher for 10,000 pieces.

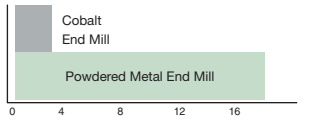
Titanium

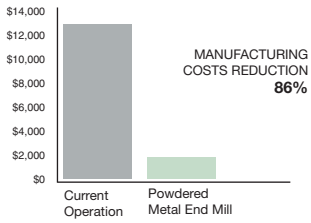
Current Operation: Speed: 75 RPM Feed: 16mm/min

Powdered Metal Operation: Speed: 175 RPM Feed: 115mm/min.

MACHINING TIME REDUCTION **88%**

FEED RATE (mm per minute)





MANUFACTURING COSTS REDUCTION **86%**

Profile milling in 6 AL-4V with a 12mm diameter finisher for 500 pieces.

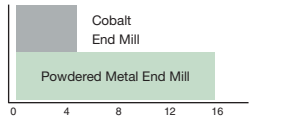
High-Temp Alloys

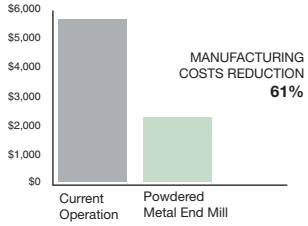
Current Operation: Speed: 65 RPM Feed: 16mm/min

Powdered Metal Operation: Speed: 85 RPM Feed: 38mm/min.

MACHINING TIME REDUCTION **57%**

FEED RATE (mm per minute)





MANUFACTURING COSTS REDUCTION **61%**

Slot milling in 718 INCONEL with a 25mm diameter finisher of cut for 200 pieces.

High-Performance High-Speed Steel (HSS-E/PM) End Mills • Finishing

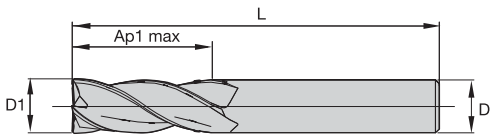
Finishing **A167–A177**

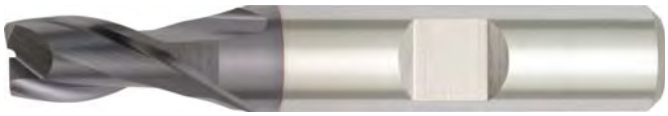
Application Data

List 1N02 . . . . . A168
List 1601 JJ A169
List 1N0M A170
List 1N0M JJ A171
List 1N77 . . . . . A172
Lists 1N05 1N07 . . . . . A173

. . . . . A174
. . . . . A174
. . . . . A175
. . . . . A175
. . . . . A176
. . . . . A177

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

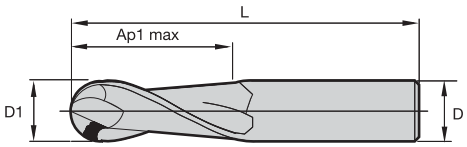
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A174.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiAlN - LW
3,0	6	5,00	49	1N0203002WW	1N0203002LW
4,0	6	7,00	51	–	1N0204002LW
5,0	6	8,00	52	–	1N0205002LW
6,0	6	8,00	52	1N0206002WW	1N0206002LW
8,0	10	11,00	61	1N0208004WW	1N0208004LW
10,0	10	13,00	63	1N0210004WW	1N0210004LW
12,0	12	16,00	73	–	1N0212005LW
14,0	12	16,00	73	1N0214005WW	1N0214005LW
16,0	16	19,00	79	1N0216006WW	1N0216006LW
18,0	16	19,00	79	–	1N0218006LW
20,0	20	22,00	88	–	1N0220007LW

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

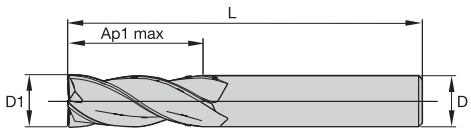
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A174.

D1	D	length of cut Ap1 max	length L	UNCOATED - JJ	TiCN - CJ
1,0	6	2,00	49	**160101002JJ**	**160101002CJ**
2,0	6	4,00	52	**–**	**160102002CJ**
2,5	6	5,00	55	**160102502JJ**	**–**
3,0	6	8,00	60	**160103002JJ**	**160103002CJ**
4,0	6	8,00	70	**160104002JJ**	**–**
5,0	6	10,00	80	**160105002JJ**	**–**
6,0	6	12,00	90	**160106002JJ**	**160106002CJ**
8,0	8	14,00	100	**160108003JJ**	**160108003CJ**
10,0	10	18,00	100	**160110004JJ**	**–**
12,0	12	22,00	110	**160112005JJ**	**–**
16,0	16	30,00	140	**160116006JJ**	**–**
20,0	20	38,00	160	**160120007JJ**	**–**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,04 / -0,0	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

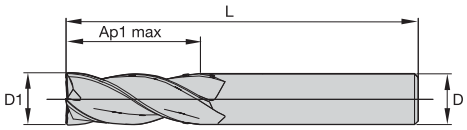
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A175.

D1	D	length of cut Ap1 max	length L	TiAlN - LW
3,0	6	8	52	**1N0M03002LW**
4,0	6	11	55	**1N0M04002LW**
5,0	6	13	57	**1N0M05002LW**
6,0	6	13	57	**1N0M06002LW**
8,0	10	19	69	**1N0M08004LW**
10,0	10	22	72	**1N0M10004LW**
12,0	12	26	83	**1N0M12005LW**
14,0	12	26	83	**1N0M14005LW**
16,0	16	32	92	**1N0M16006LW**
18,0	16	32	92	**1N0M18006LW**
20,0	20	38	104	**1N0M20007LW**
22,0	20	38	104	**1N0M22007LW**
25,0	25	45	121	**1N0M25008LW**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,02 / -0,0	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

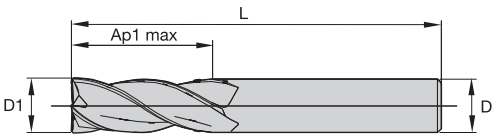
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A175.

D1	D	length of cut Ap1 max	length L	TiAlN - LJ
3,0	6	10,00	50	**1N0M03002LJ**
4,0	8	12,00	60	**1N0M04003LJ**
5,0	8	15,00	60	**1N0M05003LJ**
6,0	8	15,00	60	**1N0M06003LJ**
8,0	10	20,00	65	**1N0M08004LJ**
10,0	10	25,00	75	**1N0M10004LJ**
12,0	12	30,00	80	**1N0M12005LJ**
14,0	16	35,00	90	**1N0M14006LJ**
16,0	16	40,00	95	**1N0M16006LJ**
18,0	20	40,00	105	**1N0M18007LJ**
20,0	20	45,00	110	**1N0M20007LJ**
22,0	20	45,00	125	**1N0M22007LJ**
25,0	25	50,00	130	**1N0M25008LJ**

- Center cutting.
- Unequal flute spacing.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,04 / -0,0	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

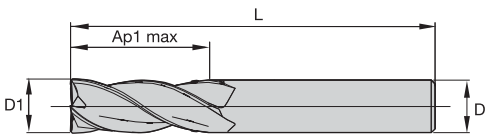
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A176.

D1	D	length of cut Ap1 max	length L	TiCN - CT	TiCN - CW
6,0	6	13,00	57	1N7706002CT	1N7706002CW
8,0	10	19,00	69	1N7708004CT	1N7708004CW
10,0	10	22,00	72	1N7710004CT	1N7710004CW
12,0	12	26,00	83	1N7712005CT	1N7712005CW
14,0	12	26,00	83	1N7714005CT	1N7714005CW
16,0	16	32,00	92	1N7716006CT	1N7716006CW
18,0	16	32,00	92	1N7718006CT	1N7718006CW
20,0	20	38,00	104	1N7720007CT	1N7720007CW
22,0	20	38,00	104	1N7722007CT	1N7722007CW
25,0	25	45,00	121	1N7725008CT	1N7725008CW
30,0	25	45,00	121	1N7730008CT	1N7730008CW

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,04 / -0,0	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

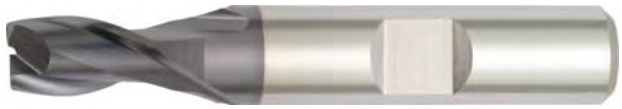
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A177.

D1	D	length of cut Ap1 max	length L	Z U	UNCOATED - WW	TiAlN - LW
6,0	6	13,00	57	4	1N0506002WW	1N0506002LW
8,0	10	19,00	69	4	1N0508004WW	1N0508004LW
10,0	10	22,00	72	4	1N0510004WW	1N0510004LW
12,0	12	26,00	83	4	1N0512005WW	1N0512005LW
14,0	12	26,00	83	4	1N0514005WW	1N0514005LW
16,0	16	32,00	92	4	1N0516006WW	1N0516006LW
18,0	16	32,00	92	4	1N0518006WW	–
20,0	20	38,00	104	4	1N0520007WW	1N0520007LW
25,0	25	45,00	121	6	–	1N0725008LW

List 1N02



	A		B	Uncoated			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	Min		Max	mm	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	0,75 x D	0,1 x D	0,5 x D	28	-	32	70	-	80	Fz	0,021	0,027	0,040	0,055	0,063	0,070	0,085	0,096
P2	0,75 x D	0,1 x D	0,5 x D	24	-	32	60	-	80	Fz	0,021	0,027	0,040	0,055	0,063	0,070	0,085	0,096
P3	0,75 x D	0,1 x D	0,5 x D	20	-	28	50	-	70	Fz	0,017	0,023	0,034	0,046	0,053	0,059	0,073	0,085
P5	0,75 x D	0,1 x D	0,5 x D	10	-	14	25	-	35	Fz	0,014	0,019	0,027	0,036	0,042	0,047	0,059	0,068
M1	0,75 x D	0,1 x D	0,5 x D	10	-	14	25	-	35	Fz	0,017	0,023	0,034	0,046	0,053	0,059	0,073	0,085
M2	0,75 x D	0,1 x D	0,5 x D	10	-	12	25	-	30	Fz	0,014	0,019	0,027	0,036	0,042	0,047	0,059	0,068
M3	0,75 x D	0,1 x D	0,5 x D	6	-	8	15	-	20	Fz	0,012	0,016	0,023	0,031	0,035	0,039	0,048	0,054
K1	0,75 x D	0,1 x D	0,5 x D	28	-	32	70	-	80	Fz	0,021	0,027	0,040	0,055	0,063	0,070	0,085	0,096
K2	0,75 x D	0,1 x D	0,5 x D	20	-	28	50	-	70	Fz	0,017	0,023	0,034	0,046	0,053	0,059	0,073	0,085
N1	0,75 x D	0,1 x D	0,5 x D	180	-	225	300	-	375	Fz	0,029	0,039	0,055	0,073	0,088	0,101	0,134	0,168
N2	0,75 x D	0,1 x D	0,5 x D	138	-	180	230	-	300	Fz	0,024	0,031	0,044	0,058	0,070	0,081	0,108	0,134
S1	0,75 x D	0,1 x D	0,5 x D	6	-	12	15	-	30	Fz	0,017	0,023	0,034	0,046	0,053	0,059	0,073	0,085
S2	0,75 x D	0,1 x D	0,5 x D	2	-	6	5	-	15	Fz	0,009	0,012	0,018	0,024	0,028	0,031	0,039	0,045
S3	0,75 x D	0,1 x D	0,5 x D	6	-	11	15	-	28	Fz	0,014	0,019	0,027	0,036	0,042	0,047	0,059	0,068
S4	0,75 x D	0,1 x D	0,5 x D	6	-	11	15	-	28	Fz	0,011	0,015	0,024	0,033	0,039	0,043	0,054	0,062

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1601 JJ

	A		B	Uncoated			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.										
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter										
Group	ap	ae	ap	Min		Max	Min		Max	mm	1,0	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0	25,0
P1	0,75 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	Fz	0,007	0,014	0,027	0,040	0,055	0,063	0,070	0,078	0,085	0,096	0,104
P2	0,75 x D	0,1 x D	0,5 x D	24	-	32	48	-	64	Fz	0,007	0,014	0,027	0,040	0,055	0,063	0,070	0,078	0,085	0,096	0,104
P3	0,75 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	Fz	0,006	0,011	0,023	0,034	0,046	0,053	0,059	0,066	0,073	0,085	0,096
P5	0,75 x D	0,1 x D	0,5 x D	10	-	14	20	-	28	Fz	0,005	0,009	0,019	0,027	0,036	0,042	0,047	0,053	0,059	0,068	0,076
M1	0,75 x D	0,1 x D	0,5 x D	10	-	14	20	-	28	Fz	0,006	0,011	0,023	0,034	0,046	0,053	0,059	0,066	0,073	0,085	0,096
M2	0,75 x D	0,1 x D	0,5 x D	10	-	12	20	-	24	Fz	0,005	0,009	0,019	0,027	0,036	0,042	0,047	0,053	0,059	0,068	0,076
M3	0,75 x D	0,1 x D	0,5 x D	6	-	8	12	-	16	Fz	0,004	0,008	0,016	0,023	0,031	0,035	0,039	0,044	0,048	0,054	0,060
K1	0,75 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	Fz	0,007	0,014	0,027	0,040	0,055	0,063	0,070	0,078	0,085	0,096	0,104
K2	0,75 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	Fz	0,006	0,011	0,023	0,034	0,046	0,053	0,059	0,066	0,073	0,085	0,096
N1	0,75 x D	0,1 x D	0,5 x D	180	-	225	240	-	300	Fz	0,010	0,020	0,039	0,055	0,073	0,088	0,101	0,118	0,134	0,168	0,210
N2	0,75 x D	0,1 x D	0,5 x D	138	-	180	184	-	240	Fz	0,008	0,016	0,031	0,044	0,058	0,070	0,081	0,094	0,108	0,134	0,168
S1	0,75 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	Fz	0,006	0,011	0,023	0,034	0,046	0,053	0,059	0,066	0,073	0,085	0,096
S2	0,75 x D	0,1 x D	0,5 x D	2	-	6	4	-	12	Fz	0,003	0,006	0,012	0,018	0,024	0,028	0,031	0,035	0,039	0,045	0,051
S3	0,75 x D	0,1 x D	0,5 x D	6	-	11	12	-	22	Fz	0,005	0,009	0,019	0,027	0,036	0,042	0,047	0,053	0,059	0,068	0,076
S4	0,75 x D	0,1 x D	0,5 x D	6	-	11	12	-	22	Fz	0,003	0,007	0,015	0,024	0,033	0,039	0,043	0,049	0,054	0,062	0,070

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1N0M

A

B

Group	A ap	A ae	B ap	TiAlN Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P1	1,5 x D	0,5 x D	1 x D	70	-	80	Fz	0,029	0,039	0,058	0,078	0,090	0,099	0,121	0,137	0,149
P2	1,5 x D	0,5 x D	1 x D	60	-	80	Fz	0,029	0,039	0,058	0,078	0,090	0,099	0,121	0,137	0,149
P3	1,5 x D	0,5 x D	1 x D	50	-	70	Fz	0,024	0,032	0,048	0,065	0,076	0,084	0,105	0,121	0,137
P5	1,5 x D	0,5 x D	1 x D	25	-	35	Fz	0,020	0,026	0,039	0,052	0,061	0,067	0,084	0,097	0,109
M1	1,5 x D	0,5 x D	1 x D	25	-	35	Fz	0,024	0,032	0,048	0,065	0,076	0,084	0,105	0,121	0,137
M2	1,5 x D	0,5 x D	1 x D	25	-	30	Fz	0,020	0,026	0,039	0,052	0,061	0,067	0,084	0,097	0,109
M3	1,5 x D	0,5 x D	1 x D	15	-	20	Fz	0,017	0,022	0,033	0,044	0,051	0,056	0,068	0,078	0,085
K1	1,5 x D	0,5 x D	1 x D	70	-	80	Fz	0,029	0,039	0,058	0,078	0,090	0,099	0,121	0,137	0,149
K2	1,5 x D	0,5 x D	1 x D	50	-	70	Fz	0,024	0,032	0,048	0,065	0,076	0,084	0,105	0,121	0,137
N1	1,5 x D	0,5 x D	1 x D	300	-	375	Fz	0,042	0,055	0,079	0,104	0,125	0,144	0,192	0,240	0,300
N2	1,5 x D	0,5 x D	1 x D	230	-	300	Fz	0,034	0,044	0,063	0,083	0,100	0,115	0,154	0,192	0,240
S1	1,5 x D	0,5 x D	1 x D	15	-	30	Fz	0,024	0,032	0,048	0,065	0,076	0,084	0,105	0,121	0,137
S2	1,5 x D	0,5 x D	0,5 x D	5	-	15	Fz	0,013	0,018	0,026	0,034	0,040	0,045	0,056	0,065	0,074
S3	1,5 x D	0,5 x D	1 x D	15	-	28	Fz	0,020	0,026	0,039	0,052	0,061	0,067	0,084	0,097	0,109
S4	1,5 x D	0,5 x D	0,5 x D	15	-	28	Fz	0,016	0,022	0,034	0,048	0,056	0,062	0,077	0,089	0,100

Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1N0M JJ

A

B

Group	A ap	A ae	B ap	TiAlN Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P1	1,5 x D	0,5 x D	1 x D	70	-	80	Fz	0,029	0,039	0,058	0,078	0,090	0,099	0,121	0,137	0,149
P2	1,5 x D	0,5 x D	1 x D	60	-	80	Fz	0,029	0,039	0,058	0,078	0,090	0,099	0,121	0,137	0,149
P3	1,5 x D	0,5 x D	1 x D	50	-	70	Fz	0,024	0,032	0,048	0,065	0,076	0,084	0,105	0,121	0,137
P5	1,5 x D	0,5 x D	1 x D	25	-	35	Fz	0,020	0,026	0,039	0,052	0,061	0,067	0,084	0,097	0,109
M1	1,5 x D	0,5 x D	1 x D	25	-	35	Fz	0,024	0,032	0,048	0,065	0,076	0,084	0,105	0,121	0,137
M2	1,5 x D	0,5 x D	1 x D	25	-	30	Fz	0,020	0,026	0,039	0,052	0,061	0,067	0,084	0,097	0,109
M3	1,5 x D	0,5 x D	1 x D	15	-	20	Fz	0,017	0,022	0,033	0,044	0,051	0,056	0,068	0,078	0,085
K1	1,5 x D	0,5 x D	1 x D	70	-	80	Fz	0,029	0,039	0,058	0,078	0,090	0,099	0,121	0,137	0,149
K2	1,5 x D	0,5 x D	1 x D	50	-	70	Fz	0,024	0,032	0,048	0,065	0,076	0,084	0,105	0,121	0,137
N1	1,5 x D	0,5 x D	1 x D	300	-	375	Fz	0,042	0,055	0,079	0,104	0,125	0,144	0,192	0,240	0,300
N2	1,5 x D	0,5 x D	1 x D	230	-	300	Fz	0,034	0,044	0,063	0,083	0,100	0,115	0,154	0,192	0,240
S1	1,5 x D	0,5 x D	1 x D	15	-	30	Fz	0,024	0,032	0,048	0,065	0,076	0,084	0,105	0,121	0,137
S2	1,5 x D	0,5 x D	0,5 x D	5	-	15	Fz	0,013	0,018	0,026	0,034	0,040	0,045	0,056	0,065	0,074
S3	1,5 x D	0,5 x D	1 x D	15	-	28	Fz	0,020	0,026	0,039	0,052	0,061	0,067	0,084	0,097	0,109
S4	1,5 x D	0,5 x D	0,5 x D	15	-	28	Fz	0,016	0,022	0,034	0,048	0,056	0,062	0,077	0,089	0,100

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1N77 • VariMill™

A

B

TiCN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.

Group	ap	ae	ap	Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 6,0	8,0	10,0	12,0	14,0	16,0	20,0	25,0	30,0
P1	1,5 x D	0,5 x D	1 x D	56	-	64	Fz	0,058	0,078	0,090	0,099	0,111	0,121	0,137	0,149	0,149
P2	1,5 x D	0,5 x D	1 x D	48	-	64	Fz	0,058	0,078	0,090	0,099	0,111	0,121	0,137	0,149	0,149
P3	1,5 x D	0,5 x D	1 x D	40	-	56	Fz	0,048	0,065	0,076	0,084	0,095	0,105	0,121	0,137	0,137
P5	1,5 x D	0,5 x D	1 x D	20	-	28	Fz	0,039	0,052	0,061	0,067	0,076	0,084	0,097	0,109	0,109
M1	1,5 x D	0,5 x D	1 x D	20	-	28	Fz	0,048	0,065	0,076	0,084	0,095	0,105	0,121	0,137	0,137
M2	1,5 x D	0,5 x D	1 x D	20	-	24	Fz	0,039	0,052	0,061	0,067	0,076	0,084	0,097	0,109	0,109
M3	1,5 x D	0,5 x D	1 x D	12	-	16	Fz	0,033	0,044	0,051	0,056	0,062	0,068	0,078	0,085	0,085
K1	1,5 x D	0,5 x D	1 x D	56	-	64	Fz	0,058	0,078	0,090	0,099	0,111	0,121	0,137	0,149	0,149
K2	1,5 x D	0,5 x D	1 x D	40	-	56	Fz	0,048	0,065	0,076	0,084	0,095	0,105	0,121	0,137	0,137
N1	1,5 x D	0,5 x D	1 x D	240	-	300	Fz	0,079	0,104	0,125	0,144	0,168	0,192	0,240	0,300	0,300
N2	1,5 x D	0,5 x D	1 x D	184	-	240	Fz	0,063	0,083	0,100	0,115	0,134	0,154	0,192	0,240	0,240
S1	1,5 x D	0,5 x D	1 x D	12	-	24	Fz	0,048	0,065	0,076	0,084	0,095	0,105	0,121	0,137	0,137
S2	1,5 x D	0,5 x D	1 x D	4	-	12	Fz	0,026	0,034	0,040	0,045	0,050	0,056	0,065	0,074	0,074
S3	1,5 x D	0,5 x D	1 x D	12	-	22	Fz	0,039	0,052	0,061	0,067	0,076	0,084	0,097	0,109	0,109
S4	1,5 x D	0,5 x D	0,5 x D	12	-	22	Fz	0,034	0,048	0,056	0,062	0,070	0,077	0,089	0,100	0,100

Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 1N05 1N07

A

Group	ap	ae	Uncoated Cutting Speed Vc m/min Min		Max	TiAlN Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 6,0	8,0	10,0	12,0	14,0	16,0	20,0	25,0
P1	1,5 x D	0,5 x D	28	-	32	70	-	80	Fz	0,046	0,062	0,072	0,079	0,089	0,097	0,109	0,119
P2	1,5 x D	0,5 x D	24	-	32	60	-	80	Fz	0,046	0,062	0,072	0,079	0,089	0,097	0,109	0,119
P3	1,5 x D	0,5 x D	20	-	28	50	-	70	Fz	0,038	0,052	0,061	0,067	0,076	0,084	0,097	0,109
P5	1,5 x D	0,5 x D	10	-	14	25	-	35	Fz	0,031	0,042	0,048	0,054	0,061	0,067	0,078	0,087
M1	1,5 x D	0,5 x D	10	-	14	25	-	35	Fz	0,038	0,052	0,061	0,067	0,076	0,084	0,097	0,109
M2	1,5 x D	0,5 x D	10	-	12	25	-	30	Fz	0,031	0,042	0,048	0,054	0,061	0,067	0,078	0,087
M3	1,5 x D	0,5 x D	6	-	8	15	-	20	Fz	0,026	0,035	0,040	0,045	0,050	0,055	0,062	0,068
K1	1,5 x D	0,5 x D	28	-	32	70	-	80	Fz	0,046	0,062	0,072	0,079	0,089	0,097	0,109	0,119
K2	1,5 x D	0,5 x D	20	-	28	50	-	70	Fz	0,038	0,052	0,061	0,067	0,076	0,084	0,097	0,109
N1	1,5 x D	0,5 x D	180	-	225	300	-	375	Fz	0,063	0,083	0,100	0,115	0,134	0,154	0,192	0,240
N2	1,5 x D	0,5 x D	138	-	180	230	-	300	Fz	0,051	0,067	0,080	0,092	0,108	0,123	0,154	0,192
S1	1,5 x D	0,5 x D	6	-	12	15	-	30	Fz	0,038	0,052	0,061	0,067	0,076	0,084	0,097	0,109
S2	1,5 x D	0,5 x D	2	-	6	5	-	15	Fz	0,021	0,027	0,032	0,036	0,040	0,045	0,052	0,059
S3	1,5 x D	0,5 x D	6	-	11	15	-	28	Fz	0,031	0,042	0,048	0,054	0,061	0,067	0,078	0,087
S4	1,5 x D	0,5 x D	6	-	11	15	-	28	Fz	0,027	0,038	0,045	0,050	0,056	0,062	0,071	0,080

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

High-Performance High-Speed Steel (HSS-E) Roughers

The most comprehensive line of high-performance roughers available for all materials and applications.

Known throughout the world as the leader in the field of roughing end mills, WIDIA-Hanita delivers the widest variety of premium cobalt and powdered metal roughing tools available that achieve maximum metal removal rates.

The tools are designed with unique sinusoidal profiles and chipbreaker forms to optimize chip evacuation and tool performance in specific materials and applications. They also are offered with high-quality PCD coatings, enabling the tools to run at high speeds and deliver the longest tool life.

WIDIA-Hanita roughers enable the user to save considerable tool costs — even over carbide tools. They can also help to avoid severe tool breakage because of their superior toughness. With their ability to take deeper and heavier cuts, these roughers enable WIDIA-Hanita users to significantly reduce machining time and increase overall productivity, often outperforming even indexable-style tools.

Roughing Profiles and Uses

Coarse profile
For slotting pocketing and heavy profile cuts in Ferrous materials.

Fine profile
For profile cuts and shallow slots (less than 12,7mm) in Ferrous materials.

WavCut™ profile
For for heavy machining of Titanium.

Extra-Fine profile
For profiling cuts in medium to hard Steels.

Chamfered profile
For machining Non-Ferrous materials.

Flat Shallow profile
For machining Alloyed Steels, Stainless Steels, High-Temp Alloys, Titanium, and Hard Materials.

Chipbreaker profile
For roughing and semi-finishing.

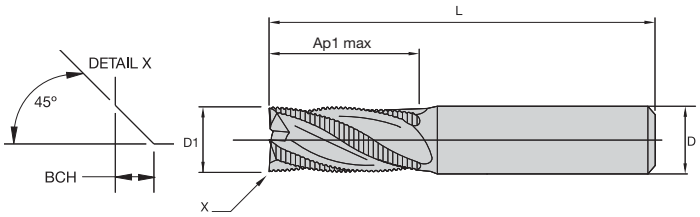
High-Performance High-Speed Steel (HSS-E/PM) End Mills • Roughing

Roughing **A179–A187**

Application Data

List 6N04 . . . . . A180 . . . . . A185
List 6N06 . . . . . A181 . . . . . A185
List 6N70 . . . . . A182 . . . . . A186
List 6NL6 . . . . . A183 . . . . . A186
Lists 664W 660W 661W . . . . . A184 . . . . . A187

- Center cutting.
- Extra fine pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,12 / -0,12	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

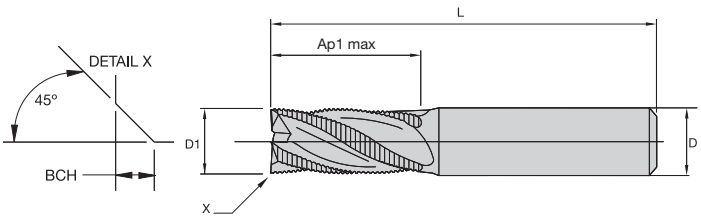
	P				M			K		S			
	1	2	3	5	1	2	3	1	2	1	2	3	4
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A185.

D1	D	length of cut Ap1 max	length L	BCH	Z U	TiCN - CW	TiAlN - LW
6,0	6	13,00	57	0,25	3	6N0406002CW	6N0406002LW
8,0	10	19,00	69	0,25	3	–	6N0408004LW
10,0	10	22,00	72	0,25	4	6N0410004CW	6N0410004LW
12,0	12	26,00	83	0,35	4	6N0412005CW	6N0412005LW
16,0	16	32,00	92	0,35	4	–	6N0416006LW
18,0	16	32,00	92	0,35	4	6N0418006CW	6N0418006LW
20,0	20	38,00	104	0,35	4	6N0420007CW	6N0420007LW
25,0	25	45,00	121	0,50	5	6N0425008CW	–

- Center cutting.
- Fine pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,12 / -0,12	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

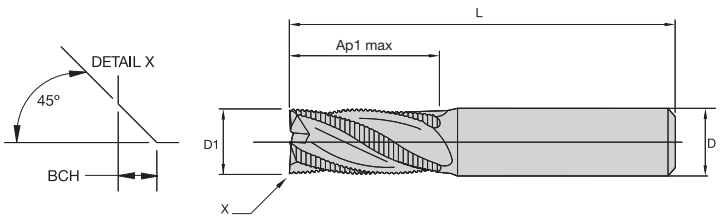
	P				M			K		S			
	1	2	3	5	1	2	3	1	2	1	2	3	4
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A185.

D1	D	length of cut Ap1 max	length L	BCH	Z U	TiCN - CW	TiAlN - LW
6,0	6	13,00	57	0,25	4	6N0606002CW	6N0606002LW
7,0	10	16,00	66	0,25	4	6N0607004CW	6N0607004LW
8,0	10	19,00	69	0,25	4	6N0608004CW	6N0608004LW
9,0	10	19,00	69	0,25	4	6N0609004CW	6N0609004LW
10,0	10	22,00	72	0,25	4	6N0610004CW	6N0610004LW
11,0	12	22,00	79	0,25	4	–	6N0611005LW
12,0	12	26,00	83	0,35	4	–	6N0612005LW
13,0	12	26,00	83	0,35	4	–	6N0613005LW
14,0	12	26,00	83	0,35	4	6N0614005CW	6N0614005LW
15,0	12	26,00	83	0,35	4	–	6N0615005LW
16,0	16	32,00	92	0,35	4	6N0616006CW	6N0616006LW
18,0	16	32,00	92	0,35	4	6N0618006CW	6N0618006LW
20,0	20	38,00	104	0,35	4	6N0620007CW	6N0620007LW
22,0	20	38,00	104	0,50	5	6N0622007CW	6N0622007LW
25,0	25	45,00	121	0,50	5	6N0625008CW	6N0625008LW
30,0	25	45,00	121	0,50	5	6N0630008CW	6N0630008LW

- Center cutting.
- Flat shallow pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,12 / -0,12	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

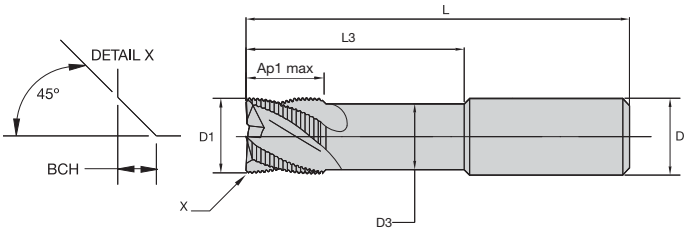
	P				M			K		S			
	1	2	3	5	1	2	3	1	2	1	2	3	4
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A185.

D1	D	length of cut Ap1 max	length L	BCH	Z U	TiAlN - LT	TiAlN - LW
6,0	6	13,00	57	0,25	4	**6N7006002LT**	**6N7006002LW**
8,0	10	19,00	69	0,25	4	**6N7008004LT**	**6N7008004LW**
10,0	10	22,00	72	0,25	4	**6N7010004LT**	**6N7010004LW**
12,0	12	26,00	83	0,35	4	**6N7012005LT**	**6N7012005LW**
14,0	12	26,00	83	–	4	**6N7014005LT**	**–**
14,0	12	26,00	83	0,35	4	**–**	**6N7014005LW**
16,0	16	32,00	92	0,35	4	**6N7016006LT**	**6N7016006LW**
18,0	16	32,00	92	0,35	4	**–**	**6N7018006LW**
18,0	16	32,00	92	–	4	**6N7018006LT**	**–**
20,0	20	38,00	104	0,35	4	**6N7020007LT**	**6N7020007LW**
25,0	25	45,00	121	0,50	4	**6N7025008LT**	**6N7025008LW**
32,0	20	53,00	133	–	6	**6N7032009LT**	**–**
32,0	32	53,00	133	0,50	6	**–**	**6N7032009LW**

- Center cutting.
- Fine pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,12 / -0,12	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

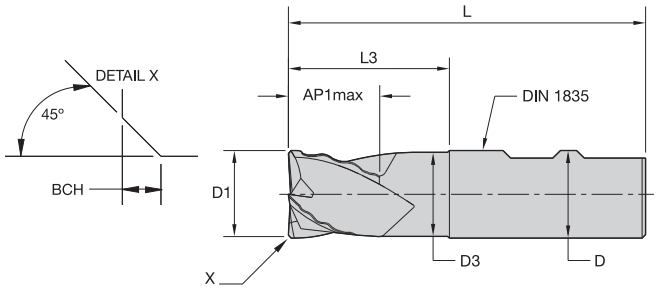
	P				M			K		S			
	1	2	3	5	1	2	3	1	2	1	2	3	4
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A186.

D1	D	length of cut Ap1 max	L3	length L	BCH	D3	Z U	TiAlN - LW
10,0	10	22,00	69,00	110	0,25	9,50	4	**6NL610004LW**
12,0	12	26,00	78,00	125	0,35	11,50	4	**6NL612005LW**
16,0	16	32,00	87,00	138	0,35	15,00	4	**6NL616006LW**
20,0	20	38,00	108,00	160	0,35	19,50	4	**6NL620007LW**
25,0	25	45,00	155,00	216	0,50	24,50	5	**6NL625008LW**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,05 / -0,05	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013
		> 30 to 50	0 / 0,016

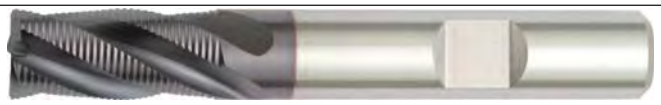
	P	M		S	
	5	1	2	3	4
Uncoated	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A187.

D1	D	length of cut Ap1 max	length L3	L	BCH	D3	Z U	UNCOATED - WW
25,0	25	26,00	46,00	102	1,00	23,00	5	**664W25008WW**
25,0	25	45,00	65,00	121	1,00	23,00	5	**660W25008WW**
25,0	25	90,00	110,00	166	1,00	23,00	6	**661W25008WW**
32,0	32	32,00	52,00	112	1,00	30,00	6	**664W32009WW**
32,0	32	53,00	73,00	133	1,00	30,00	6	**660W32009WW**
32,0	32	100,00	110,00	170	1,00	30,00	6	**661W32009WW**
40,0	32	38,00	58,00	118	1,00	–	6	**664W40009WW**
40,0	32	56,00	65,00	125	1,00	–	6	**660W40009WW**
40,0	32	100,00	110,00	170	1,00	–	6	**661W40009WW**
50,0	50	40,00	60,00	140	1,00	47,00	6	**664W50000WW**
50,0	50	75,00	95,00	175	1,00	47,00	6	**660W50000WW**
50,0	50	110,00	130,00	210	1,00	47,00	8	**661W50000WW**

List 6N04



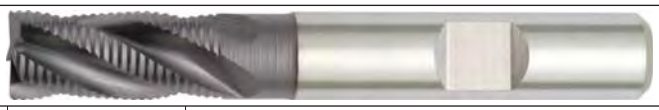
	A		B	TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	18,0	20,0	25,0
P1	1,5 x D	0,5 x D	1 x D	56	-	64	70	-	80	Fz	0,046	0,062	0,072	0,079	0,097	0,104	0,109	0,119
P2	1,5 x D	0,5 x D	1 x D	48	-	64	60	-	80	Fz	0,046	0,062	0,072	0,079	0,097	0,104	0,109	0,119
P3	1,5 x D	0,5 x D	1 x D	40	-	56	50	-	70	Fz	0,038	0,052	0,061	0,067	0,084	0,091	0,097	0,109
P5	1,5 x D	0,5 x D	1 x D	20	-	28	25	-	35	Fz	0,031	0,042	0,048	0,054	0,067	0,073	0,078	0,087
M1	1,5 x D	0,5 x D	1 x D	20	-	28	25	-	35	Fz	0,038	0,052	0,061	0,067	0,084	0,091	0,097	0,109
M2	1,5 x D	0,5 x D	1 x D	20	-	24	25	-	30	Fz	0,031	0,042	0,048	0,054	0,067	0,073	0,078	0,087
M3	1,5 x D	0,5 x D	1 x D	12	-	16	15	-	20	Fz	0,026	0,035	0,040	0,045	0,055	0,059	0,062	0,068
K1	1,5 x D	0,5 x D	1 x D	56	-	64	70	-	80	Fz	0,046	0,062	0,072	0,079	0,097	0,104	0,109	0,119
K2	1,5 x D	0,5 x D	1 x D	40	-	56	50	-	70	Fz	0,038	0,052	0,061	0,067	0,084	0,091	0,097	0,109
S1	1,5 x D	0,5 x D	1 x D	12	-	24	15	-	30	Fz	0,038	0,052	0,061	0,067	0,084	0,091	0,097	0,109
S2	1,5 x D	0,5 x D	1 x D	4	-	12	5	-	15	Fz	0,021	0,027	0,032	0,036	0,045	0,048	0,052	0,059
S3	1,5 x D	0,5 x D	1 x D	12	-	22	15	-	28	Fz	0,031	0,042	0,048	0,054	0,067	0,073	0,078	0,087
S4	1,5 x D	0,5 x D	0,5 x D	12	-	22	15	-	28	Fz	0,027	0,038	0,045	0,050	0,062	0,067	0,071	0,080

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 6N06



	A		B	TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	18,0	20,0	25,0	30,0
P1	1,5 x D	0,5 x D	1 x D	56	-	64	70	-	80	Fz	0,046	0,062	0,072	0,079	0,097	0,104	0,109	0,119	0,143
P2	1,5 x D	0,5 x D	1 x D	48	-	64	60	-	80	Fz	0,046	0,062	0,072	0,079	0,097	0,104	0,109	0,119	0,143
P3	1,5 x D	0,5 x D	1 x D	40	-	56	50	-	70	Fz	0,038	0,052	0,061	0,067	0,084	0,091	0,097	0,109	0,131
P5	1,5 x D	0,5 x D	1 x D	20	-	28	25	-	35	Fz	0,031	0,042	0,048	0,054	0,067	0,073	0,078	0,087	0,105
M1	1,5 x D	0,5 x D	1 x D	20	-	28	25	-	35	Fz	0,038	0,052	0,061	0,067	0,084	0,091	0,097	0,109	0,131
M2	1,5 x D	0,5 x D	1 x D	20	-	24	25	-	30	Fz	0,031	0,042	0,048	0,054	0,067	0,073	0,078	0,087	0,105
M3	1,5 x D	0,5 x D	1 x D	12	-	16	15	-	20	Fz	0,026	0,035	0,040	0,045	0,055	0,059	0,062	0,068	0,082
K1	1,5 x D	0,5 x D	1 x D	56	-	64	70	-	80	Fz	0,046	0,062	0,072	0,079	0,097	0,104	0,109	0,119	0,143
K2	1,5 x D	0,5 x D	1 x D	40	-	56	50	-	70	Fz	0,038	0,052	0,061	0,067	0,084	0,091	0,097	0,109	0,131
S1	1,5 x D	0,5 x D	1 x D	12	-	24	15	-	30	Fz	0,038	0,052	0,061	0,067	0,084	0,091	0,097	0,109	0,131
S2	1,5 x D	0,5 x D	1 x D	4	-	12	5	-	15	Fz	0,021	0,027	0,032	0,036	0,045	0,048	0,052	0,059	0,071
S3	1,5 x D	0,5 x D	1 x D	12	-	22	15	-	28	Fz	0,031	0,042	0,048	0,054	0,067	0,073	0,078	0,087	0,105
S4	1,5 x D	0,5 x D	1 x D	12	-	22	15	-	28	Fz	0,027	0,038	0,045	0,050	0,062	0,067	0,071	0,080	0,096

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 6N70

	A		B	TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	18,0	20,0	25,0	32,0
P1	1,5 x D	0,5 x D	1 x D	70	-	80	Fz	0,058	0,078	0,090	0,099	0,121	0,130	0,137	0,149	0,190
P2	1,5 x D	0,5 x D	1 x D	60	-	80	Fz	0,058	0,078	0,090	0,099	0,121	0,130	0,137	0,149	0,190
P3	1,5 x D	0,5 x D	1 x D	50	-	70	Fz	0,048	0,065	0,076	0,084	0,105	0,113	0,121	0,137	0,175
P5	1,5 x D	0,5 x D	1 x D	25	-	35	Fz	0,039	0,052	0,061	0,067	0,084	0,091	0,097	0,109	0,140
M1	1,5 x D	0,5 x D	1 x D	25	-	35	Fz	0,048	0,065	0,076	0,084	0,105	0,113	0,121	0,137	0,175
M2	1,5 x D	0,5 x D	1 x D	25	-	30	Fz	0,039	0,052	0,061	0,067	0,084	0,091	0,097	0,109	0,140
M3	1,5 x D	0,5 x D	1 x D	15	-	20	Fz	0,033	0,044	0,051	0,056	0,068	0,073	0,078	0,085	0,109
K1	1,5 x D	0,5 x D	1 x D	70	-	80	Fz	0,058	0,078	0,090	0,099	0,121	0,130	0,137	0,149	0,190
K2	1,5 x D	0,5 x D	1 x D	50	-	70	Fz	0,048	0,065	0,076	0,084	0,105	0,113	0,121	0,137	0,175
S1	1,5 x D	0,5 x D	1 x D	15	-	30	Fz	0,048	0,065	0,076	0,084	0,105	0,113	0,121	0,137	0,175
S2	1,5 x D	0,5 x D	1 x D	5	-	15	Fz	0,026	0,034	0,040	0,045	0,056	0,060	0,065	0,074	0,094
S3	1,5 x D	0,5 x D	1 x D	15	-	30	Fz	0,039	0,052	0,061	0,067	0,084	0,091	0,097	0,109	0,140
S4	1,5 x D	0,5 x D	1 x D	15	-	30	Fz	0,034	0,048	0,056	0,062	0,077	0,083	0,089	0,100	0,128

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 6NL6

	A		B	TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.					
				Cutting Speed Vc m/min				D1 - Diameter				
Group	ap	ae	ap	Min		Max	mm	10,0	12,0	16,0	20,0	25,0
P1	1,5 x D	0,5 x D	1 x D	70	-	80	Fz	0,063	0,070	0,085	0,096	0,104
P2	1,5 x D	0,5 x D	1 x D	60	-	80	Fz	0,063	0,070	0,085	0,096	0,104
P3	1,5 x D	0,5 x D	1 x D	50	-	70	Fz	0,053	0,059	0,073	0,085	0,096
P5	1,5 x D	0,5 x D	1 x D	25	-	35	Fz	0,042	0,047	0,059	0,068	0,076
M1	1,5 x D	0,5 x D	1 x D	25	-	35	Fz	0,053	0,059	0,073	0,085	0,096
M2	1,5 x D	0,5 x D	1 x D	25	-	30	Fz	0,042	0,047	0,059	0,068	0,076
M3	1,5 x D	0,5 x D	1 x D	15	-	20	Fz	0,035	0,039	0,048	0,054	0,060
K1	1,5 x D	0,5 x D	1 x D	70	-	80	Fz	0,063	0,070	0,085	0,096	0,104
K2	1,5 x D	0,5 x D	1 x D	50	-	70	Fz	0,053	0,059	0,073	0,085	0,096
S1	1,5 x D	0,5 x D	1 x D	15	-	30	Fz	0,053	0,059	0,073	0,085	0,096
S2	1,5 x D	0,5 x D	1 x D	5	-	15	Fz	0,028	0,031	0,039	0,045	0,051
S3	1,5 x D	0,5 x D	1 x D	15	-	30	Fz	0,042	0,047	0,059	0,068	0,076
S4	1,5 x D	0,5 x D	0,5 x D	10	-	20	Fz	0,039	0,043	0,054	0,062	0,070

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 664W 660W 661W • WavCut™

	A		B	Uncoated			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.				
				Cutting Speed Vc m/min				D1 - Diameter			
Group	ap	ae	ap	Min		Max	mm	25,0	32,0	40,0	50,0
P5	1,5 x D	0,4 x D	1 x D	10	-	14	Fz	0,091	0,105	0,124	0,146
M1	1,5 x D	0,4 x D	1 x D	10	-	14	Fz	0,114	0,131	0,155	0,182
M2	1,5 x D	0,4 x D	1 x D	10	-	12	Fz	0,091	0,105	0,124	0,146
S3	1,5 x D	0,4 x D	0,75 x D	6	-	11	Fz	0,091	0,105	0,124	0,146
S4	1,5 x D	0,4 x D	0,75 x D	6	-	11	Fz	0,084	0,096	0,114	0,134

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

General Purpose+ Solid Carbide End Mills

For general application milling, choose the best.

WIDIA-Hanita precision solid carbide end mills are manufactured from proprietary, sub-micron, extra-fine grain carbide grades, selected for their suitability to the purpose of the particular tool style. Fully controlled for compliance to specific requirements, blanks are fluted and ground on state-of-the-art CNC machines to exacting tolerances. In-process gaging, SPC measurement, and proper wheel dressing and maintenance ensure that our tools will provide consistent and reliable performance, tool to tool and batch to batch. Tools are fully conpliant with DIN, European standard, USCTI, or NAS specifications.

The WIDIA-Hanita conventional geometries are available with:

- A wide offering of diameter choices.
- Stub, regular, long, and extra-long lengths available.
- TiCN and TiAlN coatings.
- Square end and ball nose geometries.

General Purpose+ Solid Carbide End Mills • Roughing/Finishing

Roughing/Finishing **A189–A274**

Application Data

NINA™ LINE **A190–A194**

Lists 423002 323002 423001 323001 . . . . . A190 . . . . . A245
Lists 423004 423003 . . . . . A191 . . . . . A245
Lists 423048 423047 . . . . . A192 . . . . . A246
Lists 423039 423038 . . . . . A193 . . . . . A246
Lists 423036 423037 . . . . . A194 . . . . . A247

DIN Tools **A196–A219**

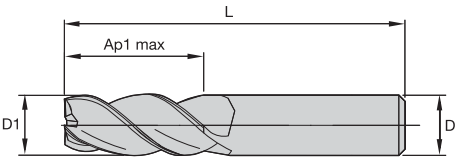
Lists D002 D012 . . . . . A196–A197 . . . . . A248
Lists 422867 022867 422807 022807 422860 422808 . . . . . A198–A200 . . . . . A249
Lists 422819 022819 . . . . . A201 . . . . . A250
Lists 422838 022838 . . . . . A202 . . . . . A250
Lists D001 D011 . . . . . A203 . . . . . A251
List D501 . . . . . A204 . . . . . A252
Lists D003 D013 . . . . . A205–A206 . . . . . A253
Lists 422861 022861 422809 022809 422862 022862 422810 022810 . . . . . A207–A208 . . . . . A254
Lists 422821 022821 . . . . . A209 . . . . . A255
List D009 . . . . . A210 . . . . . A256
List DC19 . . . . . A211 . . . . . A256
Lists D004 D014 . . . . . A212–A213 . . . . . A257
Lists 422863 022863 422811 022811 422864 022864 422812 022812 . . . . . A214–A215 . . . . . A258
Lists 422825 022825 . . . . . A216 . . . . . A259
Lists 422848 022848 . . . . . A217 . . . . . A259
Lists D000 D010 . . . . . A218 . . . . . A260
Lists 422826 422822 . . . . . A219 . . . . . A261

Factory Standard Tools **A221–A244**

List 4632 . . . . . A221 . . . . . A261
Lists 4002 4012 4022 . . . . . A222–A223 . . . . . A262, A263
Lists 422815 002815 . . . . . A224 . . . . . A264
List 4651 . . . . . A225 . . . . . A264
Lists 4001 4011 4021 . . . . . A226–A227 . . . . . A265, A266
List 4633 . . . . . A229 . . . . . A267
Lists 4003 4013 . . . . . A230–A231 . . . . . A267, A268
List 422858 . . . . . A232 . . . . . A268
Lists 4004 4014 4024 . . . . . A234–A235 . . . . . A269, A270
Lists 422816 022816 . . . . . A236 . . . . . A270
Lists 4000 4010 . . . . . A237 . . . . . A271
Lists 422845 022845 . . . . . A238 . . . . . A272
Lists 422813 022813 . . . . . A240 . . . . . A272
Lists 422818 022818 . . . . . A241 . . . . . A273
Lists 422846 022846 . . . . . A242 . . . . . A273
List 4906 . . . . . A243 . . . . . A274
List 4966 . . . . . A244 . . . . . A274

How many flutes should I choose for a finishing end mill? **A228**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

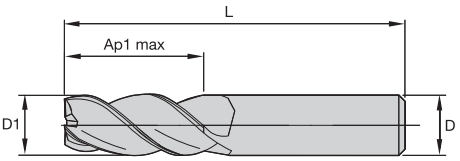
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
TiCN	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A245.

D1	D	length of cut Ap1 max	length L	K30F-TiCN TiCN - CT	K30F-DCF TiAlN - LT	K30F-TiCN TiCN - CW	K30F-DCF TiAlN - LW
2,0	6	4,00	38	323002-000020	423002-000020	323001-000020	423001-000020
3,0	6	5,00	38	323002-000030	423002-000030	323001-000030	423001-000030
4,0	6	7,00	38	323002-000040	423002-000040	323001-000040	423001-000040
5,0	6	8,00	38	323002-000050	423002-000050	323001-000050	423001-000050
6,0	6	8,00	38	323002-000060	423002-000060	323001-000060	423001-000060
8,0	8	11,00	43	323002-000080	423002-000080	323001-000080	423001-000080
10,0	10	13,00	50	323002-000100	423002-000100	323001-000100	423001-000100
12,0	12	15,00	55	323002-000120	423002-000120	323001-000120	423001-000120

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

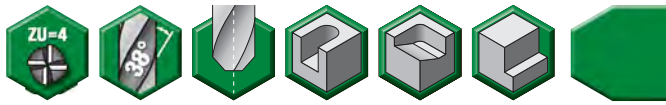
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
TiCN	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

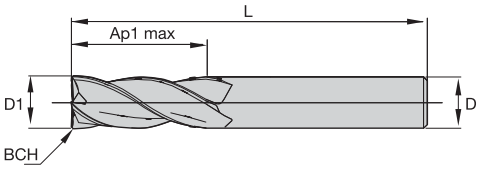
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A245.

D1	D	length of cut Ap1 max	length L	K30F-TiCN TiCN - CT	K30F-DCF TiAlN - LT	K30F-TiCN TiCN - CW	K30F-DCF TiAlN - LW
2,0	6	4,00	38	323002-000020	423002-000020	323001-000020	423001-000020
3,0	6	5,00	38	323002-000030	423002-000030	323001-000030	423001-000030
4,0	6	7,00	38	323002-000040	423002-000040	323001-000040	423001-000040
5,0	6	8,00	38	323002-000050	423002-000050	323001-000050	423001-000050
6,0	6	8,00	38	323002-000060	423002-000060	323001-000060	423001-000060
8,0	8	11,00	43	323002-000080	423002-000080	323001-000080	423001-000080
10,0	10	13,00	50	323002-000100	423002-000100	323001-000100	423001-000100
12,0	12	15,00	55	323002-000120	423002-000120	323001-000120	423001-000120

- Center cutting.
- HPC.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.





End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

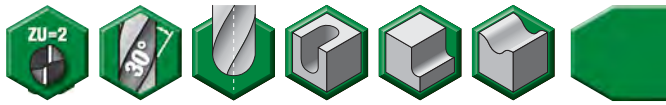
	P				M		K		
	1	2	3	4	1	2	1	2	3
AlTiN	●	●	●	●	●	●	●	●	●

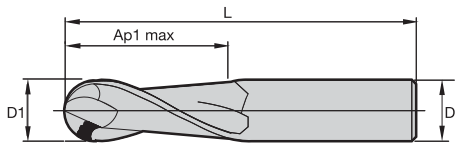
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A245.

D1	D	length of cut Ap1 max	length L	BCH	K30F-DCHP AlTiN - MT	K30F-DCHP AlTiN - MW
4,0	6	7,00	38	0,40	**423004-000040**	**423003-000040**
6,0	6	8,00	38	0,40	**423004-000060**	**423003-000060**
8,0	8	11,00	43	0,40	**423004-000080**	**423003-000080**
10,0	10	13,00	50	0,50	**423004-000100**	**423003-000100**
12,0	12	15,00	55	0,50	**423004-000120**	**423003-000120**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.





End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

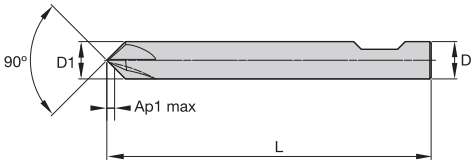
	P				M		K		N
	1	2	3	4	1	2	1	2	5
AlTiN	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A246.

D1	D	length of cut Ap1 max	length L	K30F-DCHP AlTiN - MT	K30F-DCHP AlTiN - MW
2,0	6	4,00	38	423039-000020	423038-000020
3,0	6	5,00	38	423039-000030	423038-000030
4,0	6	7,00	38	423039-000040	423038-000040
5,0	6	8,00	38	423039-000050	423038-000050
6,0	6	8,00	38	423039-000060	423038-000060
8,0	8	11,00	43	423039-000080	423038-000080
10,0	10	13,00	50	423039-000100	423038-000100
12,0	12	15,00	55	423039-000120	423038-000120

- Non-center cutting.
- Chamfering.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

	P						M			K			N						S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	5	6	1	2	3	4	1
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
AlTiN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A247.

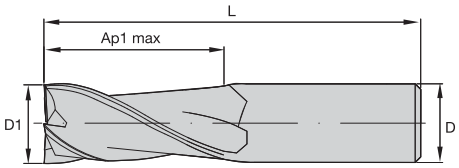
D1	D	length of cut Ap1 max	length L	K30F-DCHP AlTiN - MT	K30F-DCF TiAlN - LW
6,0	6	1,00	38	–	423036-000060
6,0	6	1,00	83	423037-000060	–
8,0	8	1,50	43	–	423036-000080
8,0	8	1,50	104	423037-000080	–
10,0	10	2,00	50	–	423036-000100
10,0	10	2,00	125	423037-000100	–

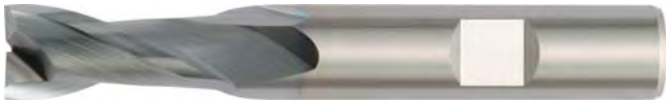
NINA™ LINE

NINA is the economic choice for high quality and high performance when regrinding isn't justified.

- Designed to minimize tool costs.
  - Shorter blanks and cut lengths.
- State-of-the-art substrate and coating enables vibration-free cutting.
- Different geometeries available for many applications.
- TiCN/DCF/DCHP coating applicable in many materials.
- Short, compact design, great for shallow axial cuts.
- Excellent tool rigidity.
- Save expensive carbide material.

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

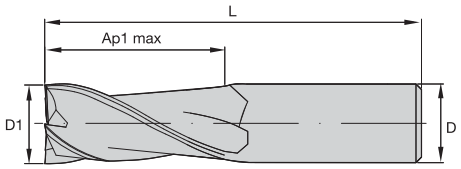
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A248.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiCN - CW	TiAlN - RW
2,0	6	3,00	50	D00202002WW	–	D00202002RW
2,0	6	6,00	53	D01202002WW	–	D01202002RW
2,5	6	3,00	50	D00202502WW	–	D00202502RW
2,5	6	6,00	53	D01202502WW	D01202502CW	D01202502RW
2,8	6	7,00	57	D01202802WW	–	D01202802RW
3,0	6	4,00	50	D00203002WW	–	D00203002RW
3,0	6	7,00	57	D01203002WW	–	D01203002RW
3,5	6	4,00	50	D00203502WW	–	D00203502RW
3,5	6	7,00	57	D01203502WW	D01203502CW	D01203502RW
3,8	6	8,00	57	D01203802WW	D01203802CW	D01203802RW
4,0	6	5,00	54	D00204002WW	–	D00204002RW
4,0	6	8,00	57	D01204002WW	–	D01204002RW

(continued)

(continued)



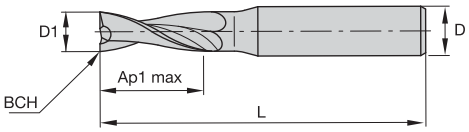
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

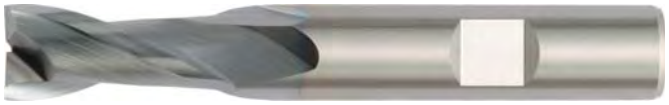
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A248.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiCN - CW	TiAlN - RW
4,5	6	5,00	54	D00204502WW	–	D00204502RW
4,5	6	8,00	57	D01204502WW	–	D01204502RW
4,8	6	10,00	57	D01204802WW	–	D01204802RW
5,0	6	6,00	54	D00205002WW	–	D00205002RW
5,0	6	10,00	57	D01205002WW	D01205002CW	D01205002RW
5,5	6	7,00	54	D00205502WW	D00205502CW	–
5,5	6	10,00	57	D01205502WW	D01205502CW	D01205502RW
5,8	6	10,00	57	D01205752WW	–	D01205752RW
6,0	6	7,00	54	D00206002WW	–	D00206002RW
6,0	6	10,00	57	D01206002WW	–	D01206002RW
6,5	8	13,00	63	D01206503WW	D01206503CW	D01206503RW
6,8	8	13,00	63	D01206753WW	–	D01206753RW
7,0	8	8,00	58	D00207003WW	D00207003CW	D00207003RW
7,0	8	13,00	63	D01207003WW	–	D01207003RW
7,8	8	16,00	63	–	–	D01207753RW
8,0	8	9,00	58	D00208003WW	–	D00208003RW
8,0	8	16,00	63	D01208003WW	–	D01208003RW
8,7	10	16,00	72	–	–	D01208704RW
9,0	10	10,00	66	D00209004WW	–	D00209004RW
9,0	10	16,00	72	D01209004WW	–	D01209004RW
9,7	10	19,00	72	–	–	D01209704RW
10,0	10	11,00	66	D00210004WW	–	D00210004RW
10,0	10	19,00	72	D01210004WW	–	D01210004RW
11,7	12	22,00	83	–	–	D01211705RW
12,0	12	12,00	73	D00212005WW	D00212005CW	D00212005RW
12,0	12	22,00	83	–	–	D01212005RW
14,0	14	14,00	75	D00214014WW	D00214014CW	D00214014RW
14,0	14	22,00	83	–	–	D01214014RW
16,0	16	16,00	82	D00216006WW	–	D00216006RW
16,0	16	26,00	92	–	–	D01216006RW
18,0	18	18,00	84	–	D00218018CW	D00218018RW
20,0	20	20,00	92	D00220007WW	D00220007CW	D00220007RW
20,0	20	32,00	104	D01220007WW	–	D01220007RW

- Center cutting.
- Items with a D1 value of 2,0; 3,0; 4,0; 5,0; 6,0; 8,0; 10,0; 12,0; 14,0; 16,0; 18,0; and 20,0 use the tolerance table for **e8.**
- Items with a D1 value of 2,5; 2,8; 3,5; 3,8; 4,5; 4,8; 5,5; 5,75; 6,5; 6,75; 7,0; 7,5; 7,75; 8,5; 8,7; 9,0; 9,5; 9,7; 11,0; 11,7; 13,0; 13,7; 15,0; and 15,7 use the tolerance table for **h10.**
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





End Mill Tolerances - h10

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A249.

End Mill Tolerances - e8

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

D1	D	length of cut Ap1 max	length L	BCH	K30F UNCOATED - ..	K30F-DCF TiAlN - LT	K30F UNCOATED - WW	K30F-DCF TiAlN - LW
2,00	6	3,00	50	0,10	022867-000020	422867-000020	022807-000020	422807-000020
2,00	6	6,00	57	0,10	–	422860-000020	–	422808-000020
2,50	6	3,00	50	0,10	022867-000025	422867-000025	022807-000025	422807-000025
2,50	6	7,00	57	0,10	–	422860-000025	–	422808-000025
2,80	6	7,00	57	0,10	–	422860-000028	–	422808-000028
3,00	6	4,00	50	0,10	022867-000030	422867-000030	022807-000030	422807-000030
3,00	6	7,00	57	0,10	–	422860-000030	–	422808-000030

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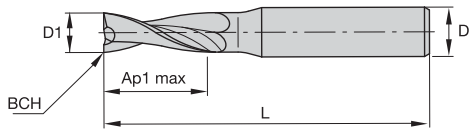

	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A249.

D1	D	length of cut Ap1 max	length L	BCH	K30F UNCOATED - ..	K30F-DCF TiAlN - LT	K30F UNCOATED - WW	K30F-DCF TiAlN - LW
3,50	6	4,00	50	0,10	022867-000035	422867-000035	022807-000035	422807-000035
3,50	6	7,00	57	0,10	–	422860-000035	–	422808-000035
3,80	6	8,00	57	0,10	–	422860-000038	–	422808-000038
4,00	6	5,00	54	0,10	022867-000040	422867-000040	022807-000040	422807-000040
4,00	6	8,00	57	0,10	–	422860-000040	–	422808-000040
4,50	6	5,00	54	0,10	022867-000045	422867-000045	022807-000045	422807-000045
4,50	6	8,00	57	0,10	–	422860-000045	–	422808-000045
4,80	6	10,00	57	0,10	–	422860-000048	–	422808-000048
5,00	6	6,00	54	0,10	022867-000050	422867-000050	022807-000050	422807-000050
5,00	6	10,00	57	0,10	–	422860-000050	–	422808-000050
5,50	6	7,00	54	0,10	022867-000055	422867-000055	–	422807-000055
5,50	6	10,00	57	0,10	–	422860-000055	–	422808-000055
5,75	6	10,00	57	0,10	–	422860-000575	–	422808-000575
6,00	6	7,00	54	0,10	022867-000060	422867-000060	022807-000060	422807-000060
6,00	6	10,00	57	0,10	–	422860-000060	–	422808-000060
6,50	8	8,00	58	0,10	022867-000065	422867-000065	–	422807-000065
6,50	8	13,00	63	0,10	–	422860-000065	–	422808-000065
6,75	8	13,00	63	0,10	–	422860-000675	–	422808-000675
7,00	8	8,00	58	0,20	022867-000070	422867-000070	022807-000070	422807-000070
7,00	8	13,00	63	0,20	–	422860-000070	–	422808-000070
7,50	8	9,00	58	0,20	022867-000075	422867-000075	–	422807-000075
7,50	8	16,00	63	0,20	–	422860-000075	–	422808-000075
7,75	8	16,00	63	0,20	–	422860-000775	–	422808-000775
8,00	8	9,00	58	0,20	022867-000080	422867-000080	022807-000080	422807-000080
8,00	8	16,00	63	0,20	–	422860-000080	–	422808-000080
8,50	10	10,00	66	0,20	022867-000085	422867-000085	–	422807-000085
8,50	10	16,00	72	0,20	–	422860-000085	–	422808-000085
8,70	10	16,00	72	0,20	–	422860-000087	–	422808-000087
9,00	10	10,00	66	0,20	–	422867-000090	022807-000090	422807-000090
9,00	10	16,00	72	0,20	–	422860-000090	–	–
9,00	10	19,00	72	0,20	–	–	–	422808-000090
9,50	10	11,00	66	0,20	022867-000095	422867-000095	022807-000095	422807-000095
9,50	10	19,00	72	0,20	–	422860-000095	–	422808-000095

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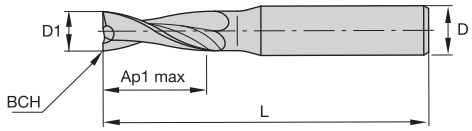


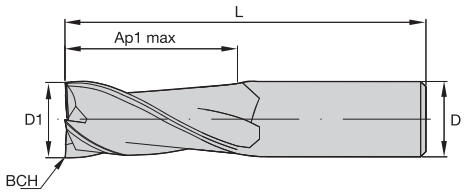
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A249.

D1	D	length of cut Ap1 max	length L	BCH	K30F UNCOATED - ..	K30F-DCF TiAlN - LT	K30F UNCOATED - WW	K30F-DCF TiAlN - LW
9,70	10	19,00	72	0,20	–	422860-000097	–	422808-000097
10,00	10	11,00	66	0,30	022867-000100	422867-000100	022807-000100	422807-000100
10,00	10	16,00	72	0,30	–	–	–	422808-000100
10,00	10	19,00	72	0,30	–	422860-000100	–	–
11,00	12	12,00	73	0,30	–	422867-000110	022807-000110	422807-000110
11,00	12	22,00	83	0,30	–	422860-000110	–	–
11,00	12	33,00	83	0,30	–	–	–	422808-000110
11,70	12	22,00	83	0,30	–	422860-000117	–	–
11,70	12	33,00	83	0,30	–	–	–	422808-000117
12,00	12	12,00	73	0,30	022867-000120	422867-000120	022807-000120	422807-000120
12,00	12	22,00	83	0,30	–	422860-000120	–	–
12,00	12	33,00	83	0,30	–	–	–	422808-000120
13,00	14	14,00	75	0,30	–	422867-000130	–	422807-000130
13,00	14	22,00	83	0,30	–	422860-000130	–	–
13,00	14	33,00	83	0,30	–	–	–	422808-000130
13,70	14	22,00	83	0,30	–	422860-000137	–	–
13,70	14	33,00	83	0,30	–	–	–	422808-000137
14,00	14	14,00	75	0,30	022867-000140	422867-000140	022807-000140	422807-000140
14,00	14	22,00	83	0,30	–	422860-000140	–	–
14,00	14	33,00	83	0,30	–	–	–	422808-000140
15,00	16	16,00	82	0,30	022867-000150	422867-000150	022807-000150	422807-000150
15,00	16	26,00	92	0,30	–	422860-000150	–	422808-000150
15,70	16	26,00	92	0,30	–	422860-000157	–	422808-000157
16,00	16	16,00	82	0,40	–	422867-000160	022807-000160	422807-000160
16,00	16	26,00	92	0,40	–	422860-000160	–	422808-000160
18,00	18	18,00	84	0,40	–	422867-000180	–	422807-000180
18,00	18	26,00	92	0,40	–	422860-000180	–	422808-000180
20,00	20	20,00	92	0,40	022867-000200	422867-000200	–	422807-000200
20,00	20	32,00	104	0,40	–	422860-000200	–	422808-000200

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

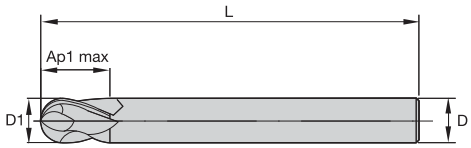
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A250.

D1	D	length of cut Ap1 max	length L	BCH	K30F UNCOATED - ..	K30F-DCF TiAlN - LT
2,0	2,0	8,00	32	0,10	022819-000020	422819-000020
2,5	2,5	8,00	32	0,10	022819-000025	422819-000025
3,0	3,0	12,00	32	0,10	022819-000030	422819-000030
3,5	3,5	7,00	50	0,10	022819-000035	422819-000035
4,0	4,0	8,00	50	0,10	022819-000040	422819-000040
4,5	4,5	8,00	50	0,10	022819-000045	422819-000045
5,0	5,0	10,00	50	0,10	022819-000050	422819-000050
5,5	5,5	10,00	57	0,10	022819-000055	422819-000055
6,0	6,0	10,00	57	0,10	022819-000060	422819-000060
6,5	6,5	13,00	60	0,10	022819-000065	422819-000065
7,0	7,0	13,00	60	0,20	022819-000070	422819-000070
7,5	7,5	16,00	63	0,20	022819-000075	422819-000075
8,0	8,0	16,00	63	0,20	022819-000080	422819-000080
8,5	8,5	16,00	67	0,20	022819-000085	422819-000085
9,0	9,0	16,00	67	0,20	022819-000090	422819-000090
9,5	9,5	19,00	72	0,20	022819-000095	422819-000095
10,0	10,0	19,00	72	0,30	022819-000100	422819-000100
11,0	11,0	22,00	83	0,30	022819-000110	422819-000110
12,0	12,0	22,00	83	0,30	022819-000120	422819-000120
13,0	13,0	22,00	83	0,30	022819-000130	422819-000130
14,0	14,0	22,00	83	0,30	022819-000140	422819-000140
15,0	15,0	26,00	92	0,30	022819-000150	422819-000150
16,0	16,0	26,00	92	0,40	022819-000160	422819-000160
18,0	18,0	26,00	92	0,40	022819-000180	422819-000180
20,0	20,0	32,00	104	0,40	022819-000200	422819-000200

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

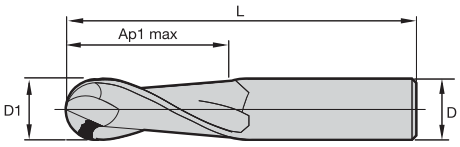
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
AlTiN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A250.

D1	D	length of cut Ap1 max	length L	K30F UNCOATED - ..	K30F-DCHP AlTiN - MT
2,0	2	6,00	32	022838-000020	422838-000020
3,0	3	7,00	32	022838-000030	422838-000030
4,0	4	8,00	50	022838-000040	422838-000040
5,0	5	10,00	50	022838-000050	422838-000050
6,0	6	10,00	57	022838-000060	422838-000060
8,0	8	16,00	63	022838-000080	422838-000080
10,0	10	19,00	72	022838-000100	422838-000100
12,0	12	22,00	83	022838-000120	422838-000120
14,0	14	22,00	83	022838-000140	422838-000140
16,0	16	26,00	92	022838-000160	422838-000160
18,0	18	26,00	92	022838-000180	422838-000180
20,0	20	32,00	104	022838-000200	422838-000200

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

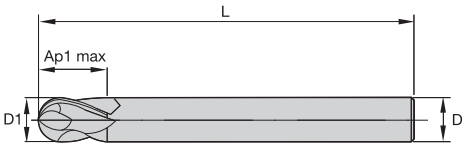
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A251.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiAlN - RW
3,0	6	4,00	50	D00103002WW	D00103002RW
3,0	6	7,00	57	D01103002WW	D01103002RW
4,0	6	5,00	54	D00104002WW	D00104002RW
4,0	6	8,00	57	D01104002WW	D01104002RW
5,0	6	6,00	54	D00105002WW	D00105002RW
5,0	6	10,00	57	D01105002WW	D01105002RW
6,0	6	7,00	54	D00106002WW	D00106002RW
6,0	6	10,00	57	D01106002WW	D01106002RW
8,0	8	9,00	58	D00108003WW	D00108003RW
8,0	8	16,00	63	D01108003WW	D01108003RW
10,0	10	11,00	66	D00110004WW	D00110004RW
10,0	10	19,00	72	D01110004WW	D01110004RW
12,0	12	12,00	73	D00112005WW	D00112005RW
12,0	12	22,00	83	D01112005WW	D01112005RW
14,0	14	14,00	75	D00114014WW	D00114014RW
14,0	14	22,00	83	D01114014WW	D01114014RW
16,0	16	16,00	82	D00116006WW	D00116006RW
16,0	16	26,00	92	–	D01116006RW
18,0	18	18,00	84	D00118018WW	D00118018RW
18,0	18	26,00	92	D01118018WW	D01118018RW
20,0	20	20,00	92	D00120007WW	D00120007RW
20,0	20	32,00	104	D01120007WW	D01120007RW

- Center cutting.
- For high-speed machining.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

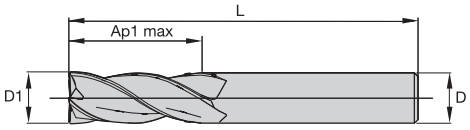
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
TiAlN	●	●	●	●	●	●	●	●	●	●	●

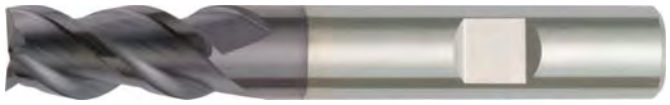
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A252.

D1	D	length of cut Ap1 max	length L	TiAlN - RT
1,0	4	2,00	50	**D50101001RT**
2,0	6	4,00	50	**D50102002RT**
3,0	6	4,00	50	**D50103002RT**
4,0	6	5,00	54	**D50104002RT**
5,0	6	6,00	54	**D50105002RT**
6,0	6	7,00	54	**D50106002RT**
8,0	8	9,00	58	**D50108003RT**
10,0	10	11,00	66	**D50110004RT**
12,0	12	12,00	73	**D50112005RT**
16,0	16	16,00	82	**D50116006RT**
18,0	18	18,00	84	**D50118018RT**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A251.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiCN - CW	TiAlN - RW
2,0	6	3,00	50	D00302002WW	–	D00302002RW
2,0	6	6,00	53	D01302002WW	D01302002CW	D01302002RW
2,5	6	3,00	50	D00302502WW	–	D00302502RW
2,5	6	6,00	53	D01302502WW	D01302502CW	D01302502RW
3,0	6	4,00	50	D00303002WW	–	D00303002RW
3,0	6	7,00	57	D01303002WW	D01303002CW	D01303002RW
3,5	6	4,00	50	D00303502WW	–	D00303502RW
3,5	6	7,00	57	D01303502WW	–	D01303502RW
4,0	6	5,00	54	D00304002WW	–	D00304002RW
4,0	6	8,00	57	D01304002WW	D01304002CW	D01304002RW

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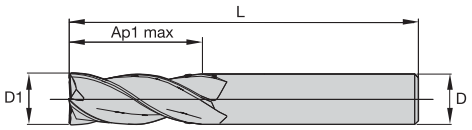


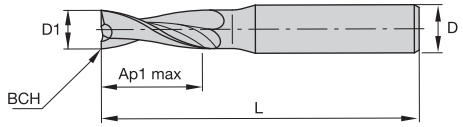
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A251.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiCN - CW	TiAlN - RW
4,5	6	5,00	54	D00304502WW	–	D00304502RW
4,5	6	8,00	57	D01304502WW	D01304502CW	D01304502RW
5,0	6	6,00	54	D00305002WW	–	D00305002RW
5,0	6	10,00	57	D01305002WW	D01305002CW	D01305002RW
5,5	6	7,00	54	D00305502WW	–	D00305502RW
5,5	6	10,00	57	D01305502WW	–	D01305502RW
6,0	6	7,00	54	D00306002WW	–	D00306002RW
6,0	6	10,00	57	D01306002WW	D01306002CW	D01306002RW
6,5	8	13,00	63	D01306503WW	D01306503CW	D01306503RW
7,0	8	8,00	58	D00307003WW	–	D00307003RW
7,0	8	13,00	63	D01307003WW	D01307003CW	D01307003RW
8,0	8	9,00	58	D00308003WW	–	D00308003RW
8,0	8	16,00	63	D01308003WW	D01308003CW	D01308003RW
9,0	10	10,00	66	D00309004WW	–	D00309004RW
9,0	10	16,00	72	D01309004WW	–	–
10,0	10	11,00	66	D00310004WW	–	D00310004RW
10,0	10	19,00	72	D01310004WW	D01310004CW	D01310004RW
12,0	12	12,00	73	D00312005WW	–	D00312005RW
12,0	12	22,00	83	D01312005WW	D01312005CW	D01312005RW
14,0	14	14,00	75	D00314014WW	–	D00314014RW
14,0	14	22,00	83	–	–	D01314014RW
16,0	16	16,00	82	D00316006WW	–	D00316006RW
16,0	16	26,00	92	D01316006WW	D01316006CW	D01316006RW
18,0	18	18,00	84	D00318018WW	–	D00318018RW
20,0	20	20,00	92	D00320007WW	D00320007CW	D00320007RW
20,0	20	32,00	104	D01320007WW	D01320007CW	D01320007RW

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A254.

D1	D	length of cut Ap1 max	length L	BCH	K30F UNCOATED - ..	K30F-DCF TiAlN - LT	K30F UNCOATED - WW	K30F-DCF TiAlN - LW
2,0	6	3,00	50	0,10	022861-000020	422861-000020	022809-000020	422809-000020
2,0	6	6,00	57	0,10	022862-000020	422862-000020	022810-000020	422810-000020
2,5	6	3,00	50	0,10	022861-000025	422861-000025	022809-000025	422809-000025
2,5	6	7,00	57	0,10	022862-000025	422862-000025	022810-000025	422810-000025
3,0	6	4,00	50	0,10	022861-000030	422861-000030	022809-000030	422809-000030
3,0	6	7,00	57	0,10	022862-000030	422862-000030	022810-000030	422810-000030
3,5	6	4,00	50	0,10	022861-000035	422861-000035	022809-000035	422809-000035
3,5	6	7,00	57	0,10	022862-000035	422862-000035	022810-000035	422810-000035
4,0	6	5,00	54	0,10	022861-000040	422861-000040	022809-000040	422809-000040
4,0	6	8,00	57	0,10	022862-000040	422862-000040	022810-000040	422810-000040
4,5	6	5,00	54	0,10	022861-000045	422861-000045	022809-000045	422809-000045
4,5	6	8,00	57	0,10	022862-000045	422862-000045	022810-000045	422810-000045
5,0	6	6,00	54	0,10	022861-000050	422861-000050	022809-000050	422809-000050
5,0	6	10,00	57	0,10	022862-000050	422862-000050	022810-000050	422810-000050
5,5	6	7,00	54	0,10	022861-000055	422861-000055	022809-000055	422809-000055
5,5	6	10,00	57	0,10	022862-000055	422862-000055	022810-000055	422810-000055

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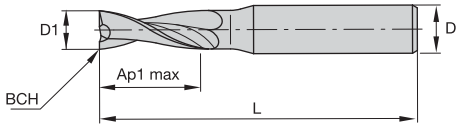


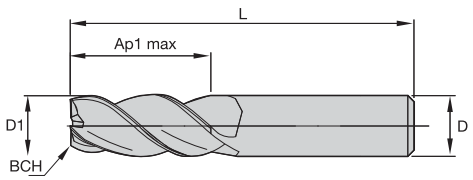
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A254.

D1	D	length of cut Ap1 max	length L	BCH	K30F UNCOATED - ..	K30F-DCF TiAlN - LT	K30F UNCOATED - WW	K30F-DCF TiAlN - LW
6,0	6	7,00	54	0,10	022861-000060	422861-000060	022809-000060	422809-000060
6,0	6	10,00	57	0,10	022862-000060	422862-000060	022810-000060	422810-000060
6,5	8	8,00	58	0,10	022861-000065	422861-000065	022809-000065	422809-000065
6,5	8	13,00	63	0,10	022862-000065	422862-000065	022810-000065	422810-000065
7,0	8	8,00	58	0,20	022861-000070	422861-000070	022809-000070	422809-000070
7,0	8	13,00	63	0,20	022862-000070	422862-000070	022810-000070	422810-000070
7,5	8	9,00	58	0,20	022861-000075	422861-000075	022809-000075	422809-000075
7,5	8	16,00	63	0,20	022862-000075	422862-000075	022810-000075	422810-000075
8,0	8	9,00	58	0,20	022861-000080	422861-000080	022809-000080	422809-000080
8,0	8	16,00	63	0,20	022862-000080	422862-000080	022810-000080	422810-000080
8,5	10	10,00	66	0,20	022861-000085	422861-000085	022809-000085	422809-000085
8,5	10	16,00	72	0,20	022862-000085	422862-000085	022810-000085	422810-000085
9,0	10	10,00	66	0,20	022861-000090	422861-000090	022809-000090	422809-000090
9,0	10	16,00	72	0,20	022862-000090	422862-000090	022810-000090	422810-000090
9,5	10	11,00	66	0,20	022861-000095	422861-000095	022809-000095	422809-000095
9,5	10	19,00	72	0,20	022862-000095	422862-000095	022810-000095	422810-000095
10,0	10	11,00	66	0,30	022861-000100	422861-000100	022809-000100	422809-000100
10,0	10	19,00	72	0,30	022862-000100	422862-000100	022810-000100	422810-000100
11,0	12	12,00	73	0,30	022861-000110	422861-000110	022809-000110	422809-000110
11,0	12	22,00	83	0,30	022862-000110	422862-000110	022810-000110	422810-000110
12,0	12	12,00	73	0,30	022861-000120	422861-000120	022809-000120	422809-000120
12,0	12	22,00	83	0,30	022862-000120	422862-000120	022810-000120	422810-000120
13,0	14	14,00	75	0,30	022861-000130	422861-000130	022809-000130	422809-000130
13,0	14	22,00	83	0,30	022862-000130	422862-000130	022810-000130	422810-000130
14,0	14	14,00	75	0,30	022861-000140	422861-000140	022809-000140	422809-000140
14,0	14	22,00	83	0,30	022862-000140	422862-000140	022810-000140	422810-000140
15,0	16	16,00	82	0,30	022861-000150	422861-000150	022809-000150	422809-000150
15,0	16	26,00	92	0,30	022862-000150	422862-000150	022810-000150	422810-000150
16,0	16	16,00	82	0,40	022861-000160	422861-000160	022809-000160	422809-000160
16,0	16	26,00	92	0,40	022862-000160	422862-000160	022810-000160	422810-000160
18,0	18	18,00	84	0,40	022861-000180	422861-000180	022809-000180	422809-000180
18,0	18	26,00	92	0,40	022862-000180	422862-000180	022810-000180	422810-000180
20,0	20	20,00	92	0,40	022861-000200	422861-000200	022809-000200	422809-000200
20,0	20	32,00	104	0,40	022862-000200	422862-000200	022810-000200	422810-000200

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

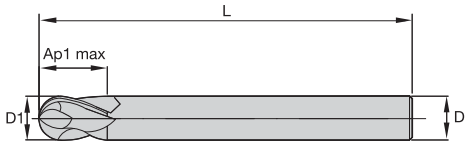
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A255.

D1	D	length of cut Ap1 max	length L	BCH	K30F UNCOATED - ..	K30F-DCF TiAlN - LT
2,0	2,0	8,00	32	0,10	022821-000020	422821-000020
2,5	2,5	8,00	32	0,10	022821-000025	422821-000025
3,0	3,0	12,00	32	0,10	022821-000030	422821-000030
3,5	3,5	7,00	50	0,10	022821-000035	422821-000035
4,0	4,0	8,00	50	0,10	022821-000040	422821-000040
4,5	4,5	8,00	50	0,10	022821-000045	422821-000045
5,0	5,0	10,00	50	0,10	022821-000050	422821-000050
5,5	5,5	10,00	57	0,10	022821-000055	422821-000055
6,0	6,0	10,00	57	0,10	022821-000060	422821-000060
6,5	6,5	13,00	60	0,10	022821-000065	422821-000065
7,0	7,0	13,00	60	0,20	022821-000070	422821-000070
7,5	7,5	16,00	63	0,20	022821-000075	422821-000075
8,0	8,0	16,00	63	0,20	022821-000080	422821-000080
8,5	8,5	16,00	67	0,20	022821-000085	422821-000085
9,0	9,0	16,00	67	0,20	022821-000090	422821-000090
9,5	9,5	19,00	72	0,20	022821-000095	422821-000095
10,0	10,0	19,00	72	0,30	022821-000100	422821-000100
11,0	11,0	22,00	83	0,30	022821-000110	422821-000110
12,0	12,0	22,00	83	0,30	022821-000120	422821-000120
13,0	13,0	22,00	83	0,30	022821-000130	422821-000130
14,0	14,0	22,00	83	0,30	022821-000140	422821-000140
15,0	15,0	26,00	92	0,30	022821-000150	422821-000150
16,0	16,0	26,00	92	0,40	022821-000160	422821-000160
18,0	18,0	26,00	92	0,40	022821-000180	422821-000180
20,0	20,0	32,00	104	0,40	022821-000200	422821-000200

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

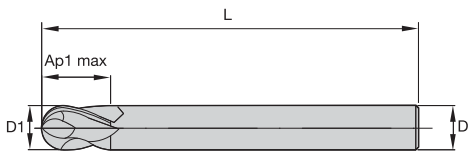
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
TiAlN	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A256.

D1	D	length of cut Ap1 max	length L	TiAlN - RW
3,0	6	7,00	57	**D00903002RW**
4,0	6	8,00	57	**D00904002RW**
5,0	6	10,00	57	**D00905002RW**
6,0	6	10,00	57	**D00906002RW**
8,0	8	16,00	63	**D00908003RW**
10,0	10	19,00	72	**D00910004RW**
12,0	12	22,00	83	**D00912005RW**
14,0	14	22,00	83	**D00914014RW**
18,0	18	26,00	92	**D00918018RW**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

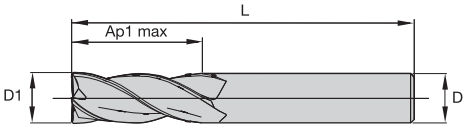
	P						M			K			S				H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	1
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A256.

D1	D	length of cut Ap1 max	length L	TiAlN - LW
3,0	6	7,00	57	**DC1903002LW**
4,0	6	8,00	57	**DC1904002LW**
5,0	6	10,00	57	**DC1905002LW**
6,0	6	10,00	57	**DC1906002LW**
8,0	8	16,00	63	**DC1908003LW**
10,0	10	19,00	72	**DC1910004LW**
12,0	12	22,00	83	**DC1912005LW**
14,0	14	22,00	83	**DC1914014LW**
16,0	16	26,00	92	**DC1916006LW**
18,0	18	26,00	92	**DC1918018LW**
20,0	20	32,00	104	**DC1920007LW**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P				M		K	
	1	2	3	4	1	2	1	2
Uncoated	●	●						
TiCN	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A257.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiCN - CW	TiAlN - RW
2,0	6	4,00	50	D00402002WW	D00402002CW	D00402002RW
2,0	6	7,00	53	D01402002WW	D01402002CW	D01402002RW
2,5	6	4,00	50	D00402502WW	D00402502CW	D00402502RW
2,5	6	7,00	53	D01402502WW	D01402502CW	D01402502RW
3,0	6	5,00	50	D00403002WW	D00403002CW	D00403002RW
3,0	6	8,00	57	D01403002WW	D01403002CW	D01403002RW
3,5	6	6,00	50	D00403502WW	D00403502CW	D00403502RW
3,5	6	10,00	57	D01403502WW	D01403502CW	D01403502RW
4,0	6	8,00	54	D00404002WW	D00404002CW	D00404002RW
4,0	6	11,00	57	D01404002WW	D01404002CW	D01404002RW
4,5	6	8,00	54	D00404502WW	–	D00404502RW
4,5	6	11,00	57	D01404502WW	–	D01404502RW

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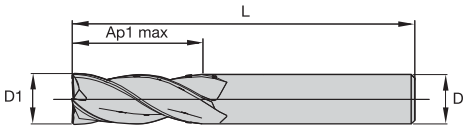


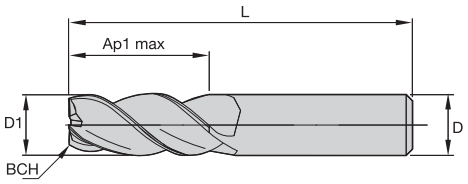
	P				M		K	
	1	2	3	4	1	2	1	2
Uncoated	●	●						
TiCN	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A257.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiCN - CW	TiAlN - RW
5,0	6	9,00	54	D00405002WW	D00405002CW	D00405002RW
5,0	6	13,00	57	D01405002WW	D01405002CW	D01405002RW
5,5	6	10,00	54	D00405502WW	D00405502CW	D00405502RW
5,5	6	13,00	57	D01405502WW	–	D01405502RW
6,0	6	10,00	54	D00406002WW	D00406002CW	D00406002RW
6,0	6	13,00	57	D01406002WW	D01406002CW	D01406002RW
6,5	8	16,00	63	D01406503WW	D01406503CW	D01406503RW
7,0	8	11,00	58	D00407003WW	D00407003CW	D00407003RW
7,0	8	16,00	63	D01407003WW	D01407003CW	D01407003RW
8,0	8	12,00	58	D00408003WW	D00408003CW	D00408003RW
8,0	8	19,00	63	D01408003WW	D01408003CW	D01408003RW
9,0	10	13,00	66	D00409004WW	D00409004CW	D00409004RW
9,0	10	19,00	72	D01409004WW	D01409004CW	D01409004RW
10,0	10	14,00	66	D00410004WW	D00410004CW	D00410004RW
10,0	10	22,00	72	D01410004WW	D01410004CW	D01410004RW
12,0	12	16,00	73	D00412005WW	D00412005CW	D00412005RW
12,0	12	26,00	83	D01412005WW	D01412005CW	D01412005RW
14,0	14	18,00	75	–	D00414014CW	D00414014RW
14,0	14	26,00	83	D01414014WW	D01414014CW	D01414014RW
16,0	16	22,00	82	D00416006WW	D00416006CW	D00416006RW
16,0	16	32,00	92	D01416006WW	D01416006CW	D01416006RW
18,0	18	24,00	84	D00418018WW	–	D00418018RW
18,0	18	32,00	92	D01418018WW	D01418018CW	D01418018RW
20,0	20	26,00	92	D00420007WW	D00420007CW	D00420007RW
20,0	20	38,00	104	D01420007WW	D01420007CW	D01420007RW
25,0	25	45,00	121	D01425008WW	D01425008CW	D01425008RW

- Center cutting ≥ 4mm.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

	P				M		K	
	1	2	3	4	1	2	1	2
Uncoated	●	●						
TiAlN	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A258.

D1	D	length of cut Ap1 max	length L	BCH	K30F UNCOATED - ..	K30F-DCF TiAlN - LT	K30F UNCOATED - WW	K30F-DCF TiAlN - LW
2,0	6	4,00	50	0,10	022863-000020	422863-000020	022811-000020	422811-000020
2,0	6	7,00	57	0,10	022864-000020	422864-000020	022812-000020	422812-000020
2,5	6	4,00	50	0,10	022863-000025	422863-000025	022811-000025	422811-000025
2,5	6	8,00	57	0,10	022864-000025	422864-000025	022812-000025	422812-000025
3,0	6	5,00	50	0,10	022863-000030	422863-000030	022811-000030	422811-000030
3,0	6	8,00	57	0,10	022864-000030	422864-000030	022812-000030	422812-000030
3,5	6	6,00	50	0,10	022863-000035	422863-000035	022811-000035	422811-000035
3,5	6	10,00	57	0,10	022864-000035	422864-000035	022812-000035	422812-000035
4,0	6	8,00	54	0,10	022863-000040	422863-000040	022811-000040	422811-000040
4,0	6	11,00	57	0,10	022864-000040	422864-000040	022812-000040	422812-000040
4,5	6	8,00	54	0,10	022863-000045	422863-000045	022811-000045	422811-000045
4,5	6	11,00	57	0,10	022864-000045	422864-000045	022812-000045	422812-000045
5,0	6	9,00	54	0,10	022863-000050	422863-000050	022811-000050	422811-000050
5,0	6	13,00	57	0,10	022864-000050	422864-000050	022812-000050	422812-000050
5,5	6	10,00	54	0,10	022863-000055	422863-000055	022811-000055	422811-000055
5,5	6	13,00	57	0,10	022864-000055	422864-000055	022812-000055	422812-000055
6,0	6	10,00	54	0,10	022863-000060	422863-000060	022811-000060	422811-000060
6,0	6	13,00	57	0,10	022864-000060	422864-000060	022812-000060	422812-000060
6,5	8	11,00	58	0,10	022863-000065	422863-000065	022811-000065	422811-000065
6,5	8	16,00	63	0,10	022864-000065	422864-000065	022812-000065	422812-000065
7,0	8	11,00	58	0,20	022863-000070	422863-000070	022811-000070	422811-000070
7,0	8	16,00	63	0,20	022864-000070	422864-000070	022812-000070	422812-000070

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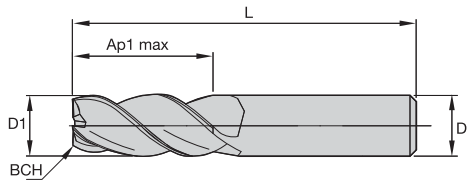


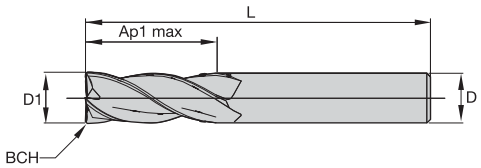
	P				M		K	
	1	2	3	4	1	2	1	2
Uncoated	●	●						
TiAlN	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A258.

D1	D	length of cut Ap1 max	length L	BCH	K30F UNCOATED - ..	K30F-DCF TiAlN - LT	K30F UNCOATED - WW	K30F-DCF TiAlN - LW
7,5	8	12,00	58	0,20	022863-000075	422863-000075	022811-000075	422811-000075
7,5	8	19,00	63	0,20	022864-000075	422864-000075	022812-000075	422812-000075
8,0	8	12,00	58	0,20	022863-000080	422863-000080	022811-000080	422811-000080
8,0	8	19,00	63	0,20	022864-000080	422864-000080	022812-000080	422812-000080
8,5	10	13,00	66	0,20	022863-000085	422863-000085	022811-000085	422811-000085
8,5	10	19,00	72	0,20	022864-000085	422864-000085	022812-000085	422812-000085
9,0	10	13,00	66	0,20	022863-000090	422863-000090	022811-000090	422811-000090
9,0	10	19,00	72	0,20	022864-000090	422864-000090	022812-000090	422812-000090
9,5	10	14,00	66	0,20	022863-000095	422863-000095	022811-000095	422811-000095
9,5	10	22,00	72	0,20	022864-000095	422864-000095	022812-000095	422812-000095
10,0	10	14,00	66	0,30	022863-000100	422863-000100	022811-000100	422811-000100
10,0	10	22,00	72	0,30	022864-000100	422864-000100	022812-000100	422812-000100
11,0	12	16,00	73	0,30	022863-000110	422863-000110	022811-000110	422811-000110
11,0	12	26,00	83	0,30	022864-000110	422864-000110	022812-000110	422812-000110
12,0	12	16,00	73	0,30	022863-000120	422863-000120	022811-000120	422811-000120
12,0	12	26,00	83	0,30	022864-000120	422864-000120	022812-000120	422812-000120
13,0	14	18,00	75	0,30	022863-000130	422863-000130	022811-000130	422811-000130
13,0	14	26,00	83	0,30	022864-000130	422864-000130	022812-000130	422812-000130
14,0	14	18,00	75	0,30	022863-000140	422863-000140	022811-000140	422811-000140
14,0	14	26,00	83	0,30	022864-000140	422864-000140	022812-000140	422812-000140
15,0	16	22,00	82	0,30	022863-000150	422863-000150	022811-000150	422811-000150
15,0	16	32,00	92	0,30	022864-000150	422864-000150	022812-000150	422812-000150
16,0	16	22,00	82	0,40	022863-000160	422863-000160	022811-000160	422811-000160
16,0	16	32,00	92	0,40	022864-000160	422864-000160	022812-000160	422812-000160
18,0	18	24,00	84	0,40	022863-000180	422863-000180	022811-000180	422811-000180
18,0	18	32,00	92	0,40	022864-000180	422863-000180	022812-000180	422812-000180
20,0	20	26,00	92	0,40	022863-000200	422863-000200	022811-000200	422811-000200
20,0	20	38,00	104	0,40	022864-000200	422864-000200	022812-000200	422812-000200

- Center cutting (D1≥4).
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

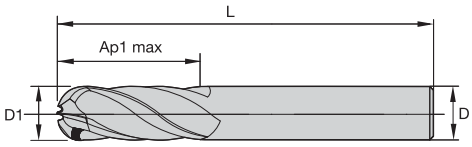
	P				M		K	
	1	2	3	4	1	2	1	2
Uncoated	●	●						
TiAlN	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A259.

D1	D	length of cut Ap1 max	length L	BCH	K30F UNCOATED - ..	K30F-DCF TiAlN - LT
2,0	2,0	8,00	32	0,10	022825-000020	422825-000020
2,5	2,5	8,00	32	0,10	022825-000025	422825-000025
3,0	3,0	12,00	32	0,10	022825-000030	422825-000030
3,5	3,5	10,00	50	0,10	022825-000035	422825-000035
4,0	4,0	11,00	50	0,10	022825-000040	422825-000040
4,5	4,5	11,00	50	0,10	022825-000045	422825-000045
5,0	5,0	13,00	50	0,10	022825-000050	422825-000050
5,5	5,5	13,00	57	0,10	022825-000055	422825-000055
6,0	6,0	13,00	57	0,10	022825-000060	422825-000060
6,5	6,5	16,00	60	0,10	022825-000065	422825-000065
7,0	7,0	16,00	60	0,20	022825-000070	422825-000070
7,5	7,5	19,00	63	0,20	022825-000075	422825-000075
8,0	8,0	19,00	63	0,20	022825-000080	422825-000080
8,5	8,5	19,00	67	0,20	022825-000085	422825-000085
9,0	9,0	19,00	67	0,20	022825-000090	422825-000090
9,5	9,5	22,00	72	0,20	022825-000095	422825-000095
10,0	10,0	22,00	72	0,30	022825-000100	422825-000100
11,0	11,0	26,00	83	0,30	022825-000110	422825-000110
12,0	12,0	26,00	83	0,30	022825-000120	422825-000120
13,0	13,0	26,00	83	0,30	022825-000130	422825-000130
14,0	14,0	26,00	83	0,30	022825-000140	422825-000140
15,0	15,0	32,00	92	0,30	022825-000150	422825-000150
16,0	16,0	32,00	92	0,40	022825-000160	422825-000160
18,0	18,0	32,00	92	0,40	022825-000180	422825-000180
20,0	20,0	38,00	104	0,40	022825-000200	422825-000200

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

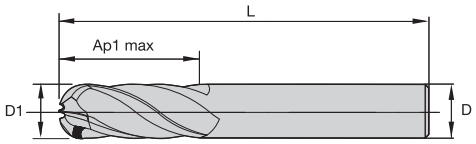
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
AlTiN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A259.

D1	D	length of cut Ap1 max	length L	K30F UNCOATED - ..	K30F-DCHP AlTiN - MT
2,0	2	7,00	32	022848-000020	422848-000020
3,0	3	8,00	32	022848-000030	422848-000030
4,0	4	11,00	50	022848-000040	422848-000040
5,0	5	13,00	50	022848-000050	422848-000050
6,0	6	13,00	57	022848-000060	422848-000060
8,0	8	19,00	63	022848-000080	422848-000080
10,0	10	22,00	72	022848-000100	422848-000100
12,0	12	26,00	83	022848-000120	422848-000120
14,0	14	26,00	83	022848-000140	422848-000140
16,0	16	32,00	92	022848-000160	422848-000160
18,0	18	32,00	92	–	422848-000180
20,0	20	38,00	104	022848-000200	422848-000200

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

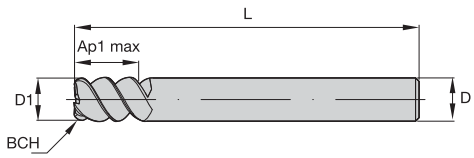
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A260.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiAlN - RW
3,0	6	5,00	50	D00003002WW	D00003002RW
3,0	6	8,00	57	D01003002WW	D01003002RW
4,0	6	8,00	54	D00004002WW	D00004002RW
4,0	6	11,00	57	D01004002WW	D01004002RW
5,0	6	9,00	54	D00005002WW	D00005002RW
5,0	6	13,00	57	D01005002WW	D01005002RW
6,0	6	10,00	54	D00006002WW	D00006002RW
6,0	6	13,00	57	D01006002WW	D01006002RW
8,0	8	12,00	58	D00008003WW	D00008003RW
8,0	8	19,00	63	D01008003WW	D01008003RW
10,0	10	14,00	66	–	D00010004RW
10,0	10	22,00	72	D01010004WW	D01010004RW
12,0	12	16,00	73	–	D00012005RW
12,0	12	26,00	83	D01012005WW	D01012005RW
14,0	14	26,00	83	D01014014WW	D01014014RW
16,0	16	22,00	82	–	D00016006RW
16,0	16	32,00	92	D01016006WW	D01016006RW
18,0	18	32,00	92	D01018018WW	–
20,0	20	26,00	92	D00020007WW	D00020007RW
20,0	20	38,00	104	D01020007WW	D01020007RW

- Non-center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
AlTiN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A261.

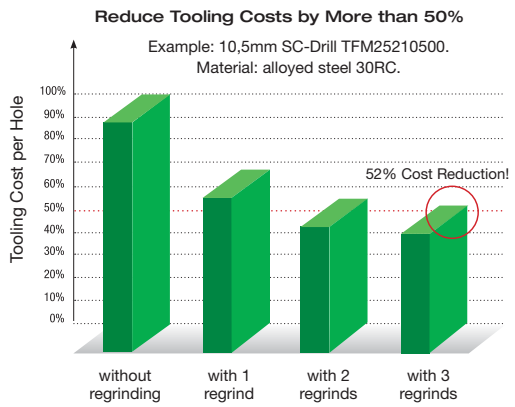
D1	D	length of cut Ap1 max	length L	BCH	Z U	K30F-DCHP AlTiN - MT	K30F-DCHP AlTiN - MW
6,0	6	13,00	57	0,10	6	422822-000060	422826-000060
8,0	8	19,00	63	0,20	6	422822-000080	422826-000080
10,0	10	22,00	72	0,30	6	422822-000100	422826-000100
12,0	12	26,00	83	0,30	6	422822-000120	422826-000120
14,0	14	26,00	83	0,30	6	422822-000140	422826-000140
16,0	16	32,00	92	0,40	6	422822-000160	422826-000160
18,0	18	32,00	92	0,40	8	422822-000180	422826-000180
20,0	20	38,00	104	0,40	8	422822-000200	422826-000200
25,0	25	45,00	121	0,40	8	422822-000250	422826-000250

Anyone Can Regrind Your Tools — Only We Can Truly Recondition Them

Why recondition?

Our Reconditioning Services help optimize the total value of your metalcutting tools throughout their entire life cycle by giving them “like-new” performance characteristics — with rapid turnaround time — so the tools you need are always on-hand and perform just like new.

By sending your worn drills and end mills for reconditioning, you will get:



- Proprietary geometry.
- Certified coatings.
- Superior quality.
- Like-new performance.
- Fast turnaround time.
- Application support throughout the entire tool life cycle.

Tools can often be reconditioned up to five times.

Reconditioning Services make perfect sense

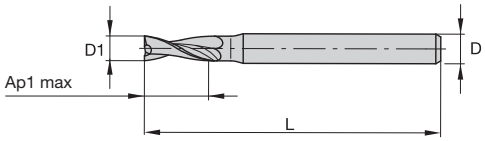
Our Reconditioning Services deliver considerable savings throughout the life of your cutting tools and can reduce your overall tooling costs by more than 50%.

How does it work?

Contact your Authorized Distributor to get started.

For facilities, or to find the nearest Distributor, visit www.widia.com.

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

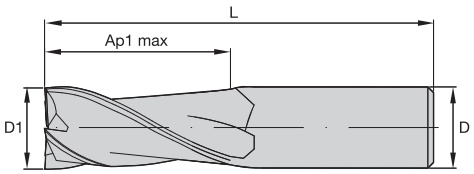
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A261.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiAlN - RT
0,4	3	1,50	38	**463200400..**	**463200400RT**
0,5	3	1,50	38	**463200500..**	**463200500RT**
0,6	3	1,50	38	**463200600..**	**463200600RT**
0,8	3	1,50	38	**463200800..**	**463200800RT**
1,0	3	2,00	38	**463201000..**	**463201000RT**
1,5	3	2,00	38	**463201500..**	**463201500RT**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A264.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiCN - CT	TiAlN - RT
1,0	3	4,00	38	400201000..	400201000CT	400201000RT
1,5	3	4,00	38	400201500..	400201500CT	400201500RT
2,0	3	6,30	38	400202000..	400202000CT	400202000RT
2,5	3	6,30	38	400202500..	400202500CT	400202500RT
3,0	3	9,50	38	400203000..	400203000CT	400203000RT
3,0	3	19,00	63	401203000..	401203000CT	401203000RT
3,0	3	25,00	75	402203000..	–	402203000RT
3,5	4	12,00	50	400203501..	400203501CT	400203501RT
4,0	4	12,00	50	400204001..	400204001CT	400204001RT
4,0	4	19,00	63	401204001..	–	401204001RT
4,0	4	31,00	75	402204001..	402204001CT	402204001RT
4,5	6	14,00	50	400204502..	400204502CT	400204502RT
5,0	6	14,00	50	400205002..	400205002CT	400205002RT
5,0	5	20,00	63	401205001..	–	401205001RT
5,0	5	31,00	100	402205001..	–	402205001RT
5,5	6	14,00	50	400205502..	400205502CT	400205502RT
6,0	6	16,00	50	400206002..	400206002CT	400206002RT
6,0	6	28,00	76	401206002..	401206002CT	401206002RT
6,0	6	38,00	100	402206002..	–	402206002RT
7,0	7	20,00	63	400207003..	–	400207003RT
8,0	8	20,00	63	400208003..	400208003CT	400208003RT
8,0	8	28,00	76	401208003..	–	401208003RT

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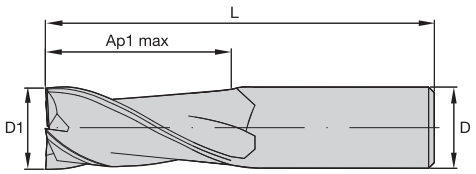


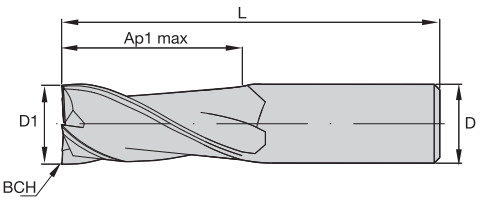
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

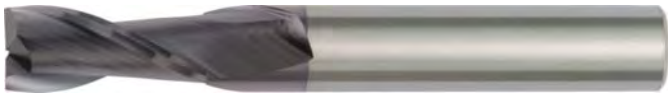
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A264.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiCN - CT	TiAlN - RT
8,0	8	41,00	100	**402208003..**	**–**	**402208003RT**
9,0	9	20,00	63	**400209004..**	**–**	**400209004RT**
10,0	10	22,00	76	**400210004..**	**400210004CT**	**400210004RT**
10,0	10	32,00	89	**401210004..**	**–**	**401210004RT**
10,0	10	45,00	100	**402210004..**	**–**	**402210004RT**
11,0	11	25,00	76	**400211005..**	**400211005CT**	**400211005RT**
12,0	12	25,00	76	**400212005..**	**400212005CT**	**400212005RT**
12,0	12	45,00	100	**401212005..**	**–**	**401212005RT**
12,0	12	75,00	150	**402212005..**	**–**	**402212005RT**
14,0	14	32,00	83	**400214014..**	**400214014CT**	**400214014RT**
14,0	14	50,00	100	**401214014..**	**401214014CT**	**401214014RT**
14,0	14	75,00	150	**402214014..**	**–**	**402214014RT**
16,0	16	32,00	89	**400216006..**	**–**	**400216006RT**
16,0	16	56,00	110	**401216006..**	**401216006CT**	**401216006RT**
16,0	16	75,00	150	**402216006..**	**402216006CT**	**–**
18,0	18	38,00	100	**400218007..**	**400218007CT**	**400218007RT**
18,0	18	60,00	125	**401218018..**	**–**	**–**
18,0	18	75,00	150	**402218018..**	**–**	**402218018RT**
20,0	20	38,00	104	**400220007..**	**400220007CT**	**400220007RT**
20,0	20	56,00	125	**401220007..**	**401220007CT**	**–**
20,0	20	75,00	150	**402220007..**	**–**	**402220007RT**
25,0	25	62,00	140	**–**	**–**	**401225008RT**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

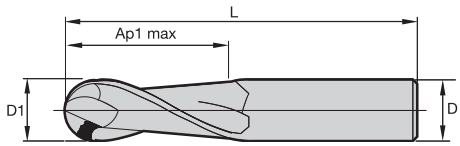
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A264.

D1	D	length of cut Ap1 max	length L	BCH	K30F UNCOATED - ..	K30F-DCF TiAlN - LT
3,0	3	20,00	75	0,10	022815-000030	422815-000030
4,0	4	25,00	75	0,10	022815-000040	422815-000040
5,0	5	30,00	75	0,10	022815-000050	422815-000050
6,0	6	30,00	75	0,10	022815-000060	422815-000060
8,0	8	40,00	100	0,20	022815-000080	422815-000080
10,0	10	40,00	100	0,30	022815-000100	422815-000100
12,0	12	45,00	150	0,30	022815-000120	422815-000120
14,0	14	45,00	150	0,30	022815-000140	422815-000140
16,0	16	65,00	150	0,40	022815-000160	422815-000160
18,0	18	65,00	150	0,40	022815-000180	422815-000180
20,0	20	65,00	150	0,40	022815-000200	422815-000200

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

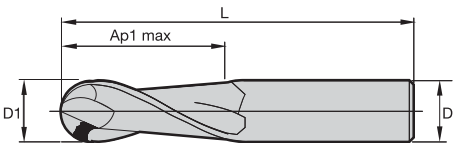
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A264.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiCN - CT	TiAlN - RT
1,0	3	2,00	38	465101000..	465101000CT	465101000RT
1,2	3	2,00	38	465101200..	465101200CT	465101200RT
1,5	3	2,00	38	465101500..	465101500CT	465101500RT
1,8	3	2,00	38	–	465101800CT	465101800RT
2,0	3	2,00	38	465102000..	465102000CT	465102000RT

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see pages A265–A266.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiAlN - RT
1,0	3	4,00	38	400101000..	400101000RT
1,5	3	5,00	38	400101500..	400101500RT
2,0	3	6,30	38	400102000..	400102000RT
3,0	3	9,50	38	400103002..	400103002RT
3,0	3	25,00	75	402103000..	402103000RT
4,0	4	12,00	50	400104002..	400104002RT
4,0	4	19,00	63	401104001..	401104001RT
4,0	4	31,00	75	402104001..	402104001RT
5,0	5	20,00	63	401105001..	401105001RT
5,0	5	31,00	100	402105001..	402105001RT
5,0	6	14,00	50	400105002..	400105002RT
6,0	6	16,00	50	400106002..	400106002RT
6,0	6	28,00	76	401106002..	401106002RT
6,0	6	38,00	100	402106002..	402106002RT
8,0	8	20,00	63	400108003..	400108003RT
8,0	8	28,00	76	401108003..	401108003RT
8,0	8	41,00	100	402108003..	402108003RT
10,0	10	22,00	76	400110004..	400110004RT
10,0	10	32,00	89	401110004..	401110004RT
10,0	10	45,00	100	402110004..	402110004RT
12,0	12	25,00	76	400112005..	400112005RT
12,0	12	45,00	100	401112005..	401112005RT

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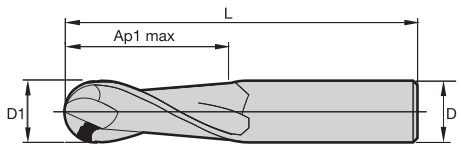
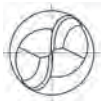


	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see pages A265–A266.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiAlN - RT
12,0	12	75,00	150	–	**402112005RT**
14,0	14	32,00	83	**400114014..**	**400114014RT**
14,0	14	50,00	100	**401114014..**	–
14,0	14	75,00	150	**402114014..**	**402114014RT**
16,0	16	32,00	89	**400116006..**	**400116006RT**
16,0	16	56,00	110	**401116006..**	–
16,0	16	75,00	150	–	**402116006RT**
18,0	18	75,00	150	–	**402118018RT**
20,0	20	38,00	104	**400120007..**	**400120007RT**
20,0	20	56,00	125	**401120007..**	**401120007RT**
20,0	20	75,00	150	–	**402120007RT**

	fine finishing	finishing	roughing	slot milling	plunging	contour milling
End Mills						
end mill Z= 1	○	○	●	●	●	○
end mill Z= 2	○	○	◑	●	●	○
end mill Z= 3	○	◑	◑	●	◑	○
end mill Z= 4/5	◑	●	●	● VariMill™ only	○	○
multi-flute cutter Z= 6–8	●	●	○	○	○	○
Ball Nose and Torus End Mills						
ball nose end mill Z= 2 				●		●
ball nose end mill Z= 4				◑		●

● first choice

◑ suitable with limitations

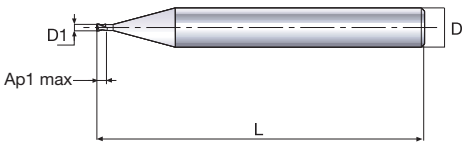
○ not recommended

Always select a tool with the shortest possible flute length whenever possible. This will increase the stability of the tool and give the best results.

When selecting an end mill, the following machining factors will affect your selection of the correct end mill for your application:

1. Tool overhang.
2. Coolant flow.
3. Machine and setup stability.
4. Machine power and torque.
5. Material to be machined.
6. Machine adapter size (CV40, CV50, HSK63, etc.).
7. See “Tool Reference Guides” on pages A4–A15.

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

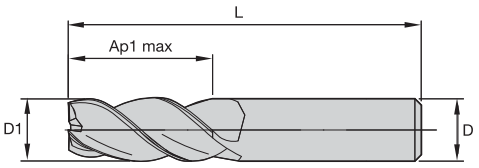
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A267.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiAlN - RT
0,4	3	1,50	38	463300400..	463300400RT
0,5	3	1,50	38	463300500..	463300500RT
0,6	3	1,50	38	463300600..	463300600RT
0,8	3	1,50	38	463300800..	463300800RT
1,0	3	2,00	38	463301000..	463301000RT
1,2	3	2,00	38	463301200..	463301200RT
1,5	3	2,00	38	463301500..	463301500RT
1,8	3	2,00	38	463301800..	463301800RT

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see pages A267–A268.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiCN - CT	TiAlN - RT
1,0	3	4,00	38	400301000..	400301000CT	400301000RT
1,5	3	4,00	38	400301500..	400301500CT	400301500RT
2,0	3	6,30	38	400302000..	400302000CT	400302000RT
2,5	3	6,30	38	400302500..	400302500CT	400302500RT
3,0	3	9,50	38	400303000..	400303000CT	400303000RT
3,0	3	19,00	63	401303000..	–	401303000RT
3,5	4	12,00	50	400303501..	400303501CT	400303501RT
4,0	4	12,00	50	400304001..	400304001CT	400304001RT
4,0	4	19,00	63	401304001..	–	401304001RT
4,5	6	14,00	50	400304502..	400304502CT	400304502RT
5,0	6	14,00	50	400305002..	400305002CT	400305002RT
5,0	5	20,00	63	401305001..	–	401305001RT
6,0	6	16,00	50	400306002..	400306002CT	400306002RT
6,0	6	28,00	76	401306002..	–	401306002RT
7,0	7	20,00	63	400307003..	400307003CT	400307003RT
8,0	8	20,00	63	400308003..	400308003CT	400308003RT
8,0	8	28,00	76	401308003..	–	401308003RT
9,0	9	20,00	63	400309004..	400309004CT	400309004RT

(continued)

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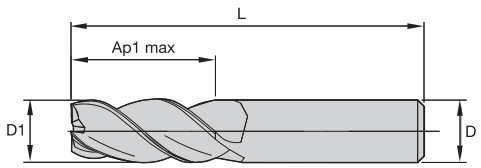


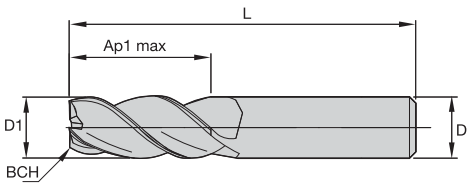
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see pages A267–A268.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiCN - CT	TiAlN - RT
10,0	10	22,00	76	**400310004..**	**400310004CT**	**400310004RT**
10,0	10	32,00	89	**401310004..**	**–**	**401310004RT**
11,0	11	25,00	76	**400311005..**	**400311005CT**	**400311005RT**
12,0	12	25,00	76	**400312005..**	**400312005CT**	**400312005RT**
12,0	12	45,00	100	**401312005..**	**–**	**401312005RT**
14,0	14	32,00	83	**400314014..**	**400314014CT**	**400314014RT**
16,0	16	32,00	89	**400316006..**	**–**	**400316006RT**
16,0	16	56,00	110	**401316006..**	**–**	**401316006RT**
18,0	18	38,00	100	**400318007..**	**400318007CT**	**400318007RT**
20,0	20	38,00	104	**400320007..**	**–**	**400320007RT**
20,0	20	56,00	125	**401320007..**	**401320007CT**	**401320007RT**
25,0	25	62,00	140	**–**	**401325008CT**	**401325008RT**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
AlTiN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A268.

D1	D	length of cut Ap1 max	length L	BCH	K30F-DCHP AlTiN - MT
3,0	6	9,00	57	0,10	422858-000030
4,0	6	12,00	57	0,10	422858-000040
5,0	6	15,00	62	0,10	422858-000050
6,0	6	18,00	62	0,10	422858-000060
8,0	8	24,00	68	0,20	422858-000080
10,0	10	30,00	80	0,30	422858-000100
12,0	12	36,00	93	0,30	422858-000120
16,0	16	48,00	108	0,40	422858-000160
20,0	20	60,00	126	0,40	422858-000200
25,0	25	75,00	150	0,40	422858-000250

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	Fax:	0800919415
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	Fax:	0805540029
Germany	**Phone:**	**0800 1015774**
	Fax:	0800 0007531
Italy	**Phone:**	**800 916568**
	Fax:	800 917749
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	Fax:	0800 0201135
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	Fax:	800 10001
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	Fax:	00800 4411940
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	Fax:	0800 981645
Sweden	**Phone:**	**020798794**
	Fax:	020790477
United Kingdom	**Phone:**	**0800 028 2996**
	Fax:	0800 028 5721

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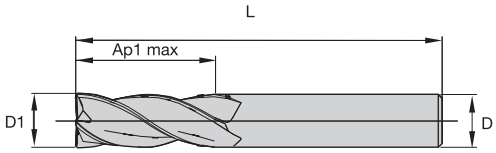
- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P				M		K	
	1	2	3	4	1	2	1	2
Uncoated	●	●						
TiCN	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, sees pages A269–A270.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiCN - CT	TiAlN - RT
1,0	3	4,00	38	400401000..	400401000CT	400401000RT
1,5	3	4,00	38	400401500..	400401500CT	400401500RT
2,0	3	6,30	38	400402000..	400402000CT	400402000RT
2,5	3	6,30	38	400402500..	400402500CT	400402500RT
3,0	3	9,50	38	400403000..	400403000CT	400403000RT
3,0	3	19,00	63	401403000..	401403000CT	401403000RT
3,0	3	25,00	75	402403000..	–	402403000RT
3,5	4	12,00	50	400403501..	400403501CT	400403501RT
4,0	4	12,00	50	400404001..	400404001CT	400404001RT
4,0	4	19,00	63	401404001..	401404001CT	401404001RT
4,0	4	31,00	75	402404001..	–	402404001RT
4,5	6	14,00	50	400404502..	400404502CT	400404502RT
5,0	5	14,00	50	400405001..	400405001CT	400405001RT
5,0	6	14,00	50	400405002..	400405002CT	400405002RT
5,0	5	20,00	63	401405001..	401405001CT	401405001RT
5,0	5	31,00	100	402405001..	402405001CT	402405001RT
5,5	6	14,00	50	400405502..	400405502CT	400405502RT
6,0	6	16,00	50	400406002..	400406002CT	400406002RT
6,0	6	28,00	76	401406002..	401406002CT	401406002RT
6,0	6	38,00	100	402406002..	–	402406002RT

(continued)

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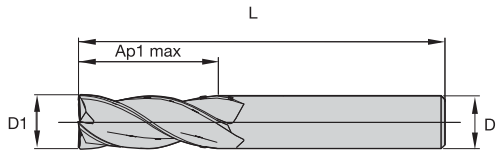


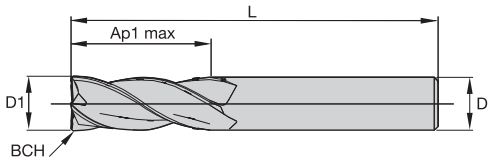
	P				M		K	
	1	2	3	4	1	2	1	2
Uncoated	●	●						
TiCN	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, sees pages A269–A270.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiCN - CT	TiAlN - RT
7,0	7	20,00	63	400407003..	400407003CT	400407003RT
8,0	8	20,00	63	400408003..	400408003CT	400408003RT
8,0	8	28,00	76	401408003..	401408003CT	401408003RT
8,0	8	41,00	100	402408003..	–	402408003RT
9,0	9	20,00	63	400409004..	–	400409004RT
10,0	10	22,00	76	400410004..	400410004CT	400410004RT
10,0	10	32,00	89	401410004..	401410004CT	401410004RT
10,0	10	45,00	100	402410004..	–	402410004RT
11,0	11	25,00	76	400411005..	400411005CT	400411005RT
12,0	12	25,00	76	400412005..	400412005CT	400412005RT
12,0	12	45,00	100	401412005..	401412005CT	401412005RT
12,0	12	75,00	150	402412005..	–	402412005RT
14,0	14	32,00	83	400414014..	–	400414014RT
14,0	14	50,00	100	401414014..	–	401414014RT
14,0	14	75,00	150	402414014..	–	402414014RT
16,0	16	32,00	89	400416006..	400416006CT	400416006RT
16,0	16	56,00	110	401416006..	401416006CT	401416006RT
16,0	16	75,00	150	402416006..	402416006CT	402416006RT
18,0	18	38,00	100	400418007..	400418007CT	400418007RT
18,0	18	60,00	125	401418018..	401418018CT	401418018RT
18,0	18	75,00	150	402418018..	402418018CT	402418018RT
20,0	20	38,00	104	400420007..	400420007CT	400420007RT
20,0	20	56,00	125	401420007..	401420007CT	401420007RT
20,0	20	75,00	150	402420007..	402420007CT	402420007RT
25,0	25	62,00	140	401425008..	401425008CT	401425008RT

- Center cutting ≥ 4mm.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

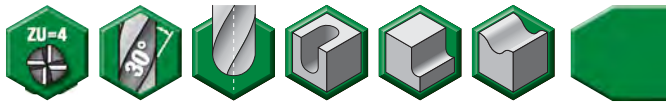
	P				M		K	
	1	2	3	4	1	2	1	2
Uncoated	●	●						
TiAlN	●	●	●	●	●	●	●	●

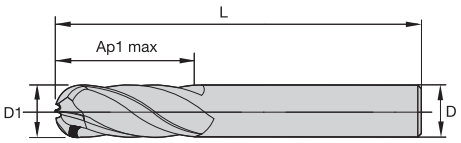
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A270.

D1	D	length of cut Ap1 max	length L	BCH	K30F UNCOATED - ..	K30F-DCF TiAlN - LT
3,0	3	20,00	75	0,10	022816-000030	422816-000030
4,0	4	25,00	75	0,10	022816-000040	422816-000040
5,0	5	30,00	75	0,10	022816-000050	422816-000050
6,0	6	30,00	75	0,10	022816-000060	422816-000060
8,0	8	40,00	100	0,20	022816-000080	422816-000080
10,0	10	40,00	100	0,30	022816-000100	422816-000100
12,0	12	45,00	150	0,30	022816-000120	422816-000120
14,0	14	45,00	150	0,30	022816-000140	422816-000140
16,0	16	65,00	150	0,40	022816-000160	422816-000160
18,0	18	65,00	150	0,40	022816-000180	422816-000180
20,0	20	65,00	150	0,40	022816-000200	422816-000200

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

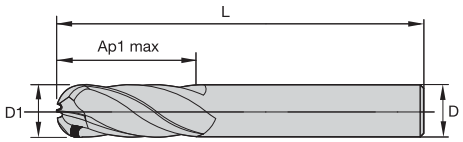
	P				M		K		N		
	1	2	3	4	1	2	1	2	1	2	5
Uncoated	●	●							●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A271.

D1	D	length of cut Ap1 max	length L	UNCOATED - ..	TiCN - CT	TiAlN - RT
3,0	3	9,50	38	400003002..	400003000CT	400003002RT
4,0	4	12,00	50	400004002..	400004002CT	400004002RT
4,0	4	19,00	63	401004001..	–	401004001RT
5,0	6	14,00	50	400005002..	400005002CT	400005002RT
5,0	5	20,00	63	401005001..	–	401005001RT
6,0	6	16,00	50	400006002..	400006002CT	400006002RT
6,0	6	28,00	76	401006002..	–	401006002RT
8,0	8	20,00	63	400008003..	400008003CT	400008003RT
8,0	8	28,00	76	401008003..	–	401008003RT
10,0	10	22,00	76	400010004..	400010004CT	400010004RT
10,0	10	32,00	89	401010004..	–	401010004RT
12,0	12	25,00	76	400012005..	400012005CT	400012005RT
12,0	12	45,00	100	401012005..	–	401012005RT
14,0	14	32,00	83	400014014..	400014014CT	400014014RT
14,0	14	50,00	100	401014014..	–	–
16,0	16	32,00	89	400016006..	400016006CT	400016006RT
18,0	18	38,00	100	400018007..	–	400018007RT
20,0	20	38,00	104	400020007..	–	400020007RT
20,0	20	56,00	125	401020007..	401020007CT	401020007RT

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

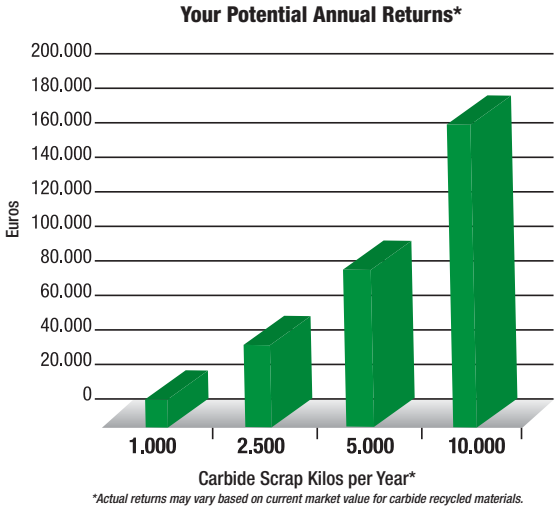
	P				M		K	
	1	2	3	4	1	2	1	2
Uncoated	●	●						
AlTiN	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A272.

D1	D	length of cut Ap1 max	length L	K30F UNCOATED - ..	K30F-DCHP AlTiN - MT
3,0	3	20,00	75	–	422845-000030
4,0	4	25,00	75	022845-000040	422845-000040
5,0	5	30,00	75	–	422845-000050
6,0	6	30,00	75	022845-000060	422845-000060
8,0	8	40,00	100	022845-000080	422845-000080
10,0	10	40,00	100	022845-000100	422845-000100
12,0	12	45,00	150	022845-000120	422845-000120
16,0	16	65,00	150	022845-000160	422845-000160

Get Cash or Credit for Your Used Carbide.



Why recycle?

It's the right thing to do!

It's easy for your company to be environmentally conscious with our Carbide Recycling Program.

By sending us your used carbide tools, you help preserve and protect the environment and ensure that these products are responsibly recycled.

It's profitable!

Not only do we make it easy for your company to be environmentally conscious, we offer an added incentive — it is profitable.

Through our Carbide Recycling Program, get the full value of your investment in metalcutting tools, improve profitability, and reduce your overall tooling spend. When you send us your used carbide, we will reward you with cash or credit. (Credit offer valid in U.S.A. only.)

It's EASY!

Our Carbide Recycling Program is available on the Web and is easy to use. You can request a quote, arrange to send us your used carbide, and check the status of your shipment. To find out more, please contact your Authorized Distributor.

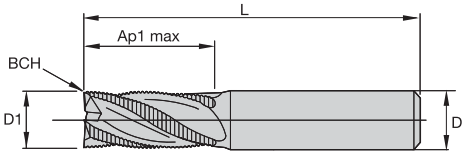
Contact your local Distributor for more information.

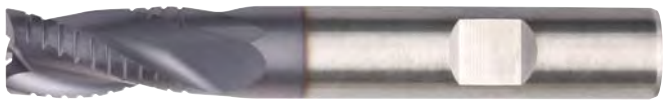
Green Boxes for Green Companies

The Green Box™ program is a safe and efficient way for you to package and ship your spent carbide tools to an authorized recycling location.

Qualified used carbide includes: mixed coated and uncoated metalcutting tools free of chips, oil, and steel contamination. Material must be free of braze.

- Center cutting.
- Flat shallow pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.





End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

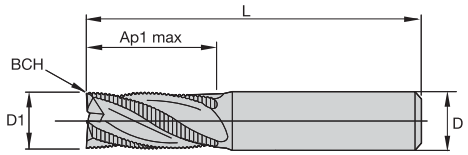
	P				M		K		
	1	2	3	4	1	2	1	2	3
Uncoated	●	●					●	●	●
TiAlN	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A272.

D1	D	length of cut Ap1 max	length L	BCH	K30F UNCOATED - WW	K30F-DCF TiAlN - LW
6,0	6	10,00	57	0,10	022813-000060	422813-000060
8,0	8	16,00	63	0,20	022813-000080	422813-000080
10,0	10	19,00	72	0,30	022813-000100	422813-000100
12,0	12	22,00	83	0,30	022813-000120	422813-000120
16,0	16	26,00	92	0,40	022813-000160	422813-000160
20,0	20	32,00	104	0,40	022813-000200	422813-000200
25,0	25	45,00	121	0,40	022813-000250	422813-000250

- Center cutting.
- Flat shallow pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

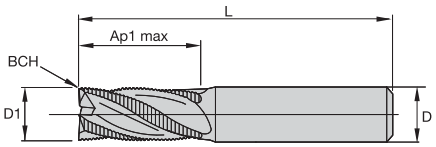
	P				K		
	1	2	3	4	1	2	3
Uncoated	●	●					
TiAlN	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A273.

D1	D	length of cut Ap1 max	length L	BCH	K30F UNCOATED - WW	K30F-DCF TiAlN - LW
6,0	6	13,00	57	0,10	022818-000060	422818-000060
8,0	8	19,00	63	0,20	022818-000080	422818-000080
10,0	10	22,00	72	0,30	022818-000100	422818-000100
12,0	12	26,00	83	0,30	022818-000120	422818-000120
16,0	16	32,00	92	0,40	022818-000160	422818-000160
20,0	20	38,00	104	0,40	022818-000200	422818-000200

- Center cutting.
- Flat shallow pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance h10 + / -	D	Tolerance h6 + / -
≤ 3	0 / 0,04	≤ 3	0 / 0,006
> 3 to 6	0 / 0,048	> 3 to 6	0 / 0,008
> 6 to 10	0 / 0,058	> 6 to 10	0 / 0,009
> 10 to 18	0 / 0,070	> 10 to 18	0 / 0,011
> 18 to 30	0 / 0,084	> 18 to 30	0 / 0,013

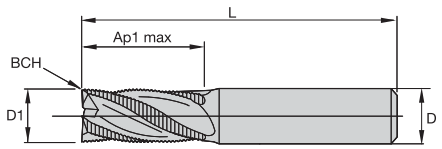
	P					K		
	1	2	3	4	5	1	2	3
Uncoated	●	●						
TiAlN	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A273.

D1	D	length of cut Ap1 max	length L	BCH	Z U	K30F UNCOATED - WW	K30F-DCF TiAlN - LW
6,0	6	13,00	57	0,10	4	022846-000060	422846-000060
8,0	8	19,00	63	0,20	4	022846-000080	422846-000080
10,0	10	22,00	72	0,30	4	022846-000100	422846-000100
12,0	12	26,00	83	0,30	4	022846-000120	422846-000120
16,0	16	32,00	92	0,40	6	022846-000160	422846-000160
20,0	20	38,00	104	0,40	6	022846-000200	422846-000200
25,0	25	45,00	121	0,40	6	022846-000250	422846-000250

- Center cutting.
- Fine pitch.
- LW = Multi-layer.
- RW = Mono-layer.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance d11	D	Tolerance h6 + / -
≤ 3	-0,020 / -0,080	≤ 3	0 / 0,006
> 3 to 6	-0,030 / -0,105	> 3 to 6	0 / 0,008
> 6 to 10	-0,040 / -0,130	> 6 to 10	0 / 0,009
> 10 to 18	-0,050 / -0,160	> 10 to 18	0 / 0,011
> 18 to 30	-0,065 / -0,195	> 18 to 30	0 / 0,013

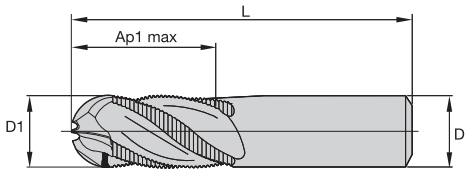
	P					M			K			N			S		H
	1	2	3	4	5	1	2	3	1	2	3	1	2	5	1	3	1
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●			●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A274.

D1	D	length of cut Ap1 max	length L	BCH	Z U	TiAlN - RT	TiCN - CW	TiAlN - LW	TiAlN - RW
4,0	6	11,00	55	0,25	3	490604002RT	490604002CW	490604002LW	490604002RW
5,0	6	13,00	57	0,25	3	490605002RT	490605002CW	490605002LW	490605002RW
6,0	6	13,00	57	0,25	3	490606002RT	490606002CW	490606002LW	490606002RW
7,0	8	16,00	63	0,25	3	490607003RT	490607003CW	490607003LW	490607003RW
8,0	8	16,00	63	0,25	3	490608003RT	490608003CW	490608003LW	490608003RW
9,0	10	19,00	72	0,25	4	490609004RT	490609004CW	490609004LW	490609004RW
10,0	10	22,00	72	0,25	4	490610004RT	490610004CW	490610004LW	490610004RW
11,0	12	26,00	83	0,25	4	490611005RT	490611005CW	490611005LW	490611005RW
12,0	12	26,00	83	0,35	4	490612005RT	490612005CW	490612005LW	490612005RW
13,0	14	26,00	83	0,35	4	490613014RT	490613014CW	490613014LW	490613014RW
14,0	14	26,00	83	0,35	4	490614014RT	490614014CW	490614014LW	490614014RW
16,0	16	32,00	92	0,35	4	490616006RT	490616006CW	490616006LW	490616006RW
18,0	18	32,00	92	0,35	4	490618018RT	490618018CW	490618018LW	490618018RW
20,0	20	38,00	104	0,35	4	490620007RT	490620007CW	490620007LW	490620007RW
25,0	25	45,00	121	0,50	5	490625008RT	490625008CW	490625008LW	490625008RW

- Center cutting.
- Fine pitch.
- LW = Multi-layer.
- RW = Mono-layer.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance d11	D	Tolerance h6 + / -
≤ 3	-0,020 / -0,080	≤ 3	0 / 0,006
> 3 to 6	-0,030 / -0,105	> 3 to 6	0 / 0,008
> 6 to 10	-0,040 / -0,130	> 6 to 10	0 / 0,009
> 10 to 18	-0,050 / -0,160	> 10 to 18	0 / 0,011
> 18 to 30	-0,065 / -0,195	> 18 to 30	0 / 0,013

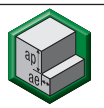
	P					M			K			N			S		H
	1	2	3	4	5	1	2	3	1	2	3	1	2	5	1	3	1
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●			●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A274.

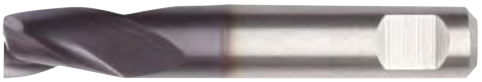
D1	D	length of cut Ap1 max	length L	Z U	TiCN - CW	TiAlN - LW	TiAlN - RW
5,0	6	13,00	57	3	**496605002CW**	**496605002LW**	**496605002RW**
6,0	6	13,00	57	3	**496606002CW**	**496606002LW**	**496606002RW**
8,0	8	16,00	63	3	**496608003CW**	**496608003LW**	**496608003RW**
10,0	10	22,00	72	4	**496610004CW**	**496610004LW**	**496610004RW**
12,0	12	26,00	83	4	**496612005CW**	**496612005LW**	**496612005RW**
14,0	14	26,00	83	4	–	**496614014LW**	**496614014RW**
16,0	16	32,00	92	4	**496616006CW**	**496616006LW**	**496616006RW**
18,0	18	32,00	92	4	**496618018CW**	–	–
20,0	20	38,00	104	4	**496620007CW**	–	**496620007RW**
25,0	25	45,00	121	4	**496625008CW**	–	**496625008RW**

Lists 423002 323002 423001 323001 • NINA



A

B



				K30F-TiCN TiCN			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	Min		Max	mm	2,0	3,0	4,0	5,0	6,0	8,0	10,0	12,0
P1	0,5 x D	0,1 x D	0,25 x D	120	-	160	150	-	200	Fz	0,0138	0,021	0,0284	0,036	0,0438	0,06	0,072	0,0828
P2	0,5 x D	0,1 x D	0,25 x D	112	-	152	140	-	190	Fz	0,0138	0,021	0,028	0,036	0,044	0,060	0,072	0,083
P3	0,5 x D	0,1 x D	0,25 x D	96	-	128	120	-	160	Fz	0,0113	0,017	0,023	0,030	0,036	0,050	0,061	0,070
P4	0,5 x D	0,1 x D	0,25 x D	72	-	120	90	-	150	Fz	0,01048	0,016	0,021	0,027	0,033	0,045	0,054	0,062
M1	0,5 x D	0,1 x D	0,25 x D	72	-	92	90	-	115	Fz	0,0113	0,017	0,023	0,030	0,036	0,050	0,061	0,070
M2	0,5 x D	0,1 x D	0,25 x D	48	-	64	60	-	80	Fz	0,0094	0,014	0,019	0,024	0,029	0,040	0,048	0,056
K1	0,5 x D	0,1 x D	0,25 x D	96	-	120	120	-	150	Fz	0,0138	0,021	0,028	0,036	0,044	0,060	0,072	0,083
K2	0,5 x D	0,1 x D	0,25 x D	88	-	104	110	-	130	Fz	0,0113	0,017	0,023	0,030	0,036	0,050	0,061	0,070
N1	0,5 x D	0,1 x D	0,25 x D	400	-	1600				Fz	0,02	0,030	0,040	0,050	0,060	0,080	0,100	0,120
N2	0,5 x D	0,1 x D	0,25 x D	400	-	1200				Fz	0,016	0,024	0,032	0,040	0,048	0,064	0,080	0,096
N5	0,5 x D	0,1 x D	0,25 x D	200	-	600	250	-	750	Fz	0,018	0,027	0,036	0,045	0,054	0,072	0,090	0,108

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 423004 423003 • NINA

A

B

				K30F-DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.					
				Cutting Speed Vc m/min				D1 - Diameter				
Group	ap	ae	ap	Min		Max	mm	4,0	6,0	8,0	10,0	12,0
P1	1,5 x D	0,5 x D	1 x D	180	-	220	Fz	0,030	0,050	0,060	0,070	0,072
P2	1,5 x D	0,5 x D	1 x D	160	-	200	Fz	0,030	0,050	0,060	0,070	0,072
P3	1,5 x D	0,5 x D	1 x D	160	-	180	Fz	0,025	0,040	0,050	0,060	0,070
P4	1,5 x D	0,5 x D	1 x D	140	-	160	Fz	0,023	0,036	0,045	0,054	0,063
M1	1,5 x D	0,5 x D	1 x D	90	-	115	Fz	0,025	0,040	0,050	0,060	0,065
M2	1,5 x D	0,5 x D	1 x D	60	-	80	Fz	0,020	0,030	0,040	0,050	0,060
K1	1,5 x D	0,5 x D	1 x D	120	-	150	Fz	0,030	0,050	0,060	0,070	0,080
K2	1,5 x D	0,5 x D	1 x D	110	-	130	Fz	0,025	0,040	0,050	0,060	0,070
K3	1,5 x D	0,5 x D	1 x D	100	-	130	Fz	0,020	0,030	0,040	0,050	0,060

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Lists 423048 423047 • NINA

A

B

K30F-DCHP
AlTiN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).
For Slotting (B), reduce Fz by 20%.

Group	ap	ae	ap	Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 4,0	6,0	8,0	10,0	12,0
P1	1 x D	0,1 x D	0,5 x D	150	-	200	Fz	0,028	0,044	0,060	0,072	0,083
P2	1 x D	0,1 x D	0,5 x D	140	-	190	Fz	0,028	0,044	0,060	0,072	0,083
P3	1 x D	0,1 x D	0,5 x D	120	-	160	Fz	0,023	0,036	0,050	0,061	0,070
P4	1 x D	0,1 x D	0,5 x D	90	-	150	Fz	0,021	0,033	0,045	0,054	0,062
M1	1 x D	0,1 x D	0,5 x D	90	-	115	Fz	0,023	0,036	0,050	0,061	0,070
M2	1 x D	0,1 x D	0,5 x D	60	-	80	Fz	0,019	0,029	0,040	0,048	0,056
K1	1 x D	0,1 x D	0,5 x D	120	-	150	Fz	0,028	0,044	0,060	0,072	0,083
K2	1 x D	0,1 x D	0,5 x D	110	-	130	Fz	0,023	0,036	0,050	0,061	0,070
N5	1 x D	0,1 x D	0,5 x D	250	-	750	Fz	0,036	0,054	0,072	0,090	0,108

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Lists 423039 423038 • NINA

A

K30F-DCHP
AlTiN

Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling.

Group	ap	ae	Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 2,0	3,0	4,0	5,0	6,0	8,0	10,0	12,0
P1	0,7 x D	0,25 x D	150	-	200	Fz	0,014	0,021	0,028	0,036	0,044	0,060	0,072	0,083
P2	0,7 x D	0,25 x D	140	-	190	Fz	0,014	0,021	0,028	0,036	0,044	0,060	0,072	0,083
P3	0,7 x D	0,25 x D	120	-	160	Fz	0,011	0,017	0,023	0,030	0,036	0,050	0,061	0,070
P4	0,7 x D	0,25 x D	90	-	150	Fz	0,010	0,016	0,021	0,027	0,033	0,045	0,054	0,062
M1	0,7 x D	0,25 x D	90	-	115	Fz	0,011	0,017	0,023	0,030	0,036	0,050	0,061	0,070
M2	0,7 x D	0,25 x D	60	-	80	Fz	0,009	0,014	0,019	0,024	0,029	0,040	0,048	0,056
K1	0,7 x D	0,25 x D	120	-	150	Fz	0,014	0,021	0,028	0,036	0,044	0,060	0,072	0,083
K2	0,7 x D	0,25 x D	110	-	130	Fz	0,011	0,017	0,023	0,030	0,036	0,050	0,061	0,070
N5	0,7 x D	0,25 x D	250	-	750	Fz	0,018	0,027	0,036	0,045	0,054	0,072	0,090	0,108

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Lists 423036 423037 • NINA

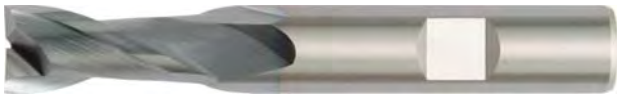
A

Group	ap	ae	K30F-DCF TiAlN Cutting Speed Vc m/min Min		Max	K30F-DCHP AlTiN Cutting Speed Vc m/min Min		Max	Recommended Feed Per Tooth (Fz=mm/th) for Chamfering (A). mm	D1 - Diameter 6,0	8,0	10,0
P1	0,35 x D	0,35 x D	145	-	155	145	-	155	Fz	0,037	0,045	0,062
P2	0,35 x D	0,35 x D	135	-	145	135	-	145	Fz	0,037	0,045	0,062
P3	0,35 x D	0,35 x D	115	-	135	115	-	135	Fz	0,037	0,045	0,062
P4	0,35 x D	0,35 x D	105	-	115	105	-	115	Fz	0,037	0,045	0,062
P5	0,35 x D	0,35 x D	90	-	105	90	-	105	Fz	0,037	0,045	0,062
P6	0,35 x D	0,35 x D	25	-	35	25	-	35	Fz	0,028	0,035	0,048
M1	0,35 x D	0,35 x D	80	-	90	80	-	90	Fz	0,028	0,035	0,048
M2	0,35 x D	0,35 x D	70	-	80	70	-	80	Fz	0,028	0,035	0,048
M3	0,35 x D	0,35 x D	60	-	70	60	-	70	Fz	0,028	0,035	0,048
K1	0,35 x D	0,35 x D	180	-	205	180	-	205	Fz	0,037	0,045	0,062
K2	0,35 x D	0,35 x D	150	-	180	150	-	180	Fz	0,037	0,045	0,062
K3	0,35 x D	0,35 x D	130	-	150	130	-	150	Fz	0,037	0,045	0,062
N1	0,35 x D	0,35 x D	690	-	720	690	-	720	Fz	0,055	0,075	0,095
N2	0,35 x D	0,35 x D	750	-	780	750	-	780	Fz	0,055	0,075	0,095
N3	0,35 x D	0,35 x D	700	-	720	700	-	720	Fz	0,055	0,075	0,095
N4	0,35 x D	0,35 x D	150	-	165	150	-	165	Fz	0,055	0,075	0,095
N5	0,35 x D	0,35 x D	225	-	270	225	-	270	Fz	0,055	0,075	0,095
N6	0,35 x D	0,35 x D	230	-	255	230	-	255	Fz	0,055	0,075	0,095
S1	0,35 x D	0,35 x D	70	-	80	70	-	80	Fz	0,028	0,035	0,048
S2	0,35 x D	0,35 x D	60	-	70	60	-	70	Fz	0,028	0,035	0,048
S3	0,35 x D	0,35 x D	80	-	90	80	-	90	Fz	0,028	0,035	0,048
S4	0,35 x D	0,35 x D	60	-	75	60	-	75	Fz	0,028	0,035	0,048
H1	0,35 x D	0,35 x D	25	-	35	25	-	35	Fz	0,028	0,035	0,048

List D002

A

B



Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min	TiCN Cutting Speed Vc m/min	TiAlN Cutting Speed Vc m/min		Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter									
								2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0	25,0
P1	0,75 x D	0,1 x D	0,5 x D	75 - 100	120 - 160	150 - 200	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131	0,142
P2	0,75 x D	0,1 x D	0,5 x D	70 - 95	112 - 152	140 - 190	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131	0,142
P3	0,75 x D	0,1 x D	0,5 x D		96 - 128	120 - 160	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116	0,131
P4	0,75 x D	0,1 x D	0,5 x D		72 - 120	90 - 150	Fz	0,012	0,025	0,038	0,052	0,062	0,072	0,081	0,088	0,101	0,112
M1	0,75 x D	0,1 x D	0,5 x D		72 - 92	90 - 115	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116	0,131
M2	0,75 x D	0,1 x D	0,5 x D		48 - 64	60 - 80	Fz	0,011	0,022	0,034	0,046	0,056	0,065	0,073	0,080	0,093	0,105
K1	0,75 x D	0,1 x D	0,5 x D		96 - 120	120 - 150	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131	0,142
K2	0,75 x D	0,1 x D	0,5 x D		88 - 104	110 - 130	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116	0,131
N1	0,75 x D	0,1 x D	0,5 x D	250 - 1000	400 - 1600		Fz	0,023	0,046	0,069	0,092	0,115	0,138	0,161	0,184	0,230	0,288
N2	0,75 x D	0,1 x D	0,5 x D	250 - 750	400 - 1200		Fz	0,018	0,037	0,055	0,074	0,092	0,110	0,129	0,147	0,184	0,230
N5	0,75 x D	0,1 x D	0,5 x D	125 - 375	200 - 600	250 - 750	Fz	0,021	0,041	0,062	0,083	0,104	0,124	0,145	0,166	0,207	0,259

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

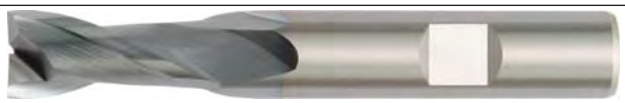
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D012

A

B



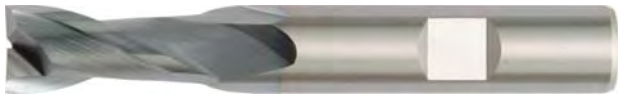
Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min	TiCN Cutting Speed Vc m/min	TiAlN Cutting Speed Vc m/min		Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter									
								2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0	25,0
P1	1,25 x D	0,1 x D	0,5 x D	90 - 110	144 - 176	180 - 220	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
P2	1,25 x D	0,1 x D	0,5 x D	80 - 100	128 - 160	160 - 200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
P3	1,25 x D	0,1 x D	0,5 x D		128 - 144	160 - 180	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
P4	1,25 x D	0,1 x D	0,5 x D		112 - 128	140 - 160	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088	0,098
M1	1,25 x D	0,1 x D	0,5 x D		72 - 92	90 - 115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
M2	1,25 x D	0,1 x D	0,5 x D		48 - 64	60 - 80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081	0,091
K1	1,25 x D	0,1 x D	0,5 x D		96 - 120	120 - 150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
K2	1,25 x D	0,1 x D	0,5 x D		88 - 104	110 - 130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
N1	1,25 x D	0,1 x D	0,5 x D	250 - 1000	400 - 1600		Fz	0,020	0,040	0,060	0,080	0,100	0,120	0,140	0,160	0,200	0,250
N2	1,25 x D	0,1 x D	0,5 x D	250 - 750	400 - 1200		Fz	0,016	0,032	0,048	0,064	0,080	0,096	0,112	0,128	0,160	0,200
N5	1,25 x D	0,1 x D	0,5 x D	250 - 500	400 - 800	500 - 1000	Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,126	0,144	0,180	0,225

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422867 022867 422807 022807



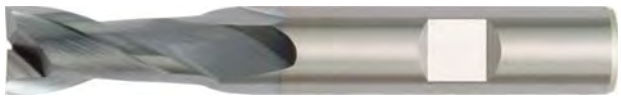
	A		B	K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	Min		Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	0,75 x D	0,1 x D	0,5 x D	60	-	80	150	-	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P2	0,75 x D	0,1 x D	0,5 x D	56	-	76	140	-	190	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P3	0,75 x D	0,1 x D	0,5 x D				120	-	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
P4	0,75 x D	0,1 x D	0,5 x D				90	-	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088
M1	0,75 x D	0,1 x D	0,5 x D				90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
M2	0,75 x D	0,1 x D	0,5 x D				60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081
K1	0,75 x D	0,1 x D	0,5 x D				120	-	150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
K2	0,75 x D	0,1 x D	0,5 x D				110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
N1	0,75 x D	0,1 x D	0,5 x D	250	-	1000				Fz	0,020	0,040	0,060	0,080	0,100	0,120	0,140	0,160	0,200
N2	0,75 x D	0,1 x D	0,5 x D	250	-	750				Fz	0,016	0,032	0,048	0,064	0,080	0,096	0,112	0,128	0,160
N5	0,75 x D	0,1 x D	0,5 x D	100	-	300	250	-	750	Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,126	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422860 422808



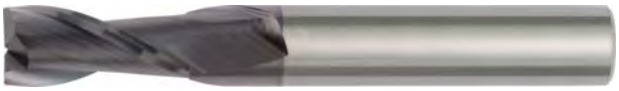
	A		B	K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	Min		Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	1,25 x D	0,1 x D	0,5 x D	150	-	200	150	-	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P2	1,25 x D	0,1 x D	0,5 x D	140	-	190	140	-	190	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P3	1,25 x D	0,1 x D	0,5 x D	120	-	160	120	-	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
P4	1,25 x D	0,1 x D	0,5 x D	90	-	150	90	-	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088
M1	1,25 x D	0,1 x D	0,5 x D	90	-	115	90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
M2	1,25 x D	0,1 x D	0,5 x D	60	-	80	60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081
K1	1,25 x D	0,1 x D	0,5 x D	120	-	150	120	-	150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
K2	1,25 x D	0,1 x D	0,5 x D	110	-	130	110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
N1	1,25 x D	0,1 x D	0,5 x D	250	-	750				Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,126	0,144	0,180
N2	0,75 x D	0,1 x D	0,5 x D	250	-	750				Fz	0,016	0,032	0,048	0,064	0,080	0,096	0,112	0,128	0,160
N5	0,75 x D	0,1 x D	0,5 x D	100	-	300	250	-	750	Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,126	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422819 022819



	A		B	K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.									
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	1,25 x D	0,1 x D	0,5 x D	60	-	80	150	-	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P2	1,25 x D	0,1 x D	0,5 x D	56	-	76	140	-	190	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P3	1,25 x D	0,1 x D	0,5 x D				120	-	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
P4	1,25 x D	0,1 x D	0,5 x D				90	-	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088
M1	1,25 x D	0,1 x D	0,5 x D				90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
M2	1,25 x D	0,1 x D	0,5 x D				60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081
K1	1,25 x D	0,1 x D	0,5 x D				120	-	150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
K2	1,25 x D	0,1 x D	0,5 x D				110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
N1	1,25 x D	0,1 x D	0,5 x D	100	-	300				Fz	0,020	0,040	0,060	0,080	0,100	0,120	0,140	0,160	0,200
N2	1,25 x D	0,1 x D	0,5 x D	250	-	750				Fz	0,016	0,032	0,048	0,064	0,080	0,096	0,112	0,128	0,160
N5	1,25 x D	0,1 x D	0,5 x D	250	-	500	250	-	750	Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,126	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422838 022838

	A		B	K30F Uncoated			K30F-DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.											
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter											
Group	ap	ae	ap	Min		Max	Min		Max	mm	2,0	3,0	4,0	5,0	6,0	8,0	10,0	12,0	14,0	16,0	18,0	20,0
P1	1 x D	0,25 x D	0,5 x D	90	-	110	180	-	220	Fz	0,014	0,021	0,028	0,036	0,044	0,060	0,072	0,083	0,092	0,101	0,107	0,114
P2	1 x D	0,25 x D	0,5 x D	80	-	100	160	-	200	Fz	0,014	0,021	0,028	0,036	0,044	0,060	0,072	0,083	0,092	0,101	0,107	0,114
P3	1 x D	0,25 x D	0,5 x D				160	-	180	Fz	0,011	0,017	0,023	0,030	0,036	0,050	0,061	0,070	0,079	0,087	0,094	0,101
P4	1 x D	0,25 x D	0,4 x D				140	-	160	Fz	0,010	0,016	0,021	0,027	0,033	0,045	0,054	0,062	0,070	0,077	0,082	0,088
M1	1 x D	0,25 x D	0,5 x D				90	-	115	Fz	0,011	0,017	0,023	0,030	0,036	0,050	0,061	0,070	0,079	0,087	0,094	0,101
M2	1 x D	0,25 x D	0,5 x D				60	-	80	Fz	0,009	0,014	0,019	0,024	0,029	0,040	0,048	0,056	0,063	0,070	0,075	0,081
K1	1 x D	0,25 x D	0,5 x D				120	-	150	Fz	0,014	0,021	0,028	0,036	0,044	0,060	0,072	0,083	0,092	0,101	0,107	0,114
K2	1 x D	0,25 x D	0,5 x D				110	-	130	Fz	0,011	0,017	0,023	0,030	0,036	0,050	0,061	0,070	0,079	0,087	0,094	0,101
N1	1 x D	0,25 x D	0,5 x D	250	-	1000				Fz	0,020	0,030	0,040	0,050	0,060	0,080	0,100	0,120	0,140	0,160	0,180	0,200
N2	1 x D	0,25 x D	0,5 x D	250	-	750				Fz	0,016	0,024	0,032	0,040	0,048	0,064	0,080	0,096	0,112	0,128	0,144	0,160
N5	1 x D	0,25 x D	0,5 x D	100	-	300	250	-	750	Fz	0,018	0,027	0,036	0,045	0,054	0,072	0,090	0,108	0,126	0,144	0,162	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D001

A

B

Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Max	TiAlN Cutting Speed Vc m/min Min	Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	1 x D	0,25 x D	0,5 x D	75	100	150	200	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	1 x D	0,25 x D	0,5 x D	70	95	140	190	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	1 x D	0,25 x D	0,5 x D			120	160	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	1 x D	0,25 x D	0,4 x D			90	150	Fz	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088
M1	1 x D	0,25 x D	0,5 x D			90	115	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	1 x D	0,25 x D	0,5 x D			60	80	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
K1	1 x D	0,25 x D	0,5 x D			120	150	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	1 x D	0,25 x D	0,5 x D			110	130	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
N1	1 x D	0,25 x D	0,5 x D	250	1000			Fz	0,030	0,040	0,060	0,080	0,100	0,120	0,160	0,200
N2	1 x D	0,25 x D	0,5 x D	250	750			Fz	0,024	0,032	0,048	0,064	0,080	0,096	0,128	0,160
N5	1 x D	0,25 x D	0,5 x D	125	375	250	750	Fz	0,027	0,036	0,054	0,072	0,090	0,108	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D011

A

B

Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Max	TiAlN Cutting Speed Vc m/min Min	Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	1,25 x D	0,25 x D	0,5 x D	75	100	150	200	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	1,25 x D	0,25 x D	0,5 x D	70	95	140	190	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	1,25 x D	0,25 x D	0,5 x D			120	160	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	1,25 x D	0,25 x D	0,5 x D			90	150	Fz	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088
M1	1,25 x D	0,25 x D	0,5 x D			90	115	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	1,25 x D	0,25 x D	0,5 x D			60	80	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
K1	1,25 x D	0,25 x D	0,5 x D			120	150	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	1,25 x D	0,25 x D	0,5 x D			110	130	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
N1	1,25 x D	0,25 x D	0,5 x D	250	1000			Fz	0,030	0,040	0,060	0,080	0,100	0,120	0,160	0,200
N2	1,25 x D	0,25 x D	0,5 x D	250	750			Fz	0,024	0,032	0,048	0,064	0,080	0,096	0,128	0,160
N5	1,25 x D	0,25 x D	0,5 x D	125	375	250	750	Fz	0,027	0,036	0,054	0,072	0,090	0,108	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D501

A

B

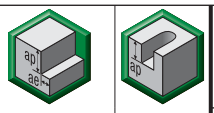
Group	A ap	A ae	B ap	TiAlN Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 1,0	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	0,7 x D	0,25 x D	0,5 x D	150	-	200	Fz	0,007	0,014	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	0,7 x D	0,25 x D	0,5 x D	140	-	190	Fz	0,007	0,014	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	0,7 x D	0,25 x D	0,5 x D	120	-	160	Fz	0,006	0,011	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	0,7 x D	0,25 x D	0,5 x D	90	-	150	Fz	0,005	0,010	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088
M1	0,7 x D	0,25 x D	0,5 x D	90	-	115	Fz	0,006	0,011	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	0,7 x D	0,25 x D	0,5 x D	60	-	80	Fz	0,005	0,009	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
K1	0,7 x D	0,25 x D	0,5 x D	120	-	150	Fz	0,007	0,014	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	0,7 x D	0,25 x D	0,5 x D	110	-	130	Fz	0,006	0,011	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
N1	0,7 x D	0,25 x D	0,5 x D	400	-	1600	Fz	0,010	0,020	0,030	0,040	0,060	0,080	0,100	0,120	0,160	0,200
N2	0,7 x D	0,25 x D	0,5 x D	400	-	1200	Fz	0,008	0,016	0,024	0,032	0,048	0,064	0,080	0,096	0,128	0,160
N5	0,7 x D	0,25 x D	0,5 x D	250	-	750	Fz	0,009	0,018	0,027	0,036	0,054	0,072	0,090	0,108	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

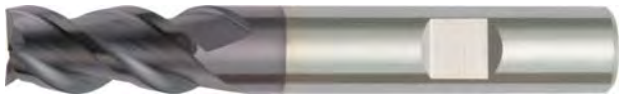
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D003



A

B



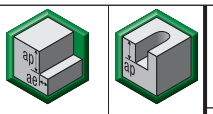
Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Max	TiCN Cutting Speed Vc m/min Min	Max	TiAlN Cutting Speed Vc m/min Min	Max	mm	D1 - Diameter 2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
											Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
P1	0,75 x D	0,1 x D	0,25 x D	75 -	100	120 -	160	150 -	200	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131
P2	0,75 x D	0,1 x D	0,25 x D	70 -	95	112 -	152	140 -	190	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131
P3	0,75 x D	0,1 x D	0,25 x D			96 -	128	120 -	160	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116
P4	0,75 x D	0,1 x D	0,25 x D			72 -	120	90 -	150	Fz	0,012	0,025	0,038	0,052	0,062	0,072	0,081	0,088	0,101
M1	0,75 x D	0,1 x D	0,25 x D			72 -	92	90 -	115	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116
M2	0,75 x D	0,1 x D	0,25 x D			48 -	64	60 -	80	Fz	0,011	0,022	0,034	0,046	0,056	0,065	0,073	0,080	0,093
K1	0,75 x D	0,1 x D	0,25 x D			96 -	120	120 -	150	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131
K2	0,75 x D	0,1 x D	0,25 x D			88 -	104	110 -	130	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116
N1	0,75 x D	0,1 x D	0,25 x D	250 -	1000	400 -	1600			Fz	0,023	0,046	0,069	0,092	0,115	0,138	0,161	0,184	0,230
N2	0,75 x D	0,1 x D	0,25 x D	250 -	750	400 -	1200			Fz	0,018	0,037	0,055	0,074	0,092	0,110	0,129	0,147	0,184
N5	0,75 x D	0,1 x D	0,25 x D	125 -	375	200 -	600	250 -	750	Fz	0,021	0,041	0,062	0,083	0,104	0,124	0,145	0,166	0,207

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

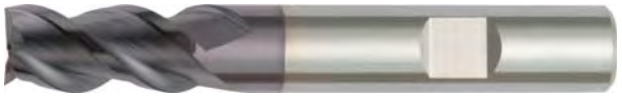
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D013



A

B



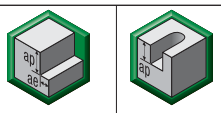
Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Max	TiCN Cutting Speed Vc m/min Min	Max	TiAlN Cutting Speed Vc m/min Min	Max	mm	D1 - Diameter 2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
											Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
P1	1,5 x D	0,1 x D	0,25 x D	75 -	100	120 -	160	150 -	200	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131
P2	1,5 x D	0,1 x D	0,25 x D	70 -	95	112 -	152	140 -	190	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131
P3	1,5 x D	0,1 x D	0,25 x D			96 -	128	120 -	160	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116
P4	1,5 x D	0,1 x D	0,25 x D			72 -	120	90 -	150	Fz	0,012	0,025	0,038	0,052	0,062	0,072	0,081	0,088	0,101
M1	1,5 x D	0,1 x D	0,25 x D			72 -	92	90 -	115	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116
M2	1,5 x D	0,1 x D	0,25 x D			48 -	64	60 -	80	Fz	0,011	0,022	0,034	0,046	0,056	0,065	0,073	0,080	0,093
K1	1,5 x D	0,1 x D	0,25 x D			96 -	120	120 -	150	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131
K2	1,5 x D	0,1 x D	0,25 x D			88 -	104	110 -	130	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116
N1	1,5 x D	0,1 x D	0,25 x D	250 -	1000	400 -	1600			Fz	0,023	0,046	0,069	0,092	0,115	0,138	0,161	0,184	0,230
N2	1,5 x D	0,1 x D	0,25 x D	250 -	750	400 -	1200			Fz	0,018	0,037	0,055	0,074	0,092	0,110	0,129	0,147	0,184
N5	1,5 x D	0,1 x D	0,25 x D	125 -	375	200 -	600	250 -	750	Fz	0,021	0,041	0,062	0,083	0,104	0,124	0,145	0,166	0,207

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422861 022861 422809 022809



A

B

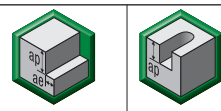
				K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.									
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	0,5 x D	0,1 x D	0,25 x D	90	-	110	150	-	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P2	0,5 x D	0,1 x D	0,25 x D	80	-	100	140	-	190	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P3	0,5 x D	0,1 x D	0,25 x D				120	-	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
P4	0,5 x D	0,1 x D	0,25 x D				90	-	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088
M1	0,5 x D	0,1 x D	0,25 x D				90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
M2	0,5 x D	0,1 x D	0,25 x D				60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081
K1	0,5 x D	0,1 x D	0,25 x D				120	-	150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
K2	0,5 x D	0,1 x D	0,25 x D				110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
N1	0,5 x D	0,1 x D	0,25 x D	250	-	1000				Fz	0,020	0,040	0,060	0,080	0,100	0,120	0,140	0,160	0,200
N2	0,5 x D	0,1 x D	0,25 x D	250	-	750				Fz	0,016	0,032	0,048	0,064	0,080	0,096	0,112	0,128	0,160
N5	0,5 x D	0,1 x D	0,25 x D	100	-	300	250	-	750	Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,126	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422862 022862 422810 022810



A

B

				K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.									
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	1,25 x D	0,1 x D	0,25 x D	90	-	110	150	-	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P2	1,25 x D	0,1 x D	0,25 x D	80	-	100	140	-	190	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P3	1,25 x D	0,1 x D	0,25 x D				120	-	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
P4	1,25 x D	0,1 x D	0,25 x D				90	-	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088
M1	1,25 x D	0,1 x D	0,25 x D				90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
M2	1,25 x D	0,1 x D	0,25 x D				60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081
K1	1,25 x D	0,1 x D	0,25 x D				120	-	150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
K2	1,25 x D	0,1 x D	0,25 x D				110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
N1	1,25 x D	0,1 x D	0,25 x D	250	-	1000				Fz	0,020	0,040	0,060	0,080	0,100	0,120	0,140	0,160	0,200
N2	1,25 x D	0,1 x D	0,25 x D	250	-	750				Fz	0,016	0,032	0,048	0,064	0,080	0,096	0,112	0,128	0,160
N5	1,25 x D	0,1 x D	0,25 x D	100	-	300	250	-	750	Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,126	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422821 022821

A

B

				K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.									
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	1,25 x D	0,1 x D	0,25 x D	60	-	80	150	-	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P2	1,25 x D	0,1 x D	0,25 x D	56	-	76	140	-	190	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P3	1,25 x D	0,1 x D	0,25 x D				120	-	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
P4	1,25 x D	0,1 x D	0,25 x D				90	-	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088
M1	1,25 x D	0,1 x D	0,25 x D				90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
M2	1,25 x D	0,1 x D	0,25 x D				60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081
K1	1,25 x D	0,1 x D	0,25 x D				120	-	150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
K2	1,25 x D	0,1 x D	0,25 x D				110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
N1	1,25 x D	0,1 x D	0,25 x D	250	-	1000				Fz	0,020	0,040	0,060	0,080	0,100	0,120	0,140	0,160	0,200
N2	1,25 x D	0,1 x D	0,25 x D	250	-	750				Fz	0,016	0,032	0,048	0,064	0,080	0,096	0,112	0,128	0,160
N5	1,25 x D	0,1 x D	0,25 x D	100	-	300	250	-	750	Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,126	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

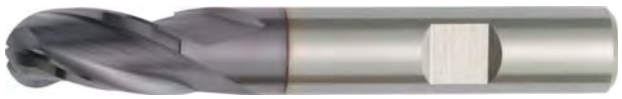
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D009

A

B



Group	A ap	A ae	B ap	TiAlN Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	1,25 x D	0,25 x D	0,5 x D	150	-	200	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	1,25 x D	0,25 x D	0,5 x D	140	-	190	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	1,25 x D	0,25 x D	0,5 x D	120	-	160	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	1,25 x D	0,25 x D	0,5 x D	90	-	150	Fz	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088
M1	1,25 x D	0,25 x D	0,5 x D	90	-	115	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	1,25 x D	0,25 x D	0,5 x D	60	-	80	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
K1	1,25 x D	0,25 x D	0,5 x D	120	-	150	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	1,25 x D	0,25 x D	0,5 x D	110	-	130	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
N1	1,25 x D	0,25 x D	0,5 x D	400	-	1600	Fz	0,030	0,040	0,060	0,080	0,100	0,120	0,160	0,200
N2	1,25 x D	0,25 x D	0,5 x D	400	-	1200	Fz	0,024	0,032	0,048	0,064	0,080	0,096	0,128	0,160
N5	1,25 x D	0,25 x D	0,5 x D	250	-	750	Fz	0,027	0,036	0,054	0,072	0,090	0,108	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

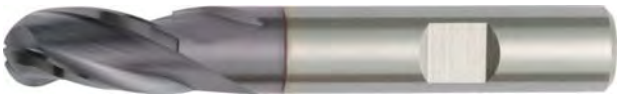
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List DC19

A

B



Group	A ap	A ae	B ap	TiAlN Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 3,0	5,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	1,0 x D	0,5 x D	0,1 x D	150	-	200	Fz	0,022	0,036	0,044	0,060	0,072	0,083	0,101	0,114
P2	1,0 x D	0,5 x D	0,1 x D	140	-	190	Fz	0,022	0,036	0,044	0,060	0,072	0,083	0,101	0,114
P3	1,0 x D	0,5 x D	0,1 x D	120	-	160	Fz	0,018	0,030	0,036	0,050	0,061	0,070	0,087	0,101
P4	1,0 x D	0,5 x D	0,1 x D	90	-	150	Fz	0,016	0,027	0,033	0,045	0,054	0,062	0,077	0,088
P5	1,0 x D	0,5 x D	0,1 x D	60	-	100	Fz	0,015	0,024	0,029	0,040	0,048	0,056	0,070	0,081
P6	1,0 x D	0,5 x D	0,1 x D	50	-	75	Fz	0,012	0,020	0,025	0,034	0,040	0,047	0,057	0,065
M1	1,0 x D	0,5 x D	0,1 x D	80	-	100	Fz	0,018	0,030	0,036	0,050	0,061	0,070	0,087	0,101
M2	1,0 x D	0,5 x D	0,1 x D	60	-	80	Fz	0,015	0,024	0,029	0,040	0,048	0,056	0,070	0,081
M3	1,0 x D	0,5 x D	0,1 x D	60	-	80	Fz	0,012	0,020	0,025	0,034	0,040	0,047	0,057	0,065
K1	1,0 x D	0,5 x D	0,1 x D	120	-	160	Fz	0,022	0,036	0,044	0,060	0,072	0,083	0,101	0,114
K2	1,0 x D	0,5 x D	0,1 x D	110	-	140	Fz	0,018	0,030	0,036	0,050	0,061	0,070	0,087	0,101
K3	1,0 x D	0,5 x D	0,1 x D	100	-	130	Fz	0,015	0,024	0,029	0,040	0,048	0,056	0,070	0,081
S1	1,0 x D	0,5 x D	0,1 x D	90	-	115	Fz	0,018	0,030	0,036	0,050	0,061	0,070	0,087	0,101
S2	1,0 x D	0,5 x D	0,1 x D	20	-	40	Fz	0,010	0,016	0,019	0,026	0,032	0,037	0,046	0,054
S3	1,0 x D	0,5 x D	0,1 x D	50	-	80	Fz	0,015	0,024	0,029	0,040	0,048	0,056	0,070	0,081
S4	1,0 x D	0,5 x D	0,1 x D	45	-	65	Fz	0,013	0,021	0,026	0,037	0,045	0,052	0,064	0,074
H1	1,0 x D	0,5 x D	0,1 x D	100	-	140	Fz	0,016	0,027	0,033	0,045	0,054	0,062	0,077	0,088

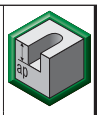
Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D004

A



B

Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Max	TiCN Cutting Speed Vc m/min Min	Max	TiAlN Cutting Speed Vc m/min Min	Max	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. mm	D1 - Diameter 2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0	25,0
P1	1,0 x D	0,1 x D	0,5 x D	75	100	120	160	150	200	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131	0,142
P2	1,0 x D	0,1 x D	0,5 x D	70	95	112	152	140	190	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131	0,142
P3	1,0 x D	0,1 x D	0,5 x D			96	128	120	160	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116	0,131
P4	1,0 x D	0,1 x D	0,5 x D			72	120	90	150	Fz	0,012	0,025	0,038	0,052	0,062	0,072	0,081	0,088	0,101	0,112
M1	1,0 x D	0,1 x D	0,5 x D			72	92	90	115	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116	0,131
M2	1,0 x D	0,1 x D	0,5 x D			48	64	60	80	Fz	0,011	0,022	0,034	0,046	0,056	0,065	0,073	0,080	0,093	0,105
K1	1,0 x D	0,1 x D	0,5 x D			96	120	120	150	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131	0,142
K2	1,0 x D	0,1 x D	0,5 x D			88	104	110	130	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116	0,131

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D014

A

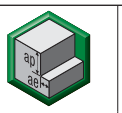
Group	A ap	A ae	Uncoated Cutting Speed Vc m/min Min	Max	TiCN Cutting Speed Vc m/min Min	Max	TiAlN Cutting Speed Vc m/min Min	Max	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. mm	D1 - Diameter 2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0	25,0
P1	1,5 x D	0,1 x D	75	100	120	160	150	200	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131	0,142
P2	1,5 x D	0,1 x D	70	95	112	152	140	190	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131	0,142
P3	1,5 x D	0,1 x D			96	128	120	160	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116	0,131
P4	1,5 x D	0,1 x D			72	120	90	150	Fz	0,012	0,025	0,038	0,052	0,062	0,072	0,081	0,088	0,101	0,112
M1	1,5 x D	0,1 x D			72	92	90	115	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116	0,131
M2	1,5 x D	0,1 x D			48	64	60	80	Fz	0,011	0,022	0,034	0,046	0,056	0,065	0,073	0,080	0,093	0,105
K1	1,5 x D	0,1 x D			96	120	120	150	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131	0,142
K2	1,5 x D	0,1 x D			88	104	110	130	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116	0,131

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422863 022863 422811 022811



A

B

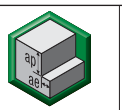
				KCF Uncoated			KCF-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.									
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	1,0 x D	0,1 x D	0,5 x D	90	-	110	180	-	220	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P2	1,0 x D	0,1 x D	0,5 x D	80	-	100	160	-	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P3	1,0 x D	0,1 x D	0,5 x D				160	-	180	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
P4	1,0 x D	0,1 x D	0,5 x D				140	-	160	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088
M1	1,0 x D	0,1 x D	0,5 x D				90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
M2	1,0 x D	0,1 x D	0,5 x D				60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081
K1	1,0 x D	0,1 x D	0,5 x D				120	-	150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
K2	1,0 x D	0,1 x D	0,5 x D				110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

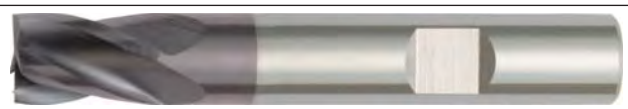
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422864 022864 422812 022812



A

B



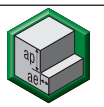
				KCF Uncoated			KCF-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.									
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	1,5 x D	0,1 x D	0,5 x D	60	-	80	150	-	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P2	1,5 x D	0,1 x D	0,5 x D	56	-	76	140	-	190	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P3	1,5 x D	0,1 x D	0,5 x D				120	-	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
P4	1,5 x D	0,1 x D	0,5 x D				90	-	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088
M1	1,5 x D	0,1 x D	0,5 x D				90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
M2	1,5 x D	0,1 x D	0,5 x D				60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081
K1	1,5 x D	0,1 x D	0,5 x D				120	-	150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
K2	1,5 x D	0,1 x D	0,5 x D				110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422825 022825



A

B

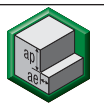
				K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.									
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	1,5 x D	0,1 x D	0,5 x D	60	-	80	150	-	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P2	1,5 x D	0,1 x D	0,5 x D	56	-	76	140	-	190	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P3	1,5 x D	0,1 x D	0,5 x D	48	-	64	120	-	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
P4	1,5 x D	0,1 x D	0,5 x D	36	-	60	90	-	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088
M1	1,5 x D	0,1 x D	0,5 x D	45	-	58	90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
M2	1,5 x D	0,1 x D	0,5 x D	30	-	40	60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081
K1	1,5 x D	0,1 x D	0,5 x D	60	-	75	120	-	150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
K2	1,5 x D	0,1 x D	0,5 x D	55	-	65	110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422848 022848



A

B

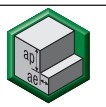
				K30F Uncoated			K30F-DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%								
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	1,25 x D	0,25 x D	0,5 x D	60	-	80	150	-	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	1,25 x D	0,25 x D	0,5 x D	56	-	76	140	-	190	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	1,25 x D	0,25 x D	0,5 x D				120	-	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	1,25 x D	0,25 x D	0,4 x D				90	-	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,077	0,088
M1	1,25 x D	0,25 x D	0,5 x D				90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	1,25 x D	0,25 x D	0,5 x D				60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,081
K1	1,25 x D	0,25 x D	0,5 x D				120	-	150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	1,25 x D	0,25 x D	0,5 x D				110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,101
N1	1,25 x D	0,25 x D	0,5 x D	250	-	1000				Fz	0,020	0,040	0,060	0,080	0,100	0,120	0,160	0,200
N2	1,25 x D	0,25 x D	0,5 x D	250	-	750				Fz	0,016	0,032	0,048	0,064	0,080	0,096	0,128	0,160
N5	1,25 x D	0,25 x D	0,5 x D	100	-	300	250	-	750	Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D000



A

B

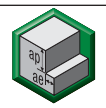
				Uncoated			TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	Min		Max	mm	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	0,7 x D	0,25 x D	0,5 x D	75	-	100	150	-	200	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	0,7 x D	0,25 x D	0,5 x D	70	-	95	140	-	190	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	0,7 x D	0,25 x D	0,5 x D				120	-	160	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	0,7 x D	0,25 x D	0,5 x D				90	-	150	Fz	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088
M1	0,7 x D	0,25 x D	0,5 x D				90	-	115	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	0,7 x D	0,25 x D	0,5 x D				60	-	80	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
K1	0,7 x D	0,25 x D	0,5 x D				120	-	150	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	0,7 x D	0,25 x D	0,5 x D				110	-	130	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
N1	0,7 x D	0,25 x D	0,5 x D	250	-	1000				Fz	0,030	0,040	0,060	0,080	0,100	0,120	0,160	0,200
N2	0,7 x D	0,25 x D	0,5 x D	250	-	750				Fz	0,024	0,032	0,048	0,064	0,080	0,096	0,128	0,160
N5	0,7 x D	0,25 x D	0,5 x D	125	-	375	250	-	750	Fz	0,027	0,036	0,054	0,072	0,090	0,108	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

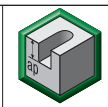
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List D010



A



B

				Uncoated			TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	Min		Max	mm	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	1,25 x D	0,25 x D	0,5 x D	75	-	100	150	-	200	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	1,25 x D	0,25 x D	0,5 x D	70	-	95	140	-	190	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	1,25 x D	0,25 x D	0,5 x D				120	-	160	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	1,25 x D	0,25 x D	0,5 x D				90	-	150	Fz	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088
M1	1,25 x D	0,25 x D	0,5 x D				90	-	115	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	1,25 x D	0,25 x D	0,5 x D				60	-	80	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
K1	1,25 x D	0,25 x D	0,5 x D				120	-	150	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	1,25 x D	0,25 x D	0,5 x D				110	-	130	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
N1	1,25 x D	0,25 x D	0,5 x D	250	-	1000				Fz	0,030	0,040	0,060	0,080	0,100	0,120	0,160	0,200
N2	1,25 x D	0,25 x D	0,5 x D	250	-	750				Fz	0,024	0,032	0,048	0,064	0,080	0,096	0,128	0,160
N5	1,25 x D	0,25 x D	0,5 x D	125	-	375	250	-	750	Fz	0,027	0,036	0,054	0,072	0,090	0,108	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422826 422822

A

B

K30F-DCHP
AlTiN

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).
For Slotting (B), reduce Fz by 20%.

Group	ap	ae	ap	Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	1,5 x D	0,1 x D	0,2 x D	150	-	200	Fz	0,011	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P2	1,5 x D	0,1 x D	0,2 x D	140	-	190	Fz	0,011	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P3	1,5 x D	0,1 x D	0,2 x D	120	-	160	Fz	0,009	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
P4	1,5 x D	0,1 x D	0,1 x D	90	-	150	Fz	0,009	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088
M1	1,5 x D	0,1 x D	0,15 x D	80	-	100	Fz	0,009	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
M2	1,5 x D	0,1 x D	0,1 x D	60	-	80	Fz	0,008	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081
K1	1,5 x D	0,1 x D	0,2 x D	120	-	160	Fz	0,011	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
K2	1,5 x D	0,1 x D	0,2 x D	110	-	140	Fz	0,009	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4632

A

B

Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).
For Slotting (B), reduce Fz by 20%.

Group	ap	ae	ap	Uncoated Cutting Speed Vc m/min Min		Max	TiAlN Cutting Speed Vc m/min Min		Max	mm	D1 - Diameter 0,4	0,5	0,6	0,8	1,0	1,2	1,5
P1	1 x D	0,1 x D	0,25 x D	75	-	100	150	-	200	Fz	0,003	0,004	0,005	0,006	0,008	0,009	0,012
P2	1 x D	0,1 x D	0,25 x D	70	-	95	140	-	190	Fz	0,003	0,004	0,005	0,006	0,008	0,009	0,012
P3	1 x D	0,1 x D	0,25 x D				120	-	160	Fz	0,003	0,003	0,004	0,005	0,006	0,008	0,010
P4	1 x D	0,1 x D	0,25 x D				90	-	150	Fz	0,002	0,003	0,004	0,005	0,006	0,007	0,009
M1	1 x D	0,1 x D	0,25 x D				90	-	115	Fz	0,003	0,003	0,004	0,005	0,006	0,008	0,010
M2	1 x D	0,1 x D	0,25 x D				60	-	80	Fz	0,002	0,003	0,003	0,004	0,005	0,006	0,008
K1	1 x D	0,1 x D	0,25 x D				120	-	150	Fz	0,003	0,004	0,005	0,006	0,008	0,009	0,012
K2	1 x D	0,1 x D	0,25 x D				110	-	130	Fz	0,003	0,003	0,004	0,005	0,006	0,008	0,010
N1	1 x D	0,1 x D	0,25 x D	250	-	1000				Fz	0,005	0,006	0,007	0,009	0,012	0,014	0,017
N2	1 x D	0,1 x D	0,25 x D	250	-	750				Fz	0,004	0,005	0,006	0,007	0,009	0,011	0,014
N5	1 x D	0,1 x D	0,25 x D	125	-	375	250	-	750	Fz	0,004	0,005	0,006	0,008	0,010	0,012	0,016

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

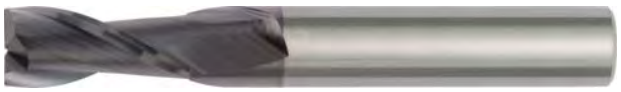
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4002

A

B



Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Uncoated Max	TiCN Min	TiCN Max	TiAlN Min	TiAlN Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0	25,0
P1	1,25 x D	0,1 x D	0,5 x D	75	100	120	160	150	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
P2	1,25 x D	0,1 x D	0,5 x D	70	95	112	152	140	190	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
P3	1,25 x D	0,1 x D	0,5 x D			96	128	120	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
P4	1,25 x D	0,1 x D	0,5 x D			72	120	90	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088	0,098
M1	1,25 x D	0,1 x D	0,5 x D			72	92	90	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
M2	1,25 x D	0,1 x D	0,5 x D			48	64	60	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081	0,091
K1	1,25 x D	0,1 x D	0,5 x D			96	120	120	150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
K2	1,25 x D	0,1 x D	0,5 x D			88	104	110	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
N1	1,25 x D	0,1 x D	0,5 x D	250	1000	400	1600			Fz	0,020	0,040	0,060	0,080	0,100	0,120	0,140	0,160	0,200	0,250
N2	1,25 x D	0,1 x D	0,5 x D	250	750	400	1200			Fz	0,016	0,032	0,048	0,064	0,080	0,096	0,112	0,128	0,160	0,200
N5	1,25 x D	0,1 x D	0,5 x D	125	375	200	600	250	750	Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,126	0,144	0,180	0,225

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

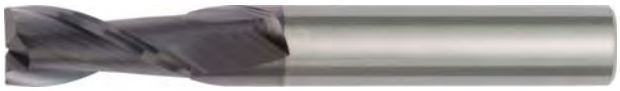
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4012

A

B



Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Uncoated Max	TiCN Min	TiCN Max	TiAlN Min	TiAlN Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0	25,0
P1	2 x D	0,1 x D	0,25 x D	90	110	144	176	180	220	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
P2	2 x D	0,1 x D	0,25 x D	80	100	128	160	160	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
P3	2 x D	0,1 x D	0,25 x D			128	144	160	180	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
P4	2 x D	0,1 x D	0,25 x D			112	128	140	160	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088	0,098
M1	2 x D	0,1 x D	0,25 x D			72	92	90	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
M2	2 x D	0,1 x D	0,25 x D			48	64	60	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081	0,091
K1	2 x D	0,1 x D	0,25 x D			96	120	120	150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
K2	2 x D	0,1 x D	0,25 x D			88	104	110	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
N1	2 x D	0,1 x D	0,25 x D	250	1000	400	1600			Fz	0,020	0,040	0,060	0,080	0,100	0,120	0,140	0,160	0,200	0,250
N2	2 x D	0,1 x D	0,25 x D	250	750	400	1200			Fz	0,016	0,032	0,048	0,064	0,080	0,096	0,112	0,128	0,160	0,200
N5	2 x D	0,1 x D	0,25 x D	250	500	400	800	500	1000	Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,126	0,144	0,180	0,225

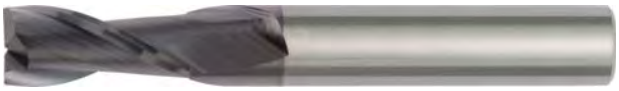
Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4022

A



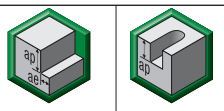
			Uncoated			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.										
			Cutting Speed Vc m/min			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter									
Group	ap	ae	Min		Max	Min		Max	Min		Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0	25,0
P1	3 x D	0,05 x D	75	-	100	120	-	160	150	-	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
P2	3 x D	0,05 x D	70	-	95	112	-	152	140	-	190	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
P3	3 x D	0,05 x D				96	-	128	120	-	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
P4	3 x D	0,05 x D				72	-	120	90	-	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088	0,098
M1	3 x D	0,05 x D				72	-	92	90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
M2	3 x D	0,05 x D				48	-	64	60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081	0,091
K1	3 x D	0,05 x D				96	-	120	120	-	150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
K2	3 x D	0,05 x D				88	-	104	110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
N1	3 x D	0,05 x D	250	-	1000	400	-	1600				Fz	0,020	0,040	0,060	0,080	0,100	0,120	0,140	0,160	0,200	0,250
N2	3 x D	0,05 x D	250	-	750	400	-	1200				Fz	0,016	0,032	0,048	0,064	0,080	0,096	0,112	0,128	0,160	0,200
N5	3 x D	0,05 x D	125	-	375	200	-	600	250	-	750	Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,126	0,144	0,180	0,225

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

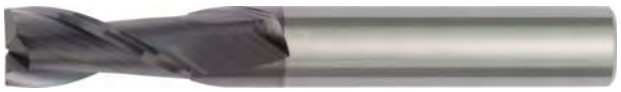
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422815 022815



A

B



				K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.									
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	mm	3,0	4,0	6,0	8,0	10,0	12,0	16,0	18,0	20,0
P1	3 x D	0,05 x D	0,15 x D	60	-	80	150	-	200	Fz	0,013	0,028	0,044	0,060	0,072	0,083	0,101	0,107	0,114
P2	3 x D	0,05 x D	0,15 x D	56	-	76	140	-	190	Fz	0,013	0,028	0,044	0,060	0,072	0,083	0,101	0,107	0,114
P3	3 x D	0,05 x D	0,15 x D				120	-	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,094	0,101
P4	3 x D	0,05 x D	0,15 x D				90	-	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,077	0,082	0,088
M1	3 x D	0,05 x D	0,15 x D				90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,094	0,101
M2	3 x D	0,05 x D	0,15 x D				60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,075	0,081
K1	3 x D	0,05 x D	0,15 x D				120	-	150	Fz	0,013	0,028	0,044	0,060	0,072	0,083	0,101	0,107	0,114
K2	3 x D	0,05 x D	0,15 x D				110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,094	0,101
N1	3 x D	0,05 x D	0,15 x D	250	-	1000				Fz	0,020	0,040	0,060	0,080	0,100	0,120	0,160	0,180	0,200
N2	3 x D	0,05 x D	0,15 x D	250	-	750				Fz	0,016	0,032	0,048	0,064	0,080	0,096	0,128	0,144	0,160
N5	3 x D	0,05 x D	0,15 x D	250	-	500	500	-	1000	Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,144	0,162	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4651

A

B

				Uncoated			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	Min		Max	Min		Max	mm	0,4	0,5	0,6	0,8	1,0	1,2	1,5	1,8
P1	0,5 x D	0,5 x D	0,5 x D	75	-	100	120	-	160	150	-	200	Fz	0,003	0,003	0,004	0,005	0,007	0,008	0,010	0,011
P2	0,5 x D	0,5 x D	0,5 x D	70	-	95	112	-	152	140	-	190	Fz	0,003	0,003	0,004	0,005	0,007	0,008	0,010	0,011
P3	0,3 x D	0,3 x D	0,3 x D				96	-	128	120	-	160	Fz	0,002	0,003	0,003	0,004	0,006	0,007	0,008	0,009
P4	0,3 x D	0,3 x D	0,3 x D				72	-	120	90	-	150	Fz	0,002	0,003	0,003	0,004	0,005	0,006	0,007	0,008
M1	0,3 x D	0,3 x D	0,3 x D				72	-	92	90	-	115	Fz	0,002	0,003	0,003	0,004	0,006	0,007	0,008	0,009
M2	0,3 x D	0,3 x D	0,3 x D				48	-	64	60	-	80	Fz	0,002	0,002	0,003	0,004	0,005	0,006	0,007	0,007
K1	0,5 x D	0,5 x D	0,5 x D				96	-	120	120	-	150	Fz	0,003	0,003	0,004	0,005	0,007	0,008	0,010	0,011
K2	0,5 x D	0,5 x D	0,5 x D				88	-	104	110	-	130	Fz	0,002	0,003	0,003	0,004	0,006	0,007	0,008	0,009
N1	0,5 x D	0,5 x D	0,5 x D	250	-	1000	400	-	1600				Fz	0,004	0,005	0,006	0,008	0,010	0,012	0,014	0,016
N2	0,5 x D	0,5 x D	0,5 x D	250	-	750	400	-	1200				Fz	0,003	0,004	0,005	0,006	0,008	0,010	0,011	0,013
N5	0,5 x D	0,5 x D	0,5 x D	125	-	375	200	-	600	250	-	750	Fz	0,004	0,005	0,005	0,007	0,009	0,011	0,013	0,014

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

List 4001

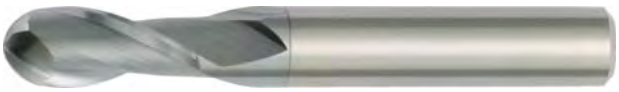
	A		B	Uncoated			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.										
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter									
Group	ap	ae	ap	Min		Max	Min		Max	mm	1,0	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	1,25 x D	0,25 x D	0,5 x D	75	-	100	150	-	200	Fz	0,007	0,014	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	1,25 x D	0,25 x D	0,5 x D	70	-	95	140	-	190	Fz	0,007	0,014	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	1,25 x D	0,25 x D	0,5 x D				120	-	160	Fz	0,006	0,011	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	1,25 x D	0,25 x D	0,5 x D				90	-	150	Fz	0,005	0,010	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088
M1	1,25 x D	0,25 x D	0,5 x D				90	-	115	Fz	0,006	0,011	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	1,25 x D	0,25 x D	0,5 x D				60	-	80	Fz	0,005	0,009	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
K1	1,25 x D	0,25 x D	0,5 x D				120	-	150	Fz	0,007	0,014	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	1,25 x D	0,25 x D	0,5 x D				110	-	130	Fz	0,006	0,011	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
N1	1,25 x D	0,25 x D	0,5 x D	250	-	1000				Fz	0,010	0,020	0,030	0,040	0,060	0,080	0,100	0,120	0,160	0,200
N2	1,25 x D	0,25 x D	0,5 x D	250	-	750				Fz	0,008	0,016	0,024	0,032	0,048	0,064	0,080	0,096	0,128	0,160
N5	1,25 x D	0,25 x D	0,5 x D	125	-	375	250	-	750	Fz	0,009	0,018	0,027	0,036	0,054	0,072	0,090	0,108	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4011



	A		B	Uncoated			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.										
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter									
Group	ap	ae	ap	Min		Max	Min		Max	mm	1,0	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	2,0 x D	0,15 x D	0,25 x D	75	-	100	150	-	200	Fz	0,007	0,014	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	2,0 x D	0,15 x D	0,25 x D	70	-	95	140	-	190	Fz	0,007	0,014	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	2,0 x D	0,15 x D	0,25 x D				120	-	160	Fz	0,006	0,011	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	2,0 x D	0,15 x D	0,25 x D				90	-	150	Fz	0,005	0,010	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088
M1	2,0 x D	0,15 x D	0,25 x D				90	-	115	Fz	0,006	0,011	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	2,0 x D	0,15 x D	0,25 x D				60	-	80	Fz	0,005	0,009	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
K1	2,0 x D	0,15 x D	0,25 x D				120	-	150	Fz	0,007	0,014	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	2,0 x D	0,15 x D	0,25 x D				110	-	130	Fz	0,006	0,011	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
N1	2,0 x D	0,15 x D	0,25 x D	250	-	1000				Fz	0,010	0,020	0,030	0,040	0,060	0,080	0,100	0,120	0,160	0,200
N2	2,0 x D	0,15 x D	0,25 x D	250	-	750				Fz	0,008	0,016	0,024	0,032	0,048	0,064	0,080	0,096	0,128	0,160
N5	2,0 x D	0,15 x D	0,25 x D	125	-	375	250	-	750	Fz	0,009	0,018	0,027	0,036	0,054	0,072	0,090	0,108	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4021

	A		B	Uncoated			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.										
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter									
Group	ap	ae	ap	Min		Max	Min		Max	mm	1,0	2,0	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P1	3,0 x D	0,05 x D	0,2 x D	75	-	100	150	-	200	Fz	0,007	0,014	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	3,0 x D	0,05 x D	0,2 x D	70	-	95	140	-	190	Fz	0,007	0,014	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	3,0 x D	0,05 x D	0,2 x D				120	-	160	Fz	0,006	0,011	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	3,0 x D	0,05 x D	0,2 x D				90	-	150	Fz	0,005	0,010	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088
M1	3,0 x D	0,05 x D	0,2 x D				90	-	115	Fz	0,006	0,011	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	3,0 x D	0,05 x D	0,2 x D				60	-	80	Fz	0,005	0,009	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
K1	3,0 x D	0,05 x D	0,2 x D				120	-	150	Fz	0,007	0,014	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	3,0 x D	0,05 x D	0,2 x D				110	-	130	Fz	0,006	0,011	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
N1	3,0 x D	0,05 x D	0,2 x D	250	-	1000				Fz	0,010	0,020	0,030	0,040	0,060	0,080	0,100	0,120	0,160	0,200
N2	3,0 x D	0,05 x D	0,2 x D	250	-	750				Fz	0,008	0,016	0,024	0,032	0,048	0,064	0,080	0,096	0,128	0,160
N5	3,0 x D	0,05 x D	0,2 x D	125	-	375	250	-	750	Fz	0,009	0,018	0,027	0,036	0,054	0,072	0,090	0,108	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4633

A

B

Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Uncoated Max	TiAlN Min	TiAlN Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 0,4	0,5	0,6	0,8	1,0	1,2	1,5
P1	1 x D	0,1 x D	0,25 x D	75	100	150	200	Fz	0,003	0,004	0,005	0,006	0,008	0,009	0,012
P2	1 x D	0,1 x D	0,25 x D	70	95	140	190	Fz	0,003	0,004	0,005	0,006	0,008	0,009	0,012
P3	1 x D	0,1 x D	0,25 x D			120	160	Fz	0,003	0,003	0,004	0,005	0,006	0,008	0,010
P4	1 x D	0,1 x D	0,25 x D			90	150	Fz	0,002	0,003	0,004	0,005	0,006	0,007	0,009
M1	1 x D	0,1 x D	0,25 x D			90	115	Fz	0,003	0,003	0,004	0,005	0,006	0,008	0,010
M2	1 x D	0,1 x D	0,25 x D			60	80	Fz	0,002	0,003	0,003	0,004	0,005	0,006	0,008
K1	1 x D	0,1 x D	0,25 x D			120	150	Fz	0,003	0,004	0,005	0,006	0,008	0,009	0,012
K2	1 x D	0,1 x D	0,25 x D			110	130	Fz	0,003	0,003	0,004	0,005	0,006	0,008	0,010
N1	1 x D	0,1 x D	0,25 x D	250	1000			Fz	0,005	0,006	0,007	0,009	0,012	0,014	0,017
N2	1 x D	0,1 x D	0,25 x D	250	750			Fz	0,004	0,005	0,006	0,007	0,009	0,011	0,014
N5	1 x D	0,1 x D	0,25 x D	125	375	250	750	Fz	0,004	0,005	0,006	0,008	0,010	0,012	0,016

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4003

A

B

Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Uncoated Max	TiCN Min	TiCN Max	TiAlN Min	TiAlN Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	0,75 x D	0,1 x D	0,25 x D	75	100	120	160	150	200	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131
P2	0,75 x D	0,1 x D	0,25 x D	70	95	112	152	140	190	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131
P3	0,75 x D	0,1 x D	0,25 x D			96	128	120	160	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116
P4	0,75 x D	0,1 x D	0,25 x D			72	120	90	150	Fz	0,012	0,025	0,038	0,052	0,062	0,072	0,081	0,088	0,101
M1	0,75 x D	0,1 x D	0,25 x D			72	92	90	115	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116
M2	0,75 x D	0,1 x D	0,25 x D			48	64	60	80	Fz	0,011	0,022	0,034	0,046	0,056	0,065	0,073	0,080	0,093
K1	0,75 x D	0,1 x D	0,25 x D			96	120	120	150	Fz	0,016	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131
K2	0,75 x D	0,1 x D	0,25 x D			88	104	110	130	Fz	0,013	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116
N1	0,75 x D	0,1 x D	0,25 x D	250	1000	400	1600			Fz	0,023	0,046	0,069	0,092	0,115	0,138	0,161	0,184	0,230
N2	0,75 x D	0,1 x D	0,25 x D	250	750	400	1200			Fz	0,018	0,037	0,055	0,074	0,092	0,110	0,129	0,147	0,184
N5	0,75 x D	0,1 x D	0,25 x D	125	375	200	600	250	750	Fz	0,021	0,041	0,062	0,083	0,104	0,124	0,145	0,166	0,207

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4013

A

B

				Uncoated			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.									
				Cutting Speed Vc m/min			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	Min		Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	1,5 x D	0,1 x D	0,25 x D	75	-	100	120	-	160	150	-	200	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P2	1,5 x D	0,1 x D	0,25 x D	70	-	95	112	-	152	140	-	190	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
P3	1,5 x D	0,1 x D	0,25 x D				96	-	128	120	-	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
P4	1,5 x D	0,1 x D	0,25 x D				72	-	120	90	-	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088
M1	1,5 x D	0,1 x D	0,25 x D				72	-	92	90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
M2	1,5 x D	0,1 x D	0,25 x D				48	-	64	60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081
K1	1,5 x D	0,1 x D	0,25 x D				96	-	120	120	-	150	Fz	0,014	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114
K2	1,5 x D	0,1 x D	0,25 x D				88	-	104	110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101
N1	1,5 x D	0,1 x D	0,25 x D	250	-	1000	400	-	1600				Fz	0,020	0,040	0,060	0,080	0,100	0,120	0,140	0,160	0,200
N2	1,5 x D	0,1 x D	0,25 x D	250	-	750	400	-	1200				Fz	0,016	0,032	0,048	0,064	0,080	0,096	0,112	0,128	0,160
N5	1,5 x D	0,1 x D	0,25 x D	125	-	375	200	-	600	250	-	750	Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,126	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 422858

A

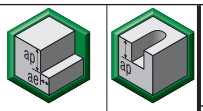
			K30F-DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).									
			Cutting Speed Vc m/min			D1 - Diameter									
Group	ap	ae	Min		Max	mm	3,0	4,0	6,0	8,0	10,0	12,0	16,0	18,0	20,0	25,0
P1	2,5 x D	0,1 x D	150	-	200	Fz	0,013	0,028	0,044	0,060	0,072	0,083	0,101	0,107	0,114	0,121
P2	2,5 x D	0,1 x D	140	-	190	Fz	0,013	0,028	0,044	0,060	0,072	0,083	0,101	0,107	0,114	0,121
P3	2,5 x D	0,1 x D	120	-	160	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,094	0,101	0,108
P4	2,5 x D	0,1 x D	90	-	150	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,077	0,082	0,088	0,094
M1	2,5 x D	0,1 x D	90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,094	0,101	0,108
M2	2,5 x D	0,1 x D	60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,075	0,081	0,086
K1	2,5 x D	0,1 x D	120	-	150	Fz	0,013	0,028	0,044	0,060	0,072	0,083	0,101	0,107	0,114	0,121
K2	2,5 x D	0,1 x D	110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,094	0,101	0,108
N5	2,5 x D	0,1 x D	250	-	750	Fz	0,018	0,036	0,054	0,072	0,090	0,108	0,144	0,162	0,180	0,198

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4004



A

B

Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Max	TiCN Cutting Speed Vc m/min Min	Max	TiAlN Cutting Speed Vc m/min Min	Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 1,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0	25,0
P1	1,5 x D	0,1 x D	0,5 x D	75	100	120	160	150	200	Fz	0,008	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131	0,142
P2	1,5 x D	0,1 x D	0,5 x D	70	95	112	152	140	190	Fz	0,008	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131	0,142
P3	1,5 x D	0,1 x D	0,5 x D			96	128	120	160	Fz	0,006	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116	0,131
P4	1,5 x D	0,1 x D	0,5 x D			72	120	90	150	Fz	0,006	0,025	0,038	0,052	0,062	0,072	0,081	0,088	0,101	0,112
M1	1,5 x D	0,1 x D	0,5 x D			72	92	90	115	Fz	0,006	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116	0,131
M2	1,5 x D	0,1 x D	0,5 x D			48	64	60	80	Fz	0,005	0,022	0,034	0,046	0,056	0,065	0,073	0,080	0,093	0,105
K1	1,5 x D	0,1 x D	0,5 x D			96	120	120	150	Fz	0,008	0,033	0,050	0,069	0,083	0,095	0,106	0,116	0,131	0,142
K2	1,5 x D	0,1 x D	0,5 x D			88	104	110	130	Fz	0,006	0,027	0,042	0,058	0,070	0,081	0,091	0,100	0,116	0,131

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4014

A

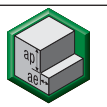
Group	A ap	A ae	Uncoated Cutting Speed Vc m/min Min	Max	TiCN Cutting Speed Vc m/min Min	Max	TiAlN Cutting Speed Vc m/min Min	Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 1,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0	25,0
P1	2 x D	0,1 x D	75	100	120	160	150	200	Fz	0,007	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
P2	2 x D	0,1 x D	70	95	112	152	140	190	Fz	0,007	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
P3	2 x D	0,1 x D			96	128	120	160	Fz	0,006	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
P4	2 x D	0,1 x D			72	120	90	150	Fz	0,005	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088	0,098
M1	2 x D	0,1 x D			72	92	90	115	Fz	0,006	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
M2	2 x D	0,1 x D			48	64	60	80	Fz	0,005	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081	0,091
K1	2 x D	0,1 x D			96	120	120	150	Fz	0,007	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
K2	2 x D	0,1 x D			88	104	110	130	Fz	0,006	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4024



	A		Uncoated			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.										
			Cutting Speed Vc m/min			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter									
Group	ap	ae	Min		Max	Min		Max	Min		Max	mm	1,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0	25,0
P1	3 x D	0,1 x D	75	-	100	120	-	160	150	-	200	Fz	0,007	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
P2	3 x D	0,1 x D	70	-	95	112	-	152	140	-	190	Fz	0,007	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
P3	3 x D	0,1 x D				96	-	128	120	-	160	Fz	0,006	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
P4	3 x D	0,05 x D				72	-	120	90	-	150	Fz	0,005	0,021	0,033	0,045	0,054	0,062	0,070	0,077	0,088	0,098
M1	3 x D	0,05 x D				72	-	92	90	-	115	Fz	0,006	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114
M2	3 x D	0,05 x D				48	-	64	60	-	80	Fz	0,005	0,019	0,029	0,040	0,048	0,056	0,063	0,070	0,081	0,091
K1	3 x D	0,1 x D				96	-	120	120	-	150	Fz	0,007	0,028	0,044	0,060	0,072	0,083	0,092	0,101	0,114	0,124
K2	3 x D	0,1 x D				88	-	104	110	-	130	Fz	0,006	0,023	0,036	0,050	0,061	0,070	0,079	0,087	0,101	0,114

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422816 022816

	A		B	K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.									
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	mm	3,0	4,0	6,0	8,0	10,0	12,0	16,0	18,0	20,0
P1	3 x D	0,1 x D	0,15 x D	90	-	110	180	-	220	Fz	0,013	0,028	0,044	0,060	0,072	0,083	0,101	0,107	0,114
P2	3 x D	0,1 x D	0,15 x D	80	-	100	160	-	200	Fz	0,013	0,028	0,044	0,060	0,072	0,083	0,101	0,107	0,114
P3	3 x D	0,1 x D	0,15 x D				160	-	180	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,094	0,101
P4	3 x D	0,05 x D	0,15 x D				140	-	160	Fz	0,010	0,021	0,033	0,045	0,054	0,062	0,077	0,082	0,088
M1	3 x D	0,1 x D	0,15 x D				90	-	115	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,094	0,101
M2	3 x D	0,1 x D	0,15 x D				60	-	80	Fz	0,009	0,019	0,029	0,040	0,048	0,056	0,070	0,075	0,081
K1	3 x D	0,1 x D	0,15 x D				120	-	150	Fz	0,013	0,028	0,044	0,060	0,072	0,083	0,101	0,107	0,114
K2	3 x D	0,1 x D	0,15 x D				110	-	130	Fz	0,011	0,023	0,036	0,050	0,061	0,070	0,087	0,094	0,101

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4000

A

B

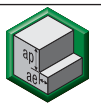
Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Uncoated Max	TiCN Min	TiCN Max	TiAlN Min	TiAlN Max	mm	D1 - Diameter 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
				Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.														
P1	1,25 x D	0,25 x D	0,5 x D	75	100	120	160	150	200	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	1,25 x D	0,25 x D	0,5 x D	70	95	112	152	140	190	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	1,25 x D	0,25 x D	0,5 x D			96	128	120	160	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	1,25 x D	0,25 x D	0,5 x D			72	120	90	150	Fz	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088
M1	1,25 x D	0,25 x D	0,5 x D			72	92	90	115	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	1,25 x D	0,25 x D	0,5 x D			48	64	60	80	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
K1	1,25 x D	0,25 x D	0,5 x D			96	120	120	150	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	1,25 x D	0,25 x D	0,5 x D			88	104	110	130	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
N1	1,25 x D	0,25 x D	0,5 x D	250	1000	400	1600			Fz	0,030	0,040	0,060	0,080	0,100	0,120	0,160	0,200
N2	1,25 x D	0,25 x D	0,5 x D	250	750	400	1200			Fz	0,024	0,032	0,048	0,064	0,080	0,096	0,128	0,160
N5	1,25 x D	0,25 x D	0,5 x D	125	375	200	600	250	750	Fz	0,027	0,036	0,054	0,072	0,090	0,108	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4010



A

B

Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Uncoated Max	TiCN Min	TiCN Max	TiAlN Min	TiAlN Max	mm	D1 - Diameter 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
				Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.														
P1	2,5 x D	0,15 x D	0,25 x D	75	100	120	160	150	200	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P2	2,5 x D	0,15 x D	0,25 x D	70	95	112	152	140	190	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
P3	2,5 x D	0,15 x D	0,25 x D			96	128	120	160	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
P4	2,5 x D	0,15 x D	0,25 x D			72	120	90	150	Fz	0,016	0,021	0,033	0,045	0,054	0,062	0,077	0,088
M1	2,5 x D	0,15 x D	0,25 x D			72	92	90	115	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
M2	2,5 x D	0,15 x D	0,25 x D			48	64	60	80	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070	0,081
K1	2,5 x D	0,15 x D	0,25 x D			96	120	120	150	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101	0,114
K2	2,5 x D	0,15 x D	0,25 x D			88	104	110	130	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087	0,101
N1	2,5 x D	0,15 x D	0,25 x D	250	1000	400	1600			Fz	0,030	0,040	0,060	0,080	0,100	0,120	0,160	0,200
N2	2,5 x D	0,15 x D	0,25 x D	250	750	400	1200			Fz	0,024	0,032	0,048	0,064	0,080	0,096	0,128	0,160
N5	2,5 x D	0,15 x D	0,25 x D	125	375	200	600	250	750	Fz	0,027	0,036	0,054	0,072	0,090	0,108	0,144	0,180

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422845 022845

	A		B	K30F Uncoated			K30F-DCHP AlTiN			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling/Profiling (A).							
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	Min		Max	mm	3,0	4,0	6,0	8,0	10,0	12,0	16,0
P1	1,5 x D	0,15 x D	0,25 x D	60	-	80	150	-	200	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101
P2	1,5 x D	0,15 x D	0,25 x D	56	-	76	140	-	190	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101
P3	1,5 x D	0,15 x D	0,25 x D				120	-	160	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087
P4	1,5 x D	0,15 x D	0,25 x D				90	-	150	Fz	0,016	0,021	0,033	0,045	0,054	0,062	0,077
M1	1,5 x D	0,15 x D	0,25 x D				90	-	115	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087
M2	1,5 x D	0,15 x D	0,25 x D				60	-	80	Fz	0,014	0,019	0,029	0,040	0,048	0,056	0,070
K1	1,5 x D	0,15 x D	0,25 x D				120	-	150	Fz	0,021	0,028	0,044	0,060	0,072	0,083	0,101
K2	1,5 x D	0,15 x D	0,25 x D				110	-	130	Fz	0,017	0,023	0,036	0,050	0,061	0,070	0,087

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422813 022813

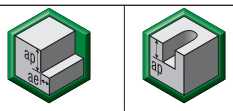
	A		B	K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P1	1 x D	0,5 x D	1 x D	60	-	80	150	-	200	Fz	0,032	0,043	0,052	0,063	0,077	0,087	0,097
P2	1 x D	0,5 x D	1 x D	56	-	76	140	-	190	Fz	0,032	0,043	0,052	0,063	0,077	0,087	0,097
P3	1 x D	0,5 x D	1 x D				120	-	160	Fz	0,026	0,036	0,044	0,054	0,067	0,077	0,088
P4	1 x D	0,4 x D	1 x D				90	-	150	Fz	0,024	0,032	0,039	0,048	0,059	0,067	0,076
M1	1 x D	0,4 x D	0,75 x D				80	-	100	Fz	0,026	0,036	0,044	0,054	0,067	0,077	0,088
M2	1 x D	0,4 x D	0,5 x D				60	-	80	Fz	0,018	0,024	0,029	0,036	0,044	0,050	0,056
K1	1 x D	0,5 x D	1 x D	48	-	64	120	-	160	Fz	0,032	0,043	0,052	0,063	0,077	0,087	0,097
K2	1 x D	0,4 x D	1 x D	44	-	56	110	-	140	Fz	0,026	0,036	0,044	0,054	0,067	0,077	0,088
K3	1 x D	0,4 x D	1 x D	40	-	52	100	-	130	Fz	0,021	0,029	0,035	0,043	0,053	0,062	0,070

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422818 022818



A

B

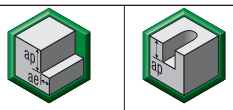
				K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.						
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter					
Group	ap	ae	ap	Min		Max	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	20,0
P1	1,5 x D	0,5 x D	1 x D	60	-	80	150	-	200	Fz	0,033	0,041	0,049	0,060	0,073	0,082
P2	1,5 x D	0,5 x D	1 x D	56	-	76	140	-	190	Fz	0,033	0,041	0,049	0,060	0,073	0,082
P3	1,5 x D	0,4 x D	1 x D				120	-	160	Fz	0,027	0,034	0,041	0,051	0,063	0,073
P4	1,5 x D	0,4 x D	0,75 x D				90	-	150	Fz	0,024	0,030	0,037	0,045	0,055	0,063
K1	1,5 x D	0,5 x D	1 x D				120	-	160	Fz	0,033	0,041	0,049	0,060	0,073	0,082
K2	1,5 x D	0,4 x D	1 x D				110	-	140	Fz	0,027	0,034	0,041	0,051	0,063	0,073
K3	1,5 x D	0,4 x D	1 x D				100	-	130	Fz	0,021	0,027	0,033	0,040	0,050	0,058

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 422846 022846



A

B

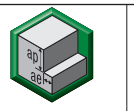
				K30F Uncoated			K30F-DCF TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.						
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter					
Group	ap	ae	ap	Min		Max	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	20,0
P1	1,5 x D	0,5 x D	1 x D	60	-	80	150	-	200	Fz	0,033	0,041	0,049	0,060	0,073	0,082
P2	1,5 x D	0,5 x D	1 x D	56	-	76	140	-	190	Fz	0,033	0,041	0,049	0,060	0,073	0,082
P3	1,5 x D	0,4 x D	1 x D				120	-	160	Fz	0,027	0,034	0,041	0,051	0,063	0,073
P4	1,5 x D	0,4 x D	0,75 x D				90	-	150	Fz	0,024	0,030	0,037	0,045	0,055	0,063
P5	1,5 x D	0,4 x D	0,75 x D				60	-	100	Fz	0,021	0,027	0,033	0,040	0,050	0,058
K1	1,5 x D	0,5 x D	1 x D				120	-	160	Fz	0,033	0,041	0,049	0,060	0,073	0,082
K2	1,5 x D	0,4 x D	1 x D				110	-	140	Fz	0,027	0,034	0,041	0,051	0,063	0,073
K3	1,5 x D	0,4 x D	1 x D				100	-	130	Fz	0,021	0,027	0,033	0,040	0,050	0,058

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4906



A

B

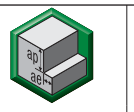
				TiCN			TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.						
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	Min		Max	mm	8,0	10,0	12,0	14,0	16,0	18,0	20,0
P1	1,5 x D	0,5 x D	1 x D	120	-	160	150	-	200	Fz	0,049	0,059	0,072	0,080	0,087	0,093	0,098
P2	1,5 x D	0,5 x D	1 x D	112	-	152	140	-	190	Fz	0,049	0,059	0,072	0,080	0,087	0,093	0,098
P3	1,5 x D	0,4 x D	0,75 x D	96	-	128	120	-	160	Fz	0,041	0,049	0,061	0,068	0,075	0,082	0,087
P4	1 x D	0,3 x D	0,5 x D	72	-	120	90	-	150	Fz	0,037	0,044	0,054	0,060	0,066	0,072	0,076
P5	1,5 x D	0,4 x D	0,75 x D	48	-	80	60	-	100	Fz	0,033	0,039	0,049	0,055	0,060	0,065	0,070
M1	1 x D	0,4 x D	0,75 x D	64	-	80	80	-	100	Fz	0,041	0,049	0,061	0,068	0,075	0,082	0,087
M2	1 x D	0,4 x D	0,75 x D	48	-	64	60	-	80	Fz	0,033	0,039	0,049	0,055	0,060	0,065	0,070
M3	1 x D	0,4 x D	0,75 x D	48	-	64	60	-	80	Fz	0,026	0,032	0,039	0,044	0,048	0,052	0,056
K1	1,5 x D	0,5 x D	1 x D	96	-	128	120	-	160	Fz	0,049	0,059	0,072	0,080	0,087	0,093	0,098
K2	1,5 x D	0,4 x D	1 x D	88	-	112	110	-	140	Fz	0,041	0,049	0,061	0,068	0,075	0,082	0,087
K3	1,5 x D	0,4 x D	1 x D	80	-	104	100	-	130	Fz	0,033	0,039	0,049	0,055	0,060	0,065	0,070
S1	1,5 x D	0,4 x D	0,75 x D	40	-	72	50	-	90	Fz	0,041	0,049	0,061	0,068	0,075	0,082	0,087
S3	1,5 x D	0,4 x D	0,75 x D	40	-	64	50	-	80	Fz	0,033	0,039	0,049	0,055	0,060	0,065	0,070
H1	1,0 x D	0,3 x D	0,5 x D	64	-	112	80	-	140	Fz	0,037	0,044	0,054	0,060	0,066	0,072	0,076

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

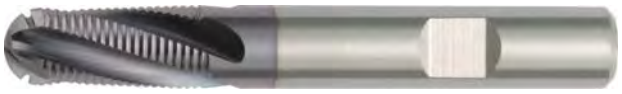
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 4966



A

B



				TiCN			TiAlN				Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.						
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	Min		Max	mm	8,0	10,0	12,0	14,0	16,0	18,0	20,0
P1	1,5 x D	0,5 x D	1 x D	120	-	160	150	-	200	Fz	0,049	0,059	0,072	0,080	0,087	0,093	0,098
P2	1,5 x D	0,5 x D	1 x D	112	-	152	140	-	190	Fz	0,049	0,059	0,072	0,080	0,087	0,093	0,098
P3	1,5 x D	0,4 x D	0,75 x D	96	-	128	120	-	160	Fz	0,041	0,049	0,061	0,068	0,075	0,082	0,087
P4	1 x D	0,3 x D	0,5 x D	72	-	120	90	-	150	Fz	0,037	0,044	0,054	0,060	0,066	0,072	0,076
P5	1,5 x D	0,4 x D	0,75 x D	48	-	80	60	-	100	Fz	0,033	0,039	0,049	0,055	0,060	0,065	0,070
M1	1 x D	0,4 x D	0,75 x D	64	-	80	80	-	100	Fz	0,041	0,049	0,061	0,068	0,075	0,082	0,087
M2	1 x D	0,4 x D	0,75 x D	48	-	64	60	-	80	Fz	0,033	0,039	0,049	0,055	0,060	0,065	0,070
M3	1 x D	0,4 x D	0,75 x D	48	-	64	60	-	80	Fz	0,026	0,032	0,039	0,044	0,048	0,052	0,056
K1	1,5 x D	0,5 x D	1 x D	96	-	128	120	-	160	Fz	0,049	0,059	0,072	0,080	0,087	0,093	0,098
K2	1,5 x D	0,4 x D	1 x D	88	-	112	110	-	140	Fz	0,041	0,049	0,061	0,068	0,075	0,082	0,087
K3	1,5 x D	0,4 x D	1 x D	80	-	104	100	-	130	Fz	0,033	0,039	0,049	0,055	0,060	0,065	0,070
S1	1,5 x D	0,4 x D	0,75 x D	40	-	72	50	-	90	Fz	0,041	0,049	0,061	0,068	0,075	0,082	0,087
S3	1,5 x D	0,4 x D	0,75 x D	40	-	64	50	-	80	Fz	0,033	0,039	0,049	0,055	0,060	0,065	0,070
H1	1,0 x D	0,3 x D	0,5 x D	64	-	112	80	-	140	Fz	0,037	0,044	0,054	0,060	0,066	0,072	0,076

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Solid End Mill Custom Solutions

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We provide exceptional application and design engineering services. Whether you need tools produced according to a blueprint, a finished part, or a drawing; assistance in process development; or expertise in optimizing an application, our world-renowned Advanced Engineering Team is available.

Our engineering departments are fully integrated with specialized production cells located in our focused factories throughout the world. ISO Certified manufacturing facilities, with state-of-the-art CNC equipment, simulation capability, CAD/CAM production, and inspection processes, ensure that customers receive the highest-quality product with accurate compliance to specifications and repeatability for future production.

Custom Solution Services:

- Blueprint Specials
- Complex Geometries
- Form Tools
- Modified Standards
- Application Engineering and Optimization
- Tool Design
- Project Development

Contact your local Distributor for more information.

General Purpose High-Speed Steel (HSS-E) Roughers and Finishers

Ideal for short-run production jobs, maintenance tool rooms, and conventional- and light-duty milling machines.

The WIDIA-Hanita General Purpose line provides a full range of roughing and finishing end mills made from the highest quality high-speed materials, including M7 and M42 cobalt. With fully compliant DIN, European standard, USCTI, or NAS specifications, WIDIA-Hanita General Purpose end mills provide consistent and reliable performance for any general application milling task.

The WIDIA-Hanita HSS-E roughing and finishing end mills are an excellent alternative to carbide. They provide the maximum toughness and durability that is often required when conventional or slow spindle machines are used or workpieces are held in less-than-rigid setups. They are especially cost effective when large diameter tools are required.

The standard offering from WIDIA-Hanita includes a wide variety of styles and sizes.

Available in:

- Coarse, fine, and Aluminium profile rougher styles.
- 2-, 3-, 4-, and 6-flute finishing styles.
- Cutting diameters from 25,4mm through 50,8mm.
- 30°, 35°, 37°, and 45° helixes.
- Stub, regular, long, and extra-long lengths.
- TiCN and TiAlN coatings.

General Purpose High-Speed Steel (HSS-E) End Mills • Roughing/Finishing

Roughing/Finishing **A277–A312**

Application Data

Lists 1602 1612 . . . . . A278–A279
List 3502 . . . . . A280
Lists 1652 JJ 1662 JJ A281
List 1601 . . . . . A282
List 1603 . . . . . A283
Lists 3605 3615 . . . . . A284
Lists 1605 1615 . . . . . A285–A286
List 1634 JJ A287
List 1625 . . . . . A288
List 1600 . . . . . A289
Lists 1606 1616 . . . . . A290
Lists 6609 6619 . . . . . A291
List 6645 . . . . . A292
List 6605 . . . . . A293
Lists 6606 6616 . . . . . A294–A295
Lists 6607 6617 . . . . . A296
Lists 6608 6618 . . . . . A297
List 6604 . . . . . A298
List 6667 JJ A299
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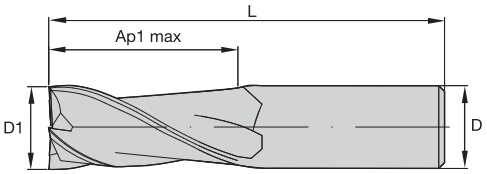
- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A300.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiCN - CW	TiAlN - LW
2,0	6	4,00	48	160202002WW	160202002CW	160202002LW
2,5	6	5,00	49	160202502WW	160202502CW	160202502LW
3,0	6	5,00	49	160203002WW	160203002CW	160203002LW
3,0	6	9,00	60	161203002WW	–	–
3,5	6	6,00	50	160203502WW	160203502CW	160203502LW
4,0	6	7,00	51	160204002WW	160204002CW	160204002LW
4,0	6	13,00	67	161204002WW	–	–
4,5	6	7,00	51	160204502WW	160204502CW	160204502LW
5,0	6	8,00	52	160205002WW	160205002CW	160205002LW
5,0	6	13,00	71	161205002WW	–	–
5,5	6	8,00	52	160205502WW	160205502CW	160205502LW
6,0	6	8,00	52	160206002WW	160206002CW	160206002LW
6,0	6	16,00	75	161206002WW	–	–
6,5	10	10,00	60	160206504WW	160206504CW	160206504LW
7,0	10	10,00	60	160207004WW	160207004CW	160207004LW
7,0	10	16,00	75	161207004WW	161207004CW	–
7,5	10	10,00	60	160207504WW	160207504CW	160207504LW
8,0	10	11,00	61	160208004WW	160208004CW	160208004LW
8,0	10	20,00	80	161208004WW	–	–
8,5	10	11,00	61	160208504WW	160208504CW	160208504LW
9,0	10	11,00	61	160209004WW	160209004CW	160209004LW
9,0	10	22,00	80	161209004WW	–	–

(continued)

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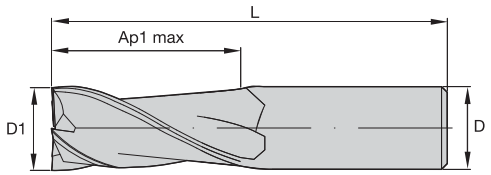


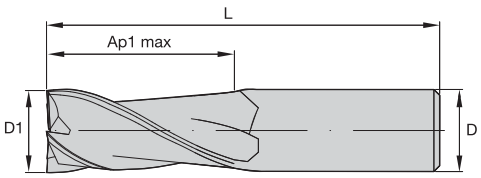
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A300.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiCN - CW	TiAlN - LW
9,5	10	11,00	61	160209504WW	160209504CW	160209504LW
10,0	10	13,00	63	160210004WW	160210004CW	160210004LW
10,0	10	22,00	80	161210004WW	–	–
10,5	12	13,00	70	160210505WW	160210505CW	160210505LW
11,0	12	13,00	70	160211005WW	160211005CW	160211005LW
12,0	12	16,00	73	160212005WW	160212005CW	160212005LW
12,0	12	25,00	100	161212005WW	–	–
12,5	12	16,00	73	160212505WW	160212505CW	160212505LW
13,0	12	16,00	73	160213005WW	160213005CW	160213005LW
13,5	12	16,00	73	160213505WW	160213505CW	160213505LW
14,0	12	16,00	73	160214005WW	160214005CW	160214005LW
14,0	12	28,00	100	161214005WW	–	–
15,0	12	16,00	73	160215005WW	160215005CW	160215005LW
16,0	16	19,00	79	160216006WW	160216006CW	160216006LW
16,0	16	32,00	116	161216006WW	–	–
17,0	16	19,00	79	160217006WW	160217006CW	160217006LW
18,0	16	19,00	79	160218006WW	160218006CW	160218006LW
18,0	16	35,00	118	161218006WW	–	–
19,0	16	19,00	79	160219006WW	160219006CW	160219006LW
20,0	16	19,00	79	160220006WW	160220006CW	160220006LW
20,0	20	22,00	88	160220007WW	160220007CW	160220007LW
20,0	16	38,00	125	161220006WW	–	–
21,0	20	22,00	88	160221007WW	160221007CW	–
22,0	20	22,00	88	160222007WW	160222007CW	160222007LW
22,0	25	40,00	140	161222008WW	–	–
24,0	25	26,00	102	160224008WW	160224008CW	160224008LW
24,0	25	45,00	150	161224008WW	–	–
25,0	25	26,00	102	160225008WW	160225008CW	160225008LW
25,0	25	45,00	160	161225008WW	–	–
26,0	25	26,00	102	160226008WW	–	160226008LW
28,0	25	26,00	102	160228008WW	160228008CW	160228008LW
30,0	25	26,00	102	160230008WW	160230008CW	–
32,0	32	32,00	112	160232009WW	–	160232009LW

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

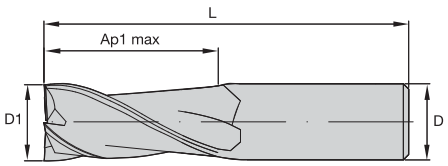
	N	
	1	2
Uncoated	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A301.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW
2,0	6	7,00	51	**350202002WW**
3,0	6	8,00	52	**350203002WW**
4,0	6	11,00	55	**350204002WW**
5,0	6	13,00	57	**350205002WW**
6,0	6	13,00	57	**350206002WW**
8,0	10	19,00	69	**350208004WW**
10,0	10	22,00	72	**350210004WW**
12,0	12	26,00	83	**350212005WW**
14,0	12	26,00	83	**350214005WW**
16,0	16	32,00	92	**350216006WW**
18,0	16	32,00	92	**350218006WW**
20,0	16	38,00	98	**350220006WW**
22,0	25	40,00	106	**350222008WW**
24,0	25	45,00	121	**350224008WW**
25,0	25	45,00	121	**350225008WW**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

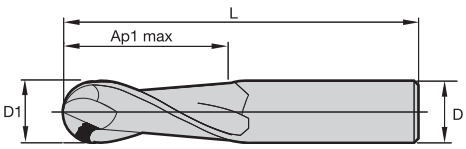
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A302.

D1	D	length of cut Ap1 max	length L	UNCOATED - JJ	TICN - CJ
2,0	6	4,00	50	165202002JJ	–
3,0	6	6,00	50	165203002JJ	–
3,0	6	15,00	50	166203002JJ	–
4,0	8	8,00	60	165204003JJ	165204003CJ
4,0	6	20,00	55	166204002JJ	–
5,0	8	10,00	60	165205003JJ	165205003CJ
5,0	6	25,00	60	166205002JJ	–
6,0	8	12,00	60	165206003JJ	165206003CJ
6,0	6	25,00	60	166206002JJ	–
7,0	10	14,00	60	165207004JJ	165207004CJ
8,0	10	14,00	60	165208004JJ	165208004CJ
8,0	10	35,00	80	166208004JJ	166208004CJ
9,0	10	18,00	70	165209004JJ	165209004CJ
10,0	10	18,00	70	165210004JJ	165210004CJ
10,0	10	45,00	90	166210004JJ	–
11,0	12	22,00	80	165211005JJ	–
12,0	12	22,00	80	165212005JJ	165212005CJ
12,0	12	55,00	105	166212005JJ	166212005CJ
13,0	12	26,00	85	165213005JJ	–
14,0	16	26,00	90	165214006JJ	165214006CJ
14,0	12	55,00	105	166214005JJ	–
15,0	16	30,00	95	165215006JJ	–
16,0	16	30,00	95	165216006JJ	165216006CJ
16,0	16	65,00	120	166216006JJ	–
17,0	16	34,00	95	165217006JJ	–
18,0	16	34,00	95	165218006JJ	165218006CJ
18,0	16	65,00	120	166218006JJ	–
19,0	20	38,00	110	165219007JJ	–
20,0	20	38,00	110	165220007JJ	165220007CJ
20,0	20	75,00	140	166220007JJ	–
22,0	20	45,00	110	165222007JJ	165222007CJ
24,0	25	50,00	120	165224008JJ	–
25,0	25	50,00	120	165225008JJ	165225008CJ
45,0	42	70,00	160	–	165245001CJ
50,0	42	75,00	165	–	165250001CJ

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

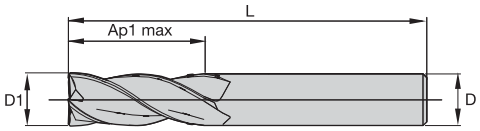
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A303.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW
3,0	6	5,00	49	**160103002WW**
4,0	6	7,00	51	**160104002WW**
5,0	6	8,00	52	**160105002WW**
6,0	6	8,00	52	**160106002WW**
7,0	10	10,00	60	**160107004WW**
8,0	10	11,00	61	**160108004WW**
10,0	10	13,00	63	**160110004WW**
12,0	12	16,00	73	**160112005WW**
14,0	12	16,00	73	**160114005WW**
16,0	16	19,00	79	**160116006WW**
18,0	16	19,00	79	**160118006WW**
20,0	16	19,00	79	**160120006WW**
25,0	25	26,00	102	**160125008WW**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance e8	D	Tolerance h6 + / -
≤ 3	-0,014 / -0,028	≤ 3	0 / 0,006
> 3 to 6	-0,020 / -0,038	> 3 to 6	0 / 0,008
> 6 to 10	-0,025 / -0,047	> 6 to 10	0 / 0,009
> 10 to 18	-0,032 / -0,059	> 10 to 18	0 / 0,011
> 18 to 30	-0,040 / -0,073	> 18 to 30	0 / 0,013

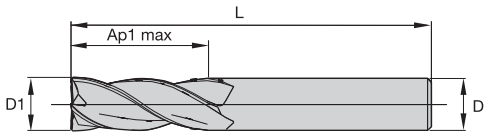
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A303.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiCN - CW	TiAlN - LW
3,0	6	8,00	52	160303002WW	160303002CW	160303002LW
3,5	6	10,00	54	160303502WW	160303502CW	160303502LW
4,0	6	11,00	55	160304002WW	160304002CW	160304002LW
4,5	6	11,00	55	160304502WW	160304502CW	160304502LW
5,0	6	13,00	57	160305002WW	160305002CW	160305002LW
5,5	6	13,00	57	160305502WW	–	160305502LW
6,0	6	13,00	57	160306002WW	160306002CW	160306002LW
6,5	10	16,00	66	160306504WW	160306504CW	160306504LW
7,0	10	16,00	66	160307004WW	160307004CW	160307004LW
8,0	10	19,00	69	160308004WW	160308004CW	160308004LW
9,0	10	19,00	69	160309004WW	160309004CW	160309004LW
10,0	10	22,00	72	160310004WW	160310004CW	160310004LW
11,0	12	22,00	79	160311005WW	160311005CW	160311005LW
12,0	12	26,00	83	160312005WW	160312005CW	160312005LW
14,0	12	26,00	83	160314005WW	160314005CW	160314005LW
15,0	12	26,00	83	160315005WW	160315005CW	160315005LW
16,0	16	32,00	92	160316006WW	160316006CW	160316006LW
18,0	16	32,00	92	160318006WW	160318006CW	160318006LW
20,0	16	38,00	98	160320006WW	160320006CW	160320006LW
25,0	25	45,00	121	160325008WW	160325008CW	–

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,04 / -0,0	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

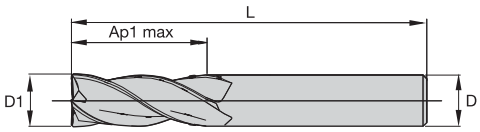
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A304.

D1	D	length of cut Ap1 max	length L	Z U	TiCN - CT	UNCOATED - WW	TiCN - CW	TiAlN - LW
3,0	6	8,00	52	3	–	360503002WW	360503002CW	360503002LW
4,0	6	11,00	55	3	–	360504002WW	360504002CW	360504002LW
5,0	6	13,00	57	3	–	360505002WW	360505002CW	360505002LW
6,0	6	13,00	57	3	360506002CT	360506002WW	360506002CW	360506002LW
7,0	10	16,00	66	3	360507004CT	360507004WW	360507004CW	360507004LW
8,0	10	19,00	69	3	360508004CT	360508004WW	360508004CW	360508004LW
9,0	10	19,00	69	3	360509004CT	–	360509004CW	360509004LW
10,0	10	45,00	95	3	360510004CT	361510004WW	360510004CW	360510004LW
12,0	12	26,00	83	3	360512005CT	361512005WW	361512005CW	361512005LW
14,0	12	26,00	83	3	360514005CT	360514005WW	360514005CW	360514005LW
15,0	12	26,00	83	3	360515005CT	360515005WW	–	360515005LW
16,0	16	32,00	92	3	360516006CT	360516006WW	361516006CW	360516006LW
18,0	16	32,00	92	3	360518006CT	360518006WW	360518006CW	360518006LW
20,0	20	38,00	104	3	360520007CT	361520007WW	360520007CW	361520007LW
22,0	20	38,00	104	4	360522007CT	360522007WW	–	360522007LW
25,0	25	90,00	166	4	360525008CT	360525008WW	361525008CW	361525008LW
28,0	25	45,00	121	4	360528008CT	360528008WW	–	–
30,0	25	45,00	121	4	360530008CT	361530008WW	361530008CW	361530008LW

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,04 / -0,0	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

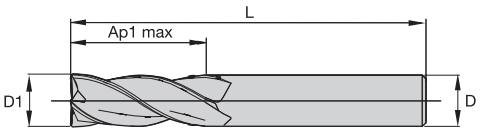
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A305.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiCN - CW	TiAlN - LW
2,0	6	7,00	51	160502002WW	160502002CW	160502002LW
2,5	6	8,00	52	160502502WW	160502502CW	160502502LW
3,0	6	8,00	52	160503002WW	160503002CW	160503002LW
3,0	6	12,00	56	161503002WW	161503002CW	161503002LW
3,5	6	10,00	54	160503502WW	160503502CW	160503502LW
4,0	6	11,00	55	160504002WW	160504002CW	160504002LW
4,0	6	19,00	63	161504002WW	161504002CW	161504002LW
4,5	6	11,00	55	160504502WW	160504502CW	160504502LW
5,0	6	13,00	57	160505002WW	160505002CW	160505002LW
5,0	6	24,00	68	161505002WW	161505002CW	161505002LW
5,5	6	13,00	57	160505502WW	160505502CW	160505502LW
6,0	6	13,00	57	160506002WW	160506002CW	160506002LW
6,0	6	24,00	68	161506002WW	161506002CW	161506002LW
6,5	10	16,00	66	160506504WW	160506504CW	160506504LW
7,0	10	16,00	66	160507004WW	160507004CW	160507004LW
7,0	10	30,00	80	161507004WW	161507004CW	161507004LW
7,5	10	16,00	66	160507504WW	160507504CW	160507504LW
8,0	10	19,00	69	160508004WW	160508004CW	160508004LW
8,0	10	38,00	88	161508004WW	161508004CW	161508004LW
8,5	10	19,00	69	160508504WW	160508504CW	160508504LW

(continued)

(continued)



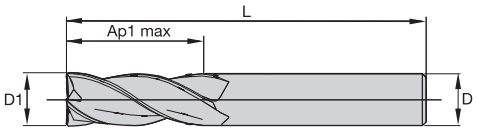
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A305.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiCN - CW	TiAlN - LW
9,0	10	19,00	69	160509004WW	160509004CW	160509004LW
9,0	10	38,00	88	161509004WW	161509004CW	161509004LW
9,5	10	19,00	69	160509504WW	160509504CW	160509504LW
10,0	10	22,00	72	160510004WW	160510004CW	160510004LW
10,0	10	45,00	95	161510004WW	161510004CW	161510004LW
10,5	12	22,00	79	160510505WW	160510505CW	160510505LW
11,0	12	22,00	79	160511005WW	160511005CW	160511005LW
11,0	12	45,00	102	161511005WW	161511005CW	161511005LW
11,5	12	22,00	79	160511505WW	160511505CW	160511505LW
12,0	12	26,00	83	160512005WW	160512005CW	160512005LW
12,0	12	53,00	110	161512005WW	161512005CW	161512005LW
12,5	12	26,00	83	160512505WW	160512505CW	160512505LW
13,0	12	26,00	83	160513005WW	160513005CW	160513005LW
13,0	12	53,00	110	161513005WW	161513005CW	161513005LW
13,5	12	26,00	83	160513505WW	–	160513505LW
14,0	12	26,00	83	160514005WW	160514005CW	160514005LW
14,0	12	53,00	110	161514005WW	161514005CW	161514005LW
14,5	12	26,00	83	160514505WW	–	160514505LW
15,0	12	26,00	83	160515005WW	160515005CW	160515005LW
15,0	12	53,00	110	161515005WW	161515005CW	161515005LW
16,0	16	32,00	92	160516006WW	160516006CW	160516006LW
16,0	16	63,00	123	161516006WW	161516006CW	161516006LW
17,0	16	32,00	92	160517006WW	160517006CW	160517006LW
17,0	16	63,00	123	161517006WW	–	–
18,0	16	32,00	92	160518006WW	160518006CW	160518006LW
18,0	16	63,00	123	161518006WW	161518006CW	161518006LW
18,5	16	32,00	92	160518506WW	–	160518506LW
19,0	16	32,00	92	160519006WW	160519006CW	160519006LW
19,0	16	63,00	123	161519006WW	161519006CW	–
20,0	16	38,00	98	160520006WW	–	160520006LW
20,0	20	38,00	104	160520007WW	160520007CW	160520007LW
20,0	20	75,00	141	161520007WW	161520007CW	161520007LW

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,04 / -0,0	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

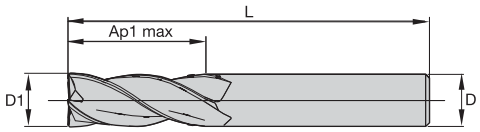
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A306.

D1	D	length of cut Ap1 max	length L	UNCOATED - JJ	TiCN - CJ
3,0	6	10,00	50	163403002JJ	163403002CJ
4,0	8	12,00	60	163404003JJ	163404003CJ
5,0	8	15,00	60	163405003JJ	163405003CJ
6,0	8	15,00	60	163406003JJ	163406003CJ
7,0	10	20,00	60	163407004JJ	163407004CJ
8,0	10	20,00	60	163408004JJ	163408004CJ
9,0	10	25,00	70	163409004JJ	–
10,0	10	25,00	70	163410004JJ	163410004CJ
12,0	12	30,00	80	163412005JJ	163412005CJ
14,0	16	35,00	90	163414006JJ	163414006CJ
15,0	16	40,00	95	–	163415006CJ
16,0	16	40,00	95	163416006JJ	163416006CJ
18,0	16	40,00	95	163418006JJ	163418006CJ
19,0	20	45,00	110	–	163419007CJ
20,0	20	45,00	110	163420007JJ	163420007CJ
22,0	20	45,00	110	163422007JJ	163422007CJ
24,0	25	50,00	120	–	163424008CJ
25,0	25	50,00	120	163425008JJ	163425008CJ
28,0	25	55,00	125	–	163428008CJ
30,0	25	55,00	125	–	163430008CJ
32,0	32	60,00	145	–	163432009CJ

- Non-center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,04 / -0,0	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

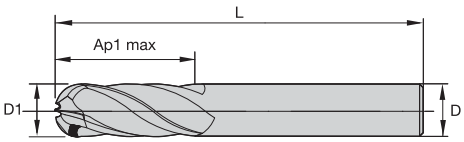
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A306.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW
6,0	6	56,00	100	**162506002WW**
7,0	10	63,00	113	**162507004WW**
8,0	10	63,00	113	**162508004WW**
10,0	10	70,00	120	**162510004WW**
12,0	12	80,00	137	**162512005WW**
14,0	12	80,00	137	**162514005WW**
16,0	16	90,00	150	**162516006WW**
18,0	16	100,00	160	**162518006WW**
19,0	20	110,00	176	**162519007WW**
20,0	20	110,00	176	**162520007WW**
22,0	20	110,00	176	**162522007WW**
25,0	25	110,00	186	**162525008WW**

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,04 / -0,0	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

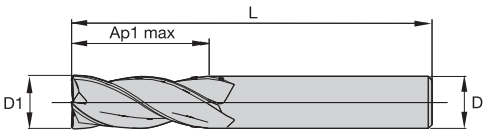
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A307.

D1	D	length of cut Ap1 max	length L	Z U	UNCOATED - WW	TiCN - CW
3,0	6	8,00	52	4	160003002WW	160003002CW
4,0	6	11,00	55	4	160004002WW	160004002CW
5,0	6	13,00	57	4	160005002WW	160005002CW
6,0	6	13,00	57	4	160006002WW	160006002CW
8,0	10	19,00	69	4	160008004WW	160008004CW
10,0	10	22,00	72	4	160010004WW	160010004CW
12,0	12	26,00	83	4	160012005WW	160012005CW
14,0	12	26,00	83	4	160014005WW	160014005CW
16,0	16	32,00	92	4	160016006WW	160016006CW
18,0	16	32,00	92	4	160018006WW	160018006CW
20,0	20	38,00	104	4	160020006WW	160020006CW
22,0	25	40,00	106	6	–	160022008CW
25,0	25	45,00	121	6	160025008WW	–

- Center cutting.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,04 / -0,0	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

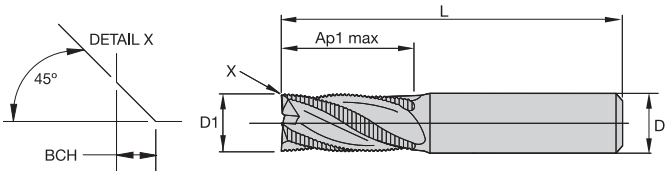
	P				M			K		N		S			
	1	2	3	5	1	2	3	1	2	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see pages A307–A308.

D1	D	length of cut Ap1 max	length L	UNCOATED - WW	TiCN - CW	TiAlN - LW
21,0	20	38,00	104	**160621007WW**	**–**	**160621007LW**
22,0	20	38,00	104	**160622007WW**	**160622007CW**	**160622007LW**
22,0	25	85,00	150	**161622008WW**	**161622008CW**	**161622008LW**
23,0	20	38,00	104	**160623007WW**	**160623007CW**	**–**
24,0	25	45,00	121	**160624008WW**	**160624008CW**	**160624008LW**
25,0	25	45,00	121	**160625008WW**	**160625008CW**	**160625008LW**
25,0	25	90,00	166	**161625008WW**	**161625008CW**	**–**
26,0	25	45,00	121	**160626008WW**	**–**	**160626008LW**
26,0	25	90,00	166	**161626008WW**	**–**	**161626008LW**
28,0	25	45,00	121	**160628008WW**	**160628008CW**	**160628008LW**
28,0	25	90,00	166	**–**	**–**	**161628008LW**
30,0	25	45,00	121	**160630008WW**	**160630008CW**	**160630008LW**
30,0	25	90,00	166	**161630008WW**	**161630008CW**	**–**
32,0	32	53,00	133	**160632009WW**	**160632009CW**	**160632009LW**
32,0	32	100,00	170	**161632009WW**	**161632009CW**	**–**
34,0	32	53,00	133	**160634009WW**	**–**	**–**
36,0	32	100,00	170	**161636009WW**	**161636009CW**	**–**
40,0	32	100,00	170	**161640009WW**	**161640009CW**	**–**

- Center cutting.
- Coarse pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,12 / -0,12	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

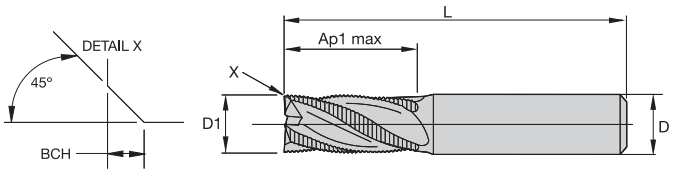
	N	
	1	2
Uncoated	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see pages A307–A308.

D1	D	length of cut Ap1 max	length L	BCH	UNCOATED - WW
6,0	6	13,00	57	0,25	**660906002WW**
8,0	10	19,00	69	0,25	**660908004WW**
10,0	10	22,00	72	0,25	**660910004WW**
12,0	12	26,00	83	0,35	**660912005WW**
12,0	12	53,00	110	0,35	**661912005WW**
16,0	16	32,00	92	0,35	**660916006WW**
16,0	16	63,00	123	0,35	**661916006WW**
20,0	20	38,00	104	0,35	**660920007WW**
20,0	20	75,00	141	0,35	**661920007WW**
25,0	25	45,00	121	0,50	**660925008WW**
25,0	25	90,00	166	0,50	**661925008WW**
30,0	25	45,00	125	0,50	**660930008WW**
32,0	32	53,00	133	0,50	**660932009WW**
32,0	32	106,00	186	0,50	**661932009WW**

- Center cutting.
- Fine pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,12 / -0,12	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

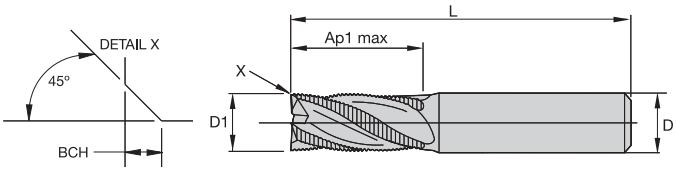
	P				M			K		S			
	1	2	3	5	1	2	3	1	2	1	2	3	4
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A309.

D1	D	length of cut Ap1 max	length L	BCH	Z U	TiCN - CW	TiAlN - LW
4,0	6	7,00	51	0,25	3	664504002CW	664504002LW
5,0	6	8,00	52	0,25	3	664505002CW	664505002LW
6,0	6	8,00	52	0,25	3	664506002CW	664506002LW
8,0	10	11,00	61	0,25	3	664508004CW	664508004LW
10,0	10	13,00	63	0,25	3	664510004CW	664510004LW
12,0	12	16,00	73	0,35	3	664512005CW	664512005LW
14,0	12	16,00	73	0,35	3	–	664514005LW
16,0	16	19,00	79	0,35	3	–	664516006LW
18,0	16	19,00	79	0,35	3	664518006CW	–
20,0	16	23,00	89	0,35	3	664520006CW	664520006LW
25,0	25	26,00	102	0,50	3	–	664525008LW
30,0	25	26,00	102	0,50	4	664530008CW	–

- Non-center cutting/center hole.
- Fine pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,12 / -0,12	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

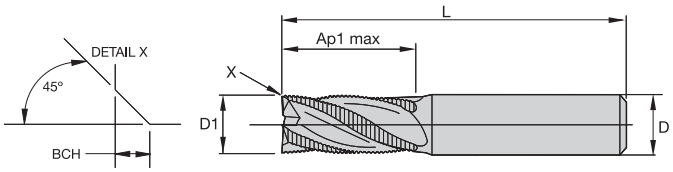
	P				M			K		S			
	1	2	3	5	1	2	3	1	2	1	2	3	4
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A310.

D1	D	length of cut Ap1 max	length L	BCH	TiCN - CW	TiAlN - LW
28,0	25	45,00	121	0,50	**660528008CW**	**660528008LW**
30,0	25	45,00	121	0,50	**660530008CW**	**660530008LW**
32,0	32	53,00	133	0,50	**660532009CW**	**660532009LW**
35,0	32	53,00	133	0,50	**660535009CW**	**660535009LW**
40,0	32	63,00	143	0,50	**660540009CW**	**–**
40,0	40	63,00	155	0,50	**660540001CW**	**660540001LW**

- Center cutting.
- Fine pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,12 / -0,12	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

	P				M			K		S			
	1	2	3	5	1	2	3	1	2	1	2	3	4
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

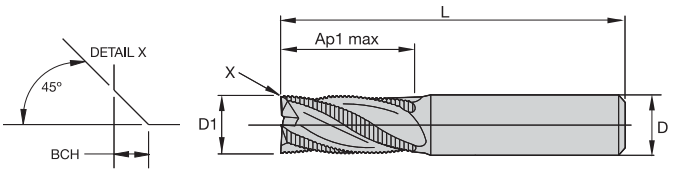
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A311.

D1	D	length of cut Ap1 max	length L	BCH	Z U	TiCN - CW	TiAlN - LW
4,0	6	11,00	55	0,25	3	660604002CW	660604002LW
5,0	6	13,00	57	0,25	3	660605002CW	660605002LW
6,0	6	13,00	57	0,25	3	660606002CW	660606002LW
6,0	6	24,00	68	0,25	3	661606002CW	661606002LW
7,0	10	16,00	66	0,25	3	660607004CW	660607004LW
8,0	10	19,00	69	0,25	3	660608004CW	660608004LW
8,0	10	38,00	88	0,25	3	661608004CW	661608004LW
9,0	10	19,00	69	0,25	3	660609004CW	660609004LW
10,0	10	22,00	72	0,25	4	660610004CW	660610004LW
10,0	10	45,00	95	0,25	4	661610004CW	661610004LW
11,0	12	22,00	79	0,25	4	660611005CW	660611005LW
12,0	12	26,00	83	0,35	4	660612005CW	660612005LW

(continued)

(continued)



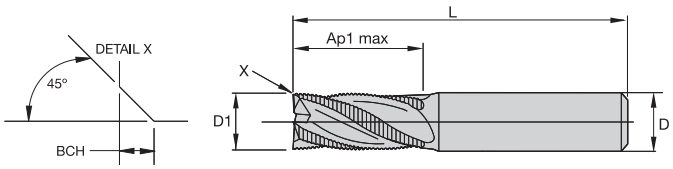
	P				M			K		S			
	1	2	3	5	1	2	3	1	2	1	2	3	4
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A311.

D1	D	length of cut Ap1 max	length L	BCH	Z U	TiCN - CW	TiAlN - LW
12,0	12	53,00	110	0,35	4	**661612005CW**	**661612005LW**
13,0	12	26,00	83	0,35	4	**660613005CW**	**660613005LW**
14,0	12	26,00	83	0,35	4	**660614005CW**	**660614005LW**
14,0	12	53,00	110	0,35	4	**661614005CW**	**661614005LW**
15,0	12	26,00	83	0,35	4	**660615005CW**	**660615005LW**
16,0	16	32,00	92	0,35	4	**660616006CW**	**660616006LW**
16,0	16	63,00	123	0,35	4	**661616006CW**	**661616006LW**
17,0	16	32,00	92	0,35	4	**660617006CW**	**660617006LW**
18,0	16	32,00	92	0,35	4	**660618006CW**	**660618006LW**
18,0	16	63,00	123	0,35	4	**661618006CW**	**661618006LW**
19,0	16	32,00	92	0,35	4	**660619006CW**	**660619006LW**
20,0	16	38,00	98	0,35	4	**660620006CW**	**660620006LW**
20,0	20	38,00	104	0,35	4	**660620007CW**	**660620007LW**
20,0	16	75,00	135	0,35	4	**661620006CW**	**661620006LW**
20,0	20	75,00	141	0,35	4	**661620007CW**	**661620007LW**
22,0	20	38,00	104	0,50	5	**660622007CW**	**660622007LW**
22,0	20	75,00	141	0,50	5	**661622007CW**	**661622007LW**
24,0	25	45,00	121	0,50	5	**660624008CW**	**660624008LW**
25,0	25	45,00	121	0,50	5	**660625008CW**	**660625008LW**
25,0	25	90,00	166	0,50	5	**661625008CW**	**661625008LW**

- Non-center cutting/center hole.
- Coarse pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,12 / -0,12	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

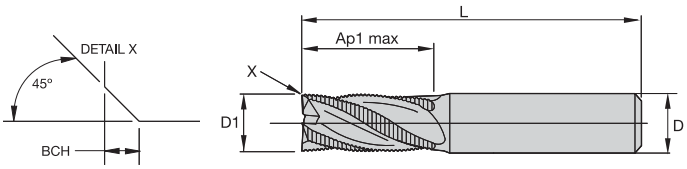
	P		K	N
	1	2	1	1
TiCN	●	●	●	●
TiAlN	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A310.

D1	D	length of cut Ap1 max	length L	BCH	TiCN - CW	TiAlN - LW
28,0	25	45,00	121	0,50	**660728008CW**	–
30,0	25	90,00	166	0,50	–	**661730008LW**
32,0	32	100,00	170	0,50	–	**661732009LW**

- Center cutting.
- Coarse pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,12 / -0,12	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

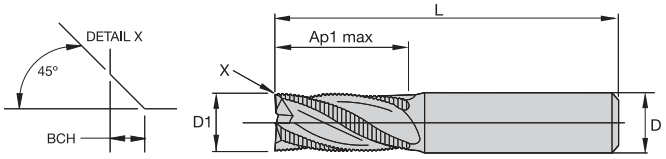
	P		K	N
	1	2	1	1
TiCN	●	●	●	●
TiAlN	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A311.

D1	D	length of cut Ap1 max	length L	BCH	Z U	TiCN - CW	TiAlN - LW
5,0	6	13,00	57	0,25	3	660805002CW	660805002LW
6,0	6	13,00	57	0,25	3	660806002CW	660806002LW
6,0	6	24,00	68	0,25	3	661806002CW	–
7,0	10	16,00	66	0,25	3	660807004CW	660807004LW
8,0	10	19,00	69	0,25	3	660808004CW	660808004LW
8,0	10	38,00	88	0,25	3	661808004CW	–
9,0	10	19,00	69	0,25	3	660809004CW	660809004LW
10,0	10	22,00	72	0,25	4	660810004CW	660810004LW
10,0	10	45,00	95	0,25	4	661810004CW	661810004LW
11,0	12	22,00	79	0,25	4	660811005CW	660811005LW
12,0	12	26,00	83	0,35	4	660812005CW	660812005LW
12,0	12	53,00	110	0,35	4	661812005CW	661812005LW
13,0	12	26,00	83	0,35	4	660813005CW	660813005LW
14,0	12	26,00	83	0,35	4	660814005CW	660814005LW
14,0	12	53,00	110	0,35	4	–	661814005LW
15,0	12	26,00	83	0,35	4	660815005CW	660815005LW
16,0	16	32,00	92	0,35	4	660816006CW	660816006LW
16,0	16	63,00	123	0,35	4	661816006CW	661816006LW
18,0	16	32,00	92	0,35	4	660818006CW	660818006LW
18,0	16	63,00	123	0,35	4	661818006CW	661818006LW
20,0	20	38,00	104	0,35	4	660820007CW	660820007LW
20,0	16	75,00	135	0,35	4	661820006CW	–
20,0	20	75,00	141	0,35	4	661820007CW	661820007LW
22,0	20	38,00	104	0,50	5	660822007CW	660822007LW
24,0	25	45,00	121	0,50	5	660824008CW	660824008LW
25,0	25	45,00	121	0,50	5	660825008CW	660825008LW
25,0	25	90,00	166	0,50	5	661825008CW	–

- Center cutting.
- Extra fine pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,12 / -0,12	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

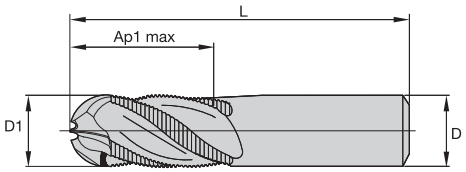
	P				M			K		S			
	1	2	3	5	1	2	3	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●
TiCN	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Steel*

For material descriptions, see Inside Back Cover.
For application data, see page A312.

D1	D	length of cut Ap1 max	length L	BCH	Z U	UNCOATED - WW	TiCN - CW	TiAlN - LW
6,0	6	13,00	57	0,25	3	660406002WW	660406002CW	660406002LW
8,0	10	19,00	69	0,25	3	660408004WW	660408004CW	660408004LW
10,0	10	22,00	72	0,25	4	660410004WW	660410004CW	660410004LW
12,0	12	26,00	83	0,35	4	660412005WW	660412005CW	660412005LW
14,0	12	26,00	83	0,35	4	660414005WW	660414005CW	660414005LW
16,0	16	32,00	92	0,35	4	660416006WW	660416006CW	660416006LW
18,0	16	32,00	92	0,35	4	660418006WW	660418006CW	660418006LW
20,0	20	38,00	104	0,35	4	660420007WW	660420007CW	660420007LW
22,0	20	38,00	104	0,50	5	–	–	660422007LW
25,0	25	45,00	121	0,50	5	660425008WW	660425008CW	660425008LW

- Center cutting.
- Coarse pitch.
- Standard items listed. Additional styles and coatings made to order.
- For information about Custom Solutions, see page A136.
- For information about Reconditioning Services, see page A220.



End Mill Tolerances

D1	Tolerance	D	Tolerance h6 + / -
all	+0,12 / -0,12	≤ 3	0 / 0,006
		> 3 to 6	0 / 0,008
		> 6 to 10	0 / 0,009
		> 10 to 18	0 / 0,011
		> 18 to 30	0 / 0,013

	P				M			K		S			
	1	2	3	5	1	2	3	1	2	1	2	3	4
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page A312.

D1	D	length of cut Ap1 max	length L	Z U	UNCOATED - JJ	TiAlN - LJ
8,0	8	20,00	90	4	**666708003JJ**	**666708003LJ**
10,0	10	25,00	100	4	**666710004JJ**	**666710004LJ**
12,0	12	32,00	115	4	**666712005JJ**	**666712005LJ**
14,0	12	32,00	115	4	**666714005JJ**	**666714005LJ**
16,0	16	36,00	130	4	**666716006JJ**	**666716006LJ**
18,0	16	40,00	130	4	**666718006JJ**	**–**
20,0	20	45,00	145	4	**666720007JJ**	**666720007LJ**
25,0	25	50,00	165	6	**666725008JJ**	**–**
30,0	25	63,00	180	6	**666730008JJ**	**–**
40,0	32	70,00	190	6	**666740009JJ**	**–**

List 1602

	A		B	Uncoated			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	Min		Max	mm	4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0	32,0
P1	1 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	70	-	80	Fz	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119	0,119
P2	1 x D	0,1 x D	0,5 x D	24	-	32	48	-	64	60	-	80	Fz	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119	0,119
P3	1 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	50	-	70	Fz	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109	0,109
P5	1 x D	0,1 x D	0,5 x D	10	-	14	20	-	28	25	-	35	Fz	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087	0,087
M1	1 x D	0,1 x D	0,5 x D	10	-	14	20	-	28	25	-	35	Fz	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109	0,109
M2	1 x D	0,1 x D	0,5 x D	10	-	12	20	-	24	25	-	30	Fz	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087	0,087
M3	1 x D	0,1 x D	0,5 x D	6	-	8	12	-	16	15	-	20	Fz	0,018	0,026	0,035	0,040	0,045	0,055	0,062	0,068	0,068
K1	1 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	70	-	80	Fz	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119	0,119
K2	1 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	50	-	70	Fz	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109	0,109
N1	1 x D	0,1 x D	0,5 x D	180	-	225	240	-	300	300	-	375	Fz	0,044	0,063	0,083	0,100	0,115	0,154	0,192	0,240	0,240
N2	1 x D	0,1 x D	0,5 x D	138	-	180	184	-	240	230	-	300	Fz	0,035	0,051	0,067	0,080	0,092	0,123	0,154	0,192	0,192
S1	1 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	15	-	30	Fz	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109	0,109
S2	1 x D	0,1 x D	0,25 x D	2	-	6	4	-	12	5	-	15	Fz	0,014	0,021	0,027	0,032	0,036	0,045	0,052	0,059	0,059
S3	1 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	15	-	30	Fz	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087	0,087
S4	1 x D	0,1 x D	0,25 x D	4	-	12	8	-	24	10	-	30	Fz	0,017	0,027	0,038	0,045	0,050	0,062	0,071	0,080	0,080

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1612

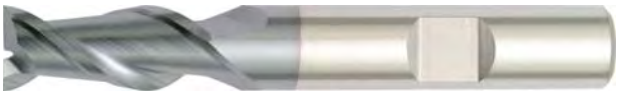
	A		B	Uncoated			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	Min		Max	mm	4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0	32,0
P1	1,5 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	70	-	80	Fz	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119	0,119
P2	1,5 x D	0,1 x D	0,5 x D	24	-	32	48	-	64	60	-	80	Fz	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119	0,119
P3	1,5 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	50	-	70	Fz	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109	0,109
P5	1,5 x D	0,1 x D	0,25 x D	10	-	14	20	-	28	25	-	35	Fz	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087	0,087
M1	1,5 x D	0,1 x D	0,5 x D	10	-	14	20	-	28	25	-	35	Fz	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109	0,109
M2	1,5 x D	0,1 x D	0,25 x D	10	-	12	20	-	24	25	-	30	Fz	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087	0,087
M3	1,5 x D	0,1 x D	0,25 x D	6	-	8	12	-	16	15	-	20	Fz	0,018	0,026	0,035	0,040	0,045	0,055	0,062	0,068	0,068
K1	1,5 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	70	-	80	Fz	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119	0,119
K2	1,5 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	50	-	70	Fz	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109	0,109
N1	1,5 x D	0,1 x D	0,5 x D	180	-	225	240	-	300	300	-	375	Fz	0,044	0,063	0,083	0,100	0,115	0,154	0,192	0,240	0,240
N2	1,5 x D	0,1 x D	0,5 x D	138	-	180	184	-	240	230	-	300	Fz	0,035	0,051	0,067	0,080	0,092	0,123	0,154	0,192	0,192
S1	1,5 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	15	-	30	Fz	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109	0,109
S2	1,5 x D	0,1 x D	0,25 x D	2	-	6	4	-	12	5	-	15	Fz	0,014	0,021	0,027	0,032	0,036	0,045	0,052	0,059	0,059
S3	1,5 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	15	-	30	Fz	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087	0,087
S4	1,5 x D	0,1 x D	0,25 x D	4	-	12	8	-	24	10	-	30	Fz	0,017	0,027	0,038	0,045	0,050	0,062	0,071	0,080	0,080

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 3502



	A		B	Uncoated			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
N1	1,5 x D	0,5 x D	1,0 x D	180	-	225	Fz	0,022	0,044	0,063	0,083	0,100	0,115	0,154	0,192	0,240
N2	1,5 x D	0,5 x D	1,0 x D	138	-	180	Fz	0,018	0,035	0,051	0,067	0,080	0,092	0,123	0,154	0,192

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1652 JJ

	A		B	Uncoated			TiCN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.									
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	mm	2,0	4,0	8,0	12,0	16,0	20,0	25,0	45,0	50,0
P1	1 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	Fz	0,015	0,031	0,062	0,079	0,097	0,109	0,119	0,178	0,186
P2	1 x D	0,1 x D	0,5 x D	24	-	32	48	-	64	Fz	0,015	0,031	0,062	0,079	0,097	0,109	0,119	0,178	0,186
P3	1 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,164	0,171
P5	1 x D	0,1 x D	0,5 x D	10	-	14	20	-	28	Fz	0,011	0,021	0,042	0,054	0,067	0,078	0,087	0,131	0,137
M1	1 x D	0,1 x D	0,5 x D	10	-	14	20	-	28	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,164	0,171
M2	1 x D	0,1 x D	0,5 x D	10	-	12	20	-	24	Fz	0,011	0,021	0,042	0,054	0,067	0,078	0,087	0,131	0,137
M3	1 x D	0,1 x D	0,5 x D	6	-	8	12	-	16	Fz	0,009	0,018	0,035	0,045	0,055	0,062	0,068	0,102	0,107
K1	1 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	Fz	0,015	0,031	0,062	0,079	0,097	0,109	0,119	0,178	0,186
K2	1 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,164	0,171
N1	1 x D	0,1 x D	0,5 x D	180	-	225	240	-	300	Fz	0,022	0,044	0,083	0,115	0,154	0,192	0,240	0,360	0,375
N2	1 x D	0,1 x D	0,5 x D	138	-	180	184	-	240	Fz	0,018	0,035	0,067	0,092	0,123	0,154	0,192	0,288	0,300
S1	1 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,164	0,171
S2	1 x D	0,1 x D	0,25 x D	2	-	6	4	-	12	Fz	0,007	0,014	0,027	0,036	0,045	0,052	0,059	0,088	0,092
S3	1 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	Fz	0,011	0,021	0,042	0,054	0,067	0,078	0,087	0,131	0,137
S4	1 x D	0,1 x D	0,25 x D	4	-	12	8	-	24	Fz	0,008	0,017	0,038	0,050	0,062	0,071	0,080	0,120	0,125

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1662 JJ • JIS

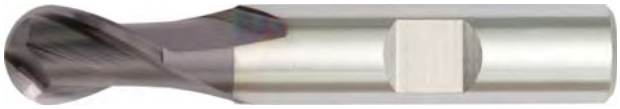
	A		B	Uncoated			TiCN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.									
				Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	mm	2,0	4,0	8,0	12,0	16,0	20,0	25,0	45,0	50,0
P1	1,5 x D	0,1 x D	0,25 x D	28	-	32	56	-	64	Fz	0,015	0,031	0,062	0,079	0,097	0,109	0,119	0,178	0,186
P2	1,5 x D	0,1 x D	0,25 x D	24	-	32	48	-	64	Fz	0,015	0,031	0,062	0,079	0,097	0,109	0,119	0,178	0,186
P3	1,5 x D	0,1 x D	0,25 x D	20	-	28	40	-	56	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,164	0,171
P5	1,5 x D	0,1 x D	0,15 x D	10	-	14	20	-	28	Fz	0,011	0,021	0,042	0,054	0,067	0,078	0,087	0,131	0,137
M1	1,5 x D	0,1 x D	0,25 x D	10	-	14	20	-	28	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,164	0,171
M2	1,5 x D	0,1 x D	0,25 x D	10	-	12	20	-	24	Fz	0,011	0,021	0,042	0,054	0,067	0,078	0,087	0,131	0,137
M3	1,5 x D	0,1 x D	0,25 x D	6	-	8	12	-	16	Fz	0,009	0,018	0,035	0,045	0,055	0,062	0,068	0,102	0,107
K1	1,5 x D	0,1 x D	0,25 x D	28	-	32	56	-	64	Fz	0,015	0,031	0,062	0,079	0,097	0,109	0,119	0,178	0,186
K2	1,5 x D	0,1 x D	0,15 x D	20	-	28	40	-	56	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,164	0,171
N1	1,5 x D	0,1 x D	0,25 x D	180	-	225	240	-	300	Fz	0,022	0,044	0,083	0,115	0,154	0,192	0,240	0,360	0,375
N2	1,5 x D	0,1 x D	0,25 x D	138	-	180	184	-	240	Fz	0,018	0,035	0,067	0,092	0,123	0,154	0,192	0,288	0,300
S1	1,5 x D	0,1 x D	0,25 x D	6	-	12	12	-	24	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,164	0,171
S2	1,5 x D	0,1 x D	0,15 x D	2	-	6	4	-	12	Fz	0,007	0,014	0,027	0,036	0,045	0,052	0,059	0,088	0,092
S3	1,5 x D	0,1 x D	0,25 x D	6	-	12	12	-	24	Fz	0,011	0,021	0,042	0,054	0,067	0,078	0,087	0,131	0,137
S4	1,5 x D	0,1 x D	0,15 x D	4	-	12	8	-	24	Fz	0,008	0,017	0,038	0,050	0,062	0,071	0,080	0,120	0,125

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1601



	A		Uncoated			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling.								
			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	Min		Max	mm	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P1	0,3 x D	0,7 x D	28	-	32	Fz	0,024	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119
P2	0,3 x D	0,7 x D	24	-	32	Fz	0,024	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119
P3	0,3 x D	0,7 x D	20	-	28	Fz	0,019	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109
P5	0,3 x D	0,7 x D	10	-	14	Fz	0,016	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087
M1	0,3 x D	0,7 x D	10	-	14	Fz	0,019	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109
M2	0,3 x D	0,7 x D	10	-	12	Fz	0,016	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087
M3	0,3 x D	0,7 x D	6	-	8	Fz	0,013	0,018	0,026	0,035	0,040	0,045	0,055	0,062	0,068
K1	0,3 x D	0,7 x D	28	-	32	Fz	0,024	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119
K2	0,3 x D	0,7 x D	20	-	28	Fz	0,019	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109
N1	0,3 x D	0,7 x D	180	-	225	Fz	0,034	0,044	0,063	0,083	0,100	0,115	0,154	0,192	0,240
N2	0,3 x D	0,7 x D	138	-	180	Fz	0,027	0,035	0,051	0,067	0,080	0,092	0,123	0,154	0,192
S1	0,3 x D	0,7 x D	6	-	12	Fz	0,019	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109
S2	0,3 x D	0,7 x D	2	-	6	Fz	0,011	0,014	0,021	0,027	0,032	0,036	0,045	0,052	0,059
S3	0,3 x D	0,7 x D	6	-	12	Fz	0,016	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087
S4	0,3 x D	0,7 x D	4	-	12	Fz	0,013	0,017	0,027	0,038	0,045	0,050	0,062	0,071	0,080

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1603

	A		B	Uncoated			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.							
				Cutting Speed Vc m/min			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	ap	Min		Max	Min		Max	Min		Max	mm	4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P1	1,5 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	70	-	80	Fz	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119
P2	1,5 x D	0,1 x D	0,5 x D	24	-	32	48	-	64	60	-	80	Fz	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119
P3	1,5 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	50	-	70	Fz	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109
P5	1,5 x D	0,1 x D	0,25 x D	10	-	14	20	-	28	25	-	35	Fz	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087
M1	1,5 x D	0,1 x D	0,5 x D	10	-	14	20	-	28	25	-	35	Fz	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109
M2	1,5 x D	0,1 x D	0,25 x D	10	-	12	20	-	24	25	-	30	Fz	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087
M3	1,5 x D	0,1 x D	0,25 x D	6	-	8	12	-	16	15	-	20	Fz	0,018	0,026	0,035	0,040	0,045	0,055	0,062	0,068
K1	1,5 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	70	-	80	Fz	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119
K2	1,5 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	50	-	70	Fz	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109
N1	1,5 x D	0,1 x D	0,5 x D	180	-	225	240	-	300	300	-	375	Fz	0,044	0,063	0,083	0,100	0,115	0,154	0,192	0,240
N2	1,5 x D	0,1 x D	0,5 x D	138	-	180	184	-	240	230	-	300	Fz	0,035	0,051	0,067	0,080	0,092	0,123	0,154	0,192
S1	1,5 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	15	-	30	Fz	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109
S2	1,5 x D	0,1 x D	0,25 x D	2	-	6	4	-	12	5	-	15	Fz	0,014	0,021	0,027	0,032	0,036	0,045	0,052	0,059
S3	1,5 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	15	-	30	Fz	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087
S4	1,5 x D	0,1 x D	0,25 x D	4	-	12	8	-	24	10	-	30	Fz	0,017	0,027	0,038	0,045	0,050	0,062	0,071	0,080

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 3605

A

B

				Uncoated			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	ap	Min		Max	Min		Max	Min		Max	mm	2,0	4,0	8,0	12,0	16,0	20,0	25,0	30,0
P1	1,5 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	70	-	80	Fz	0,015	0,031	0,062	0,079	0,097	0,109	0,119	0,149
P2	1,5 x D	0,1 x D	0,5 x D	24	-	32	48	-	64	60	-	80	Fz	0,015	0,031	0,062	0,079	0,097	0,109	0,119	0,149
P3	1,5 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	50	-	70	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,137
P5	1,5 x D	0,1 x D	0,25 x D	10	-	14	20	-	28	25	-	35	Fz	0,011	0,021	0,042	0,054	0,067	0,078	0,087	0,109
M1	1,5 x D	0,1 x D	0,5 x D	10	-	14	20	-	28	25	-	35	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,137
M2	1,5 x D	0,1 x D	0,25 x D	10	-	12	20	-	24	25	-	30	Fz	0,011	0,021	0,042	0,054	0,067	0,078	0,087	0,109
M3	1,5 x D	0,1 x D	0,25 x D	6	-	8	12	-	16	15	-	20	Fz	0,009	0,018	0,035	0,045	0,055	0,062	0,068	0,085
K1	1,5 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	70	-	80	Fz	0,015	0,031	0,062	0,079	0,097	0,109	0,119	0,149
K2	1,5 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	50	-	70	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,137
N1	1,5 x D	0,1 x D	0,5 x D	180	-	225	240	-	300	300	-	375	Fz	0,022	0,044	0,083	0,115	0,154	0,192	0,240	0,240
N2	1,5 x D	0,1 x D	0,5 x D	138	-	180	184	-	240	230	-	300	Fz	0,018	0,035	0,067	0,092	0,123	0,154	0,192	0,192
S1	1,5 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	15	-	30	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,137
S2	1,5 x D	0,1 x D	0,25 x D	2	-	6	4	-	12	5	-	15	Fz	0,007	0,014	0,027	0,036	0,045	0,052	0,059	0,074
S3	1,5 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	15	-	30	Fz	0,011	0,021	0,042	0,054	0,067	0,078	0,087	0,109
S4	1,5 x D	0,1 x D	0,25 x D	4	-	12	8	-	24	10	-	30	Fz	0,008	0,017	0,038	0,050	0,062	0,071	0,080	0,100

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 3615

A

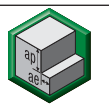
				Uncoated			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae		Min		Max	Min		Max	Min		Max	mm	2,0	4,0	8,0	12,0	16,0	20,0	25,0	30,0
P1	2,5 x D	0,1 x D		28	-	32	56	-	64	70	-	80	Fz	0,015	0,031	0,062	0,079	0,097	0,109	0,119	0,149
P2	2,5 x D	0,1 x D		24	-	32	48	-	64	60	-	80	Fz	0,015	0,031	0,062	0,079	0,097	0,109	0,119	0,149
P3	2,5 x D	0,1 x D		20	-	28	40	-	56	50	-	70	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,137
P5	2,5 x D	0,1 x D		10	-	14	20	-	28	25	-	35	Fz	0,011	0,021	0,042	0,054	0,067	0,078	0,087	0,109
M1	2,5 x D	0,1 x D		10	-	14	20	-	28	25	-	35	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,137
M2	2,5 x D	0,1 x D		10	-	12	20	-	24	25	-	30	Fz	0,011	0,021	0,042	0,054	0,067	0,078	0,087	0,109
M3	2,5 x D	0,1 x D		6	-	8	12	-	16	15	-	20	Fz	0,009	0,018	0,035	0,045	0,055	0,062	0,068	0,085
K1	2,5 x D	0,1 x D		28	-	32	56	-	64	70	-	80	Fz	0,015	0,031	0,062	0,079	0,097	0,109	0,119	0,149
K2	2,5 x D	0,1 x D		20	-	28	40	-	56	50	-	70	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,137
N1	2,5 x D	0,1 x D		180	-	225	240	-	300	300	-	375	Fz	0,022	0,044	0,083	0,115	0,154	0,192	0,240	0,240
N2	2,5 x D	0,1 x D		138	-	180	184	-	240	230	-	300	Fz	0,018	0,035	0,067	0,092	0,123	0,154	0,192	0,192
S1	2,5 x D	0,1 x D		6	-	12	12	-	24	15	-	30	Fz	0,013	0,026	0,052	0,067	0,084	0,097	0,109	0,137
S2	2,5 x D	0,1 x D		2	-	6	4	-	12	5	-	15	Fz	0,007	0,014	0,027	0,036	0,045	0,052	0,059	0,074
S3	2,5 x D	0,1 x D		6	-	12	12	-	24	15	-	30	Fz	0,011	0,021	0,042	0,054	0,067	0,078	0,087	0,109
S4	2,5 x D	0,1 x D		4	-	12	8	-	24	10	-	30	Fz	0,008	0,017	0,038	0,050	0,062	0,071	0,080	0,100

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1605



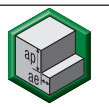
	A		Uncoated			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).								
			Cutting Speed Vc m/min			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min	-	Max	Min	-	Max	Min	-	Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	1,5 x D	0,1 x D	28	-	32	56	-	64	70	-	80	Fz	0,015	0,031	0,046	0,062	0,072	0,079	0,089	0,097	0,109
P2	1,5 x D	0,1 x D	24	-	32	48	-	64	60	-	80	Fz	0,015	0,031	0,046	0,062	0,072	0,079	0,089	0,097	0,109
P3	1,5 x D	0,1 x D	20	-	28	40	-	56	50	-	70	Fz	0,013	0,026	0,038	0,052	0,061	0,067	0,076	0,084	0,097
P5	1,5 x D	0,1 x D	10	-	14	20	-	28	25	-	35	Fz	0,011	0,021	0,031	0,042	0,048	0,054	0,061	0,067	0,078
M1	1,5 x D	0,1 x D	10	-	14	20	-	28	25	-	35	Fz	0,013	0,026	0,038	0,052	0,061	0,067	0,076	0,084	0,097
M2	1,5 x D	0,1 x D	10	-	12	20	-	24	25	-	30	Fz	0,011	0,021	0,031	0,042	0,048	0,054	0,061	0,067	0,078
M3	1,5 x D	0,1 x D	6	-	8	12	-	16	15	-	20	Fz	0,009	0,018	0,026	0,035	0,040	0,045	0,050	0,055	0,062
K1	1,5 x D	0,1 x D	28	-	32	56	-	64	70	-	80	Fz	0,015	0,031	0,046	0,062	0,072	0,079	0,089	0,097	0,109
K2	1,5 x D	0,1 x D	20	-	28	40	-	56	50	-	70	Fz	0,013	0,026	0,038	0,052	0,061	0,067	0,076	0,084	0,097
N1	1,5 x D	0,1 x D	180	-	225	240	-	300	300	-	375	Fz	0,022	0,044	0,063	0,083	0,100	0,115	0,134	0,154	0,192
N2	1,5 x D	0,1 x D	138	-	180	184	-	240	230	-	300	Fz	0,018	0,035	0,051	0,067	0,080	0,092	0,108	0,123	0,154
S1	1,5 x D	0,1 x D	6	-	12	12	-	24	15	-	30	Fz	0,013	0,026	0,038	0,052	0,061	0,067	0,076	0,084	0,097
S2	1,5 x D	0,1 x D	2	-	6	4	-	12	5	-	15	Fz	0,007	0,014	0,021	0,027	0,032	0,036	0,040	0,045	0,052
S3	1,5 x D	0,1 x D	6	-	12	12	-	24	15	-	30	Fz	0,011	0,021	0,031	0,042	0,048	0,054	0,061	0,067	0,078
S4	1,5 x D	0,1 x D	4	-	12	8	-	24	10	-	30	Fz	0,008	0,017	0,027	0,038	0,045	0,050	0,056	0,062	0,071

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1615



	A		Uncoated			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).								
			Cutting Speed Vc m/min			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min	-	Max	Min	-	Max	Min	-	Max	mm	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	20,0
P1	2,5 x D	0,1 x D	28	-	32	56	-	64	70	-	80	Fz	0,015	0,031	0,046	0,062	0,072	0,079	0,089	0,097	0,109
P2	2,5 x D	0,1 x D	24	-	32	48	-	64	60	-	80	Fz	0,015	0,031	0,046	0,062	0,072	0,079	0,089	0,097	0,109
P3	2,5 x D	0,1 x D	20	-	28	40	-	56	50	-	70	Fz	0,013	0,026	0,038	0,052	0,061	0,067	0,076	0,084	0,097
P5	2,5 x D	0,1 x D	10	-	14	20	-	28	25	-	35	Fz	0,011	0,021	0,031	0,042	0,048	0,054	0,061	0,067	0,078
M1	2,5 x D	0,1 x D	10	-	14	20	-	28	25	-	35	Fz	0,013	0,026	0,038	0,052	0,061	0,067	0,076	0,084	0,097
M2	2,5 x D	0,1 x D	10	-	12	20	-	24	25	-	30	Fz	0,011	0,021	0,031	0,042	0,048	0,054	0,061	0,067	0,078
M3	2,5 x D	0,1 x D	6	-	8	12	-	16	15	-	20	Fz	0,009	0,018	0,026	0,035	0,040	0,045	0,050	0,055	0,062
K1	2,5 x D	0,1 x D	28	-	32	56	-	64	70	-	80	Fz	0,015	0,031	0,046	0,062	0,072	0,079	0,089	0,097	0,109
K2	2,5 x D	0,1 x D	20	-	28	40	-	56	50	-	70	Fz	0,013	0,026	0,038	0,052	0,061	0,067	0,076	0,084	0,097
N1	2,5 x D	0,1 x D	180	-	225	240	-	300	300	-	375	Fz	0,022	0,044	0,063	0,083	0,100	0,115	0,134	0,154	0,192
N2	2,5 x D	0,1 x D	138	-	180	184	-	240	230	-	300	Fz	0,018	0,035	0,051	0,067	0,080	0,092	0,108	0,123	0,154
S1	2,5 x D	0,1 x D	6	-	12	12	-	24	15	-	30	Fz	0,013	0,026	0,038	0,052	0,061	0,067	0,076	0,084	0,097
S2	2,5 x D	0,1 x D	2	-	6	4	-	12	5	-	15	Fz	0,007	0,014	0,021	0,027	0,032	0,036	0,040	0,045	0,052
S3	2,5 x D	0,1 x D	6	-	12	12	-	24	15	-	30	Fz	0,011	0,021	0,031	0,042	0,048	0,054	0,061	0,067	0,078
S4	2,5 x D	0,1 x D	4	-	12	8	-	24	10	-	30	Fz	0,008	0,017	0,027	0,038	0,045	0,050	0,056	0,062	0,071

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1634 JJ • JIS

	A		Uncoated			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).								
			Cutting Speed Vc m/min			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter							
Group	ap	ae	Min		Max	Min		Max	Min		Max	mm	3,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0	32,0
P1	1,5 x D	0,1 x D	28	-	32	56	-	64	70	-	80	Fz	0,024	0,046	0,062	0,072	0,079	0,097	0,109	0,119	0,152
P2	1,5 x D	0,1 x D	24	-	32	48	-	64	60	-	80	Fz	0,024	0,046	0,062	0,072	0,079	0,097	0,109	0,119	0,152
P3	1,5 x D	0,1 x D	20	-	28	40	-	56	50	-	70	Fz	0,019	0,038	0,052	0,061	0,067	0,084	0,097	0,109	0,140
P5	1,5 x D	0,1 x D	10	-	14	20	-	28	25	-	35	Fz	0,016	0,031	0,042	0,048	0,054	0,067	0,078	0,087	0,112
M1	1,5 x D	0,1 x D	10	-	14	20	-	28	25	-	35	Fz	0,019	0,038	0,052	0,061	0,067	0,084	0,097	0,109	0,140
M2	1,5 x D	0,1 x D	10	-	12	20	-	24	25	-	30	Fz	0,016	0,031	0,042	0,048	0,054	0,067	0,078	0,087	0,112
M3	1,5 x D	0,1 x D	6	-	8	12	-	16	15	-	20	Fz	0,013	0,026	0,035	0,040	0,045	0,055	0,062	0,068	0,087
K1	1,5 x D	0,1 x D	28	-	32	56	-	64	70	-	80	Fz	0,024	0,046	0,062	0,072	0,079	0,097	0,109	0,119	0,152
K2	1,5 x D	0,1 x D	20	-	28	40	-	56	50	-	70	Fz	0,019	0,038	0,052	0,061	0,067	0,084	0,097	0,109	0,140
N1	1,5 x D	0,1 x D	180	-	225	240	-	300	300	-	375	Fz	0,034	0,063	0,083	0,100	0,115	0,154	0,192	0,240	0,240
N2	1,5 x D	0,1 x D	138	-	180	184	-	240	230	-	300	Fz	0,027	0,051	0,067	0,080	0,092	0,123	0,154	0,192	0,192
S1	1,5 x D	0,1 x D	6	-	12	12	-	24	15	-	30	Fz	0,019	0,038	0,052	0,061	0,067	0,084	0,097	0,109	0,140
S2	1,5 x D	0,1 x D	2	-	6	4	-	12	5	-	15	Fz	0,011	0,021	0,027	0,032	0,036	0,045	0,052	0,059	0,075
S3	1,5 x D	0,1 x D	6	-	12	12	-	24	15	-	30	Fz	0,016	0,031	0,042	0,048	0,054	0,067	0,078	0,087	0,112
S4	1,5 x D	0,1 x D	4	-	12	8	-	24	10	-	30	Fz	0,013	0,027	0,038	0,045	0,050	0,062	0,071	0,080	0,103

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1625

	A		Uncoated			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A).							
			Cutting Speed Vc m/min				D1 - Diameter						
Group	ap	ae	Min		Max	mm	6,0	8,0	10,0	12,0	16,0	18,0	20,0	25,0
P1	3,0 x D	0,05 x D	28	-	32	Fz	0,046	0,062	0,072	0,079	0,097	0,104	0,109	0,119
P2	3,0 x D	0,05 x D	24	-	32	Fz	0,046	0,062	0,072	0,079	0,097	0,104	0,109	0,119
P3	3,0 x D	0,05 x D	20	-	28	Fz	0,038	0,052	0,061	0,067	0,084	0,091	0,097	0,109
P5	3,0 x D	0,05 x D	10	-	14	Fz	0,031	0,042	0,048	0,054	0,067	0,073	0,078	0,087
M1	3,0 x D	0,05 x D	10	-	14	Fz	0,038	0,052	0,061	0,067	0,084	0,091	0,097	0,109
M2	3,0 x D	0,05 x D	10	-	12	Fz	0,031	0,042	0,048	0,054	0,067	0,073	0,078	0,087
M3	3,0 x D	0,05 x D	6	-	8	Fz	0,026	0,035	0,040	0,045	0,055	0,059	0,062	0,068
K1	3,0 x D	0,05 x D	28	-	32	Fz	0,046	0,062	0,072	0,079	0,097	0,104	0,109	0,119
K2	3,0 x D	0,05 x D	20	-	28	Fz	0,038	0,052	0,061	0,067	0,084	0,091	0,097	0,109
N1	3,0 x D	0,05 x D	180	-	225	Fz	0,063	0,083	0,100	0,115	0,154	0,173	0,192	0,240
N2	3,0 x D	0,05 x D	138	-	180	Fz	0,051	0,067	0,080	0,092	0,123	0,138	0,154	0,192
S1	3,0 x D	0,05 x D	6	-	12	Fz	0,038	0,052	0,061	0,067	0,084	0,091	0,097	0,109
S2	3,0 x D	0,05 x D	2	-	6	Fz	0,021	0,027	0,032	0,036	0,045	0,048	0,052	0,059
S3	3,0 x D	0,05 x D	6	-	12	Fz	0,031	0,042	0,048	0,054	0,067	0,073	0,078	0,087
S4	3,0 x D	0,05 x D	4	-	12	Fz	0,027	0,038	0,045	0,050	0,062	0,067	0,071	0,080

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1600

	A		Uncoated			TiCN			Recommended Feed Per Tooth (Fz=mm/th) for 3D Milling / Profiling.									
			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	Min		Max	Min		Max	mm	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0
P1	0,3 x D	0,7 x D	28	-	32	56	-	64	Fz	0,024	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119
P2	0,3 x D	0,7 x D	24	-	32	48	-	64	Fz	0,024	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119
P3	0,3 x D	0,7 x D	20	-	28	40	-	56	Fz	0,019	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109
P5	0,3 x D	0,7 x D	10	-	14	20	-	28	Fz	0,016	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087
M1	0,3 x D	0,7 x D	10	-	14	20	-	28	Fz	0,019	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109
M2	0,3 x D	0,7 x D	10	-	12	20	-	24	Fz	0,016	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087
M3	0,3 x D	0,7 x D	6	-	8	12	-	16	Fz	0,013	0,018	0,026	0,035	0,040	0,045	0,055	0,062	0,068
K1	0,3 x D	0,7 x D	28	-	32	56	-	64	Fz	0,024	0,031	0,046	0,062	0,072	0,079	0,097	0,109	0,119
K2	0,3 x D	0,7 x D	20	-	28	40	-	56	Fz	0,019	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109
N1	0,3 x D	0,7 x D	180	-	225	240	-	300	Fz	0,034	0,044	0,063	0,083	0,100	0,115	0,154	0,192	0,240
N2	0,3 x D	0,7 x D	138	-	180	184	-	240	Fz	0,027	0,035	0,051	0,067	0,080	0,092	0,123	0,154	0,192
S1	0,3 x D	0,7 x D	6	-	12	12	-	24	Fz	0,019	0,026	0,038	0,052	0,061	0,067	0,084	0,097	0,109
S2	0,3 x D	0,7 x D	2	-	6	4	-	12	Fz	0,011	0,014	0,021	0,027	0,032	0,036	0,045	0,052	0,059
S3	0,3 x D	0,7 x D	6	-	12	12	-	24	Fz	0,016	0,021	0,031	0,042	0,048	0,054	0,067	0,078	0,087
S4	0,3 x D	0,7 x D	4	-	12	8	-	24	Fz	0,013	0,017	0,027	0,038	0,045	0,050	0,062	0,071	0,080

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1606

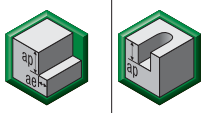
	A		B	Uncoated			TiCN			TiAlN			Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%.								
				Cutting Speed Vc m/min			Cutting Speed Vc m/min			Cutting Speed Vc m/min				D1 - Diameter								
Group	ap	ae	ap	Min		Max	Min		Max	Min		Max	mm	21,0	24,0	26,0	28,0	30,0	32,0	34,0	36,0	40,0
P1	1,25 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	70	-	80	Fz	0,105	0,114	0,124	0,133	0,143	0,152	0,162	0,171	0,190
P2	1,25 x D	0,1 x D	0,5 x D	24	-	32	48	-	64	60	-	80	Fz	0,105	0,114	0,124	0,133	0,143	0,152	0,162	0,171	0,190
P3	1,25 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	50	-	70	Fz	0,096	0,105	0,114	0,122	0,131	0,140	0,149	0,157	0,175
P5	1,25 x D	0,1 x D	0,25 x D	10	-	14	20	-	28	25	-	35	Fz	0,077	0,084	0,091	0,098	0,105	0,112	0,119	0,126	0,140
M1	1,25 x D	0,1 x D	0,5 x D	10	-	14	20	-	28	25	-	35	Fz	0,096	0,105	0,114	0,122	0,131	0,140	0,149	0,157	0,175
M2	1,25 x D	0,1 x D	0,25 x D	10	-	12	20	-	24	25	-	30	Fz	0,077	0,084	0,091	0,098	0,105	0,112	0,119	0,126	0,140
M3	1,25 x D	0,1 x D	0,25 x D	6	-	8	12	-	16	15	-	20	Fz	0,060	0,065	0,071	0,076	0,082	0,087	0,093	0,098	0,109
K1	1,25 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	70	-	80	Fz	0,105	0,114	0,124	0,133	0,143	0,152	0,162	0,171	0,190
K2	1,25 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	50	-	70	Fz	0,096	0,105	0,114	0,122	0,131	0,140	0,149	0,157	0,175
N1	1,25 x D	0,1 x D	0,5 x D	180	-	225	240	-	300	300	-	375	Fz	0,211	0,230	0,250	0,269	0,288	0,288	0,288	0,288	0,288
N2	1,25 x D	0,1 x D	0,5 x D	138	-	180	184	-	240	230	-	300	Fz	0,169	0,184	0,200	0,215	0,230	0,230	0,230	0,230	0,230
S1	1,25 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	15	-	30	Fz	0,096	0,105	0,114	0,122	0,131	0,140	0,149	0,157	0,175
S2	1,25 x D	0,1 x D	0,25 x D	2	-	6	4	-	12	5	-	15	Fz	0,052	0,056	0,061	0,066	0,071	0,075	0,080	0,085	0,094
S3	1,25 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	15	-	30	Fz	0,077	0,084	0,091	0,098	0,105	0,112	0,119	0,126	0,140
S4	1,25 x D	0,1 x D	0,25 x D	4	-	12	8	-	24	10	-	30	Fz	0,071	0,077	0,083	0,090	0,096	0,103	0,109	0,115	0,128

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 1616



A

B

Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min		Max	TiCN Cutting Speed Vc m/min Min		Max	TiAlN Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 21,0	24,0	26,0	28,0	30,0	32,0	34,0	36,0	40,0
P1	1,25 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	70	-	80	Fz	0,105	0,114	0,124	0,133	0,143	0,152	0,162	0,171	0,190
P2	1,25 x D	0,1 x D	0,5 x D	24	-	32	48	-	64	60	-	80	Fz	0,105	0,114	0,124	0,133	0,143	0,152	0,162	0,171	0,190
P3	1,25 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	50	-	70	Fz	0,096	0,105	0,114	0,122	0,131	0,140	0,149	0,157	0,175
P5	1,25 x D	0,1 x D	0,25 x D	10	-	14	20	-	28	25	-	35	Fz	0,077	0,084	0,091	0,098	0,105	0,112	0,119	0,126	0,140
M1	1,25 x D	0,1 x D	0,5 x D	10	-	14	20	-	28	25	-	35	Fz	0,096	0,105	0,114	0,122	0,131	0,140	0,149	0,157	0,175
M2	1,25 x D	0,1 x D	0,25 x D	10	-	12	20	-	24	25	-	30	Fz	0,077	0,084	0,091	0,098	0,105	0,112	0,119	0,126	0,140
M3	1,25 x D	0,1 x D	0,25 x D	6	-	8	12	-	16	15	-	20	Fz	0,060	0,065	0,071	0,076	0,082	0,087	0,093	0,098	0,109
K1	1,25 x D	0,1 x D	0,5 x D	28	-	32	56	-	64	70	-	80	Fz	0,105	0,114	0,124	0,133	0,143	0,152	0,162	0,171	0,190
K2	1,25 x D	0,1 x D	0,5 x D	20	-	28	40	-	56	50	-	70	Fz	0,096	0,105	0,114	0,122	0,131	0,140	0,149	0,157	0,175
N1	1,25 x D	0,1 x D	0,5 x D	180	-	225	240	-	300	300	-	375	Fz	0,211	0,230	0,250	0,269	0,288	0,288	0,288	0,288	0,288
N2	1,25 x D	0,1 x D	0,5 x D	138	-	180	184	-	240	230	-	300	Fz	0,169	0,184	0,200	0,215	0,230	0,230	0,230	0,230	0,230
S1	1,25 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	15	-	30	Fz	0,096	0,105	0,114	0,122	0,131	0,140	0,149	0,157	0,175
S2	1,25 x D	0,1 x D	0,25 x D	2	-	6	4	-	12	5	-	15	Fz	0,052	0,056	0,061	0,066	0,071	0,075	0,080	0,085	0,094
S3	1,25 x D	0,1 x D	0,5 x D	6	-	12	12	-	24	15	-	30	Fz	0,077	0,084	0,091	0,098	0,105	0,112	0,119	0,126	0,140
S4	1,25 x D	0,1 x D	0,25 x D	4	-	12	8	-	24	10	-	30	Fz	0,071	0,077	0,083	0,090	0,096	0,103	0,109	0,115	0,128

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 6609

A

B

Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min		Max	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 6,0	10,0	12,0	16,0	20,0	25,0	32,0
N1	1,25 x D	0,5 x D	1,0 x D	180	-	225	Fz 0,063	0,100	0,115	0,154	0,192	0,200	0,240
N2	1,25 x D	0,5 x D	1,0 x D	138	-	180	Fz 0,051	0,080	0,092	0,123	0,154	0,170	0,200

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 6619

A

B

Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 6,0	10,0	12,0	16,0	20,0	25,0	32,0
N1	2,5 x D	0,3 x D	0,5 x D	180	-	225	Fz	0,063	0,100	0,115	0,154	0,192	0,200	0,240
N2	2,5 x D	0,3 x D	0,5 x D	138	-	180	Fz	0,051	0,080	0,092	0,123	0,154	0,170	0,200

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 6645

A

B

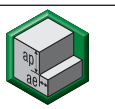
Group	A ap	A ae	B ap	TiCN Cutting Speed Vc m/min Min		Max	TiAlN Cutting Speed Vc m/min Min		Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0	30,0
P1	0,75 x D	0,5 x D	0,75 x D	56	-	64	70	-	80	Fz	0,039	0,058	0,078	0,090	0,099	0,121	0,137	0,149	0,178
P2	0,75 x D	0,5 x D	0,75 x D	48	-	64	60	-	80	Fz	0,039	0,058	0,078	0,090	0,099	0,121	0,137	0,149	0,178
P3	0,75 x D	0,5 x D	0,75 x D	40	-	56	50	-	70	Fz	0,032	0,048	0,065	0,076	0,084	0,105	0,121	0,137	0,164
P5	0,75 x D	0,3 x D	0,5 x D	20	-	28	25	-	35	Fz	0,026	0,039	0,052	0,061	0,067	0,084	0,097	0,109	0,131
M1	0,75 x D	0,5 x D	0,75 x D	20	-	28	25	-	35	Fz	0,032	0,048	0,065	0,076	0,084	0,105	0,121	0,137	0,164
M2	0,75 x D	0,5 x D	0,75 x D	20	-	24	25	-	30	Fz	0,026	0,039	0,052	0,061	0,067	0,084	0,097	0,109	0,131
M3	0,75 x D	0,5 x D	0,75 x D	12	-	16	15	-	20	Fz	0,022	0,033	0,044	0,051	0,056	0,068	0,078	0,085	0,102
K1	0,75 x D	0,5 x D	0,75 x D	56	-	64	70	-	80	Fz	0,039	0,058	0,078	0,090	0,099	0,121	0,137	0,149	0,178
K2	0,75 x D	0,5 x D	0,75 x D	40	-	56	50	-	70	Fz	0,032	0,048	0,065	0,076	0,084	0,105	0,121	0,137	0,164
S1	0,75 x D	0,5 x D	0,75 x D	12	-	24	15	-	30	Fz	0,032	0,048	0,065	0,076	0,084	0,105	0,121	0,137	0,164
S2	0,75 x D	0,3 x D	0,5 x D	4	-	12	5	-	15	Fz	0,018	0,026	0,034	0,040	0,045	0,056	0,065	0,074	0,088
S3	0,75 x D	0,5 x D	0,75 x D	12	-	24	15	-	30	Fz	0,026	0,039	0,052	0,061	0,067	0,084	0,097	0,109	0,131
S4	0,75 x D	0,3 x D	0,5 x D	8	-	24	10	-	30	Fz	0,022	0,034	0,048	0,056	0,062	0,077	0,089	0,100	0,120

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 6605 6606



A

B

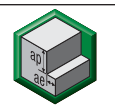
Group	A ap	A ae	B ap	TiCN Cutting Speed Vc m/min Min		TiCN Max	TiAlN Cutting Speed Vc m/min Min		TiAlN Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0	30,0
P1	1,5 x D	0,5 x D	1 x D	56	-	64	70	-	80	Fz	0,027	0,040	0,055	0,063	0,070	0,078	0,085	0,104	0,125
P2	1,5 x D	0,5 x D	1 x D	48	-	64	60	-	80	Fz	0,027	0,040	0,055	0,063	0,070	0,078	0,085	0,104	0,125
P3	1,5 x D	0,5 x D	1 x D	40	-	56	50	-	70	Fz	0,023	0,034	0,046	0,053	0,059	0,066	0,073	0,096	0,115
P5	1,5 x D	0,3 x D	0,5 x D	20	-	28	25	-	35	Fz	0,019	0,027	0,036	0,042	0,047	0,053	0,059	0,076	0,092
M1	1,5 x D	0,5 x D	1 x D	20	-	28	25	-	35	Fz	0,023	0,034	0,046	0,053	0,059	0,066	0,073	0,096	0,115
M2	1,5 x D	0,5 x D	1 x D	20	-	24	25	-	30	Fz	0,019	0,027	0,036	0,042	0,047	0,053	0,059	0,076	0,092
M3	1,5 x D	0,5 x D	1 x D	12	-	16	15	-	20	Fz	0,016	0,023	0,031	0,035	0,039	0,044	0,048	0,060	0,072
K1	1,5 x D	0,5 x D	1 x D	56	-	64	70	-	80	Fz	0,027	0,040	0,055	0,063	0,070	0,078	0,085	0,104	0,125
K2	1,5 x D	0,5 x D	1 x D	40	-	56	50	-	70	Fz	0,023	0,034	0,046	0,053	0,059	0,066	0,073	0,096	0,115
S1	1,5 x D	0,5 x D	1 x D	12	-	24	15	-	30	Fz	0,023	0,034	0,046	0,053	0,059	0,066	0,073	0,096	0,115
S2	1,5 x D	0,3 x D	0,5 x D	4	-	12	5	-	15	Fz	0,012	0,018	0,024	0,028	0,031	0,035	0,039	0,051	0,062
S3	1,5 x D	0,5 x D	1 x D	12	-	24	15	-	30	Fz	0,019	0,027	0,036	0,042	0,047	0,053	0,059	0,076	0,092
S4	1,5 x D	0,3 x D	0,5 x D	8	-	24	10	-	30	Fz	0,015	0,024	0,033	0,039	0,043	0,049	0,054	0,070	0,084

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

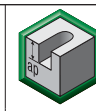
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

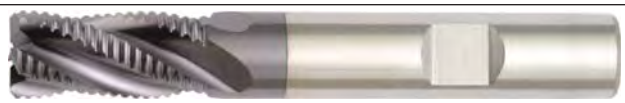
Lists 6616



A



B



Group	A ap	A ae	B ap	TiCN Cutting Speed Vc m/min Min		TiCN Max	TiAlN Cutting Speed Vc m/min Min		TiAlN Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 4,0	6,0	8,0	10,0	12,0	16,0	20,0	25,0	30,0
P1	2,5 x D	0,3 x D	0,3 x D	56	-	64	70	-	80	Fz	0,027	0,040	0,055	0,063	0,070	0,078	0,085	0,104	0,125
P2	2,5 x D	0,3 x D	0,3 x D	48	-	64	60	-	80	Fz	0,027	0,040	0,055	0,063	0,070	0,078	0,085	0,104	0,125
P3	2,5 x D	0,3 x D	0,3 x D	40	-	56	50	-	70	Fz	0,023	0,034	0,046	0,053	0,059	0,066	0,073	0,096	0,115
P5	2,5 x D	0,15 x D	0,15 x D	20	-	28	25	-	35	Fz	0,019	0,027	0,036	0,042	0,047	0,053	0,059	0,076	0,092
M1	2,5 x D	0,3 x D	0,3 x D	20	-	28	25	-	35	Fz	0,023	0,034	0,046	0,053	0,059	0,066	0,073	0,096	0,115
M2	2,5 x D	0,3 x D	0,3 x D	20	-	24	25	-	30	Fz	0,019	0,027	0,036	0,042	0,047	0,053	0,059	0,076	0,092
M3	2,5 x D	0,3 x D	0,3 x D	12	-	16	15	-	20	Fz	0,016	0,023	0,031	0,035	0,039	0,044	0,048	0,060	0,072
K1	2,5 x D	0,3 x D	0,3 x D	56	-	64	70	-	80	Fz	0,027	0,040	0,055	0,063	0,070	0,078	0,085	0,104	0,125
K2	2,5 x D	0,3 x D	0,3 x D	40	-	56	50	-	70	Fz	0,023	0,034	0,046	0,053	0,059	0,066	0,073	0,096	0,115
S1	2,5 x D	0,3 x D	0,3 x D	12	-	24	15	-	30	Fz	0,023	0,034	0,046	0,053	0,059	0,066	0,073	0,096	0,115
S2	2,5 x D	0,15 x D	0,15 x D	4	-	12	5	-	15	Fz	0,012	0,018	0,024	0,028	0,031	0,035	0,039	0,051	0,062
S3	2,5 x D	0,3 x D	0,3 x D	12	-	24	15	-	30	Fz	0,019	0,027	0,036	0,042	0,047	0,053	0,059	0,076	0,092
S4	2,5 x D	0,15 x D	0,25 x D	8	-	24	10	-	30	Fz	0,015	0,024	0,033	0,039	0,043	0,049	0,054	0,070	0,084

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 6607 6608

A

B

Group	A ap	A ae	B ap	TiCN Cutting Speed Vc m/min Min		TiCN Max	TiAlN Cutting Speed Vc m/min Min		TiAlN Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 5,0	8,0	10,0	16,0	20,0	24,0	30,0	36,0	40,0
P1	1,5 x D	0,5 x D	1,0 x D	63	-	72	70	-	80	Fz	0,034	0,055	0,063	0,063	0,096	0,104	0,125	0,140	0,150
P2	1,5 x D	0,5 x D	1,0 x D	54	-	72	60	-	80	Fz	0,034	0,055	0,063	0,063	0,096	0,104	0,125	0,140	0,150
K1	1,5 x D	0,5 x D	1,0 x D	56	-	64	70	-	80	Fz	0,034	0,055	0,063	0,063	0,096	0,104	0,125	0,140	0,150
N1	1,5 x D	0,5 x D	1,0 x D	240	-	300	300	-	375	Fz	0,047	0,073	0,088	0,134	0,168	0,210	0,220	0,220	0,230

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Lists 6617 6618

A

B

Group	A ap	A ae	B ap	TiCN Cutting Speed Vc m/min Min		TiCN Max	TiAlN Cutting Speed Vc m/min Min		TiAlN Max	mm	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. D1 - Diameter 5,0	8,0	10,0	16,0	20,0	24,0	30,0	36,0	40,0
P1	2,5 x D	0,3 x D	0,3 x D	63	-	72	70	-	80	Fz	0,034	0,055	0,063	0,063	0,096	0,104	0,125	0,140	0,150
P2	2,5 x D	0,3 x D	0,3 x D	54	-	72	60	-	80	Fz	0,034	0,055	0,063	0,063	0,096	0,104	0,125	0,140	0,150
K1	2,5 x D	0,3 x D	0,3 x D	56	-	64	70	-	80	Fz	0,034	0,055	0,063	0,063	0,096	0,104	0,125	0,140	0,150
N1	2,5 x D	0,5 x D	0,3 x D	240	-	300	300	-	375	Fz	0,047	0,073	0,088	0,134	0,168	0,210	0,220	0,220	0,230

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

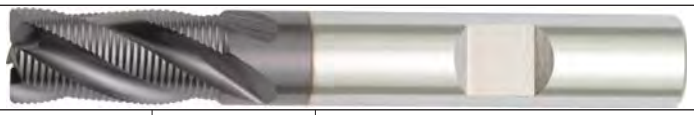
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 6604

A

B



Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Max	TiCN Cutting Speed Vc m/min Min	Max	TiAlN Cutting Speed Vc m/min Min	Max	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. mm	D1 - Diameter 6,0	8,0	10,0	12,0	16,0	20,0	22,0	25,0
P1	1,5 x D	0,5 x D	1 x D	28	32	56	64	70	80	Fz	0,040	0,055	0,063	0,070	0,078	0,085	0,094	0,104
P2	1,5 x D	0,5 x D	1 x D	24	32	48	64	60	80	Fz	0,040	0,055	0,063	0,070	0,078	0,085	0,094	0,104
P3	1,5 x D	0,5 x D	1 x D	20	28	40	56	50	70	Fz	0,034	0,046	0,053	0,059	0,066	0,073	0,084	0,096
P5	1,5 x D	0,3 x D	0,5 x D	10	14	20	28	25	35	Fz	0,027	0,036	0,042	0,047	0,053	0,059	0,068	0,076
M1	1,5 x D	0,5 x D	1 x D	10	14	20	28	25	35	Fz	0,034	0,046	0,053	0,059	0,066	0,073	0,084	0,096
M2	1,5 x D	0,5 x D	1 x D	10	12	20	24	25	30	Fz	0,027	0,036	0,042	0,047	0,053	0,059	0,068	0,076
M3	1,5 x D	0,5 x D	1 x D	6	8	12	16	15	20	Fz	0,023	0,031	0,035	0,039	0,044	0,048	0,054	0,060
K1	1,5 x D	0,5 x D	1 x D	28	32	56	64	70	80	Fz	0,040	0,055	0,063	0,070	0,078	0,085	0,094	0,104
K2	1,5 x D	0,5 x D	1 x D	20	28	40	56	50	70	Fz	0,034	0,046	0,053	0,059	0,066	0,073	0,084	0,096
S1	1,5 x D	0,5 x D	1 x D	6	12	12	24	15	30	Fz	0,034	0,046	0,053	0,059	0,066	0,073	0,084	0,096
S2	1,5 x D	0,3 x D	0,5 x D	2	6	4	12	5	15	Fz	0,018	0,024	0,028	0,031	0,035	0,039	0,045	0,051
S3	1,5 x D	0,5 x D	1 x D	6	11	12	24	15	30	Fz	0,027	0,036	0,042	0,047	0,053	0,059	0,068	0,076
S4	1,5 x D	0,3 x D	0,5 x D	6	11	8	24	10	30	Fz	0,024	0,033	0,039	0,043	0,049	0,054	0,062	0,070

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

List 6667 JJ

A

B

Group	A ap	A ae	B ap	Uncoated Cutting Speed Vc m/min Min	Max	TiAlN Cutting Speed Vc m/min Min	Max	Recommended Feed Per Tooth (Fz=mm/th) for Side Milling (A). For Slotting (B), reduce Fz by 20%. mm	D1 - Diameter 8,0	12,0	16,0	20,0	25,0	30,0	40,0
P1	1,5 x D	0,5 x D	1 x D	28	32	70	80	Fz	0,055	0,070	0,078	0,085	0,104	0,125	0,166
P2	1,5 x D	0,5 x D	1 x D	24	32	60	80	Fz	0,055	0,070	0,078	0,085	0,104	0,125	0,166
P3	1,5 x D	0,5 x D	1 x D	20	28	50	70	Fz	0,046	0,059	0,066	0,073	0,096	0,115	0,153
P5	1,5 x D	0,3 x D	0,5 x D	10	14	25	35	Fz	0,036	0,047	0,053	0,059	0,076	0,092	0,122
M1	1,5 x D	0,5 x D	1 x D	10	14	25	35	Fz	0,046	0,059	0,066	0,073	0,096	0,115	0,153
M2	1,5 x D	0,5 x D	1 x D	10	12	25	30	Fz	0,036	0,047	0,053	0,059	0,076	0,092	0,122
M3	1,5 x D	0,5 x D	1 x D	6	8	15	20	Fz	0,031	0,039	0,044	0,048	0,060	0,072	0,095
K1	1,5 x D	0,5 x D	1 x D	28	32	70	80	Fz	0,055	0,070	0,078	0,085	0,104	0,125	0,166
K2	1,5 x D	0,5 x D	1 x D	20	28	50	70	Fz	0,046	0,059	0,066	0,073	0,096	0,115	0,153
S1	1,5 x D	0,5 x D	1 x D	6	12	15	30	Fz	0,046	0,059	0,066	0,073	0,096	0,115	0,153
S2	1,5 x D	0,3 x D	0,5 x D	2	6	5	15	Fz	0,024	0,031	0,035	0,039	0,051	0,062	0,082
S3	1,5 x D	0,5 x D	1 x D	6	12	15	30	Fz	0,036	0,047	0,053	0,059	0,076	0,092	0,122
S4	1,5 x D	0,3 x D	0,5 x D	4	12	10	30	Fz	0,033	0,043	0,049	0,054	0,070	0,084	0,112

Lower value of cutting speed is used for high-stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.

Cross Reference Chart for Solid End Milling

The Rübig product families listed below are NOT included in this catalog but have either a direct equivalent or substitute replacement as shown in this chart.

MM	Rübig Brand ANSI / ISO	NEW Substitute MM	NEW Substitute ISO	NEW Equivalent MM	NEW Equivalent ISO	Page Reference Number
2331996	022701-000040			1655230	400204001..	
2331998	022701-000050			1610803	400205002..	
2332000	022701-000060			1610805	400206002..	
2332004	022701-000080			1610807	400208003..	
2332008	022701-000100			1610809	400210004..	A222–A223
2332010	022701-000120			1610810	400212005..	
2332012	022701-000140			1655347	400214014..	
2332014	022701-000160			1616606	400216006..	
2332016	022701-000200			1610821	400220007..	
2332022	022711-000040			1655429	400304001..	
2332024	022711-000050			1610822	400305002..	
2332027	022711-000060			1610823	400306002..	
2332031	022711-000080			1610825	400308003..	
2332035	022711-000100			1610826	400310004..	A230–A231
2332038	022711-000120			1610827	400312005..	
2332040	022711-000140			1610828	400314014..	
2332042	022711-000160			1610829	400316006..	
2332044	022711-000200			1610830	400320007..	
2332050	022721-000040			1655614	400404001..	
2332054	022721-000050			1655630	400405001..	
2332057	022721-000060			1610833	400406002..	
2332061	022721-000080			1616604	400408003..	
2332065	022721-000100			1610837	400410004..	A234–A235
2332067	022721-000120			1610841	400412005..	
2332069	022721-000140			1610842	400414014..	
2332071	022721-000160			1610844	400416006..	
2332073	022721-000200			1610846	400420007..	
2346052	022832-000030	1611006	D01103002WW			
2346103	022832-000040	1611007	D01104002WW			
2346104	022832-000050	1611008	D01105002WW			
2346105	022832-000060	1611009	D01106002WW			
2346106	022832-000080	1611010	D01108003WW			
2346107	022832-000100	1611011	D01110004WW			A203
2346108	022832-000120	1611012	D01112005WW			
2346109	022832-000140	1661157	D01114014WW			
2346110	022832-000160	1611013	D01116006WW			
2346111	022832-000180	1661166	D01118018WW			
2346112	022832-000200	1661171	D01120007WW			

(continued)

Cross Reference Chart for Solid End Milling

The Rübig product families listed below are NOT included in this catalog but have either a direct equivalent or substitute replacement as shown in this chart.

(continued)

MM	Rübig Brand ANSI / ISO	NEW Substitute MM	NEW Substitute ISO	NEW Equivalent MM	NEW Equivalent ISO	Page Reference Number
2332557	022835-000030			1656183	402103000..	A226–A227
2332558	022835-000040			1656188	402104001..	
2332560	022835-000050			1656193	402105001..	
2332561	022835-000060			1985514	402106002..	
2332562	022835-000080			1985515	402108003..	
2332563	022835-000100			1985516	402110004..	
2332564	022835-000120			1985517	402112005..	
2332565	022835-000160			1985519	402116006..	
2346154	022842-000030	1610970	D01003002WW			A218
2346155	022842-000040	1611001	D01004002WW			
2346156	022842-000050	1661088	D01005002WW			
2346157	022842-000060	1611002	D01006002WW			
2346158	022842-000080	1611003	D01008003WW			
2346159	022842-000100	1611004	D01010004WW			
2346160	022842-000120	1611005	D01012005WW			
2346161	022842-000140	1661105	D01014014WW			
2346162	022842-000160	1616617	D01016006WW			
2346193	022842-000180	1661113	D01018018WW			
2346194	022842-000200	1661117	D01020007WW			
2654789	422828-000040	1920424	477704002LT			A18–A19
2654792	422828-000060	1920430	477706002LT			
2654903	422828-000080	1920432	477708003LT			
2654904	422828-000100	1920434	477710004LT			
2654905	422828-000120	1920436	477712005LT			
2654906	422828-000160	1920438	477716006LT			
2654907	422828-000200	1920442	477720007LT			
2868691	422829-000040	2882431	477704002LW			
2868764	422829-000060	2882983	477706002LW			
2868765	422829-000080	2882985	477708003LW			
2868766	422829-000100	2882987	477710004LW			
2868767	422829-000120	2882988	477712005LW			
2868768	422829-000160	2202395	477716006LW			
2868769	422829-000200	1972613	477720007LW			

(continued)

(continued)

MM	Rübig Brand ANSI/ISO	NEW Substitute MM	NEW Substitute ISO	NEW Equivalent MM	NEW Equivalent ISO	Page Reference Number
2342404	422832-000030	1661121	D01103002RW			A203
2342406	422832-000040	1661125	D01104002RW			
2342409	422832-000050	1661129	D01105002RW			
2342411	422832-000060	1661133	D01106002RW			
2342413	422832-000080	1661140	D01108003RW			
2342415	422832-000100	1661147	D01110004RW			
2342417	422832-000120	1661151	D01112005RW			
2342419	422832-000140	1661155	D01114014RW			
2342421	422832-000160	1661160	D01116006RW			
2342423	422832-000180	1661164	D01118018RW			
2342425	422832-000200	1661169	D01120007RW			
2342464	422835-000030			1656185	402103000RT	A226–A227
2342466	422835-000040			1656190	402104001RT	
2342468	422835-000050			1656195	402105001RT	
2342470	422835-000060			1985543	402106002RT	
2342472	422835-000080			1985544	402108003RT	
2342474	422835-000100			1985545	402110004RT	
2342476	422835-000120			1985546	402112005RT	
2342478	422835-000160			1985548	402116006RT	
2342576	422842-000030	1661078	D01003002RW			A218
2342578	422842-000040	1661082	D01004002RW			
2342580	422842-000050	1661086	D01005002RW			
2342582	422842-000060	1661090	D01006002RW			
2342586	422842-000080	1661093	D01008003RW			
2342588	422842-000100	1661096	D01010004RW			
2342590	422842-000120	1661099	D01012005RW			
2342592	422842-000140	1661103	D01014014RW			
2342594	422842-000160	1661107	D01016006RW			
2342596	422842-000180	1661111	D01018018RW			
2342598	422842-000200	1661115	D01020007RW			
2343069	422865-000020			1661478	D50102002RT	A204
2343071	422865-000030			1602508	D50103002RT	
2343074	422865-000040			1602509	D50104002RT	
2343076	422865-000050			1602510	D50105002RT	
2408882	423033-000015			3665164	7N2101501RT	A37
2409004	423033-000020			3665166	7N2102001RT	
2409006	423033-000025			3665167	7N2102501RT	
2409007	423033-000030			3665168	7N2103001RT	
2411660	423033-000005			3665122	7N2100501RT	
2411662	423033-000006			3665140	7N2100601RT	
2411664	423033-000008			3665141	7N2100801RT	
2411666	423033-000010			3665142	7N2101001RT	
2411668	423033-000012			3665163	7N2101201RT	

WIDIA
RÜBIG

Holemaking

Best Tool Selector Guide • Drilling B4–B5

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High-Performance Solid Carbide Drills B11–B57

Solid Carbide Drills with Through Coolant Holes B59–B110

Reaming Tools B113–B137

Custom Reaming Tools B139–B140

High-Performance Holemaking

A complete offering of standard and custom solution drilling and hole finishing products is now available from your trusted source of end milling solutions.

Solid Carbide Drills

Features and Benefits:

- Complete drilling solutions for flood coolant applications in Steel, Stainless Steel, Iron, High-Temp Materials, and Hard Materials.
- Unique “dry drilling” solutions for Aluminium (See 517113 Series, pages B30–B33).

Solid Carbide Drills with Through Coolant Holes

Features and Benefits:

- High-performance through coolant drills for applications in Steel, Stainless Steel, Iron, High-Temp Materials, and Hard Materials.
- Advanced substrates, coatings, and grade technology for ultimate performance.
- New deep-hole drilling platform for unparalleled metal removal rates in applications up to 30 x D.

High-Performance Reaming

Solid Carbide as well as Carbide- and Cermet-Tipped Reamers

Features and Benefits:

- Extensive reaming program for machining of all common materials.
- Dimensions from Ø 1,4mm up to Ø 50mm and reaming depths up to 214mm.
- Hole tolerance up to IT6 and surface quality up to Ra = 0,2 µm achievable.
- High-Speed Reamers (HSR) enable high metal removal rates and excellent tool life, providing excellent economy of use.

Another customer's tough challenge is solved...

A comprehensive solid carbide drilling portfolio...

Features and Benefits:

- Extensive drilling program for machining of all common materials.
- Dimensions from Ø 1mm up to Ø 25mm and drilling depths from 1,5 up to 30 x D.
- Different shank designs available.
- Drilling tolerance up to IT8 and surface quality up to R_a = 0,5 µm achievable.
- Excellent economy of use achieved through high metal removal combined with excellent tool life.

Challenge:

- Interrupted drilling in Steel.

Application Details:

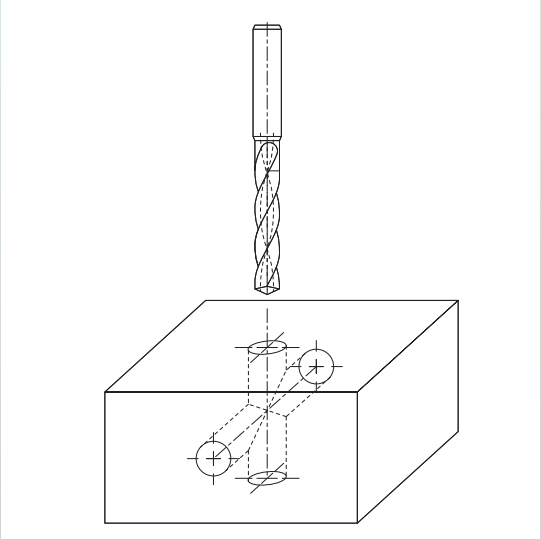
- Material: C45 — (Equivalent to 1045 — Material Group P3)
- Coolant: Emulsion approximately 6%
- Machine: SAMAG special machine
- Cutting Data: Vc = 73 m/min, f = 0,1 mm/rev

Solution:

- High-Performance Solid Carbide Drill
  — K20 F, DIN 6537 LONG
  — TiN-coated, Type ND
- Catalog Series: 412527
- Code: Ø4,7mm

Result:

- Two holes in one workpiece, drill depth = 20mm
  — number of holes = 4,000



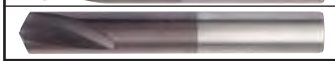
Drilling Depth = bold Series = standard	 **Flood Coolant**	 **Flood Coolant** **Drill and Chamfer/Step Drills**	
P **Steel**	**3 x D** 412811 412813	412846	
M **Stainless Steel**	**3 x D** 412511 412513	412846	
K **Cast Iron**	**3 x D** 412811 412813	412846	
N **Non-Ferrous**	**3 x D** 159 559	412846	
S **Heat-Resistant Alloys,** **Titanium Alloys**	**3 x D** 412511 412513	–	–
H **Hard Materials**	**1,5 x D** 412523 **2,5 x D** 412516	–	–

	Through Coolant	Flood Coolant or MQL Deep Hole Drilling	Dry Drilling	
	3 x D 412820 412822 **5 x D** 412827 412533 **8 x D** 412533 412534	**15 x D** H101 **20 x D** H102 **25 x D** H103 **30 x D** H104	–	–
	3 x D 412520 412522 **5 x D** 412525 412527 **8 x D** 412833 412834	**15 x D** H101 **20 x D** H102 **25 x D** H103 **30 x D** H104	–	–
	3 x D 412820 412822 **5 x D** 412825 412827 **8 x D** 412533 412534	**15 x D** H101 **20 x D** H102 **25 x D** H103 **30 x D** H104	–	–
	3 x D 259, 659 **5 x D** 269, 669 **8 x D** 012536 **12 x D** 012537	– –	**3 x D** 517113	
	3 x D 412520 412522 **5 x D** 412525 412527 **8 x D** 412833 412834	– –	–	–
	7 x D 412518	– –	–	–

* *Length to diameter ratios are approximate; for exact drilling depth, please refer to specific dimension tables for that product.*

** *For exact drilling depth please refer to specific dimension tables for that product.*

PP*** *For drilling depth, please refer to product pages for that specific series and diameter.*

• = Recommended	Series	Diameter Range min – max	Shank	Profile	Coolant Options	Drilling Depth
Solid Carbide Drills						
	412813/412811	3,0mm–20,0mm				3 x D*
	152/552	3,0mm–20,0mm				Short**
	162/562	2,8mm–20,0mm				Long**
	412513/412511	3,0mm–20,0mm				3 x D*
	517113	2,8mm–20,0mm				3 x D*
	159/559	3,0mm–20,5mm				Short**
	412516	3,18mm–10,72mm				2,5 x D*
	412523	1,0mm–14,0mm				1,5 x D*
	412846	3,3mm–14,0mm				Step** Drill
	132	0,5mm–20,0mm				Stub**
	112	0,5mm–20,0mm				Jobber**
	012601	0,5mm–6,3mm				Center** Drill
	412611	0,5mm–20,0mm				Spot** Drill
	412610	0,5mm–20,0mm				Spot** Drill
Solid Carbide Drills with Through Coolant Holes						
	H101Z	3,0mm–13,0mm				15 x D*
	H102Z	3,0mm–13,0mm				20 x D*
	H103Z	3,0mm–13,0mm				25 x D*
	H104Z	3,0mm–13,0mm				30 x D*
	412822/412820	3,0mm–20,0mm				3 x D*
	412825/412827	3,0mm–20,0mm				5 x D*
	412534/412533	3,0mm–20,0mm				8 x D*
	252/652	2,8mm–20,0mm				Short**
	262/662	2,8mm–20,0mm				Long**
	412522/412520	3,0mm–20,0mm				3 x D*
	412525/412527	3,0mm–20,0mm				5 x D*

P				M		K		N			S				H			
1 2 3	4	5	6	1 2 3		1 2		1 2 3 4 5	6		1	2	3	4	1 2	3 4		
Steel <35 HRC	Steel 36–48 HRC	PH and Ferritic Stainless Steel <35 HRC	PH and Ferritic Stainless Steel >35 HRC	Stainless Steel		Cast Iron		Non-Ferrous	Graphite		Iron-Based	Nickel-Based	Pure Titanium	Titanium Alloys	Hardened Steels H1 = <48 HRC H2 = 48 ~ 55	H3 = 56 ~ 60 HRC H4 = >60 HRC	Product Information	Cutting Data
Solid Carbide Drills (continued)																		
•	•					•											B12–B15	B53
•	•	•	•	•								•	•	•	•	•	B16–B20	B53
•	•	•	•	•								•	•	•	•	•	B21–B25	B53
		•	•	•							•	•	•	•			B26–B29	B54
								•									B30–B33	B54
								•									B34–B37	B110
															•	•	B38	B55
															•	•	B39	B55
•	•	•	•			•		•									B40	B55
•	•	•	•	•		•		•			•	•					B41–B45	B56
•	•	•	•	•		•		•			•	•					B46–B49	B56
						•		•					•	•			B50	B56
•	•	•	•	•		•		•			•	•			•		B51	B57
•	•	•	•	•		•		•			•	•	•	•	•		B52	B57
Solid Carbide Drills with Through Coolant Holes (continued)																		
•	•					•											B60–B61	B108
•	•					•											B62–B63	B108
•	•					•											B64–B65	B108
•	•					•											B66–B67	B108
•	•					•											B68–B71	B108
•	•					•											B72–B75	B108
•	•					•											B76–B77	B108
•	•	•	•	•								•	•	•	•	•	B78–B81	B109
•	•	•	•	•								•	•	•	•	•	B82–B85	B109
		•	•	•		•		•	•		•	•	•	•			B86–B89	B109
		•	•	•		•		•	•		•	•	•	•			B90–B93	B109

* *Length to diameter ratios are approximate; for exact drilling depth, please refer to specific dimension tables for that product.*

** *For exact drilling depth please refer to specific dimension tables for that product.*

PP*** *For drilling depth, please refer to product pages for that specific series and diameter.*

• = Recommended	Series	Diameter Range min – max	Shank	Profile	Coolant Options	Drilling Depth
Solid Carbide Drills with Through Coolant Holes (continued)						
	412834/412833	3,0mm–20,0mm				8 x D*
	012535	3,18mm–20,0mm				5 x D*
	012536	4,6mm–20,0mm				8 x D*
	012537	3,0mm–20,0mm				12 x D*
	412535	3,18mm–20,0mm				5 x D*
	412536	4,6mm–20,0mm				8 x D*
	412537	3,0mm–20,5mm				12 x D*
	412518	5,0mm–16,0mm				7 x D*
	259/259	3,0mm–20,5mm				Short**

• = Recommended	Series	Diameter Range min – max	Hole Type Icons	Coolant Options	Depth
Precision Hole Finishing — Multi-Blade Reamers					
	050221	1,4mm–10,0mm			PP***
	050227	1,4mm–14,15mm			PP***
	450227	1,4mm–14,15mm			PP***
	050271	4,8mm–14,15mm			PP***
	450271	4,8mm–14,15mm			PP***
	050281	14,0mm–32,0mm			PP***
	450281	14,0mm–32,0mm			PP***
	456681	14,0mm–32,0mm			PP***
	050222	1,4mm–4,15mm			PP***
	450222	1,4mm–4,15mm			PP***
	050270	4,16mm–14,15mm			PP***
	450270	4,16mm–14,15mm			PP***
	050280	14,0mm–32,0mm			PP***
	450280	14,0mm–32,0mm			PP***
	456680	14,0mm–32,0mm			PP***

P				M		K		N			S				H			
1 2 3	4	5	6	1 2 3		1 2		1 2 3 4 5	6		1	2	3	4	1 2	3 4		
Steel <35 HRC	Steel 36–48 HRC	PH and Ferritic Stainless Steel <35 HRC	PH and Ferritic Stainless Steel >35 HRC	Stainless Steel		Cast Iron		Non-Ferrous	Graphite		Iron-Based	Nickel-Based	Pure Titanium	Titanium Alloys	Hardened Steels H1 = <48 HRC H2 = 48 ~ 55	H3 = 56 ~ 60 HRC H4 = >60 HRC	Product Information	Cutting Data
Solid Carbide Drills with Through Coolant Holes (continued)																		
		•	•	•		•		•	•		•	•	•	•			B94–B95	B109
						•		•									B96–B97	B110
						•		•									B98–B99	B110
						•		•									B100–B101	B110
						•		•									B96–B97	B110
						•		•									B98–B99	B110
						•		•									B100–B101	B110
															•	•	B102–B103	B110
								•									B104–B107	B110
Precision Hole Finishing — Multi-Blade Reamers (continued)																		
•	•	•	•	•		•		•	•		•	•	•	•			B119–B120	B130
•	•	•	•	•		•		•	•		•	•	•	•			B121	B131
•	•	•	•	•		•					•	•	•	•			B121	B131
•	•	•	•	•		•		•	•		•	•	•	•			B122	B132
•	•	•	•	•		•					•	•	•	•			B122	B132
•	•	•	•	•		•		•	•		•	•	•	•			B123	B133
•	•	•	•	•		•					•	•	•	•			B123	B133
•	•	•	•														B124	B134
•	•	•	•	•		•		•	•		•	•	•	•			B125	B134
•	•	•	•	•		•					•	•	•	•			B125	B135
•	•	•	•	•		•		•	•		•	•	•	•			B126	B135
•	•	•	•	•		•					•	•	•	•			B126	B136
•	•	•	•	•		•		•	•		•	•	•	•			B127	B136
•	•	•	•	•		•					•	•	•	•			B127	B137
•	•	•	•														B128	B137

High-Performance Solid Carbide Drills

A comprehensive portfolio of tools that covers flood coolant and dry drilling operations.

Another customer's tough challenge is solved...

Challenge:

- Drill and Chamfer hole in Steel for M10 Tapping Operation.

Application Details:

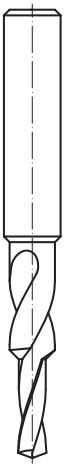
- Material: St 37 (Material Group P6)
- Coolant: Emulsion approximately 6%
- Machine: Deckol Maho DMC 125
- Cutting Data: Vc = 80 m/min, f = 0,16 mm/rev
- Manufacturing task: blind hole, drill depth = 29mm

Solution:

- High-Performance Solid Carbide — Step Drill
  – K20 F, DIN 6537 LONG
  – DCF-coated, Type UD
- Catalog Series: 412846
- Code: M10

Result:

– number of holes = 1,300



Another customer's tough challenge is solved...

Challenge:

- Stainless Steel Drilling.

Application Details:

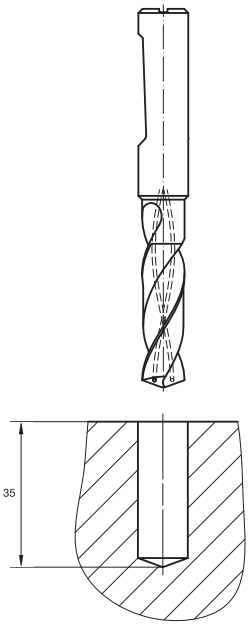
- Material: 1.4350 (X10 CrNi S 18 9) —
  (Equivalent to 30 304SS — Material Group M1)
- Coolant: Emulsion approximately 8%
- Machine: Machining center, 20 bar coolant pressure
- Cutting Data: Vc = 95 m/min, f = 0,15 mm/rev

Solution:

- High-Performance Solid Carbide Drill
  — K20 F, DIN 6537 SHORT
  — DCF-coated, Type WD
- Catalog Series: 412520
- Code: Ø12mm

Result:

— number of holes = 3,500
— tool life = 120m



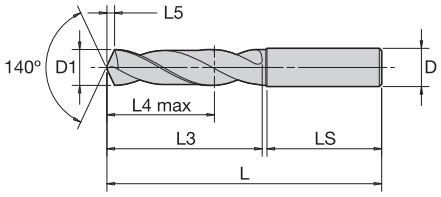
High-Performance Solid Carbide Drills

High-Performance Solid Carbide Drills B11–B57

Steels and Cast Iron • K20F-DCF • Type ND • SHORT B12–B15
Stainless Steels, High-Temp Alloys, Hard Steels • Series 152 552 •
SHORT • "A" and "E" Shanks B16–B20
Stainless Steels, High-Temp Alloys, Hard Steels • Series 162 562 • LONG B21–B25
Stainless Steels and High-Temp Alloys • Type WD • K20F-DCF •
3 x D • "A" and "E" Shanks B26–B29
Aluminium • Type WDT • K10F-DCL • 3 x D B30–B33
Aluminium • Series 159 559 • SHORT B34–B37
Hard Materials • K10F-DCX • 2,5 x D B38
Hard Materials • K10F-DCX • 1,5 x D B39
Drill and Chamfer/Step Drills • Type UD • K20F-DCF B40
2 Flute • Type N • Series 132 • STUB Length B41–B45
2 Flute • Type N • Series 112 • JOBBER Length B46–B49
Form A • K10 . . . . . B50
Spot Drill • 90° • K20F-DCF B51
Spot Drill • 145° • K20F-DCF B52

Application Data
Series 412813 412811 • Series M152 M162 . . . . . B53
Series 412513 412511 • Series 517113 . . . . . B54
Series 412516 412523 • Series 412846 . . . . . B55
Series M132 M112 • Series 012601 . . . . . B56
Series 412611 412610 . . . . . B57

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance

D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	P				K		
	1	2	3	4	1	2	3
K20F-DCF	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B53.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF "A" Shank	K20F-DCF "E" Shank
3,000	6	20	14	0,5	36	62	412813-000300	412811-000300
3,100	6	20	14	0,6	36	62	412813-000310	412811-000310
3,200	6	20	14	0,6	36	62	412813-000320	412811-000320
3,250	6	20	14	0,6	36	62	412813-000325	412811-000325
3,300	6	20	14	0,6	36	62	412813-000330	412811-000330
3,400	6	20	14	0,6	36	62	412813-000340	412811-000340
3,500	6	20	14	0,6	36	62	412813-000350	412811-000350
3,600	6	20	14	0,7	36	62	412813-000360	412811-000360
3,700	6	20	14	0,7	36	62	412813-000370	412811-000370
3,800	6	24	17	0,7	36	66	412813-000380	412811-000380
3,900	6	24	17	0,7	36	66	412813-000390	412811-000390
4,000	6	24	17	0,7	36	66	412813-000400	412811-000400
4,100	6	24	17	0,7	36	66	412813-000410	412811-000410
4,200	6	24	17	0,8	36	66	412813-000420	412811-000420
4,300	6	24	17	0,8	36	66	412813-000430	412811-000430
4,400	6	24	17	0,8	36	66	412813-000440	412811-000440
4,500	6	24	17	0,8	36	66	412813-000450	412811-000450
4,600	6	24	17	0,8	36	66	412813-000460	412811-000460
4,650	6	24	17	0,8	36	66	412813-000465	412811-000465
4,700	6	24	17	0,9	36	66	412813-000470	412811-000470
4,800	6	28	20	0,9	36	66	412813-000480	412811-000480
4,900	6	28	20	0,9	36	66	412813-000490	412811-000490
5,000	6	28	20	0,9	36	66	412813-000500	412811-000500
5,100	6	28	20	0,9	36	66	412813-000510	412811-000510

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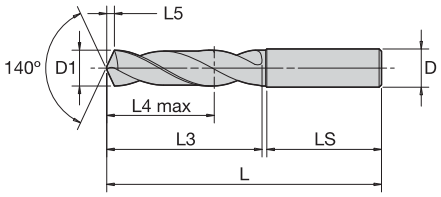

	P				K		
	1	2	3	4	1	2	3
K20F-DCF	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B53.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF "A" Shank	K20F-DCF "E" Shank
5,200	6	28	20	0,9	36	66	412813-000520	412811-000520
5,300	6	28	20	1,0	36	66	412813-000530	412811-000530
5,400	6	28	20	1,0	36	66	412813-000540	412811-000540
5,500	6	28	20	1,0	36	66	412813-000550	412811-000550
5,550	6	28	20	1,0	36	66	412813-000555	412811-000555
5,600	6	28	20	1,0	36	66	412813-000560	412811-000560
5,700	6	28	20	1,0	36	66	412813-000570	412811-000570
5,800	6	28	20	1,1	36	66	412813-000580	412811-000580
5,900	6	28	20	1,1	36	66	412813-000590	412811-000590
6,000	6	28	20	1,1	36	66	412813-000600	412811-000600
6,100	8	34	24	1,1	36	79	412813-000610	412811-000610
6,200	8	34	24	1,1	36	79	412813-000620	412811-000620
6,300	8	34	24	1,1	36	79	412813-000630	412811-000630
6,400	8	34	24	1,2	36	79	412813-000640	412811-000640
6,500	8	34	24	1,2	36	79	412813-000650	412811-000650
6,600	8	34	24	1,2	36	79	412813-000660	412811-000660
6,700	8	34	24	1,2	36	79	412813-000670	412811-000670
6,800	8	34	24	1,2	36	79	412813-000680	412811-000680
6,900	8	34	24	1,3	36	79	412813-000690	412811-000690
7,000	8	34	24	1,3	36	79	412813-000700	412811-000700
7,100	8	41	29	1,3	36	79	412813-000710	412811-000710
7,200	8	41	29	1,3	36	79	412813-000720	412811-000720
7,300	8	41	29	1,3	36	79	412813-000730	412811-000730
7,400	8	41	29	1,3	36	79	412813-000740	412811-000740
7,500	8	41	29	1,4	36	79	412813-000750	412811-000750
7,600	8	41	29	1,4	36	79	412813-000760	412811-000760
7,700	8	41	29	1,4	36	79	412813-000770	412811-000770
7,800	8	41	29	1,4	36	79	412813-000780	412811-000780
7,900	8	41	29	1,4	36	79	412813-000790	412811-000790
8,000	8	41	29	1,5	36	79	412813-000800	412811-000800
8,100	10	47	35	1,5	40	89	412813-000810	412811-000810
8,200	10	47	35	1,5	40	89	412813-000820	412811-000820

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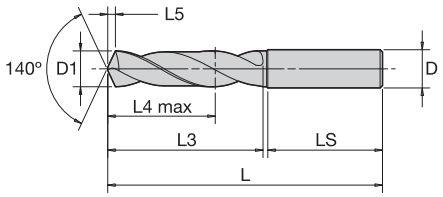

	P				K		
	1	2	3	4	1	2	3
K20F-DCF	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B53.

							K20F-DCF	K20F-DCF
D1	D	L3	L4 max	L5	LS	L	"A" Shank	"E" Shank
8,300	10	47	35	1,5	40	89	412813-000830	412811-000830
8,400	10	47	35	1,5	40	89	412813-000840	412811-000840
8,500	10	47	35	1,5	40	89	412813-000850	412811-000850
8,600	10	47	35	1,6	40	89	412813-000860	412811-000860
8,700	10	47	35	1,6	40	89	412813-000870	412811-000870
8,800	10	47	35	1,6	40	89	412813-000880	412811-000880
8,900	10	47	35	1,6	40	89	412813-000890	412811-000890
9,000	10	47	35	1,6	40	89	412813-000900	412811-000900
9,100	10	47	35	1,7	40	89	412813-000910	412811-000910
9,200	10	47	35	1,7	40	89	412813-000920	412811-000920
9,300	10	47	35	1,7	40	89	412813-000930	412811-000930
9,400	10	47	35	1,7	40	89	412813-000940	412811-000940
9,500	10	47	35	1,7	40	89	412813-000950	412811-000950
9,600	10	47	35	1,7	40	89	412813-000960	412811-000960
9,700	10	47	35	1,8	40	89	412813-000970	412811-000970
9,800	10	47	35	1,8	40	89	412813-000980	412811-000980
9,900	10	47	35	1,8	40	89	412813-000990	412811-000990
10,000	10	47	35	1,8	40	89	412813-001000	412811-001000
10,100	12	55	40	1,8	45	102	412813-001010	412811-001010
10,200	12	55	40	1,9	45	102	412813-001020	412811-001020
10,300	12	55	40	1,9	45	102	412813-001030	412811-001030
10,400	12	55	40	1,9	45	102	412813-001040	412811-001040
10,500	12	55	40	1,9	45	102	412813-001050	412811-001050
10,600	12	55	40	1,9	45	102	412813-001060	412811-001060
10,700	12	55	40	1,9	45	102	412813-001070	412811-001070
10,800	12	55	40	2,0	45	102	412813-001080	412811-001080
10,900	12	55	40	2,0	45	102	412813-001090	412811-001090
11,000	12	55	40	2,0	45	102	412813-001100	412811-001100
11,100	12	55	40	2,0	45	102	412813-001110	412811-001110
11,200	12	55	40	2,0	45	102	412813-001120	412811-001120
11,300	12	55	40	2,1	45	102	412813-001130	412811-001130
11,400	12	55	40	2,1	45	102	412813-001140	412811-001140

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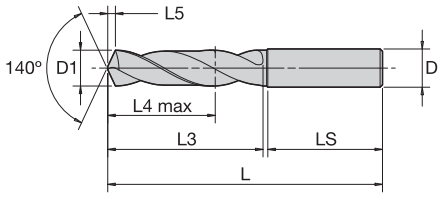


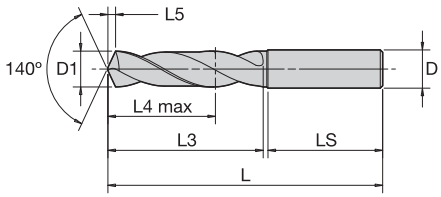
	P				K		
	1	2	3	4	1	2	3
K20F-DCF	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B53.

							K20F-DCF	K20F-DCF
D1	D	L3	L4 max	L5	LS	L	"A" Shank	"E" Shank
11,500	12	55	40	2,1	45	102	412813-001150	412811-001150
11,600	12	55	40	2,1	45	102	412813-001160	412811-001160
11,700	12	55	40	2,1	45	102	412813-001170	412811-001170
11,800	12	55	40	2,1	45	102	412813-001180	412811-001180
11,900	12	55	40	2,2	45	102	412813-001190	412811-001190
12,000	12	55	40	2,2	45	102	412813-001200	412811-001200
12,500	14	60	43	2,3	45	107	412813-001250	412811-001250
12,800	14	60	43	2,3	45	107	412813-001280	412811-001280
13,000	14	60	43	2,4	45	107	412813-001300	412811-001300
13,500	14	60	43	2,5	45	107	412813-001350	412811-001350
13,800	14	60	43	2,5	45	107	412813-001380	412811-001380
14,000	14	60	43	2,5	45	107	412813-001400	412811-001400
14,500	16	65	45	2,6	48	115	412813-001450	412811-001450
14,800	16	65	45	2,7	48	115	412813-001480	412811-001480
15,000	16	65	45	2,7	48	115	412813-001500	412811-001500
15,500	16	65	45	2,8	48	115	412813-001550	412811-001550
15,800	16	65	45	2,9	48	115	412813-001580	412811-001580
16,000	16	65	45	2,9	48	115	412813-001600	412811-001600
16,500	18	73	51	3,0	48	123	412813-001650	412811-001650
16,800	18	73	51	3,1	48	123	412813-001680	412811-001680
17,000	18	73	51	3,1	48	123	412813-001700	412811-001700
17,500	18	73	51	3,2	48	123	412813-001750	412811-001750
17,800	18	73	51	3,2	48	123	412813-001780	412811-001780
18,000	18	73	51	3,3	48	123	412813-001800	412811-001800
18,500	20	79	55	3,4	50	131	412813-001850	412811-001850
18,800	20	79	55	3,4	50	131	412813-001880	412811-001880
19,000	20	79	55	3,5	50	131	412813-001900	412811-001900
19,500	20	79	55	3,5	50	131	412813-001950	412811-001950
19,800	20	79	55	3,6	50	131	412813-001980	412811-001980
20,000	20	79	55	3,6	50	131	412813-002000	412811-002000

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	P				M		S			H		
	3	4	5	6	1	2	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B53.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
6,747	8	38	8	0,5	68	79	TFM55207100	–
3,000	6	20	14	0,5	36	62	M15203000RT	M15203000RN
3,100	6	20	14	0,6	36	62	M15203100RT	M15203100RN
3,175	5	23	10	0,6	54	66	TFM55203000	–
3,200	6	20	14	0,6	36	62	M15203200RT	M15203200RN
3,300	6	20	14	0,6	36	62	M15203300RT	M15203300RN
3,400	6	20	14	0,6	36	62	M15203400RT	M15203400RN
3,500	6	20	14	0,6	36	62	M15203500RT	M15203500RN
3,600	6	20	14	0,7	36	62	M15203600RT	M15203600RN
3,700	6	20	14	0,7	36	62	M15203700RT	M15203700RN
3,800	6	24	17	0,7	36	66	M15203800RT	M15203800RN
3,900	6	24	17	0,7	36	66	M15203900RT	M15203900RN
3,962	5	23	12	0,7	52	66	TFM55204000	–
4,000	6	24	17	0,7	36	66	M15204000RT	M15204000RN
4,100	6	24	17	0,7	36	66	M15204100RT	M15204100RN
4,200	6	24	17	0,8	36	66	M15204200RT	M15204200RN
4,300	6	24	17	0,8	36	66	M15204300RT	M15204300RN
4,400	6	24	17	0,8	36	66	M15204400RT	M15204400RN
4,500	6	24	17	0,8	36	66	M15204500RT	M15204500RN
4,600	6	24	17	0,8	36	66	M15204600RT	M15204600RN

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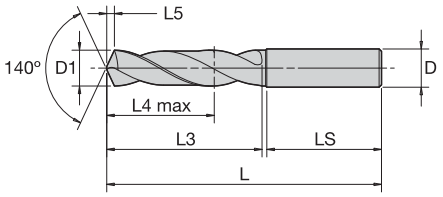

	P				M		S			H		
	3	4	5	6	1	2	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B53.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
4,700	6	24	17	0,9	36	66	M15204700RT	M15204700RN
4,763	5	29	14	0,9	49	66	TFM55205000	–
4,800	6	28	20	0,9	36	66	M15204800RT	M15204800RN
4,900	6	28	20	0,9	36	66	M15204900RT	M15204900RN
5,000	6	28	20	0,9	36	66	M15205000RT	M15205000RN
5,100	6	28	20	0,9	36	66	M15205100RT	M15205100RN
5,159	6	34	15	0,9	56	74	TFM55205160	–
5,200	6	28	20	0,9	36	66	M15205200RT	M15205200RN
5,300	6	28	20	1,0	36	66	M15205300RT	M15205300RN
5,400	6	28	20	1,0	36	66	M15205400RT	M15205400RN
5,410	6	34	16	1,0	55	74	TFM55205410	–
5,500	6	28	20	1,0	36	66	M15205500RT	M15205500RN
5,556	6	34	17	1,0	55	74	TFM55205500	–
5,600	6	28	20	1,0	36	66	M15205600RT	M15205600RN
5,700	6	28	20	1,0	36	66	M15205700RT	M15205700RN
5,800	6	28	20	1,1	36	66	M15205800RT	M15205800RN
5,900	6	28	20	1,1	36	66	M15205900RT	M15205900RN
5,944	6	34	18	1,1	54	74	TFM55206250	–
6,000	6	28	20	1,1	36	66	M15206000RT	M15206000RN
6,100	8	34	24	1,1	36	79	M15206100RT	M15206100RN
6,200	8	34	24	1,1	36	79	M15206200RT	M15206200RN
6,300	8	34	24	1,1	36	79	M15206300RT	M15206300RN
6,350	6	34	19	1,2	52	74	TFM55207000	–
6,400	8	34	24	1,2	36	79	M15206400RT	M15206400RN
6,500	8	34	24	1,2	36	79	M15206500RT	M15206500RN
6,528	8	38	20	1,2	57	79	TFM55206530	–
6,600	8	34	24	1,2	36	79	M15206600RT	M15206600RN
6,700	8	34	24	1,2	36	79	M15206700RT	M15206700RN
6,800	8	34	24	1,2	36	79	M15206800RT	M15206800RN
6,900	8	34	24	1,3	36	79	M15206900RT	M15206900RN
7,000	8	34	24	1,3	36	79	M15207000RT	M15207000RN
7,100	8	41	29	1,3	36	79	M15207100RT	M15207100RN

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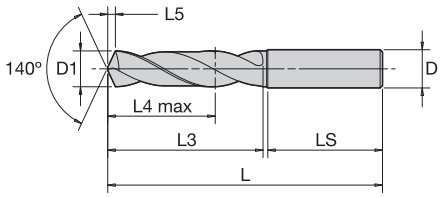

	P				M		S			H		
	3	4	5	6	1	2	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B53.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
7,145	8	38	21	1,3	55	79	TFM55207300	–
7,200	8	41	29	1,3	36	79	M15207200RT	M15207200RN
7,300	8	41	29	1,3	36	79	M15207300RT	M15207300RN
7,400	8	41	29	1,3	36	79	M15207400RT	M15207400RN
7,500	8	41	29	1,4	36	79	M15207500RT	M15207500RN
7,541	8	38	23	1,4	54	79	TFM55207500	–
7,600	8	41	29	1,4	36	79	M15207600RT	M15207600RN
7,700	8	41	29	1,4	36	79	M15207700RT	M15207700RN
7,800	8	41	29	1,4	36	79	M15207800RT	M15207800RN
7,900	8	41	29	1,4	36	79	M15207900RT	M15207900RN
7,938	8	38	24	1,4	53	79	TFM55208000	–
8,000	8	41	29	1,5	36	79	M15208000RT	M15208000RN
8,100	10	47	35	1,5	40	89	M15208100RT	M15208100RN
8,200	10	47	35	1,5	40	89	M15208200RT	M15208200RN
8,300	10	47	35	1,5	40	89	M15208300RT	M15208300RN
8,400	10	47	35	1,5	40	89	M15208400RT	M15208400RN
8,433	10	46	25	1,5	61	89	TFM55208430	–
8,500	10	47	35	1,5	40	89	M15208500RT	M15208500RN
8,600	10	47	35	1,6	40	89	M15208600RT	M15208600RN
8,700	10	47	35	1,6	40	89	M15208700RT	M15208700RN
8,733	10	46	26	1,6	60	89	TFM55208500	–
8,800	10	47	35	1,6	40	89	M15208800RT	M15208800RN
8,900	10	47	35	1,6	40	89	M15208900RT	M15208900RN
9,000	10	47	35	1,6	40	89	M15209000RT	M15209000RN
9,100	10	47	35	1,7	40	89	M15209100RT	M15209100RN
9,129	10	46	27	1,7	59	89	TFM55208700	–
9,200	10	47	35	1,7	40	89	M15209200RT	M15209200RN
9,300	10	47	35	1,7	40	89	M15209300RT	M15209300RN
9,347	10	46	28	1,7	58	89	TFM55209350	–
9,400	10	47	35	1,7	40	89	M15209400RT	M15209400RN
9,500	10	47	35	1,7	40	89	M15209500RT	M15209500RN
9,525	10	46	29	1,7	58	89	TFM55210000	–

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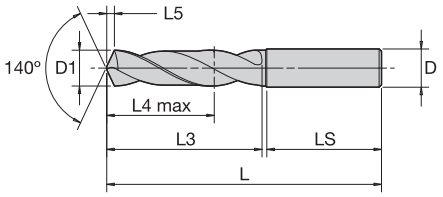

	P				M		S			H		
	3	4	5	6	1	2	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B53.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
9,600	10	47	35	1,7	40	89	M15209600RT	M15209600RN
9,700	10	47	35	1,8	40	89	M15209700RT	M15209700RN
9,800	10	47	35	1,8	40	89	M15209800RT	M15209800RN
9,900	10	47	35	1,8	40	89	M15209900RT	M15209900RN
9,921	11	51	30	1,8	64	96	TFM55210100	–
10,000	10	47	35	1,8	40	89	M15210000RT	M15210000RN
10,100	12	55	40	1,8	45	102	M15210100RT	M15210100RN
10,200	12	55	40	1,9	45	102	M15210200RT	M15210200RN
10,300	12	55	40	1,9	45	102	M15210300RT	M15210300RN
10,320	11	51	31	1,9	63	96	TFM55210300	–
10,400	12	55	40	1,9	45	102	M15210400RT	M15210400RN
10,500	12	55	40	1,9	45	102	M15210500RT	M15210500RN
10,600	12	55	40	1,9	45	102	M15210600RT	M15210600RN
10,700	12	55	40	1,9	45	102	M15210700RT	M15210700RN
10,716	11	51	32	2,0	61	96	TFM55210500	–
10,800	12	55	40	2,0	45	102	M15210800RT	M15210800RN
10,900	12	55	40	2,0	45	102	M15210900RT	M15210900RN
11,000	12	55	40	2,0	45	102	M15211000RT	M15211000RN
11,100	12	55	40	2,0	45	102	M15211100RT	M15211100RN
11,113	11	51	33	2,0	60	96	TFM55211000	–
11,200	12	55	40	2,0	45	102	M15211200RT	M15211200RN
11,300	12	55	40	2,1	45	102	M15211300RT	M15211300RN
11,400	12	55	40	2,1	45	102	M15211400RT	M15211400RN
11,500	12	55	40	2,1	45	102	M15211500RT	M15211500RN
11,509	13	54	35	2,1	65	102	TFM55211500	–
11,600	12	55	40	2,1	45	102	M15211600RT	M15211600RN
11,700	12	55	40	2,1	45	102	M15211700RT	M15211700RN
11,800	12	55	40	2,1	45	102	M15211800RT	M15211800RN
11,900	12	55	40	2,2	45	102	M15211900RT	M15211900RN
11,908	13	54	36	2,2	64	102	TFM55211900	–
12,000	12	55	40	2,2	45	102	M15212000RT	M15212000RN
12,304	13	54	37	2,2	62	102	TFM55212100	–

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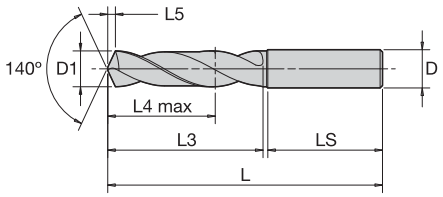


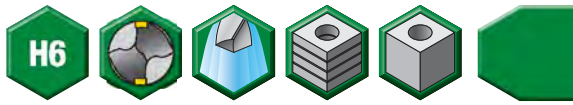
	P				M		S			H		
	3	4	5	6	1	2	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●

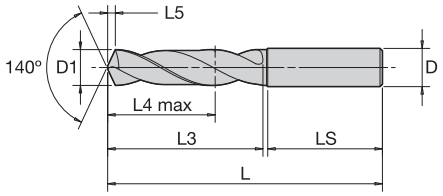
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B53.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
12,500	14	60	43	2,3	45	107	**M15212500RT**	**M15212500RN**
12,700	13	54	38	2,3	61	102	**TFM55213000**	**–**
12,800	14	60	43	2,3	45	107	**M15212800RT**	**M15212800RN**
13,000	14	60	43	2,4	45	107	**M15213000RT**	**M15213000RN**
13,500	14	60	43	2,5	45	107	**M15213500RT**	**M15213500RN**
13,800	14	60	43	2,5	45	107	**M15213800RT**	**M15213800RN**
14,000	14	60	43	2,6	45	107	**M15214000RT**	**M15214000RN**
14,288	14	59	43	2,6	62	107	**TFM55214000**	**–**
14,500	16	65	45	2,6	48	115	**M15214500RT**	**M15214500RN**
14,800	16	65	45	2,7	48	115	**M15214800RT**	**M15214800RN**
15,000	16	65	45	2,7	48	115	**M15215000RT**	**M15215000RN**
15,500	16	65	45	2,8	48	115	**M15215500RT**	**M15215500RN**
15,800	16	65	45	2,9	48	115	**M15215800RT**	**M15215800RN**
15,875	16	64	48	2,9	65	115	**TFM55216000**	**–**
16,000	16	65	45	2,9	48	115	**M15216000RT**	**M15216000RN**
16,500	18	73	51	3,0	48	123	**M15216500RT**	**M15216500RN**
17,000	18	73	51	3,1	48	123	**M15217000RT**	**M15217000RN**
17,463	17	72	52	3,2	68	123	**TFM55217400**	**–**
17,500	18	73	51	3,2	48	123	**M15217500RT**	**M15217500RN**
18,000	18	73	51	3,3	48	123	**M15218000RT**	**M15218000RN**
18,500	20	79	55	3,4	50	131	**M15218500RT**	**M15218500RN**
19,000	20	79	55	3,5	50	131	**M15219000RT**	**M15219000RN**
19,050	19	76	57	3,5	69	129	**TFM55219000**	**–**
19,500	20	79	55	3,6	50	131	**M15219500RT**	**M15219500RN**
20,000	20	79	55	3,6	50	131	**M15220000RT**	**M15220000RN**

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.





Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	P				M		S			H			
	3	4	5	6	1	2	2	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B53.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
2,779	8	50	14	0,5	75	91	**TFM56207100**	**–**
3,000	6	28	23	0,5	36	66	**M16203000RT**	**M16203000RN**
3,100	6	28	23	0,6	36	66	**M16203100RT**	**M16203100RN**
3,175	5	27	16	0,6	51	70	**TFM56203000**	**–**
3,200	6	28	23	0,6	36	66	**M16203200RT**	**M16203200RN**
3,300	6	28	23	0,6	36	66	**M16203300RT**	**M16203300RN**
3,400	6	28	23	0,6	36	66	**M16203400RT**	**M16203400RN**
3,500	6	28	23	0,6	36	66	**M16203500RT**	**M16203500RN**
3,600	6	28	23	0,7	36	66	**M16203600RT**	**M16203600RN**
3,700	6	28	23	0,7	36	66	**M16203700RT**	**M16203700RN**
3,800	6	36	29	0,7	36	74	**M16203800RT**	**M16203800RN**
3,900	6	36	29	0,7	36	74	**M16203900RT**	**M16203900RN**
3,962	5	27	20	0,7	48	70	**TFM56204000**	**–**
4,000	6	36	29	0,7	36	74	**M16204000RT**	**M16204000RN**
4,100	6	36	29	0,7	36	74	**M16204100RT**	**M16204100RN**
4,200	6	36	29	0,8	36	74	**M16204200RT**	**M16204200RN**
4,300	6	36	29	0,8	36	74	**M16204300RT**	**M16204300RN**
4,400	6	36	29	0,8	36	74	**M16204400RT**	**M16204400RN**
4,500	6	36	29	0,8	36	74	**M16204500RT**	**M16204500RN**
4,600	6	36	29	0,8	36	74	**M16204600RT**	**M16204600RN**

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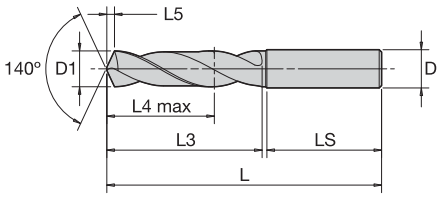

	P				M		S			H			
	3	4	5	6	1	2	2	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B53.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
4,700	6	36	29	0,9	36	74	M16204700RT	M16204700RN
4,763	5	35	24	0,9	48	74	TFM56205000	–
4,800	6	44	35	0,9	36	82	M16204800RT	M16204800RN
4,900	6	44	35	0,9	36	82	M16204900RT	M16204900RN
5,000	6	44	35	0,9	36	82	M16205000RT	M16205000RN
5,100	6	44	35	0,9	36	82	M16205100RT	M16205100RN
5,159	6	43	26	0,9	46	74	TFM56205160	–
5,200	6	44	35	0,9	36	82	M16205200RT	M16205200RN
5,300	6	44	35	1,0	36	82	M16205300RT	M16205300RN
5,400	6	44	35	1,0	36	82	M16205400RT	M16205400RN
5,410	6	43	27	1,0	52	82	TFM56205410	–
5,500	6	44	35	1,0	36	82	M16205500RT	M16205500RN
5,556	6	43	28	1,0	52	82	TFM56205500	
5,600	6	44	35	1,0	36	82	M16205600RT	M16205600RN
5,700	6	44	35	1,0	36	82	M16205700RT	M16205700RN
5,800	6	44	35	1,1	36	82	M16205800RT	M16205800RN
5,900	6	44	35	1,1	36	82	M16205900RT	M16205900RN
5,944	6	43	30	1,1	50	82	TFM56206250	–
6,000	6	44	35	1,1	36	82	M16206000RT	M16206000RN
6,100	8	53	43	1,1	36	91	M16206100RT	M16206100RN
6,200	8	53	43	1,1	36	91	M16206200RT	M16206200RN
6,300	8	53	43	1,1	36	91	M16206300RT	M16206300RN
6,350	8	43	32	1,2	48	82	TFM56205950	–
6,400	8	53	43	1,2	36	91	M16206400RT	M16206400RN
6,500	8	53	43	1,2	36	91	M16206500RT	M16206500RN
6,528	8	50	33	1,2	56	91	TFM56206530	–
6,600	8	53	43	1,2	36	91	M16206600RT	M16206600RN
6,700	8	53	43	1,2	36	91	M16206700RT	M16206700RN
6,800	8	53	43	1,2	36	91	M16206800RT	M16206800RN
6,900	8	53	43	1,3	36	91	M16206900RT	M16206900RN
7,000	8	53	43	1,3	36	91	M16207000RT	M16207000RN
7,100	8	53	43	1,3	36	91	M16207100RT	M16207100RN

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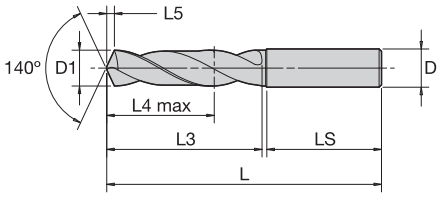

	P				M		S			H			
	3	4	5	6	1	2	2	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B53.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
7,145	8	50	36	1,3	53	91	TFM56207300	–
7,200	8	53	43	1,3	36	91	M16207200RT	M16207200RN
7,300	8	53	43	1,3	36	91	M16207300RT	M16207300RN
7,400	8	53	43	1,3	36	91	M16207400RT	M16207400RN
7,500	8	53	43	1,4	36	91	M16207500RT	M16207500RN
7,541	8	50	38	1,4	51	91	TFM56207500	–
7,600	8	53	43	1,4	36	91	M16207600RT	M16207600RN
7,700	8	53	43	1,4	36	91	M16207700RT	M16207700RN
7,800	8	53	43	1,4	36	91	M16207800RT	M16207800RN
7,900	8	53	43	1,4	36	91	M16207900RT	M16207900RN
7,938	8	50	40	1,4	49	91	TFM56208000	–
8,000	8	53	43	1,5	36	91	M16208000RT	M16208000RN
8,100	10	61	49	1,5	40	103	M16208100RT	M16208100RN
8,200	10	61	49	1,5	40	103	M16208200RT	M16208200RN
8,300	10	61	49	1,5	40	103	M16208300RT	M16208300RN
8,400	10	61	49	1,5	40	103	M16208400RT	M16208400RN
8,433	10	60	42	1,5	58	103	TFM56208430	–
8,500	10	61	49	1,5	40	103	M16208500RT	M16208500RN
8,600	10	61	49	1,6	40	103	M16208600RT	M16208600RN
8,700	10	61	49	1,6	40	103	M16208700RT	M16208700RN
8,733	10	60	44	1,6	57	103	TFM56208500	–
8,800	10	61	49	1,6	40	103	M16208800RT	M16208800RN
8,900	10	61	49	1,6	40	103	M16208900RT	M16208900RN
9,000	10	61	49	1,6	40	103	M16209000RT	M16209000RN
9,100	10	61	49	1,7	40	103	M16209100RT	M16209100RN
9,129	10	60	46	1,7	55	103	TFM56208900	–
9,200	10	61	49	1,7	40	103	M16209200RT	M16209200RN
9,300	10	61	49	1,7	40	103	M16209300RT	M16209300RN
9,347	10	60	47	1,7	54	103	TFM56209350	–
9,400	10	61	49	1,7	40	103	M16209400RT	M16209400RN
9,500	10	61	49	1,7	40	103	M16209500RT	M16209500RN
9,525	10	60	48	1,7	53	103	TFM56210000	–

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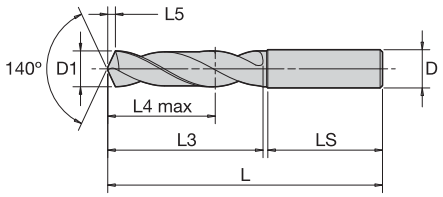

	P				M		S			H			
	3	4	5	6	1	2	2	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B53.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
9,600	10	61	49	1,7	40	103	**M16209600RT**	**M16209600RN**
9,700	10	61	49	1,8	40	103	**M16209700RT**	**M16209700RN**
9,800	10	61	49	1,8	40	103	**M16209800RT**	**M16209800RN**
9,900	10	61	49	1,8	40	103	**M16209900RT**	**M16209900RN**
9,921	11	66	50	1,8	59	111	**TFM56210100**	**–**
10,000	10	61	49	1,8	40	103	**M16210000RT**	**M16210000RN**
10,100	12	71	56	1,8	45	118	**M16210100RT**	**M16210100RN**
10,200	12	71	56	1,9	45	118	**M16210200RT**	**M16210200RN**
10,300	12	71	56	1,9	45	118	**M16210300RT**	**M16210300RN**
10,320	11	66	52	1,9	57	111	**TFM56210300**	**–**
10,400	12	71	56	1,9	45	118	**M16210400RT**	**M16210400RN**
10,500	12	71	56	1,9	45	118	**M16210500RT**	**M16210500RN**
10,600	12	71	56	1,9	45	118	**M16210600RT**	**M16210600RN**
10,700	12	71	56	1,9	45	118	**M16210700RT**	**M16210700RN**
10,716	11	66	54	2,0	55	111	**TFM56210500**	**–**
10,800	12	71	56	2,0	45	118	**M16210800RT**	**M16210800RN**
10,900	12	71	56	2,0	45	118	**M16210900RT**	**M16210900RN**
11,000	12	71	56	2,0	45	118	**M16211000RT**	**M16211000RN**
11,100	12	71	56	2,0	45	118	**M16211100RT**	**M16211100RN**
11,113	11	66	56	2,0	53	111	**TFM56211000**	**–**
11,200	12	71	56	2,0	45	118	**M16211200RT**	**M16211200RN**
11,300	12	71	56	2,1	45	118	**M16211300RT**	**M16211300RN**
11,400	12	71	56	2,1	45	118	**M16211400RT**	**M16211400RN**
11,500	12	71	56	2,1	45	118	**M16211500RT**	**M16211500RN**
11,509	13	70	58	2,1	58	118	**TFM56211500**	**–**
11,600	12	71	56	2,1	45	118	**M16211600RT**	**M16211600RN**
11,700	12	71	56	2,1	45	118	**M16211700RT**	**M16211700RN**
11,800	12	71	56	2,1	45	118	**M16211800RT**	**M16211800RN**

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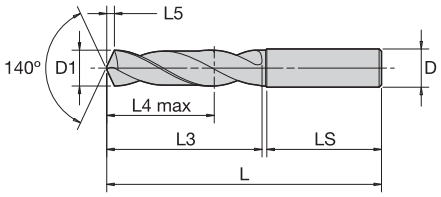


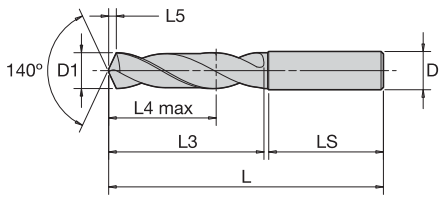
	P				M		S			H			
	3	4	5	6	1	2	2	3	4	1	2	3	4
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B53.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
11,900	12	71	56	2,2	45	118	**M16211900RT**	**M16211900RN**
11,908	13	70	60	2,2	56	118	**TFM56211900**	**–**
12,000	12	71	56	2,2	45	118	**M16212000RT**	**M16212000RN**
12,304	13	70	62	2,2	54	118	**TFM56212300**	**–**
12,500	14	77	60	2,3	45	124	**M16212500RT**	**M16212500RN**
12,700	13	70	64	2,3	52	118	**TFM56213000**	**–**
13,000	14	77	60	2,4	45	124	**M16213000RT**	**M16213000RN**
13,500	14	77	60	2,5	45	124	**M16213500RT**	**M16213500RN**
14,000	14	77	60	2,6	45	124	**M16214000RT**	**M16214000RN**
14,288	14	76	71	2,6	50	124	**TFM56214000**	**–**
14,500	16	83	63	2,6	48	133	**M16214500RT**	**M16214500RN**
15,000	16	83	63	2,7	48	133	**M16215000RT**	**M16215000RN**
15,500	16	83	63	2,8	48	133	**M16215500RT**	**M16215500RN**
15,875	16	82	79	2,9	51	133	**TFM56216000**	**–**
16,000	16	83	63	2,9	48	133	**M16216000RT**	**M16216000RN**
16,500	18	93	71	3,0	48	143	**M16216500RT**	**M16216500RN**
17,000	18	93	71	3,1	48	143	**M16217000RT**	**M16217000RN**
17,463	17	92	87	3,2	53	143	**TFM56217400**	**–**
17,500	18	93	71	3,2	48	143	**M16217500RT**	**M16217500RN**
18,000	18	93	71	3,3	48	143	**M16218000RT**	**M16218000RN**
18,500	20	101	77	3,4	50	153	**M16218500RT**	**M16218500RN**
19,000	20	101	77	3,5	50	153	**M16219000RT**	**M16219000RN**
19,050	19	95	95	3,5	45	143	**TFM56219000**	**–**
19,500	20	101	77	3,6	50	153	**M16219500RT**	**M16219500RN**
20,000	20	101	77	3,6	50	153	**M16220000RT**	**M16220000RN**

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance

D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	P		M			S			
	5	6	1	2	3	1	2	3	4
K20F-DCF	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B54.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF "A" Shank	K20F-DCF "E" Shank
3,000	6	20	14	0,5	36	62	**412513-000300**	**412511-000300**
3,100	6	20	14	0,6	36	62	**412513-000310**	**412511-000310**
3,200	6	20	14	0,6	36	62	**412513-000320**	**412511-000320**
3,250	6	20	14	0,6	36	62	**412513-000325**	**412511-000325**
3,300	6	20	14	0,6	36	62	**412513-000330**	**412511-000330**
3,400	6	20	14	0,6	36	62	**412513-000340**	**412511-000340**
3,500	6	20	14	0,6	36	62	**412513-000350**	**412511-000350**
3,600	6	20	14	0,7	36	62	**412513-000360**	**412511-000360**
3,700	6	20	14	0,7	36	62	**412513-000370**	**412511-000370**
3,800	6	24	17	0,7	36	66	**412513-000380**	**412511-000380**
3,900	6	24	17	0,7	36	66	**412513-000390**	**412511-000390**
4,000	6	24	17	0,7	36	66	**412513-000400**	**412511-000400**
4,100	6	24	17	0,7	36	66	**412513-000410**	**412511-000410**
4,200	6	24	17	0,8	36	66	**412513-000420**	**412511-000420**
4,300	6	24	17	0,8	36	66	**412513-000430**	**412511-000430**
4,400	6	24	17	0,8	36	66	**412513-000440**	**412511-000440**
4,500	6	24	17	0,8	36	66	**412513-000450**	**412511-000450**
4,600	6	24	17	0,8	36	66	**412513-000460**	**412511-000460**
4,650	6	24	17	0,8	36	66	**412513-000465**	**412511-000465**
4,700	6	24	17	0,9	36	66	**412513-000470**	**412511-000470**

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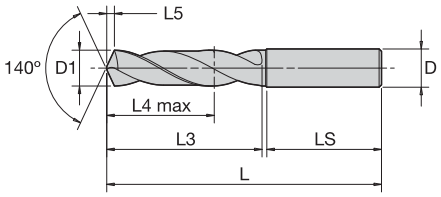

	P		M			S			
	5	6	1	2	3	1	2	3	4
K20F-DCF	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B54.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF "A" Shank	K20F-DCF "E" Shank
4,800	6	28	20	0,9	36	66	412513-000480	412511-000480
4,900	6	28	20	0,9	36	66	412513-000490	412511-000490
5,000	6	28	20	0,9	36	66	412513-000500	412511-000500
5,100	6	28	20	0,9	36	66	412513-000510	412511-000510
5,200	6	28	20	0,9	36	66	412513-000520	412511-000520
5,300	6	28	20	1,0	36	66	412513-000530	412511-000530
5,400	6	28	20	1,0	36	66	412513-000540	412511-000540
5,500	6	28	20	1,0	36	66	412513-000550	412511-000550
5,550	6	28	20	1,0	36	66	412513-000555	412511-000555
5,600	6	28	20	1,0	36	66	412513-000560	412511-000560
5,700	6	28	20	1,0	36	66	412513-000570	412511-000570
5,800	6	28	20	1,1	36	66	412513-000580	412511-000580
5,900	6	28	20	1,1	36	66	412513-000590	412511-000590
6,000	6	28	20	1,1	36	66	412513-000600	412511-000600
6,100	8	34	24	1,1	36	79	412513-000610	412511-000610
6,200	8	34	24	1,1	36	79	412513-000620	412511-000620
6,300	8	34	24	1,1	36	79	412513-000630	412511-000630
6,400	8	34	24	1,2	36	79	412513-000640	412511-000640
6,500	8	34	24	1,2	36	79	412513-000650	412511-000650
6,600	8	34	24	1,2	36	79	412513-000660	412511-000660
6,700	8	34	24	1,2	36	79	412513-000670	412511-000670
6,800	8	34	24	1,2	36	79	412513-000680	412511-000680
6,900	8	34	24	1,3	36	79	412513-000690	412511-000690
7,000	8	34	24	1,3	36	79	412513-000700	412511-000700
7,100	8	41	29	1,3	36	79	412513-000710	412511-000710
7,200	8	41	29	1,3	36	79	412513-000720	412511-000720
7,300	8	41	29	1,3	36	79	412513-000730	412511-000730
7,400	8	41	29	1,3	36	79	412513-000740	412511-000740
7,500	8	41	29	1,4	36	79	412513-000750	412511-000750
7,600	8	41	29	1,4	36	79	412513-000760	412511-000760
7,700	8	41	29	1,4	36	79	412513-000770	412511-000770
7,800	8	41	29	1,4	36	79	412513-000780	412511-000780
7,900	8	41	29	1,4	36	79	412513-000790	412511-000790
8,000	8	41	29	1,5	36	79	412513-000800	412511-000800
8,100	10	47	35	1,5	40	89	412513-000810	412511-000810
8,200	10	47	35	1,5	40	89	412513-000820	412511-000820

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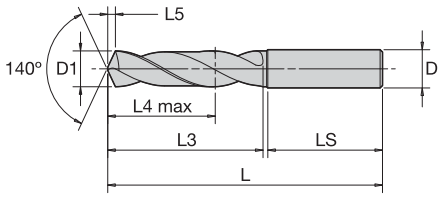

	P		M			S			
	5	6	1	2	3	1	2	3	4
K20F-DCF	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B54.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF “A” Shank	K20F-DCF “E” Shank
8,300	10	47	35	1,5	40	89	412513-000830	412511-000830
8,400	10	47	35	1,5	40	89	412513-000840	412511-000840
8,500	10	47	35	1,5	40	89	412513-000850	412511-000850
8,600	10	47	35	1,6	40	89	412513-000860	412511-000860
8,700	10	47	35	1,6	40	89	412513-000870	412511-000870
8,800	10	47	35	1,6	40	89	412513-000880	412511-000880
8,900	10	47	35	1,6	40	89	412513-000890	412511-000890
9,000	10	47	35	1,6	40	89	412513-000900	412511-000900
9,100	10	47	35	1,7	40	89	412513-000910	412511-000910
9,200	10	47	35	1,7	40	89	412513-000920	412511-000920
9,300	10	47	35	1,7	40	89	412513-000930	412511-000930
9,400	10	47	35	1,7	40	89	412513-000940	412511-000940
9,500	10	47	35	1,7	40	89	412513-000950	412511-000950
9,600	10	47	35	1,7	40	89	412513-000960	412511-000960
9,700	10	47	35	1,8	40	89	412513-000970	412511-000970
9,800	10	47	35	1,8	40	89	412513-000980	412511-000980
9,900	10	47	35	1,8	40	89	412513-000990	412511-000990
10,000	10	47	35	1,8	40	89	412513-001000	412511-001000
10,100	12	55	40	1,8	45	102	412513-001010	412511-001010
10,200	12	55	40	1,9	45	102	412513-001020	412511-001020
10,300	12	55	40	1,9	45	102	412513-001030	412511-001030
10,400	12	55	40	1,9	45	102	412513-001040	412511-001040
10,500	12	55	40	1,9	45	102	412513-001050	412511-001050
10,600	12	55	40	1,9	45	102	412513-001060	412511-001060
10,700	12	55	40	1,9	45	102	412513-001070	412511-001070
10,800	12	55	40	2,0	45	102	412513-001080	412511-001080
10,900	12	55	40	2,0	45	102	412513-001090	412511-001090
11,000	12	55	40	2,0	45	102	412513-001100	412511-001100
11,100	12	55	40	2,0	45	102	412513-001110	412511-001110
11,200	12	55	40	2,0	45	102	412513-001120	412511-001120
11,300	12	55	40	2,1	45	102	412511-001130	–
11,300	12	55	40	2,1	45	102	412513-001130	–

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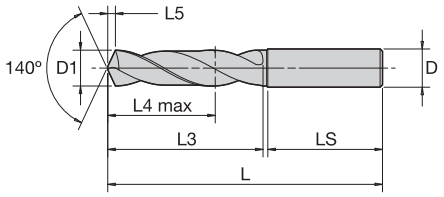


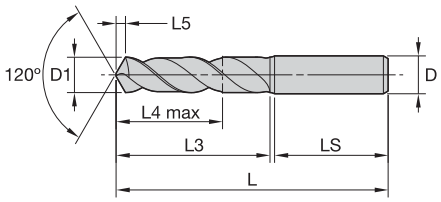
	P		M			S			
	5	6	1	2	3	1	2	3	4
K20F-DCF	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B54.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF "A" Shank	K20F-DCF "E" Shank
11,400	12	55	40	2,1	45	102	412513-001140	412511-001140
11,500	12	55	40	2,1	45	102	412513-001150	412511-001150
11,600	12	55	40	2,1	45	102	412513-001160	412511-001160
11,700	12	55	40	2,1	45	102	412513-001170	412511-001170
11,800	12	55	40	2,1	45	102	412513-001180	412511-001180
11,900	12	55	40	2,2	45	102	412513-001190	412511-001190
12,000	12	55	40	2,2	45	102	412513-001200	412511-001200
12,500	14	60	43	2,3	45	107	412513-001250	412511-001250
12,800	14	60	43	2,3	45	107	412513-001280	412511-001280
13,000	14	60	43	2,4	45	107	412513-001300	412511-001300
13,500	14	60	43	2,5	45	107	412513-001350	412511-001350
13,800	14	60	43	2,5	45	107	412513-001380	412511-001380
14,000	14	60	43	2,5	45	107	412513-001400	412511-001400
14,500	16	65	45	2,6	48	115	412513-001450	412511-001450
14,800	16	65	45	2,7	48	115	412513-001480	412511-001480
15,000	16	65	45	2,7	48	115	412513-001500	412511-001500
15,500	16	65	45	2,8	48	115	412513-001550	412511-001550
15,800	16	65	45	2,9	48	115	412513-001580	412511-001580
16,000	16	65	45	2,9	48	115	412513-001600	412511-001600
16,500	18	73	51	3,0	48	123	412513-001650	412511-001650
16,800	18	73	51	3,1	48	123	412513-001680	412511-001680
17,000	18	73	51	3,1	48	123	412513-001700	412511-001700
17,500	18	73	51	3,2	48	123	412513-001750	412511-001750
17,800	18	73	51	3,2	48	123	412513-001780	412511-001780
18,000	18	73	51	3,3	48	123	412513-001800	412511-001800
18,500	20	79	55	3,4	50	131	412513-001850	412511-001850
18,800	20	79	55	3,4	50	131	412513-001880	412511-001880
19,000	20	79	55	3,5	50	131	412513-001900	412511-001900
19,500	20	79	55	3,5	50	131	412513-001950	412511-001950
19,800	20	79	55	3,6	50	131	412513-001980	412511-001980
20,000	20	79	55	3,6	50	131	412513-002000	412511-002000

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance

D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	N			
	1	2	3	5
K10F-DCL	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B54.

D1	D	L3	L4 max	L5	LS	L	K10F-DCL
2,800	6	20	14	0,8	36	62	**517113-000280**
2,900	6	20	14	0,8	36	62	**517113-000290**
3,000	6	20	14	0,9	36	62	**517113-000300**
3,100	6	20	14	0,9	36	62	**517113-000310**
3,200	6	20	14	0,9	36	62	**517113-000320**
3,250	6	20	14	0,9	36	62	**517113-000325**
3,300	6	20	14	1,0	36	62	**517113-000330**
3,400	6	20	14	1,0	36	62	**517113-000340**
3,500	6	20	14	1,0	36	62	**517113-000350**
3,600	6	20	14	1,0	36	62	**517113-000360**
3,700	6	20	14	1,1	36	62	**517113-000370**
3,800	6	24	17	1,1	36	66	**517113-000380**
3,900	6	24	17	1,1	36	66	**517113-000390**
4,000	6	24	17	1,2	36	66	**517113-000400**
4,100	6	24	17	1,2	36	66	**517113-000410**
4,200	6	24	17	1,2	36	66	**517113-000420**

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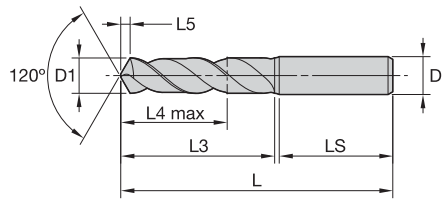

	N			
	1	2	3	5
K10F-DCL	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B54.

D1	D	L3	L4 max	L5	LS	L	K10F-DCL
4,300	6	24	17	1,2	36	66	**517113-000430**
4,400	6	24	17	1,3	36	66	**517113-000440**
4,500	6	24	17	1,3	36	66	**517113-000450**
4,600	6	24	17	1,3	36	66	**517113-000460**
4,650	6	24	17	1,3	36	66	**517113-000465**
4,700	6	24	17	1,4	36	66	**517113-000470**
4,800	6	28	20	1,4	36	66	**517113-000480**
4,900	6	28	20	1,4	36	66	**517113-000490**
5,000	6	28	20	1,4	36	66	**517113-000500**
5,100	6	28	20	1,5	36	66	**517113-000510**
5,200	6	28	20	1,5	36	66	**517113-000520**
5,300	6	28	20	1,5	36	66	**517113-000530**
5,400	6	28	20	1,6	36	66	**517113-000540**
5,500	6	28	20	1,6	36	66	**517113-000550**
5,550	6	28	20	1,6	36	66	**517113-000555**
5,600	6	28	20	1,6	36	66	**517113-000560**
5,700	6	28	20	1,6	36	66	**517113-000570**
5,800	6	28	20	1,7	36	66	**517113-000580**
5,900	6	28	20	1,7	36	66	**517113-000590**
6,000	6	28	20	1,7	36	66	**517113-000600**
6,100	8	34	24	1,8	36	79	**517113-000610**
6,200	8	34	24	1,8	36	79	**517113-000620**
6,300	8	34	24	1,8	36	79	**517113-000630**
6,400	8	34	24	1,8	36	79	**517113-000640**
6,500	8	34	24	1,9	36	79	**517113-000650**
6,600	8	34	24	1,9	36	79	**517113-000660**
6,700	8	34	24	1,9	36	79	**517113-000670**
6,800	8	34	24	2,0	36	79	**517113-000680**

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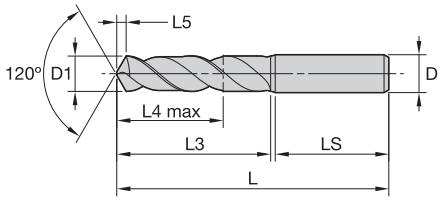

	N			
	1	2	3	5
K10F-DCL	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B54.

D1	D	L3	L4 max	L5	LS	L	K10F-DCL
6,900	8	34	24	2,0	36	79	**517113-000690**
7,000	8	34	24	2,0	36	79	**517113-000700**
7,100	8	41	29	2,1	36	79	**517113-000710**
7,200	8	41	29	2,1	36	79	**517113-000720**
7,300	8	41	29	2,1	36	79	**517113-000730**
7,400	8	41	29	2,1	36	79	**517113-000740**
7,450	8	41	29	2,2	36	79	**517113-000745**
7,500	8	41	29	2,2	36	79	**517113-000750**
7,600	8	41	29	2,2	36	79	**517113-000760**
7,700	8	41	29	2,2	36	79	**517113-000770**
7,800	8	41	29	2,3	36	79	**517113-000780**
7,900	8	41	29	2,3	36	79	**517113-000790**
8,000	8	41	29	2,3	36	79	**517113-000800**
8,100	10	47	35	2,3	40	89	**517113-000810**
8,200	10	47	35	2,4	40	89	**517113-000820**
8,300	10	47	35	2,4	40	89	**517113-000830**
8,400	10	47	35	2,4	40	89	**517113-000840**
8,500	10	47	35	2,5	40	89	**517113-000850**
8,600	10	47	35	2,5	40	89	**517113-000860**
8,700	10	47	35	2,5	40	89	**517113-000870**
8,800	10	47	35	2,5	40	89	**517113-000880**
8,900	10	47	35	2,6	40	89	**517113-000890**
9,000	10	47	35	2,6	40	89	**517113-000900**
9,100	10	47	35	2,6	40	89	**517113-000910**
9,200	10	47	35	2,7	40	89	**517113-000920**
9,300	10	47	35	2,7	40	89	**517113-000930**
9,400	10	47	35	2,7	40	89	**517113-000940**
9,500	10	47	35	2,7	40	89	**517113-000950**

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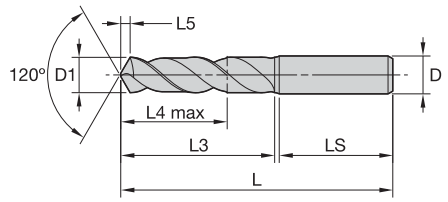


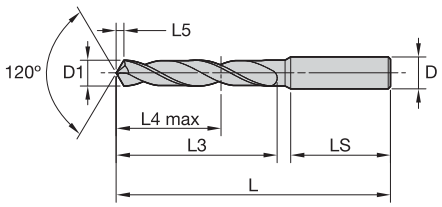
	N			
	1	2	3	5
K10F-DCL	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B54.

D1	D	L3	L4 max	L5	LS	L	K10F-DCL
9,600	10	47	35	2,8	40	89	**517113-000960**
9,700	10	47	35	2,8	40	89	**517113-000970**
9,800	10	47	35	2,8	40	89	**517113-000980**
9,900	10	47	35	2,9	40	89	**517113-000990**
10,000	10	47	35	2,9	40	89	**517113-001000**
10,100	12	55	40	2,9	45	102	**517113-001010**
10,200	12	55	40	2,9	45	102	**517113-001020**
10,300	12	55	40	3,0	45	102	**517113-001030**
10,400	12	55	40	3,0	45	102	**517113-001040**
10,500	12	55	40	3,0	45	102	**517113-001050**
10,600	12	55	40	3,1	45	102	**517113-001060**
10,700	12	55	40	3,1	45	102	**517113-001070**
10,800	12	55	40	3,1	45	102	**517113-001080**
10,900	12	55	40	3,1	45	102	**517113-001090**
11,000	12	55	40	3,2	45	102	**517113-001100**
11,100	12	55	40	3,2	45	102	**517113-001110**
11,200	12	55	40	3,2	45	102	**517113-001120**
11,300	12	55	40	3,3	45	102	**517113-001130**
11,400	12	55	40	3,3	45	102	**517113-001140**
11,500	12	55	40	3,3	45	102	**517113-001150**
11,600	12	55	40	3,3	45	102	**517113-001160**
11,700	12	55	40	3,4	45	102	**517113-001170**
11,800	12	55	40	3,4	45	102	**517113-001180**
11,900	12	55	40	3,4	45	102	**517113-001190**
12,000	12	55	40	3,5	45	102	**517113-001200**

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	N	
	1	2
TiCN	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

D1	D	L3	L4 max	L5	LS	L	TiCN
3,000	6	20	14	0,9	36	62	**TCM15903000**
3,100	6	20	14	0,9	36	62	**TCM15903100**
3,200	6	20	14	0,9	36	62	**TCM15903200**
3,300	6	20	14	1,0	36	62	**TCM15903300**
3,400	6	20	14	1,0	36	62	**TCM15903400**
3,500	6	20	14	1,0	36	62	**TCM15903500**
3,600	6	20	14	1,0	36	62	**TCM15903600**
3,700	6	20	14	1,1	36	62	**TCM15903700**
3,800	6	24	17	1,1	36	66	**TCM15903800**
3,900	6	24	17	1,1	36	66	**TCM15903900**
4,000	6	24	17	1,2	36	66	**TCM15904000**
4,100	6	24	17	1,2	36	66	**TCM15904100**
4,200	6	24	17	1,2	36	66	**TCM15904200**
4,300	6	24	17	1,2	36	66	**TCM15904300**
4,400	6	24	17	1,3	36	66	**TCM15904400**
4,500	6	24	17	1,3	36	66	**TCM15904500**
4,600	6	24	17	1,3	36	66	**TCM15904600**
4,700	6	24	17	1,4	36	66	**TCM15904700**
4,800	6	28	20	1,4	36	66	**TCM15904800**
4,900	6	28	20	1,4	36	66	**TCM15904900**

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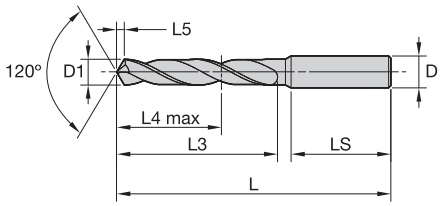

	N	
	1	2
TiCN	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

D1	D	L3	L4 max	L5	LS	L	TiCN
5,000	6	28	20	1,4	36	66	**TCM15905000**
5,100	6	28	20	1,5	36	66	**TCM15905100**
5,200	6	28	20	1,5	36	66	**TCM15905200**
5,300	6	28	20	1,5	36	66	**TCM15905300**
5,400	6	28	20	1,6	36	66	**TCM15905400**
5,500	6	28	20	1,6	36	66	**TCM15905500**
5,600	6	28	20	1,6	36	66	**TCM15905600**
5,700	6	28	20	1,6	36	66	**TCM15905700**
5,800	6	28	20	1,7	36	66	**TCM15905800**
5,900	6	28	20	1,7	36	66	**TCM15905900**
6,000	6	28	20	1,7	36	66	**TCM15906000**
6,100	8	34	24	1,8	36	79	**TCM15906100**
6,200	8	34	24	1,8	36	79	**TCM15906200**
6,300	8	34	24	1,8	36	79	**TCM15906300**
6,400	8	34	24	1,8	36	79	**TCM15906400**
6,500	8	34	24	1,9	36	79	**TCM15906500**
6,600	8	34	24	1,9	36	79	**TCM15906600**
6,700	8	34	24	1,9	36	79	**TCM15906700**
6,800	8	34	24	2,0	36	79	**TCM15906800**
6,900	8	34	24	2,0	36	79	**TCM15906900**
7,000	8	34	24	2,0	36	79	**TCM15907000**
7,100	8	41	29	2,1	36	79	**TCM15907100**
7,200	8	41	29	2,1	36	79	**TCM15907200**
7,300	8	41	29	2,1	36	79	**TCM15907300**
7,400	8	41	29	2,1	36	79	**TCM15907400**
7,500	8	41	29	2,2	36	79	**TCM15907500**
7,600	8	41	29	2,2	36	79	**TCM15907600**
7,700	8	41	29	2,2	36	79	**TCM15907700**
7,800	8	41	29	2,3	36	79	**TCM15907800**
7,900	8	41	29	2,3	36	79	**TCM15907900**
8,000	8	41	29	2,3	36	79	**TCM15908000**
8,100	10	47	35	2,3	40	89	**TCM15908100**

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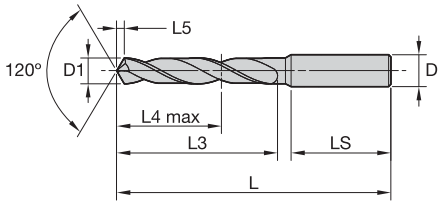

	N	
	1	2
TiCN	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

D1	D	L3	L4 max	L5	LS	L	TiCN
8,200	10	47	35	2,4	40	89	**TCM15908200**
8,300	10	47	35	2,4	40	89	**TCM15908300**
8,400	10	47	35	2,4	40	89	**TCM15908400**
8,500	10	47	35	2,5	40	89	**TCM15908500**
8,600	10	47	35	2,5	40	89	**TCM15908600**
8,700	10	47	35	2,5	40	89	**TCM15908700**
8,800	10	47	35	2,5	40	89	**TCM15908800**
8,900	10	47	35	2,6	40	89	**TCM15908900**
9,000	10	47	35	2,6	40	89	**TCM15909000**
9,100	10	47	35	2,6	40	89	**TCM15909100**
9,200	10	47	35	2,7	40	89	**TCM15909200**
9,300	10	47	35	2,7	40	89	**TCM15909300**
9,400	10	47	35	2,7	40	89	**TCM15909400**
9,500	10	47	35	2,7	40	89	**TCM15909500**
9,600	10	47	35	2,8	40	89	**TCM15909600**
9,700	10	47	35	2,8	40	89	**TCM15909700**
9,800	10	47	35	2,8	40	89	**TCM15909800**
9,900	10	47	35	2,9	40	89	**TCM15909900**
10,000	10	47	35	2,9	40	89	**TCM15910000**
10,100	12	55	40	2,9	45	102	**TCM15910100**
10,200	12	55	40	2,9	45	102	**TCM15910200**
10,300	12	55	40	3,0	45	102	**TCM15910300**
10,400	12	55	40	3,0	45	102	**TCM15910400**
10,500	12	55	40	3,0	45	102	**TCM15910500**
10,600	12	55	40	3,1	45	102	**TCM15910600**
10,700	12	55	40	3,1	45	102	**TCM15910700**
10,800	12	55	40	3,1	45	102	**TCM15910800**
10,900	12	55	40	3,1	45	102	**TCM15910900**
11,000	12	55	40	3,2	45	102	**TCM15911000**
11,100	12	55	40	3,2	45	102	**TCM15911100**
11,200	12	55	40	3,2	45	102	**TCM15911200**
11,300	12	55	40	3,3	45	102	**TCM15911300**

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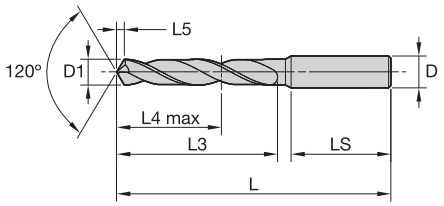


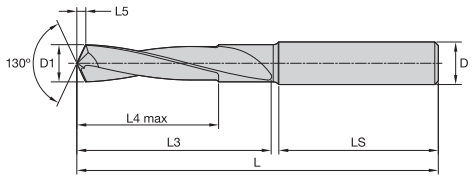
	N	
	1	2
TiCN	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

D1	D	L3	L4 max	L5	LS	L	TiCN
11,400	12	55	40	3,3	45	102	**TCM15911400**
11,500	12	55	40	3,3	45	102	**TCM15911500**
11,600	12	55	40	3,4	45	102	**TCM15911600**
11,700	12	55	40	3,4	45	102	**TCM15911700**
11,800	12	55	40	3,4	45	102	**TCM15911800**
11,900	12	55	40	3,4	45	102	**TCM15911900**
12,000	12	55	40	3,5	45	102	**TCM15912000**
12,500	14	60	43	3,6	45	107	**TCM15912500**
13,000	14	60	43	3,8	45	107	**TCM15913000**
13,100	14	60	43	3,8	45	107	**TCM15913100**
13,500	14	60	43	3,9	45	107	**TCM15913500**
13,800	14	60	43	4,0	45	107	**TCM15913800**
14,000	14	60	43	4,0	45	107	**TCM15914000**
14,500	16	65	45	4,2	48	115	**TCM15914500**
14,800	16	65	45	4,3	48	115	**TCM15914800**
15,000	16	65	45	4,3	48	115	**TCM15915000**
15,500	16	65	45	4,5	48	115	**TCM15915500**
15,800	16	65	45	4,6	48	115	**TCM15915800**
16,000	16	65	45	4,6	48	115	**TCM15916000**
16,500	18	73	51	4,8	48	123	**TCM15916500**
16,800	18	73	51	4,9	48	123	**TCM15916800**
17,000	18	73	51	4,9	48	123	**TCM15917000**
17,500	18	73	51	5,1	48	123	**TCM15917500**
18,000	18	73	51	5,2	48	123	**TCM15918000**
18,500	20	79	55	5,3	50	131	**TCM15918500**
19,000	20	79	55	5,5	50	131	**TCM15919000**
19,500	20	79	55	5,6	50	131	**TCM15919500**
20,000	20	79	55	5,8	50	131	**TCM15920000**
20,500	22	83	55	5,9	50	133	**TCM15920500**

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

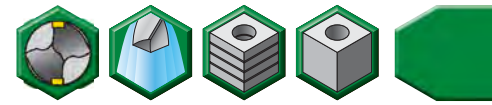
	H			
	1	2	3	4
K10F-DCX	●	●	●	●

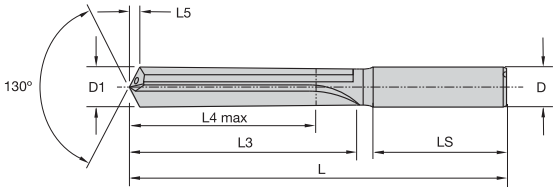
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B55.

D1	D	L3	L4 max	L5	LS	L	K10F-DCX
3,500	6	20	14	0,8	36	62	**412516-000350**
4,000	6	24	17	0,9	36	66	**412516-000400**
4,400	6	24	17	1,0	36	66	**412516-000440**
5,000	6	28	20	1,2	36	66	**412516-000500**
5,300	6	28	20	1,2	36	66	**412516-000530**
6,000	6	28	20	1,4	36	79	**412516-000600**
7,100	8	41	29	1,7	36	79	**412516-000710**
8,000	8	41	20	1,9	36	79	**412516-000800**
8,801	10	47	35	2,1	40	89	**412516-000880**
10,000	10	47	35	2,3	40	89	**412516-001000**
10,500	12	55	40	2,4	45	102	**412516-001050**

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.





Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,010/-0,010	6	0,000/-0,008
>6 to 10	0,010/-0,010	8 to 10	0,000/-0,009
>10 to 18	0,010/-0,010	12 to 18	0,000/-0,011
>18 to 21	0,010/-0,010	20	0,000/-0,013

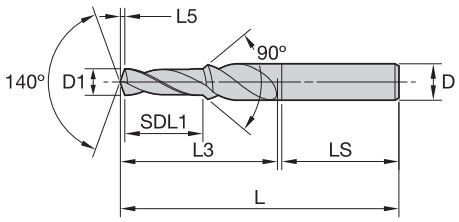
	H			
	1	2	3	4
K10F-DCX	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B55.

D1	D	L3	L4 max	L5	LS	L	K10F-DCX
1,000	1	7	6	0,2	31	38	412523-000100
1,500	2	10	8	0,4	28	38	412523-000150
2,000	2	11	9	0,5	27	38	412523-000200
2,500	3	15	13	0,6	23	38	412523-000250
2,700	3	15	16	0,6	23	38	412523-000270
3,000	3	18	16	0,7	20	38	412523-000300
3,300	3	18	16	0,8	20	38	412523-000330
3,500	4	19	16	0,8	31	50	412523-000350
4,000	4	19	16	0,9	31	50	412523-000400
4,200	4	19	16	1,0	31	50	412523-000420
4,500	5	20	16	1,0	30	50	412523-000450
5,000	5	23	19	1,2	27	50	412523-000500
5,500	6	24	19	1,3	26	50	412523-000550
6,000	6	24	19	1,4	26	50	412523-000600
6,500	7	24	19	1,5	26	50	412523-000650
6,800	7	24	19	1,6	39	63	412523-000680
7,000	7	24	19	1,6	39	63	412523-000700
8,000	8	25	19	1,9	38	63	412523-000800
8,500	9	25	25	2,0	38	63	412523-000850
10,000	10	32	25	2,3	38	70	412523-001000
10,200	10	32	25	2,4	38	70	412523-001020
12,000	12	34	25	2,8	41	75	412523-001200
14,000	14	38	28	3,3	51	89	412523-001400

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,000/0,000	6	0,000/-0,008
>6 to 10	0,000/0,000	8 to 10	0,000/-0,009
>10 to 18	0,000/0,000	12 to 18	0,000/-0,011
>18 to 21	0,000/0,000	20	0,000/-0,013

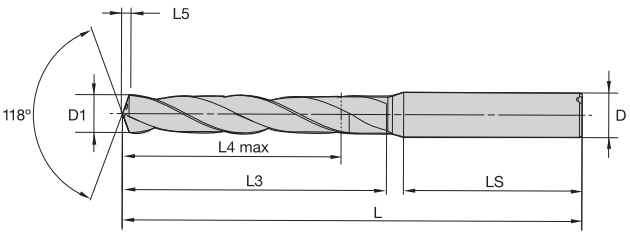
	P						K			N				
	1	2	3	4	5	6	1	2	3	1	2	4	5	4
K20F-DCF	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B55.

D1	D	L3	SDL1	L5	LS	L	K20F-DCF
3,300	6	28	11,4	0,6	36	66	**412846-004533**
4,200	6	28	13,6	0,8	36	66	**412846-006042**
5,000	8	41	16,5	0,9	36	79	**412846-008050**
6,800	10	47	21,0	1,2	40	89	**412846-010068**
8,500	12	55	25,5	1,5	45	102	**412846-012085**
10,200	14	60	30,0	1,9	45	107	**412846-140102**
12,000	16	65	34,5	2,2	48	115	**412846-160120**
14,000	18	73	38,5	2,5	48	123	**412846-180140**

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



	P						M			K		N			S	
	1	2	3	4	5	6	1	2	3	1	2	1	2	3	1	2
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B56.

D1	D	L3	L4 max	L5	LS	L	Uncoated	TiAlN
0,500	1	6	4	0,2	20	26	M13200500..	M13200500RT
0,600	1	6	4	0,2	20	26	M13200600..	M13200600RT
0,700	1	6	4	0,2	20	26	M13200700..	M13200700RT
0,800	1	6	4	0,2	20	26	M13200800..	M13200800RT
0,900	1	6	4	0,3	20	26	M13200900..	M13200900RT
1,000	1	6	4	0,3	20	26	M13201000..	M13201000RT
1,100	1	7	5	0,3	21	28	M13201100..	M13201100RT
1,200	1	8	6	0,4	22	30	M13201200..	M13201200RT
1,300	1	8	6	0,4	22	30	M13201300..	M13201300RT
1,400	1	9	9	0,4	23	32	–	M13201400RT
1,400	1	9	6	0,4	23	32	M13201400..	–
1,500	2	9	7	0,5	23	32	M13201500..	M13201500RT
1,600	2	10	7	0,5	24	34	M13201600..	M13201600RT
1,700	2	10	7	0,5	24	34	M13201700..	M13201700RT
1,800	2	11	8	0,5	25	36	M13201800..	M13201800RT
1,900	2	11	8	0,6	25	36	M13201900..	M13201900RT

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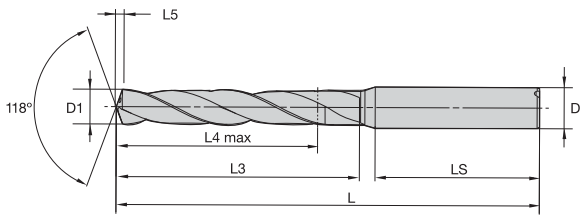

	P						M			K		N			S	
	1	2	3	4	5	6	1	2	3	1	2	1	2	3	1	2
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B56.

D1	D	L3	L4 max	L5	LS	L	Uncoated	TiAlN
2,000	2	12	9	0,6	26	38	M13202000..	M13202000RT
2,100	2	12	9	0,6	26	38	M13202100..	M13202100RT
2,200	2	13	10	0,7	27	40	M13202200..	M13202200RT
2,300	2	13	10	0,7	27	40	M13202300..	M13202300RT
2,400	2	14	11	0,7	29	43	M13202400..	M13202400RT
2,500	3	14	12	0,8	29	43	M13202500..	M13202500RT
2,600	3	14	12	0,8	29	43	M13202600..	M13202600RT
2,700	3	16	12	0,8	30	46	M13202700..	M13202700RT
2,800	3	16	12	0,8	30	46	M13202800..	M13202800RT
2,900	3	16	12	0,9	30	46	M13202900..	M13202900RT
3,000	3	16	12	0,9	30	46	M13203000..	M13203000RT
3,100	3	18	14	0,9	31	49	M13203100..	M13203100RT
3,200	3	18	14	1,0	31	49	M13203200..	M13203200RT
3,300	3	18	14	1,0	31	49	M13203300..	M13203300RT
3,400	3	20	15	1,0	32	52	M13203400..	M13203400RT
3,500	4	20	15	1,1	32	52	M13203500..	M13203500RT
3,600	4	20	15	1,1	32	52	M13203600..	M13203600RT
3,700	4	20	15	1,1	32	52	M13203700..	M13203700RT
3,800	4	22	17	1,1	33	55	M13203800..	M13203800RT
3,900	4	22	17	1,2	33	55	M13203900..	M13203900RT
4,000	4	22	17	1,2	33	55	M13204000..	M13204000RT
4,100	4	22	17	1,2	33	55	M13204100..	M13204100RT
4,200	4	22	17	1,3	33	55	M13204200..	M13204200RT
4,300	4	24	18	1,3	34	58	M13204300..	M13204300RT
4,400	4	24	18	1,3	34	58	M13204400..	M13204400RT
4,500	5	24	18	1,4	34	58	M13204500..	M13204500RT
4,600	5	24	18	1,4	34	58	M13204600..	M13204600RT
4,700	5	24	18	1,4	34	58	M13204700..	M13204700RT

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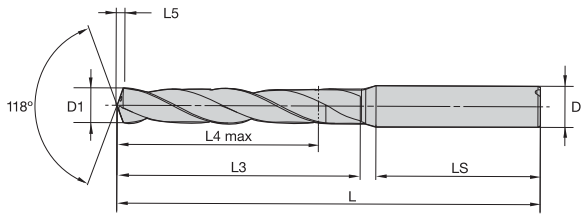

	P						M			K		N			S	
	1	2	3	4	5	6	1	2	3	1	2	1	2	3	1	2
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B56.

D1	D	L3	L4 max	L5	LS	L	Uncoated	TiAlN
4,800	5	26	20	1,4	36	62	M13204800..	M13204800RT
4,900	5	26	20	1,5	36	62	M13204900..	M13204900RT
5,000	5	26	20	1,5	36	62	M13205000..	M13205000RT
5,100	5	26	20	1,5	36	62	M13205100..	M13205100RT
5,200	5	26	20	1,6	36	62	M13205200..	M13205200RT
5,300	5	26	20	1,6	36	62	M13205300..	M13205300RT
5,400	5	28	21	1,6	38	66	M13205400..	M13205400RT
5,500	6	28	21	1,7	38	66	M13205500..	M13205500RT
5,600	6	28	21	1,7	38	66	M13205600..	M13205600RT
5,700	6	28	21	1,7	38	66	M13205700..	M13205700RT
5,800	6	28	21	1,7	38	66	M13205800..	M13205800RT
5,900	6	28	21	1,8	38	66	M13205900..	M13205900RT
6,000	6	28	21	1,8	38	66	M13206000..	M13206000RT
6,100	6	31	23	1,8	39	70	M13206100..	M13206100RT
6,200	6	31	23	1,9	39	70	M13206200..	M13206200RT
6,300	6	31	23	1,9	39	70	M13206300..	M13206300RT
6,400	6	31	23	1,9	39	70	M13206400..	M13206400RT
6,500	7	31	23	2,0	39	70	M13206500..	M13206500RT
6,600	7	31	23	2,0	39	70	M13206600..	M13206600RT
6,700	7	31	23	2,0	39	70	M13206700..	M13206700RT
6,800	7	34	25	2,0	40	74	M13206800..	M13206800RT
6,900	7	34	25	2,1	40	74	M13206900..	M13206900RT
7,000	7	34	25	2,1	40	74	M13207000..	M13207000RT
7,100	7	34	25	2,1	40	74	M13207100..	M13207100RT
7,200	7	34	25	2,2	40	74	M13207200..	M13207200RT
7,300	7	34	25	2,2	40	74	M13207300..	M13207300RT
7,400	7	34	25	2,2	40	74	M13207400..	M13207400RT
7,500	8	34	25	2,3	40	74	M13207500..	M13207500RT

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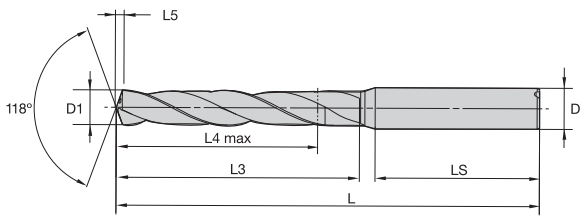

	P						M			K		N			S	
	1	2	3	4	5	6	1	2	3	1	2	1	2	3	1	2
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B56.

D1	D	L3	L4 max	L5	LS	L	Uncoated	TiAlN
7,600	8	37	27	2,3	42	79	M13207600..	M13207600RT
7,700	8	37	27	2,3	42	79	M13207700..	M13207700RT
7,800	8	37	27	2,3	42	79	M13207800..	M13207800RT
7,900	8	37	27	2,4	42	79	M13207900..	M13207900RT
8,000	8	37	27	2,4	42	79	M13208000..	M13208000RT
8,100	8	37	27	2,4	42	79	M13208100..	M13208100RT
8,200	8	37	27	2,5	42	79	M13208200..	M13208200RT
8,300	8	37	27	2,5	42	79	M13208300..	M13208300RT
8,400	8	37	27	2,5	42	79	M13208400..	M13208400RT
8,500	9	37	27	2,6	42	79	M13208500..	M13208500RT
8,600	9	40	29	2,6	44	84	M13208600..	M13208600RT
8,700	9	40	29	2,6	44	84	M13208700..	M13208700RT
8,800	9	40	29	2,6	44	84	M13208800..	M13208800RT
8,900	9	40	29	2,7	44	84	M13208900..	M13208900RT
9,000	9	40	29	2,7	44	84	M13209000..	M13209000RT
9,100	9	40	29	2,7	44	84	M13209100..	M13209100RT
9,200	9	40	29	2,8	44	84	M13209200..	M13209200RT
9,300	9	40	29	2,8	44	84	M13209300..	M13209300RT
9,400	9	40	29	2,8	44	84	M13209400..	M13209400RT
9,500	10	40	29	2,9	44	84	M13209500..	M13209500RT
9,600	10	43	31	2,9	46	89	M13209600..	M13209600RT
9,700	10	43	31	2,9	46	89	M13209700..	M13209700RT
9,800	10	43	31	2,9	46	89	M13209800..	M13209800RT
9,900	10	43	31	3,0	46	89	M13209900..	M13209900RT

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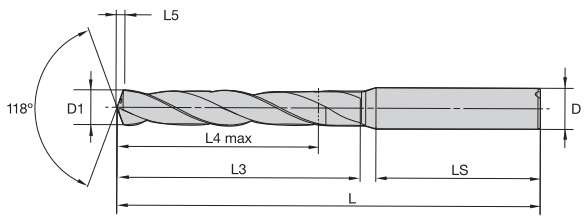


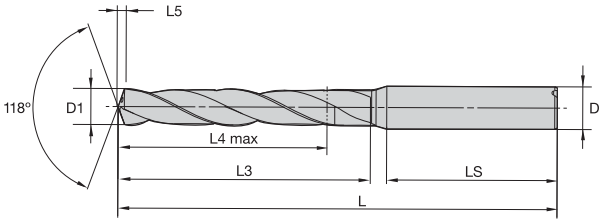
	P						M			K		N			S	
	1	2	3	4	5	6	1	2	3	1	2	1	2	3	1	2
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B56.

D1	D	L3	L4 max	L5	LS	L	Uncoated	TiAlN
10,000	10	43	31	3,0	46	89	M13210000..	M13210000RT
10,200	10	43	31	3,1	46	89	M13210200..	M13210200RT
10,500	11	43	31	3,2	46	89	M13210500..	M13210500RT
10,800	11	47	33	3,2	48	95	M13210800..	M13210800RT
11,000	11	47	33	3,3	48	95	M13211000..	M13211000RT
11,500	12	47	33	3,5	48	95	M13211500..	M13211500RT
11,800	12	47	35	3,5	48	95	M13211800..	M13211800RT
12,000	12	51	35	3,6	51	102	M13212000..	M13212000RT
12,500	13	51	35	3,8	51	102	M13212500..	M13212500RT
13,000	13	51	35	3,9	51	102	M13213000..	M13213000RT
13,500	14	54	37	4,1	53	107	M13213500..	M13213500RT
14,000	14	54	37	4,2	53	107	M13214000..	M13214000RT
14,500	15	56	38	4,4	55	111	M13214500..	M13214500RT
15,000	15	56	38	4,5	55	111	M13215000..	M13215000RT
15,500	16	58	38	4,7	57	115	M13215500..	M13215500RT
16,000	16	58	38	4,8	57	115	M13216000..	M13216000RT
16,500	17	60	39	5,0	59	119	M13216500..	M13216500RT
17,000	17	60	39	5,1	59	119	M13217000..	M13217000RT
17,500	18	62	40	5,3	61	123	M13217500..	M13217500RT
18,000	18	62	40	5,4	61	123	M13218000..	M13218000RT
18,500	19	64	41	5,6	63	127	M13218500..	M13218500RT
19,000	19	64	41	5,7	63	127	M13219000..	M13219000RT
19,500	20	66	42	5,9	65	131	M13219500..	M13219500RT
20,000	20	66	42	6,0	65	131	M13220000..	M13220000RT

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



	P						M			K		N			S	
	1	2	3	4	5	6	1	2	3	1	2	1	2	3	1	2
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B56.

D1	D	L3	L4 max	L5	LS	L	Uncoated	TiAlN
1,000	1	12	10	0,3	22	34	M11201000..	M11201000RT
1,100	1	14	12	0,3	22	36	M11201100..	M11201100RT
1,200	1	16	14	0,4	22	38	M11201200..	M11201200RT
1,300	1	16	14	0,4	22	38	M11201300..	M11201300RT
1,400	1	18	15	0,4	22	40	M11201400..	M11201400RT
1,500	2	18	15	0,5	22	40	M11201500..	M11201500RT
1,600	2	20	17	0,5	23	43	M11201600..	M11201600RT
1,700	2	20	17	0,5	23	43	M11201700..	M11201700RT
1,800	2	22	19	0,5	23	46	M11201800..	M11201800RT
1,900	2	22	19	0,6	24	46	M11201900..	M11201900RT
2,000	2	24	21	0,6	25	49	M11202000..	M11202000RT
2,100	2	24	21	0,6	25	49	M11202100..	M11202100RT
2,200	2	27	24	0,7	26	53	M11202200..	M11202200RT
2,300	2	27	24	0,7	26	53	M11202300..	M11202300RT
2,400	2	30	27	0,7	27	57	M11202400..	M11202400RT
2,500	3	30	27	0,8	27	57	M11202500..	M11202500RT
2,600	3	30	27	0,8	27	57	M11202600..	M11202600RT
2,700	3	33	29	0,8	28	61	M11202700..	M11202700RT
2,800	3	33	29	0,8	28	61	M11202800..	M11202800RT
2,900	3	33	29	0,9	28	61	M11202900..	M11202900RT

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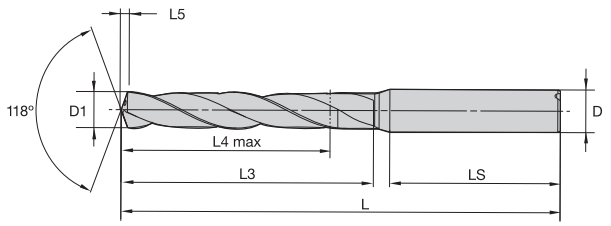

	P						M			K		N			S	
	1	2	3	4	5	6	1	2	3	1	2	1	2	3	1	2
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B56.

D1	D	L3	L4 max	L5	LS	L	Uncoated	TiAlN
3,000	3	33	29	0,9	28	61	M11203000..	M11203000RT
3,100	3	36	32	0,9	29	65	M11203100..	M11203100RT
3,200	3	36	32	1,0	29	65	M11203200..	M11203200RT
3,300	3	36	32	1,0	29	65	M11203300..	M11203300RT
3,400	3	39	34	1,0	31	70	M11203400..	M11203400RT
3,500	4	39	34	1,1	31	70	M11203500..	M11203500RT
3,600	4	39	34	1,1	31	70	M11203600..	–
3,700	4	39	34	1,1	31	70	M11203700..	M11203700RT
3,800	4	43	38	1,1	32	75	M11203800..	M11203800RT
3,900	4	43	38	1,2	32	75	M11203900..	M11203900RT
4,000	4	43	38	1,2	32	75	M11204000..	M11204000RT
4,100	4	43	38	1,2	32	75	M11204100..	M11204100RT
4,200	4	43	38	1,3	32	75	M11204200..	M11204200RT
4,300	4	47	41	1,3	33	80	M11204300..	M11204300RT
4,400	4	47	41	1,3	33	80	M11204400..	M11204400RT
4,500	5	47	41	1,4	33	80	M11204500..	M11204500RT
4,600	5	47	41	1,4	33	80	M11204600..	M11204600RT
4,700	5	47	41	1,4	33	80	M11204700..	M11204700RT
4,800	5	52	46	1,4	34	86	M11204800..	M11204800RT
4,900	5	52	46	1,5	34	86	M11204900..	M11204900RT
5,000	5	52	46	1,5	34	86	M11205000..	M11205000RT
5,100	5	52	46	1,5	34	86	M11205100..	M11205100RT
5,200	5	52	46	1,6	34	86	M11205200..	M11205200RT
5,300	5	52	46	1,6	34	86	M11205300..	M11205300RT
5,400	5	57	50	1,6	36	93	M11205400..	M11205400RT
5,500	6	57	50	1,7	36	93	M11205500..	M11205500RT
5,600	6	57	50	1,7	36	93	M11205600..	M11205600RT
5,700	6	57	50	1,7	36	93	M11205700..	M11205700RT
5,800	6	57	50	1,7	36	93	M11205800..	M11205800RT
5,900	6	57	50	1,8	36	93	M11205900..	M11205900RT
6,000	6	57	50	1,8	36	93	M11206000..	M11206000RT
6,100	6	63	55	1,8	38	101	M11206100..	M11206100RT

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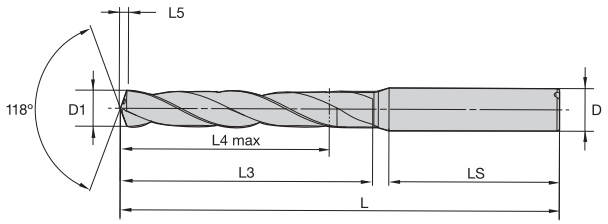

	P						M			K		N			S	
	1	2	3	4	5	6	1	2	3	1	2	1	2	3	1	2
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B56.

D1	D	L3	L4 max	L5	LS	L	Uncoated	TiAlN
6,200	6	63	55	1,9	38	101	M11206200..	M11206200RT
6,300	6	63	55	1,9	38	101	M11206300..	M11206300RT
6,400	6	63	55	1,9	38	101	M11206400..	M11206400RT
6,500	7	63	55	2,0	38	101	M11206500..	M11206500RT
6,600	7	63	55	2,0	38	101	M11206600..	M11206600RT
6,700	7	63	55	2,0	38	101	M11206700..	M11206700RT
6,800	7	69	60	2,0	40	109	M11206800..	M11206800RT
6,900	7	69	60	2,1	40	109	M11206900..	M11206900RT
7,000	7	69	60	2,1	40	109	M11207000..	M11207000RT
7,100	7	69	60	2,1	40	109	M11207100..	M11207100RT
7,200	7	69	60	2,2	40	109	M11207200..	M11207200RT
7,300	7	69	60	2,2	40	109	M11207300..	M11207300RT
7,400	7	69	60	2,2	40	109	M11207400..	M11207400RT
7,500	8	69	60	2,3	40	109	M11207500..	M11207500RT
7,600	8	75	65	2,3	42	117	M11207600..	M11207600RT
7,700	8	75	65	2,3	42	117	M11207700..	M11207700RT
7,800	8	75	65	2,3	42	117	M11207800..	M11207800RT
7,900	8	75	65	2,4	42	117	M11207900..	M11207900RT
8,000	8	75	65	2,4	42	117	M11208000..	M11208000RT
8,100	8	75	65	2,4	42	117	M11208100..	M11208100RT
8,200	8	75	65	2,5	42	117	M11208200..	M11208200RT
8,300	8	75	65	2,5	42	117	M11208300..	M11208300RT
8,400	8	75	65	2,5	42	117	M11208400..	M11208400RT
8,500	9	75	65	2,6	42	117	M11208500..	M11208500RT
8,600	9	81	70	2,6	44	125	M11208600..	M11208600RT
8,700	9	81	70	2,6	44	125	M11208700..	M11208700RT
8,800	9	81	70	2,6	44	125	M11208800..	M11208800RT
8,900	9	81	70	2,7	44	125	M11208900..	M11208900RT
9,000	9	81	70	2,7	44	125	M11209000..	M11209000RT
9,100	9	81	70	2,7	44	125	M11209100..	M11209100RT
9,200	9	81	70	2,8	44	125	M11209200..	M11209200RT
9,300	9	81	70	2,8	44	125	M11209300..	M11209300RT

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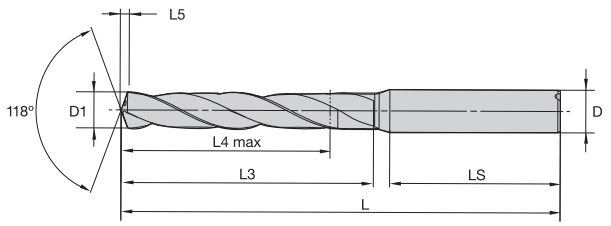


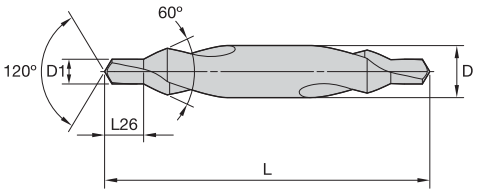
	P						M			K		N			S	
	1	2	3	4	5	6	1	2	3	1	2	1	2	3	1	2
Uncoated	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B56.

D1	D	L3	L4 max	L5	LS	L	Uncoated	TiAlN
9,400	9	81	70	2,8	44	125	M11209400..	M11209400RT
9,500	10	81	70	2,9	44	125	M11209500..	M11209500RT
9,600	10	87	75	2,9	46	133	M11209600..	M11209600RT
9,700	10	87	75	2,9	46	133	M11209700..	M11209700RT
9,800	10	87	75	2,9	46	133	M11209800..	M11209800RT
9,900	10	87	75	3,0	46	133	M11209900..	M11209900RT
10,000	10	87	75	3,0	46	133	M11210000..	M11210000RT
10,200	10	87	75	3,1	46	133	M11210200..	M11210200RT
10,500	11	87	75	3,2	46	133	M11210500..	M11210500RT
10,800	11	94	80	3,2	48	142	M11210800..	M11210800RT
11,000	11	94	80	3,3	48	142	M11211000..	M11211000RT
11,500	12	94	80	3,5	48	142	M11211500..	M11211500RT
12,000	12	101	85	3,6	50	151	M11212000..	M11212000RT
12,500	13	101	85	3,8	50	151	M11212500..	M11212500RT
13,000	13	101	85	3,9	50	151	M11213000..	M11213000RT
13,500	14	108	91	4,1	52	160	M11213500..	M11213500RT
14,000	14	108	91	4,2	52	160	M11214000..	M11214000RT
14,500	15	114	96	4,4	55	169	M11214500..	M11214500RT
15,000	15	114	96	4,5	55	169	M11215000..	M11215000RT
15,500	16	120	100	4,7	57	178	M11215500..	M11215500RT
16,000	16	120	100	4,8	57	178	M11216000..	M11216000RT
16,500	17	125	100	5,0	57	184	M11216500..	M11216500RT
17,000	17	125	100	5,1	57	184	M11217000..	M11217000RT
17,500	18	130	100	5,3	57	191	M11217500..	M11217500RT
18,000	18	130	100	5,4	57	191	M11218000..	M11218000RT
18,500	19	135	100	5,6	57	198	M11218500..	M11218500RT
19,000	19	135	100	5,7	57	198	M11219000..	M11219000RT
19,500	20	140	100	5,9	57	205	M11219500..	M11219500RT
20,000	20	140	100	6,0	57	205	M11220000..	M11220000RT

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance

D1	Tolerance H13	D	Tolerance h9
>3 to 6	0,000/+0,180	6	0,000/-0,030
>6 to 10	0,000/+0,220	8 to 10	0,000/-0,036
		12 to 18	0,000/-0,043
		20	0,000/-0,052

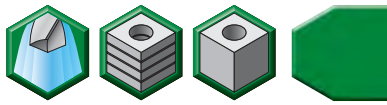
	K			N					S	
	1	2	3	1	2	3	4	5	3	4
K10	●	●	●	●	●	●	●	●	●	●

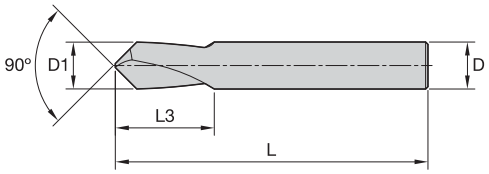
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

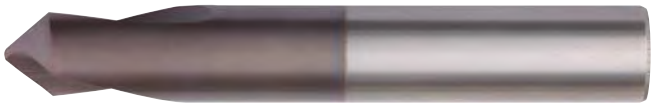
For material descriptions, see Inside Back Cover.
For application data, see page B56.

D1	D	L	L26	K10
0,500	3	25	0,8	**012601-000050**
0,800	3	25	1,1	**012601-000080**
1,000	3	32	1,3	**012601-000100**
1,250	3	32	1,6	**012601-000125**
1,600	4	36	2,0	**012601-000160**
2,000	5	40	2,5	**012601-000200**
2,500	6	45	3,1	**012601-000250**
3,150	8	50	3,9	**012601-000315**
4,000	10	56	5,0	**012601-000400**
5,000	13	63	6,3	**012601-000500**
6,300	16	71	8,0	**012601-000630**

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.







Tolerance			
D1	Tolerance h7	D	Tolerance h7
>3 to 6	0,000/-0,012	6	0,000/-0,012
>6 to 10	0,000/-0,015	8 to 10	0,000/-0,015
>10 to 18	0,000/-0,018	12 to 18	0,000/-0,018
>18 to 21	0,000/-0,021	20	0,000/-0,021

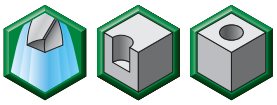
	P						M			K			N			S			H
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	1	2	3	1
K20F-DCF	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

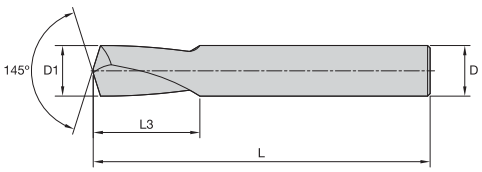
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B57.

				K20F-DCF
D1	D	L3	L	TiN
5,000	5	10	62	**412611-000050**
6,000	6	15	66	**412611-000060**
8,000	8	17	79	**412611-000080**
10,000	10	20	89	**412611-000100**
12,000	12	25	102	**412611-000120**
14,000	14	30	107	**412611-000140**
16,000	16	35	115	**412611-000160**
20,000	20	40	131	**412611-000200**

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.





Tolerance			
D1	Tolerance h7	D	Tolerance h7
>3 to 6	0,000/-0,012	6	0,000/-0,012
>6 to 10	0,000/-0,015	8 to 10	0,000/-0,015
>10 to 18	0,000/-0,018	12 to 18	0,000/-0,018
>18 to 21	0,000/-0,021	20	0,000/-0,021

	P						M			K		N			S				H
	1	2	3	4	5	6	1	2	3	1	2	1	2	3	1	2	3	4	1
K20F-DCF	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B57.

				K20F-DCF
D1	D	L3	L	TiN
5,000	5	10	62	**412610-000050**
6,000	6	15	66	**412610-000060**
8,000	8	17	79	**412610-000080**
10,000	10	20	89	**412610-000100**
12,000	12	25	102	**412610-000120**
14,000	14	30	107	**412610-000140**
16,000	16	35	115	**412610-000160**
20,000	20	40	131	**412610-000200**

Series 412813 412811 • Grade DCF • Flood Coolant

Group		Cutting Speed - Vc Range - m/min Min		Max	Recommended Feed Rate (Fz) Tool Diameter	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P	1	90	-	110	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	2	90	-	100	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	3	70	-	85	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	4	65	-	75	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
K	1	105	-	115	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	2	85	-	95	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	3	100	-	110	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38

Series M152 M162 • Flood Coolant

Group		Cutting Speed - Vc Range - m/min Min		Max	Recommended Feed Rate (Fz) Tool Diameter	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P	3	40	-	70	mm/r	0,05 - 0,06	0,06 - 0,08	0,09 - 0,12	0,12 - 0,16	0,15 - 0,20	0,18 - 0,24	0,24 - 0,32	0,30 - 0,40
	4	25	-	40	mm/r	0,04 - 0,05	0,05 - 0,06	0,07 - 0,09	0,10 - 0,12	0,12 - 0,15	0,14 - 0,18	0,19 - 0,24	0,24 - 0,30
	5	45	-	60	mm/r	0,03 - 0,04	0,04 - 0,05	0,05 - 0,07	0,07 - 0,10	0,09 - 0,12	0,11 - 0,14	0,14 - 0,19	0,18 - 0,24
	6	40	-	50	mm/r	0,03 - 0,04	0,04 - 0,05	0,05 - 0,07	0,07 - 0,10	0,09 - 0,12	0,11 - 0,14	0,14 - 0,19	0,18 - 0,24
M	1	40	-	50	mm/r	0,04 - 0,05	0,05 - 0,06	0,07 - 0,10	0,10 - 0,13	0,12 - 0,16	0,14 - 0,19	0,19 - 0,26	0,24 - 0,32
	2	30	-	45	mm/r	0,04 - 0,05	0,05 - 0,06	0,07 - 0,10	0,10 - 0,13	0,12 - 0,16	0,14 - 0,19	0,19 - 0,26	0,24 - 0,32
S	2	10	-	15	mm/r	0,03 - 0,04	0,04 - 0,05	0,05 - 0,07	0,07 - 0,10	0,09 - 0,12	0,11 - 0,14	0,14 - 0,19	0,18 - 0,24
	3	35	-	50	mm/r	0,03 - 0,04	0,04 - 0,05	0,05 - 0,07	0,07 - 0,10	0,09 - 0,12	0,11 - 0,14	0,14 - 0,19	0,18 - 0,24
	4	25	-	40	mm/r	0,02 - 0,03	0,03 - 0,04	0,05 - 0,07	0,06 - 0,09	0,08 - 0,11	0,10 - 0,13	0,13 - 0,18	0,16 - 0,22
H	1	25	-	40	mm/r	0,04 - 0,05	0,05 - 0,06	0,07 - 0,09	0,10 - 0,12	0,12 - 0,15	0,14 - 0,18	0,19 - 0,24	0,24 - 0,30
	2	10	-	35	mm/r	0,03 - 0,04	0,04 - 0,05	0,06 - 0,08	0,08 - 0,10	0,10 - 0,13	0,12 - 0,16	0,16 - 0,21	0,20 - 0,26
	3	5	-	15	mm/r	0,02 - 0,03	0,02 - 0,04	0,03 - 0,06	0,04 - 0,08	0,05 - 0,10	0,06 - 0,12	0,08 - 0,16	0,10 - 0,20

Series 412513 412511 • Grade DCF • Flood Coolant

Group		Cutting Speed - Vc Range - m/min Min		Max	Recommended Feed Rate (Fz) Tool Diameter	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P	5	40	-	45	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	6	30	-	40	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
M	1	25	-	35	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	2	25	-	35	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	3	25	-	30	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
K	1	110	-	120	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	2	90	-	100	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	3	105	-	115	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
N	1	140	-	160	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	2	180	-	200	mm/r	0,15 - 0,18	0,18 - 0,20	0,20 - 0,30	0,30 - 0,35	0,35 - 0,40	0,40 - 0,45	0,45 - 0,50	0,50 - 0,55
	4	80	-	100	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	5	110	-	120	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	6	100	-	110	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
S	1	40	-	50	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	2	30	-	40	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	3	40	-	50	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	4	35	-	45	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22

Series 517113 • Grade DCL • Dry

Group		Cutting Speed - Vc Range - m/min DRY	WET	Recommended Feed Rate (Fz) Tool Diameter	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
N	1	70-80	245-280	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	2	90-100	300-350	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	3	80-90	280-315	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	5	55-65	210-225	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28

Series 412516 412523 • Grade DCX • Flood Coolant

Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate (Fz) 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
H	1	40	-	45	mm/r	0,02 - 0,03	0,03 - 0,04	0,04 - 0,05	0,05 - 0,06	0,06 - 0,07	0,07 - 0,08	0,08 - 0,10	0,10 - 0,12
	2	30	-	35	mm/r	0,005 - 0,01	0,01 - 0,015	0,015 - 0,02	0,02 - 0,025	0,025 - 0,03	0,03 - 0,04	0,04 - 0,05	0,05 - 0,08
	3	20	-	25	mm/r	0,005 - 0,01	0,01 - 0,015	0,015 - 0,02	0,02 - 0,025	0,025 - 0,03	0,03 - 0,04	0,04 - 0,05	0,05 - 0,08
	4	35	-	40	mm/r	0,02 - 0,03	0,03 - 0,04	0,04 - 0,05	0,05 - 0,06	0,06 - 0,07	0,07 - 0,08	0,08 - 0,10	0,10 - 0,12

Series 412846 • K20F-DCF • Flood Coolant

Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate (Fz) 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P	1	90	-	110	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	2	80	-	90	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	3	70	-	85	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	4	65	-	75	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	5	40	-	45	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	6	45	-	40	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
K	1	105	-	115	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	2	85	-	95	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	3	100	-	110	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
N	1	140	-	160	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	2	220	-	240	mm/r	0,15 - 0,18	0,18 - 0,20	0,20 - 0,30	0,30 - 0,35	0,35 - 0,40	0,40 - 0,45	0,45 - 0,50	0,50 - 0,55
	3	180	-	200	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	5	110	-	150	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	6	95	-	105	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34

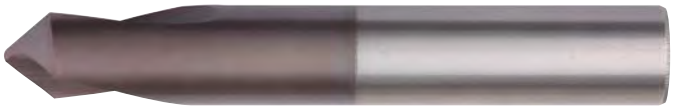
Series M132 M112 • Flood Coolant

Group		Cutting Speed - Vc Range - m/min Min		Max	Recommended Feed Rate (Fz) Tool Diameter	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P	1	25	-	45	mm/r	0,06 - 0,09	0,08 - 0,12	0,10 - 0,15	0,12 - 0,18	0,14 - 0,21	0,18 - 0,27	0,19 - 0,28	0,20 - 0,30
	2	25	-	45	mm/r	0,06 - 0,09	0,08 - 0,12	0,10 - 0,15	0,12 - 0,18	0,14 - 0,21	0,18 - 0,27	0,19 - 0,28	0,20 - 0,30
	3	20	-	40	mm/r	0,04 - 0,06	0,06 - 0,09	0,09 - 0,12	0,10 - 0,15	0,12 - 0,18	0,16 - 0,24	0,18 - 0,27	0,18 - 0,27
	4	20	-	40	mm/r	0,04 - 0,06	0,06 - 0,09	0,09 - 0,12	0,10 - 0,15	0,12 - 0,18	0,16 - 0,24	0,18 - 0,27	0,18 - 0,27
	5	10	-	30	mm/r	0,04 - 0,05	0,05 - 0,07	0,06 - 0,09	0,08 - 0,11	0,08 - 0,12	0,10 - 0,15	0,11 - 0,17	0,12 - 0,18
	6	10	-	30	mm/r	0,04 - 0,05	0,05 - 0,07	0,06 - 0,09	0,08 - 0,11	0,08 - 0,12	0,10 - 0,15	0,11 - 0,17	0,12 - 0,18
M	1	15	-	45	mm/r	0,04 - 0,05	0,05 - 0,08	0,07 - 0,11	0,08 - 0,12	0,09 - 0,14	0,12 - 0,18	0,14 - 0,21	0,16 - 0,24
	2	15	-	45	mm/r	0,04 - 0,05	0,05 - 0,08	0,07 - 0,11	0,08 - 0,12	0,09 - 0,14	0,12 - 0,18	0,14 - 0,21	0,16 - 0,24
	3	15	-	45	mm/r	0,04 - 0,05	0,05 - 0,08	0,07 - 0,11	0,08 - 0,12	0,09 - 0,14	0,12 - 0,18	0,14 - 0,21	0,16 - 0,24
K	1	30	-	90	mm/r	0,09 - 0,12	0,12 - 0,18	0,16 - 0,24	0,18 - 0,27	0,18 - 0,27	0,20 - 0,30	0,23 - 0,34	0,24 - 0,37
	2	20	-	75	mm/r	0,09 - 0,12	0,11 - 0,16	0,12 - 0,18	0,13 - 0,19	0,14 - 0,21	0,16 - 0,24	0,18 - 0,27	0,18 - 0,27
N	1	45	-	120	mm/r	0,08 - 0,12	0,11 - 0,17	0,14 - 0,21	0,18 - 0,27	0,20 - 0,30	0,26 - 0,40	0,28 - 0,46	0,32 - 0,46
	2	45	-	120	mm/r	0,08 - 0,12	0,11 - 0,17	0,14 - 0,21	0,18 - 0,27	0,20 - 0,30	0,26 - 0,40	0,28 - 0,46	0,32 - 0,46
	3	45	-	120	mm/r	0,08 - 0,12	0,11 - 0,17	0,14 - 0,21	0,18 - 0,27	0,20 - 0,30	0,26 - 0,40	0,28 - 0,46	0,32 - 0,46
S	1	10	-	30	mm/r	0,06 - 0,09	0,08 - 0,11	0,08 - 0,12	0,09 - 0,13	0,10 - 0,14	0,10 - 0,15	0,11 - 0,17	0,12 - 0,18
	2	10	-	30	mm/r	0,06 - 0,09	0,08 - 0,11	0,08 - 0,12	0,09 - 0,13	0,10 - 0,14	0,10 - 0,15	0,11 - 0,17	0,12 - 0,18

Series 012601 • Flood Coolant

Group		Cutting Speed - Vc Range - m/min Min		Max	Recommended Feed Rate (Fz) Tool Diameter	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
K	1	60	-	85	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	2	60	-	85	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	3	60	-	85	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
N	1	60	-	150	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	2	60	-	150	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	3	60	-	150	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	4	60	-	150	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	5	60	-	150	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
S	3	20	-	30	mm/r	0,03 - 0,04	0,04 - 0,05	0,05 - 0,06	0,06 - 0,08	0,08 - 0,10	0,10 - 0,12	0,12 - 0,14	0,14 - 0,16
	4	20	-	30	mm/r	0,03 - 0,04	0,04 - 0,05	0,05 - 0,06	0,06 - 0,08	0,08 - 0,10	0,10 - 0,12	0,12 - 0,14	0,14 - 0,16

Series 412611 412610 • K20F-DCF • Flood Coolant



Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate (Fz) 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P	1	55	-	105	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	2	55	-	105	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	3	55	-	105	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	4	55	-	105	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	5	50	-	60	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	6	50	-	60	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
M	1	40	-	50	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	2	40	-	50	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	3	40	-	50	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
K	1	100	-	120	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	2	100	-	120	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	3	100	-	120	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
N	1	90	-	360	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	2	90	-	360	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	3	90	-	360	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
S	1	40	-	75	mm/r	0,03 - 0,04	0,04 - 0,05	0,05 - 0,06	0,06 - 0,08	0,08 - 0,10	0,10 - 0,12	0,12 - 0,14	0,14 - 0,16
	2	40	-	75	mm/r	0,03 - 0,04	0,04 - 0,05	0,05 - 0,06	0,06 - 0,08	0,08 - 0,10	0,10 - 0,12	0,12 - 0,14	0,14 - 0,16
	3	40	-	75	mm/r	0,03 - 0,04	0,04 - 0,05	0,05 - 0,06	0,06 - 0,08	0,08 - 0,10	0,10 - 0,12	0,12 - 0,14	0,14 - 0,16
	4	40	-	75	mm/r	0,03 - 0,04	0,04 - 0,05	0,05 - 0,06	0,06 - 0,08	0,08 - 0,10	0,10 - 0,12	0,12 - 0,14	0,14 - 0,16

High-Performance Solid Carbide Drills with Coolant Holes

Reach the productivity and tool life you have dreamed about with through-coolant drilling capability.

Another customer's tough challenge is solved...

Challenge:

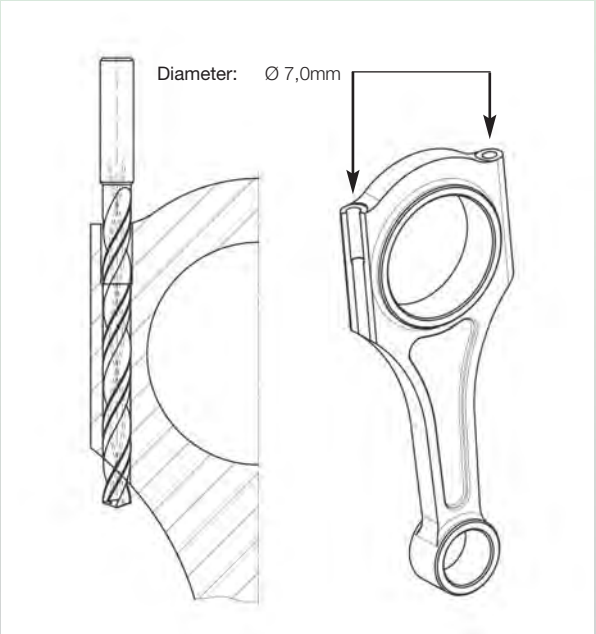
- Drilling Connecting Rods.

Application Details:

- Material: C70S6by
- Coolant: Emulsion approximately 6%
- Machine: Machining center, 20 bar internal coolant
- Cutting Data: Vc = 70 m/min, f = 0,2 mm/rev
- Catalog Series: 412533
- Tool: Solid Carbide Drill, with 4-lands, with internal coolant, K20F, type NDX, DCF-coated

Result:

— Number of holes = 2,000 before first regrind



Another customer's tough challenge is solved...

Challenge:

- Turbine Housing — Drilling through holes on the circumference with a drilling depth of 32mm.

Application Details:

- Material: INCONEL® 718 (Material Group S2)
- Coolant: Emulsion approximately 8%
- Machine: Okuma™, machining center
- Cutting Data: Vc = 40 m/min, f = 0,07 mm/rev

Solution:

- High-Performance Solid Carbide Drill
  — K20 F, DIN 6537 SHORT
  — DCF-coated, Type WD
- Catalog Series: 412522
- Code: Ø14,0mm

Result:

— Number of holes = 515
— Tool life = 16,5 m

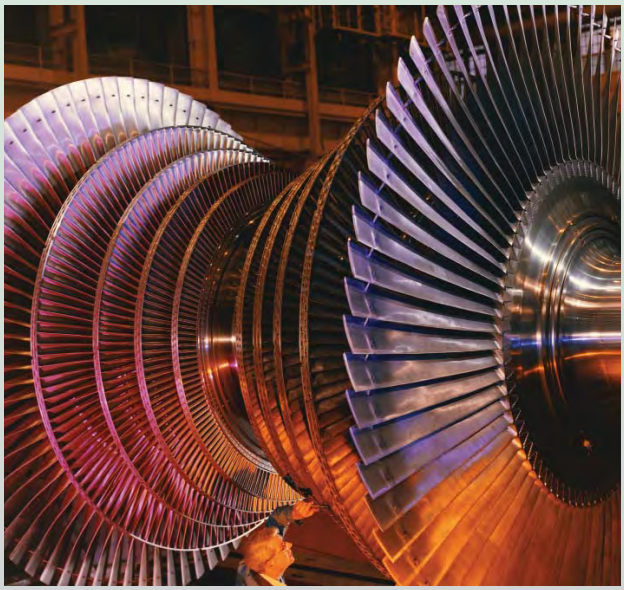


Photo is a representation of the part, not actual part.

Solid Carbide Drills with Through Coolant Holes

Deep-Hole Solid Carbide Drills with Through Coolant Holes B59–B67

Steels and Cast Iron • HCPK25 • 15 x D B60–B61
Steels and Cast Iron • HCPK25 • 20 x D B62–B63
Steels and Cast Iron • HCPK25 • 25 x D B64–B65
Steels and Cast Iron • HCPK25 • 30 x D B66–B67

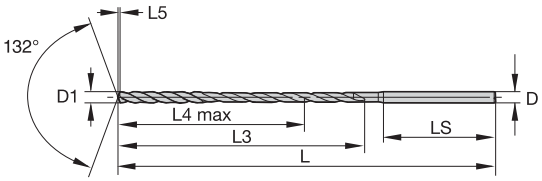
High-Performance Solid Carbide Drills with Through Coolant Holes B68–B110

Steels and Cast Iron • Type ND • K20F-DCF • 3 x D • "A" and "E" Shanks B68–B71
Steels and Cast Iron • Type ND • K20F-DCF • 5 x D • "A" and "E" Shanks B72–B75
Steels and Cast Iron • Type NDX • K20F-DCF • 8 x D • "A" and "E" Shanks B76–B77
Stainless Steels, High-Temp Alloys, Hard Steels • Series 252 652 • SHORT B78–B81
Stainless Steels, High-Temp Alloys, Hard Steels • Series 262 662 • LONG B82–B85
Stainless Steels and High-Temp Alloys • Type WD • K20F-DCF • 3 x D • "A" and "E" Shanks B86–B89
Stainless Steels and High-Temp Alloys • Type WD • K20F-DCF • 5 x D • "A" and "E" Shanks B90–B93
Stainless Steels and High-Temp Alloys • Type WDX • K20F-DCF • 8 x D • "A" and "E" Shanks B94–B95
Cast Iron and Aluminium • Type GGX • K20F-Uncoated/K20F-DCF • 5 x D B96–B97
Cast Iron and Aluminium • Type GGX • K20F-Uncoated/K20F-DCF • 8 x D B98–B99
Cast Iron and Aluminium • Type GGX • K20F-Uncoated/K20F-DCF • 12 x D B100–B101
Hard Materials • Type HRC-IK • K10F-DCHP • 7 x D B102–B103
Aluminium • Series 259 659 • SHORT B104–B107

Application Data

Series H101 H102 H103 H104 • Series 412820 412825 412533 412822 412827 412534 . . . . . B108
Series 252 262 652 662 • Series 412520 412522 412525 412527 412833 412834 . . . . . B109
Series 012535 012536 012537 • 412535 412536 412537 • 412518 • 159 259 559 659 . . . . . B110

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.
- For best results, please use recommended pilot drill as indicated below.



Tolerance			
D1	Tolerance h7	D	Tolerance h6
>3 to 6	0,000/-0,012	>3 to 6	0,000/-0,008
>6 to 10	0,000/-0,015	>6 to 10	0,000/-0,009

	P				K		
	1	2	3	4	1	2	3
HCPK25	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

D1	pilot hole	D	L3	L4 max	L5	LS	L	HCPK25
3,000	412822-000300	3	53	45	0,6	30	86	**H101Z03000**
3,500	412822-000350	4	68	59	0,7	32	105	**H101Z03500**
3,800	412822-000380	4	69	60	0,8	32	105	**H101Z03800**
4,000	412822-000400	4	70	60	0,8	32	105	**H101Z04000**
4,039	412822-000404	5	84	73	0,8	34	124	**H101Z04039**
4,300	412822-000430	5	85	74	0,9	34	124	**H101Z04300**
4,500	412822-000450	5	85	74	0,9	34	124	**H101Z04500**
5,000	412822-000500	5	87	75	1,0	34	124	**H101Z05000**
5,159	412822-000203	6	102	88	1,1	36	143	**H101Z05159**
5,500	412822-000550	6	102	89	1,1	36	143	**H101Z05500**
5,800	412822-000580	6	103	90	1,2	36	143	**H101Z05800**
6,000	412822-000600	6	104	90	1,2	36	143	**H101Z06000**
6,200	412822-000620	7	118	103	1,3	38	162	**H101Z06200**
6,500	412822-000650	7	119	104	1,4	38	162	**H101Z06500**
6,800	412822-000680	7	120	105	1,4	38	162	**H101Z06800**
7,000	412822-000700	7	121	105	1,5	38	162	**H101Z07000**

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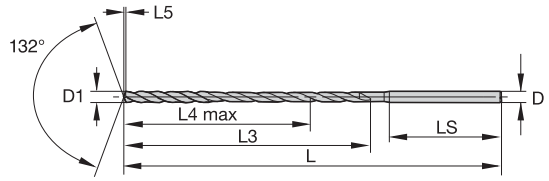


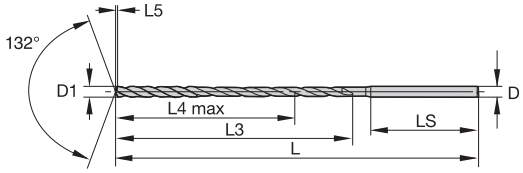
	P				K		
	1	2	3	4	1	2	3
HCPK25	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

D1	pilot hole	D	L3	L4 max	L5	LS	L	HCPK25
7,500	412822-000750	8	136	119	1,6	40	181	**H101Z07500**
8,000	412822-000800	8	138	120	1,7	40	181	**H101Z08000**
8,500	412822-000850	9	153	134	1,8	42	200	**H101Z08500**
9,000	412822-000900	9	155	135	1,9	42	200	**H101Z09000**
9,347	412822-000935	10	170	149	2,0	44	219	**H101Z09347**
9,500	412822-000950	10	170	149	2,0	44	219	**H101Z09500**
9,750	412822-000980	10	171	150	2,1	44	219	**H101Z09750**
10,000	412822-001000	10	172	150	2,1	44	219	**H101Z10000**
10,200	412822-001020	11	186	163	2,2	46	238	**H101Z10200**
10,317	412822-001032	11	187	164	2,2	46	238	**H101Z10317**
10,500	412822-001050	11	187	164	2,2	46	238	**H101Z10500**
11,000	412822-001100	11	203	178	2,3	46	238	**H101Z11000**
11,500	412822-001150	12	204	179	2,4	48	257	**H101Z11500**
12,000	412822-001200	12	206	180	2,5	48	257	**H101Z12000**
12,500	412822-001250	13	221	194	2,7	50	276	**H101Z12500**
13,000	412822-001300	13	223	195	2,8	50	276	**H101Z13000**

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.
- For best results, please use recommended pilot drill as indicated below.



Tolerance			
D1	Tolerance h7	D	Tolerance h6
>3 to 6	0,000/-0,012	>3 to 6	0,000/-0,008
>6 to 10	0,000/-0,015	>6 to 10	0,000/-0,009

	P				K		
	1	2	3	4	1	2	3
HCPK25	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

D1	pilot hole	D	L3	L4 max	L5	LS	L	HCPK25
3,000	412822-000300	3	68	60	0,6	30	101	**H102Z03000**
3,500	412822-000350	4	86	77	0,7	32	125	**H102Z03500**
3,800	412822-000380	4	88	79	0,8	32	125	**H102Z03800**
4,000	412822-000400	4	90	80	0,8	32	125	**H102Z04000**
4,039	412822-000404	5	104	93	0,8	34	149	**H102Z04039**
4,300	412822-000430	5	106	95	0,9	34	149	**H102Z04300**
4,500	412822-000450	5	108	97	0,9	34	149	**H102Z04500**
4,623	412822-000462	5	109	97	1,0	34	149	**H102Z04623**
5,000	412822-000500	5	112	100	1,0	34	149	**H102Z05000**
5,159	412822-000203	6	128	114	1,1	36	173	**H102Z05159**
5,500	412822-000550	6	130	117	1,1	36	173	**H102Z05500**
5,800	412822-000580	6	132	119	1,2	36	173	**H102Z05800**
6,000	412822-000600	6	134	120	1,2	36	173	**H102Z06000**
6,200	412822-000620	7	149	134	1,3	38	197	**H102Z06200**
6,500	412822-000650	7	152	137	1,4	38	197	**H102Z06500**
6,800	412822-000680	7	154	139	1,4	38	197	**H102Z06800**

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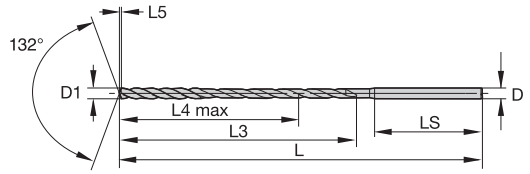


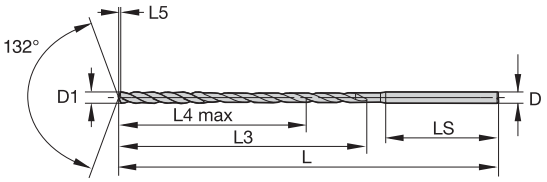
	P				K		
	1	2	3	4	1	2	3
HCPK25	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

D1	pilot hole	D	L3	L4 max	L5	LS	L	HCPK25
7,000	412822-000700	7	156	140	1,5	38	197	**H102Z07000**
7,500	412822-000750	8	174	157	1,6	40	221	**H102Z07500**
8,000	412822-000800	8	178	160	1,7	40	221	**H102Z08000**
8,500	412822-000850	9	196	177	1,8	42	245	**H102Z08500**
9,000	412822-000900	9	200	180	1,9	42	245	**H102Z09000**
9,347	412822-000935	10	217	195	2,0	44	269	**H102Z09347**
9,500	412822-000950	10	218	197	2,0	44	269	**H102Z09500**
9,750	412822-000980	10	220	198	2,1	44	269	**H102Z09750**
10,000	412822-001000	10	222	200	2,1	44	269	**H102Z10000**
10,200	412822-001020	11	237	214	2,2	46	293	**H102Z10200**
10,317	412822-001032	11	238	215	2,2	46	293	**H102Z10317**
10,500	412822-001050	11	240	217	2,2	46	293	**H102Z10500**
11,000	412822-001100	11	258	233	2,3	46	317	**H102Z11000**
11,500	412822-001150	12	262	237	2,4	48	317	**H102Z11500**
12,000	412822-001200	12	266	240	2,5	48	317	**H102Z12000**
12,500	412822-001250	13	284	257	2,7	50	341	**H102Z12500**
13,000	412822-001300	13	288	260	2,8	50	341	**H102Z13000**

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



NEW!

Tolerance			
D1	Tolerance h7	D	Tolerance h6
>3 to 6	0,000/-0,012	>3 to 6	0,000/-0,008
>6 to 10	0,000/-0,015	>6 to 10	0,000/-0,009

	P				K		
	1	2	3	4	1	2	3
HCPK25	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

D1	pilot hole	D	L3	L4 max	L5	LS	L	HCPK25
3,000	412822-000300	3	83	75	0,6	30	116	**H103Z03000**
3,500	412822-000350	4	103	94	0,7	32	145	**H103Z03500**
3,800	412822-000380	4	107	98	0,8	32	145	**H103Z03800**
4,000	412822-000400	4	110	100	0,8	32	145	**H103Z04000**
4,039	412822-000404	5	124	113	0,8	34	174	**H103Z04039**
4,300	412822-000430	5	128	117	0,9	34	174	**H103Z04300**
4,500	412822-000450	5	130	119	0,9	34	174	**H103Z04500**
4,623	412822-000462	5	132	120	1,0	34	174	**H103Z04623**
5,000	412822-000500	5	137	125	1,0	34	174	**H103Z05000**
5,159	412822-000203	6	154	140	1,1	36	203	**H103Z05159**
5,410	412822-000541	6	156	143	1,1	36	203	**H103Z05410**
5,500	412822-000550	6	157	144	1,1	36	203	**H103Z05500**
5,800	412822-000580	6	161	148	1,2	36	203	**H103Z05800**
6,000	412822-000600	6	164	150	1,2	36	203	**H103Z06000**
6,200	412822-000620	7	180	165	1,3	38	232	**H103Z06200**
6,500	412822-000650	7	184	169	1,4	38	232	**H103Z06500**

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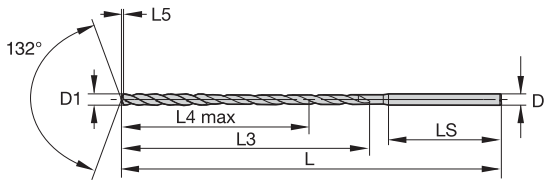


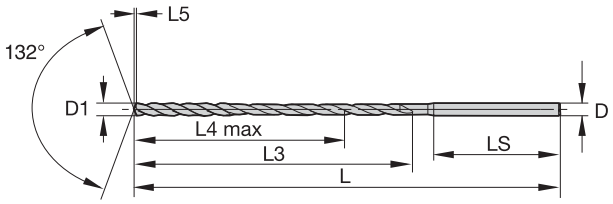
	P				K		
	1	2	3	4	1	2	3
HCPK25	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

D1	pilot hole	D	L3	L4 max	L5	LS	L	HCPK25
6,528	412822-000652	7	185	169	1,4	38	232	**H103Z06528**
6,800	412822-000680	7	188	173	1,4	38	232	**H103Z06800**
6,909	412822-000691	7	190	174	1,4	38	232	**H103Z06909**
7,000	412822-000700	7	191	175	1,5	38	232	**H103Z07000**
7,500	412822-000750	8	211	194	1,6	40	261	**H103Z07500**
8,000	412822-000800	8	218	200	1,7	40	261	**H103Z08000**
8,433	412822-000843	9	237	218	1,8	42	290	**H103Z08433**
8,500	412822-000850	9	238	219	1,8	42	290	**H103Z08500**
9,000	412822-000900	9	245	225	1,9	42	290	**H103Z09000**
9,347	412822-000935	10	263	242	2,0	44	319	**H103Z09347**
9,500	412822-000950	10	265	244	2,0	44	319	**H103Z09500**
9,750	412822-000980	10	269	247	2,1	44	319	**H103Z09750**
10,000	412822-001000	10	272	250	2,1	44	319	**H103Z10000**
10,200	412822-001020	11	288	265	2,2	46	348	**H103Z10200**
10,317	412822-001032	11	290	267	2,2	46	348	**H103Z10317**
10,500	412822-001050	11	292	269	2,2	46	348	**H103Z10500**
11,000	412822-001100	11	313	288	2,3	46	377	**H103Z11000**
11,500	412822-001150	12	319	294	2,4	48	377	**H103Z11500**
12,000	412822-001200	12	326	300	2,5	48	377	**H103Z12000**
12,500	412822-001250	13	346	319	2,7	50	406	**H103Z12500**
13,000	412822-001300	13	353	325	2,8	50	406	**H103Z13000**

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



NEW!

Tolerance			
D1	Tolerance h7	D	Tolerance h6
>3 to 6	0,000/-0,012	>3 to 6	0,000/-0,008
>6 to 10	0,000/-0,015	>6 to 10	0,000/-0,009

	P				K		
	1	2	3	4	1	2	3
HCPK25	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

D1	pilot hole	D	L3	L4 max	L5	LS	L	HCPK25
3,000	412822-000300	3	98	90	0,6	30	131	**H104Z03000**
3,500	412822-000350	4	121	112	0,7	32	165	**H104Z03500**
3,800	412822-000380	4	126	117	0,8	32	165	**H104Z03800**
4,000	412822-000400	4	130	120	0,8	32	165	**H104Z04000**
4,039	412822-000404	5	144	134	0,8	34	199	**H104Z04039**
4,300	412822-000430	5	149	138	0,9	34	199	**H104Z04300**
4,500	412822-000450	5	153	142	0,9	34	199	**H104Z04500**
4,623	412822-000462	5	155	144	1,0	34	199	**H104Z04623**
5,000	412822-000500	5	162	150	1,0	34	199	**H104Z05000**
5,159	412822-000203	6	180	166	1,1	36	233	**H104Z05159**
5,410	412822-000541	6	183	170	1,1	36	233	**H104Z05410**
5,500	412822-000550	6	185	172	1,1	36	233	**H104Z05500**
5,800	412822-000580	6	190	177	1,2	36	233	**H104Z05800**
6,000	412822-000600	6	194	180	1,2	36	233	**H104Z06000**
6,200	412822-000620	7	211	196	1,3	38	267	**H104Z06200**
6,500	412822-000650	7	217	202	1,4	38	267	**H104Z06500**

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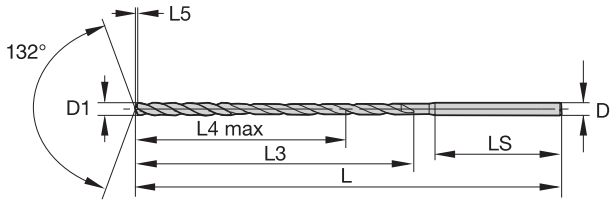


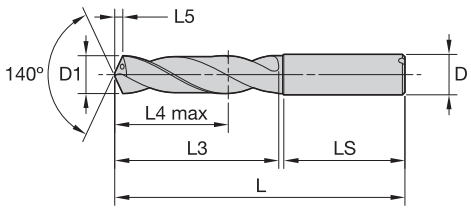
	P				K		
	1	2	3	4	1	2	3
HCPK25	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

D1	pilot hole	D	L3	L4 max	L5	LS	L	HCPK25
6,528	412822-000652	7	217	202	1,4	38	267	**H104Z06528**
6,800	412822-000680	7	222	207	1,4	38	267	**H104Z06800**
6,909	412822-000691	7	224	208	1,4	38	267	**H104Z06909**
7,000	412822-000700	7	226	210	1,5	38	267	**H104Z07000**
7,500	412822-000750	8	249	232	1,6	40	301	**H104Z07500**
8,000	412822-000800	8	258	240	1,7	40	301	**H104Z08000**
8,433	412822-000843	9	280	260	1,8	42	335	**H104Z08433**
8,500	412822-000850	9	281	262	1,8	42	335	**H104Z08500**
9,000	412822-000900	9	290	270	1,9	42	335	**H104Z09000**
9,347	412822-000935	10	310	289	2,0	44	369	**H104Z09347**
9,500	412822-000950	10	313	292	2,0	44	369	**H104Z09500**
9,750	412822-000980	10	317	296	2,1	44	369	**H104Z09750**
10,000	412822-001000	10	322	300	2,1	44	369	**H104Z10000**
10,200	412822-001020	11	339	316	2,2	46	403	**H104Z10200**
10,317	412822-001032	11	342	318	2,2	46	403	**H104Z10317**
10,500	412822-001050	11	345	322	2,2	46	403	**H104Z10500**
11,000	412822-001100	11	368	343	2,3	46	437	**H104Z11000**
11,500	412822-001150	12	377	352	2,4	48	437	**H104Z11500**
12,000	412822-001200	12	386	360	2,5	48	437	**H104Z12000**
12,500	412822-001250	13	409	382	2,7	50	471	**H104Z12500**
13,000	412822-001300	13	418	390	2,8	50	471	**H104Z13000**

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	P				K		
	1	2	3	4	1	2	3
K20-DCF	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

							K20F-DCF	K20F-DCF
D1	D	L3	L4 max	L5	LS	L	“A” Shank	“E” Shank
3,000	6	20	14	0,5	36	62	412822-000300	412820-000300
3,100	6	20	14	0,6	36	62	412822-000310	412820-000310
3,200	6	20	14	0,6	36	62	412822-000320	412820-000320
3,250	6	20	14	0,6	36	62	412822-000325	412820-000325
3,300	6	20	14	0,6	36	62	412822-000330	412820-000330
3,400	6	20	14	0,6	36	62	412822-000340	412820-000340
3,500	6	20	14	0,6	36	62	412822-000350	412820-000350
3,600	6	20	14	0,7	36	62	412822-000360	412820-000360
3,700	6	20	14	0,7	36	62	412822-000370	412820-000370
3,800	6	24	17	0,7	36	66	412822-000380	412820-000380
3,900	6	24	17	0,7	36	66	412822-000390	412820-000390
4,000	6	24	17	0,7	36	66	412822-000400	412820-000400
4,100	6	24	17	0,7	36	66	412822-000410	412820-000410
4,200	6	24	17	0,8	36	66	412822-000420	412820-000420
4,300	6	24	17	0,8	36	66	412822-000430	412820-000430
4,400	6	24	17	0,8	36	66	412822-000440	412820-000440
4,500	6	24	17	0,8	36	66	412822-000450	412820-000450
4,600	6	24	17	0,8	36	66	412822-000460	412820-000460
4,650	6	24	17	0,8	36	66	412822-000465	412820-000465
4,700	6	24	17	0,9	36	66	412822-000470	412820-000470
4,800	6	28	20	0,9	36	66	412822-000480	412820-000480
4,900	6	28	20	0,9	36	66	412822-000490	412820-000490

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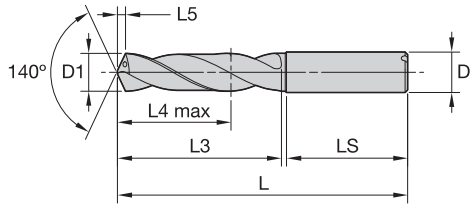

	P				K		
	1	2	3	4	1	2	3
K20-DCF	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF “A” Shank	K20F-DCF “E” Shank
5,000	6	28	20	0,9	36	66	412822-000500	412820-000500
5,100	6	28	20	0,9	36	66	412822-000510	412820-000510
5,200	6	28	20	0,9	36	66	412822-000520	412820-000520
5,300	6	28	20	1,0	36	66	412822-000530	412820-000530
5,400	6	28	20	1,0	36	66	412822-000540	412820-000540
5,500	6	28	20	1,0	36	66	412822-000550	412820-000550
5,550	6	28	20	1,0	36	66	412822-000555	412820-000555
5,600	6	28	20	1,0	36	66	412822-000560	412820-000560
5,700	6	28	20	1,0	36	66	412822-000570	412820-000570
5,800	6	28	20	1,1	36	66	412822-000580	412820-000580
5,900	6	28	20	1,1	36	66	412822-000590	412820-000590
6,000	6	28	20	1,1	36	66	412822-000600	412820-000600
6,100	8	34	24	1,1	36	79	412822-000610	412820-000610
6,200	8	34	24	1,1	36	79	412822-000620	412820-000620
6,300	8	34	24	1,1	36	79	412822-000630	412820-000630
6,400	8	34	24	1,2	36	79	412822-000640	412820-000640
6,500	8	34	24	1,2	36	79	412822-000650	412820-000650
6,600	8	34	24	1,2	36	79	412822-000660	412820-000660
6,700	8	34	24	1,2	36	79	412822-000670	412820-000670
6,800	8	34	24	1,2	36	79	412822-000680	412820-000680
6,900	8	34	24	1,3	36	79	412822-000690	412820-000690
7,000	8	34	24	1,3	36	79	412822-000700	412820-000700
7,100	8	41	29	1,3	36	79	412822-000710	412820-000710
7,200	8	41	29	1,3	36	79	412822-000720	412820-000720
7,300	8	41	29	1,3	36	79	412822-000730	412820-000730
7,400	8	41	29	1,3	36	79	412822-000740	412820-000740
7,500	8	41	29	1,4	36	79	412822-000750	412820-000750
7,600	8	41	29	1,4	36	79	412822-000760	412820-000760

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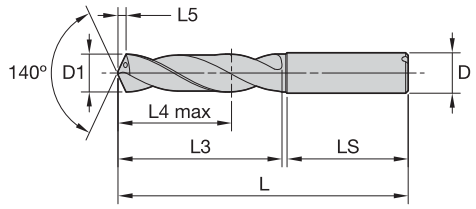

	P				K		
	1	2	3	4	1	2	3
K20-DCF	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF “A” Shank	K20F-DCF “E” Shank
7,700	8	41	29	1,4	36	79	412822-000770	412820-000770
7,800	8	41	29	1,4	36	79	412822-000780	412820-000780
7,900	8	41	29	1,4	36	79	412822-000790	412820-000790
8,000	8	41	29	1,5	36	79	412822-000800	412820-000800
8,100	10	47	35	1,5	40	89	412822-000810	412820-000810
8,200	10	47	35	1,5	40	89	412822-000820	412820-000820
8,300	10	47	35	1,5	40	89	412822-000830	412820-000830
8,400	10	47	35	1,5	40	89	412822-000840	412820-000840
8,500	10	47	35	1,5	40	89	412822-000850	412820-000850
8,600	10	47	35	1,6	40	89	412822-000860	412820-000860
8,700	10	47	35	1,6	40	89	412822-000870	412820-000870
8,800	10	47	35	1,6	40	89	412822-000880	412820-000880
8,900	10	47	35	1,6	40	89	412822-000890	412820-000890
9,000	10	47	35	1,6	40	89	412822-000900	412820-000900
9,100	10	47	35	1,7	40	89	412822-000910	412820-000910
9,200	10	47	35	1,7	40	89	412822-000920	412820-000920
9,300	10	47	35	1,7	40	89	412822-000930	412820-000930
9,400	10	47	35	1,7	40	89	412822-000940	412820-000940
9,500	10	47	35	1,7	40	89	412822-000950	412820-000950
9,600	10	47	35	1,7	40	89	412822-000960	412820-000960
9,700	10	47	35	1,8	40	89	412822-000970	412820-000970
9,800	10	47	35	1,8	40	89	412822-000980	412820-000980
9,900	10	47	35	1,8	40	89	412822-000990	412820-000990
10,000	10	47	35	1,8	40	89	412822-001000	412820-001000
10,100	12	55	40	1,8	45	102	412822-001010	412820-001010
10,200	12	55	40	1,9	45	102	412822-001020	412820-001020
10,300	12	55	40	1,9	45	102	412822-001030	412820-001030
10,400	12	55	40	1,9	45	102	412822-001040	412820-001040
10,500	12	55	40	1,9	45	102	412822-001050	412820-001050
10,600	12	55	40	1,9	45	102	412822-001060	412820-001060
10,700	12	55	40	1,9	45	102	412822-001070	412820-001070
10,800	12	55	40	2,0	45	102	412822-001080	412820-001080
10,900	12	55	40	2,0	45	102	412822-001090	412820-001090
11,000	12	55	40	2,0	45	102	412822-001100	412820-001100

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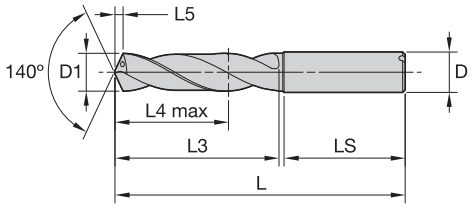


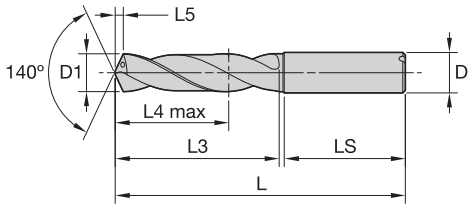
	P				K		
	1	2	3	4	1	2	3
K20-DCF	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF “A” Shank	K20F-DCF “E” Shank
11,100	12	55	40	2,0	45	102	412822-001110	412820-001110
11,200	12	55	40	2,0	45	102	412822-001120	412820-001120
11,300	12	55	40	2,1	45	102	412822-001130	412820-001130
11,400	12	55	40	2,1	45	102	412822-001140	412820-001140
11,500	12	55	40	2,1	45	102	412822-001150	412820-001150
11,600	12	55	40	2,1	45	102	412822-001160	412820-001160
11,700	12	55	40	2,1	45	102	412822-001170	412820-001170
11,800	12	55	40	2,1	45	102	412822-001180	412820-001180
11,900	12	55	40	2,2	45	102	412822-001190	412820-001190
12,000	12	55	40	2,2	45	102	412822-001200	412820-001200
12,500	14	60	43	2,3	45	107	412822-001250	412820-001250
12,800	14	60	43	2,3	45	107	412822-001280	412820-001280
13,000	14	60	43	2,4	45	107	412822-001300	412820-001300
13,500	14	60	43	2,5	45	107	412822-001350	412820-001350
13,800	14	60	43	2,5	45	107	412822-001380	412820-001380
14,000	14	60	43	2,5	45	107	412822-001400	412820-001400
14,500	16	65	45	2,6	48	115	412822-001450	412820-001450
14,800	16	65	45	2,7	48	115	412822-001480	412820-001480
15,000	16	65	45	2,7	48	115	412822-001500	412820-001500
15,500	16	65	45	2,8	48	115	412822-001550	412820-001550
15,800	16	65	45	2,9	48	115	412822-001580	412820-001580
16,000	16	65	45	2,9	48	115	412822-001600	412820-001600
16,500	18	73	51	3,0	48	123	412822-001650	412820-001650
16,800	18	73	51	3,1	48	123	412822-001680	412820-001680
17,000	18	73	51	3,1	48	123	412822-001700	412820-001700
17,500	18	73	51	3,2	48	123	412822-001750	412820-001750
17,800	18	73	51	3,2	48	123	412822-001780	412820-001780
18,000	18	73	51	3,3	48	123	412822-001800	412820-001800
18,500	20	79	55	3,4	50	131	412822-001850	412820-001850
18,800	20	79	55	3,4	50	131	412822-001880	412820-001880
19,000	20	79	55	3,5	50	131	412822-001900	412820-001900
19,500	20	79	55	3,5	50	131	412822-001950	412820-001950
19,800	20	79	55	3,6	50	131	412822-001980	412820-001980
20,000	20	79	55	3,6	50	131	412822-002000	412820-002000

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	P				K		
	1	2	3	4	1	2	3
K20-DCF	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

							K20F-DCF	K20F-DCF
D1	D	L3	L4 max	L5	LS	L	"A" Shank	"E" Shank
3,000	6	28	23	0,5	36	66	412827-000300	412825-000300
3,100	6	28	23	0,6	36	66	412827-000310	412825-000310
3,200	6	28	23	0,6	36	66	412827-000320	412825-000320
3,250	6	28	23	0,6	36	66	412827-000325	412825-000325
3,300	6	28	23	0,6	36	66	412827-000330	412825-000330
3,400	6	28	23	0,6	36	66	412827-000340	412825-000340
3,500	6	28	23	0,6	36	66	412827-000350	412825-000350
3,600	6	28	23	0,7	36	66	412827-000360	412825-000360
3,700	6	28	23	0,7	36	66	412827-000370	412825-000370
3,800	6	36	29	0,7	36	74	412827-000380	412825-000380
3,900	6	36	29	0,7	36	74	412827-000390	412825-000390
4,000	6	36	29	0,7	36	74	412827-000400	412825-000400
4,100	6	36	29	0,7	36	74	412827-000410	412825-000410
4,200	6	36	29	0,8	36	74	412827-000420	412825-000420
4,300	6	36	29	0,8	36	74	412827-000430	412825-000430
4,400	6	36	29	0,8	36	74	412827-000440	412825-000440
4,500	6	36	29	0,8	36	74	412827-000450	412825-000450
4,600	6	36	29	0,8	36	74	412827-000460	412825-000460
4,650	6	36	29	0,8	36	74	412827-000465	412825-000465
4,700	6	36	29	0,9	36	74	412827-000470	412825-000470

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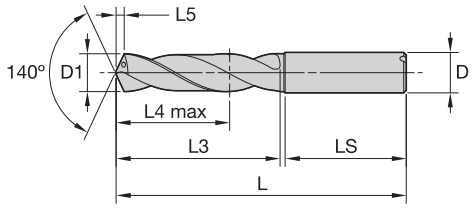

	P				K		
	1	2	3	4	1	2	3
K20-DCF	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF "A" Shank	K20F-DCF "E" Shank
4,800	6	44	35	0,9	36	82	412827-000480	412825-000480
4,900	6	44	35	0,9	36	82	412827-000490	412825-000490
5,000	6	44	35	0,9	36	82	412827-000500	412825-000500
5,100	6	44	35	0,9	36	82	412827-000510	412825-000510
5,200	6	44	35	0,9	36	82	412827-000520	412825-000520
5,300	6	44	35	1,0	36	82	412827-000530	412825-000530
5,400	6	44	35	1,0	36	82	412827-000540	412825-000540
5,500	6	44	35	1,0	36	82	412827-000550	412825-000550
5,550	6	44	35	1,0	36	82	412827-000555	412825-000555
5,600	6	44	35	1,0	36	82	412827-000560	412825-000560
5,700	6	44	35	1,0	36	82	412827-000570	412825-000570
5,800	6	44	35	1,1	36	82	412827-000580	412825-000580
5,900	6	44	35	1,1	36	82	412827-000590	412825-000590
6,000	6	44	35	1,1	36	82	412827-000600	412825-000600
6,100	8	53	43	1,1	36	91	412827-000610	412825-000610
6,200	8	53	43	1,1	36	91	412827-000620	412825-000620
6,300	8	53	43	1,1	36	91	412827-000630	412825-000630
6,400	8	53	43	1,2	36	91	412827-000640	412825-000640
6,500	8	53	43	1,2	36	91	412827-000650	412825-000650
6,600	8	53	43	1,2	36	91	412827-000660	412825-000660
6,700	8	53	43	1,2	36	91	412827-000670	412825-000670
6,800	8	53	43	1,2	36	91	412827-000680	412825-000680
6,900	8	53	43	1,3	36	91	412827-000690	412825-000690
7,000	8	53	43	1,3	36	91	412827-000700	412825-000700
7,100	8	53	43	1,3	36	91	412827-000710	412825-000710
7,200	8	53	43	1,3	36	91	412827-000720	412825-000720
7,300	8	53	43	1,3	36	91	412827-000730	412825-000730
7,400	8	53	43	1,3	36	91	412827-000740	412825-000740

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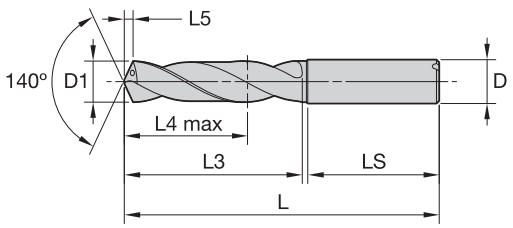

	P				K		
	1	2	3	4	1	2	3
K20-DCF	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

							K20F-DCF	K20F-DCF
D1	D	L3	L4 max	L5	LS	L	“A” Shank	“E” Shank
7,500	8	53	43	1,4	36	91	412827-000750	412825-000750
7,600	8	53	43	1,4	36	91	412827-000760	412825-000760
7,700	8	53	43	1,4	36	91	412827-000770	412825-000770
7,800	8	53	43	1,4	36	91	412827-000780	412825-000780
7,900	8	53	43	1,4	36	91	412827-000790	412825-000790
8,000	8	53	43	1,5	36	91	412827-000800	412825-000800
8,100	10	61	49	1,5	40	103	412827-000810	412825-000810
8,200	10	61	49	1,5	40	103	412827-000820	412825-000820
8,300	10	61	49	1,5	40	103	412827-000830	412825-000830
8,400	10	61	49	1,5	40	103	412827-000840	412825-000840
8,500	10	61	49	1,5	40	103	412827-000850	412825-000850
8,600	10	61	49	1,6	40	103	412827-000860	412825-000860
8,700	10	61	49	1,6	40	103	412827-000870	412825-000870
8,800	10	61	49	1,6	40	103	412827-000880	412825-000880
8,900	10	61	49	1,6	40	103	412827-000890	412825-000890
9,000	10	61	49	1,6	40	103	412827-000900	412825-000900
9,100	10	61	49	1,7	40	103	412827-000910	412825-000910
9,200	10	61	49	1,7	40	103	412827-000920	412825-000920
9,300	10	61	49	1,7	40	103	412827-000930	412825-000930
9,400	10	61	49	1,7	40	103	412827-000940	412825-000940
9,500	10	61	49	1,7	40	103	412827-000950	412825-000950
9,600	10	61	49	1,7	40	103	412827-000960	412825-000960
9,700	10	61	49	1,8	40	103	412827-000970	412825-000970
9,800	10	61	49	1,8	40	103	412827-000980	412825-000980
9,900	10	61	49	1,8	40	103	412827-000990	412825-000990
10,000	10	61	49	1,8	40	103	412827-001000	412825-001000
10,100	12	71	56	1,8	45	118	412827-001010	412825-001010
10,200	12	71	56	1,9	45	118	412827-001020	412825-001020
10,300	12	71	56	1,9	45	118	412827-001030	412825-001030
10,400	12	71	56	1,9	45	118	412827-001040	412825-001040
10,500	12	71	56	1,9	45	118	412827-001050	412825-001050
10,600	12	71	56	1,9	45	118	412827-001060	412825-001060
10,700	12	71	56	1,9	45	118	412827-001070	412825-001070
10,800	12	71	56	2,0	45	118	412827-001080	412825-001080
10,900	12	71	56	2,0	45	118	412827-001090	412825-001090
11,000	12	71	56	2,0	45	118	412827-001100	412825-001100

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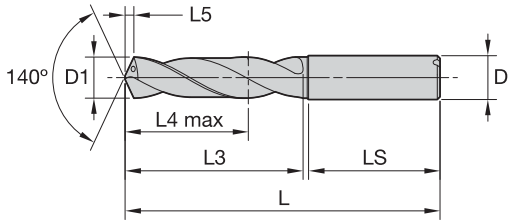


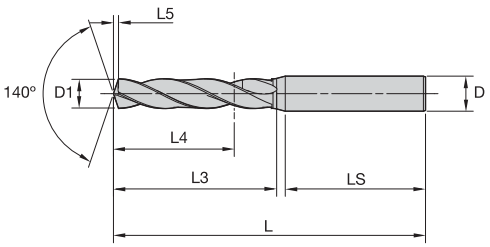
	P				K		
	1	2	3	4	1	2	3
K20-DCF	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF “A” Shank	K20F-DCF “E” Shank
11,100	12	71	56	2,0	45	118	412827-001110	412825-001110
11,200	12	71	56	2,0	45	118	412827-001120	412825-001120
11,300	12	71	56	2,1	45	118	412827-001130	412825-001130
11,400	12	71	56	2,1	45	118	412827-001140	412825-001140
11,500	12	71	56	2,1	45	118	412827-001150	412825-001150
11,600	12	71	56	2,1	45	118	412827-001160	412825-001160
11,700	12	71	56	2,1	45	118	412827-001170	412825-001170
11,800	12	71	56	2,1	45	118	412827-001180	412825-001180
11,900	12	71	56	2,2	45	118	412827-001190	412825-001190
12,000	12	71	56	2,2	45	118	412827-001200	412825-001200
12,500	14	77	60	2,3	45	124	412827-001250	412825-001250
12,800	14	77	60	2,3	45	124	412827-001280	412825-001280
13,000	14	77	60	2,4	45	124	412827-001300	412825-001300
13,500	14	77	60	2,5	45	124	412827-001350	412825-001350
13,800	14	77	60	2,5	45	124	412827-001380	412825-001380
14,000	14	77	60	2,5	45	124	412827-001400	412825-001400
14,500	16	83	63	2,6	48	133	412827-001450	412825-001450
14,800	16	83	63	2,7	48	133	412827-001480	412825-001480
15,000	16	83	63	2,7	48	133	412827-001500	412825-001500
15,500	16	83	63	2,8	48	133	412827-001550	412825-001550
15,800	16	83	63	2,9	48	133	412827-001580	412825-001580
16,000	16	83	63	2,9	48	133	412827-001600	412825-001600
16,500	18	93	71	3,0	48	143	412827-001650	412825-001650
16,800	18	93	71	3,1	48	143	412825-001680	–
16,800	18	93	71	3,1	48	143	412827-001680	–
17,000	18	93	71	3,1	48	143	412827-001700	412825-001700
17,500	18	93	71	3,2	48	143	412827-001750	412825-001750
17,800	18	93	71	3,2	48	143	412827-001780	412825-001780
18,000	18	93	71	3,3	48	143	412827-001800	412825-001800
18,500	20	101	77	3,4	50	153	412827-001850	412825-001850
18,800	20	101	77	3,4	50	153	412827-001880	412825-001880
19,000	20	101	77	3,5	50	153	412827-001900	412825-001900
19,500	20	101	77	3,5	50	153	412827-001950	412825-001950
19,800	20	101	77	3,6	50	153	412827-001980	412825-001980
20,000	20	101	77	3,6	50	153	412827-002000	412825-002000

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	P				K		
	1	2	3	4	1	2	3
K20F-DCF	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

							K20F-DCF	K20F-DCF
D1	D	L3	L4 max	L5	LS	L	"A" Shank	"E" Shank
3,000	6	32	27	0,5	36	70	412534-000300	412533-000300
3,300	6	32	27	0,6	36	70	412534-000330	412533-000330
3,500	6	32	27	0,6	36	70	412534-000350	412533-000350
3,700	6	32	27	0,7	36	70	412534-000370	412533-000370
3,800	6	42	35	0,7	36	80	412534-000380	412533-000380
4,000	6	42	35	0,7	36	80	412534-000400	412533-000400
4,200	6	42	35	0,8	36	80	412534-000420	412533-000420
4,500	6	42	35	0,8	36	80	412534-000450	412533-000450
4,700	6	42	35	0,9	36	80	412534-000470	412533-000470
4,800	6	54	45	0,9	36	92	412534-000480	412533-000480
5,000	6	54	45	0,9	36	92	412534-000500	412533-000500
5,500	6	54	45	1,0	36	92	412534-000550	412533-000550
5,800	6	54	45	1,1	36	92	412534-000580	412533-000580
6,000	6	54	45	1,1	36	92	412534-000600	412533-000600
6,500	8	62	52	1,2	36	100	412534-000650	412533-000650
6,800	8	62	52	1,2	36	100	412534-000680	412533-000680

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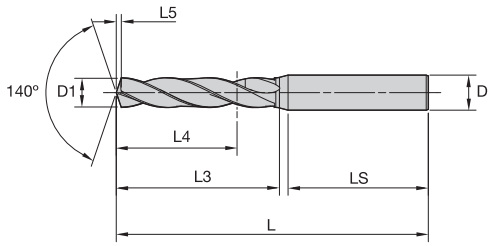


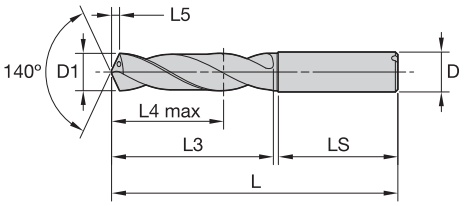
	P				K		
	1	2	3	4	1	2	3
K20F-DCF	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B108.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF “A” Shank	K20F-DCF “E” Shank
7,000	8	70	60	1,3	36	108	412534-000700	412533-000700
7,500	8	70	60	1,4	36	108	412534-000750	412533-000750
7,800	8	70	60	1,4	36	108	412534-000780	412533-000780
8,000	8	70	60	1,5	36	108	412534-000800	412533-000800
8,500	10	80	68	1,5	40	122	412534-000850	412533-000850
9,000	10	80	68	1,6	40	122	412534-000900	412533-000900
9,500	10	88	76	1,7	40	130	412534-000950	412533-000950
9,800	10	88	76	1,8	40	130	412534-000980	412533-000980
10,000	10	88	76	1,8	40	130	412534-001000	412533-001000
10,200	12	105	90	1,9	45	152	412534-001020	412533-001020
10,500	12	105	90	1,9	45	152	412534-001050	412533-001050
10,800	12	105	90	2,0	45	152	412534-001080	412533-001080
11,000	12	105	90	2,0	45	152	412534-001100	412533-001100
11,500	12	105	90	2,1	45	152	412534-001150	412533-001150
11,800	12	105	90	2,1	45	152	412534-001180	412533-001180
12,000	14	105	90	2,2	45	152	412534-001200	412533-001200
12,500	14	123	106	2,3	45	170	412534-001250	412533-001250
12,800	14	123	106	2,3	45	170	412534-001280	412533-001280
13,000	14	123	106	2,4	45	170	412534-001300	412533-001300
13,500	14	123	106	2,5	45	170	412534-001350	412533-001350
13,800	14	123	106	2,5	45	170	412534-001380	412533-001380
14,000	14	123	106	2,5	45	170	412534-001400	412533-001400
14,500	16	142	122	2,6	48	192	412534-001450	412533-001450
14,800	16	142	122	2,7	48	192	412534-001480	412533-001480
15,000	16	142	122	2,7	48	192	412534-001500	412533-001500
15,500	16	142	122	2,8	48	192	412534-001550	412533-001550
15,800	16	142	122	2,9	48	192	412534-001580	412533-001580
16,000	16	142	122	2,9	48	192	412534-001600	412533-001600

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance

D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	P				M		S			H		
	3	4	5	6	1	2	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
2,779	8	38	8	0,5	68	79	**TFM65207100**	–
3,000	6	20	14	0,5	36	62	**M25203000RT**	**M25203000RN**
3,100	6	20	14	0,6	36	62	**M25203100RT**	**M25203100RN**
3,175	5	23	10	0,6	50	62	**TFM65203000**	–
3,200	6	20	14	0,6	36	62	**M25203200RT**	**M25203200RN**
3,300	6	20	14	0,6	36	62	**M25203300RT**	**M25203300RN**
3,400	6	20	14	0,6	36	62	**M25203400RT**	**M25203400RN**
3,500	6	20	14	0,6	36	62	**M25203500RT**	**M25203500RN**
3,600	6	20	14	0,7	36	62	**M25203600RT**	**M25203600RN**
3,700	6	20	14	0,7	36	62	**M25203700RT**	**M25203700RN**
3,800	6	24	17	0,7	36	66	**M25203800RT**	**M25203800RN**
3,900	6	24	17	0,7	36	66	**M25203900RT**	**M25203900RN**
3,962	5	23	12	0,7	48	62	**TFM65204000**	–
4,000	6	24	17	0,7	36	66	**M25204000RT**	**M25204000RN**
4,100	6	24	17	0,7	36	66	**M25204100RT**	**M25204100RN**
4,200	6	24	17	0,8	36	66	**M25204200RT**	**M25204200RN**
4,300	6	24	17	0,8	36	66	**M25204300RT**	**M25204300RN**
4,400	6	24	17	0,8	36	66	**M25204400RT**	**M25204400RN**
4,500	6	24	17	0,8	36	66	**M25204500RT**	**M25204500RN**
4,600	6	24	17	0,8	36	66	**M25204600RT**	**M25204600RN**
4,700	6	24	17	0,9	36	66	**M25204700RT**	**M25204700RN**
4,763	5	29	14	0,9	49	66	**TFM65205000**	–

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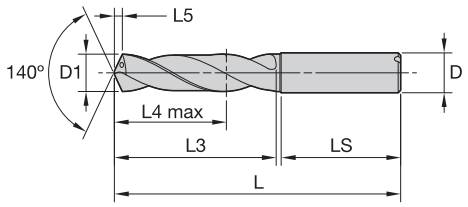

	P				M		S			H		
	3	4	5	6	1	2	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
4,800	6	28	20	0,9	36	66	M25204800RT	M25204800RN
4,900	6	28	20	0,9	36	66	M25204900RT	M25204900RN
5,000	6	28	20	0,9	36	66	M25205000RT	M25205000RN
5,100	6	28	20	0,9	36	66	M25205100RT	M25205100RN
5,159	6	34	15	0,9	56	74	TFM65205160	–
5,200	6	28	20	0,9	36	66	M25205200RT	M25205200RN
5,300	6	28	20	1,0	36	66	M25205300RT	M25205300RN
5,400	6	28	20	1,0	36	66	M25205400RT	M25205400RN
5,410	6	34	16	1,0	55	74	TFM65205410	–
5,500	6	28	20	1,0	36	66	M25205500RT	M25205500RN
5,556	6	34	17	1,0	55	74	TFM65205500	–
5,600	6	28	20	1,0	36	66	M25205600RT	M25205600RN
5,700	6	28	20	1,0	36	66	M25205700RT	M25205700RN
5,800	6	28	20	1,1	36	66	M25205800RT	M25205800RN
5,900	6	28	20	1,1	36	66	M25205900RT	M25205900RN
5,944	6	34	18	1,1	54	74	TFM65206250	–
6,000	6	28	20	1,1	36	66	M25206000RT	M25206000RN
6,100	8	34	24	1,1	36	79	M25206100RT	M25206100RN
6,200	8	34	24	1,1	36	79	M25206200RT	M25206200RN
6,300	8	34	24	1,1	36	79	M25206300RT	M25206300RN
6,350	8	34	19	1,2	52	74	TFM65205950	–
6,400	8	34	24	1,2	36	79	M25206400RT	M25206400RN
6,500	8	34	24	1,2	36	79	M25206500RT	M25206500RN
6,528	8	38	20	1,2	52	74	TFM65206530	–
6,600	8	34	24	1,2	36	79	M25206600RT	M25206600RN
6,700	8	34	24	1,2	36	79	M25206700RT	M25206700RN
6,800	8	34	24	1,2	36	79	M25206800RT	M25206800RN
6,900	8	34	24	1,3	36	79	M25206900RT	M25206900RN
7,000	8	34	24	1,3	36	79	M25207000RT	M25207000RN
7,100	8	41	29	1,3	36	79	M25207100RT	M25207100RN
7,145	8	38	21	1,3	55	79	TFM65207300	–
7,200	8	41	29	1,3	36	79	M25207200RT	M25207200RN
7,300	8	41	29	1,3	36	79	M25207300RT	M25207300RN
7,400	8	41	29	1,3	36	79	M25207400RT	M25207400RN
7,500	8	41	29	1,4	36	79	M25207500RT	M25207500RN
7,541	8	38	23	1,4	54	79	TFM65207500	–

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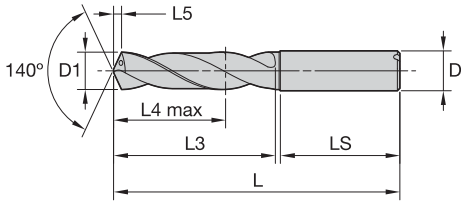

	P				M		S			H		
	3	4	5	6	1	2	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
7,600	8	41	29	1,4	36	79	M25207600RT	M25207600RN
7,700	8	41	29	1,4	36	79	M25207700RT	M25207700RN
7,800	8	41	29	1,4	36	79	M25207800RT	M25207800RN
7,900	8	41	29	1,4	36	79	M25207900RT	M25207900RN
7,938	8	38	24	1,4	53	79	TFM65208000	–
8,000	8	41	29	1,5	36	79	M25208000RT	M25208000RN
8,100	10	47	35	1,5	40	89	M25208100RT	M25208100RN
8,200	10	47	35	1,5	40	89	M25208200RT	M25208200RN
8,300	10	47	35	1,5	40	89	M25208300RT	M25208300RN
8,400	10	47	35	1,5	40	89	M25208400RT	M25208400RN
8,433	10	46	25	1,5	61	89	TFM65208430	–
8,500	10	47	35	1,5	40	89	M25208500RT	M25208500RN
8,600	10	47	35	1,6	40	89	M25208600RT	M25208600RN
8,700	10	47	35	1,6	40	89	M25208700RT	M25208700RN
8,733	10	46	26	1,6	60	89	TFM65208500	–
8,800	10	47	35	1,6	40	89	M25208800RT	M25208800RN
8,900	10	47	35	1,6	40	89	M25208900RT	M25208900RN
9,000	10	47	35	1,6	40	89	M25209000RT	M25209000RN
9,100	10	47	35	1,7	40	89	M25209100RT	M25209100RN
9,129	10	46	27	1,7	59	89	TFM65208900	–
9,200	10	47	35	1,7	40	89	M25209200RT	M25209200RN
9,300	10	47	35	1,7	40	89	M25209300RT	M25209300RN
9,347	10	46	28	1,7	58	89	TFM65209350	–
9,400	10	47	35	1,7	40	89	M25209400RT	M25209400RN
9,500	10	47	35	1,7	40	89	M25209500RT	M25209500RN
9,525	10	46	29	1,7	58	89	TFM65210000	–
9,600	10	47	35	1,7	40	89	M25209600RT	M25209600RN
9,700	10	47	35	1,8	40	89	M25209700RT	M25209700RN
9,800	10	47	35	1,8	40	89	M25209800RT	M25209800RN
9,900	10	47	35	1,8	40	89	M25209900RT	M25209900RN
9,921	11	51	30	1,8	64	96	TFM65210100	–
10,000	10	47	35	1,8	40	89	M25210000RT	M25210000RN
10,100	12	55	40	1,8	45	102	M25210100RT	M25210100RN
10,200	12	55	40	1,9	45	102	M25210200RT	M25210200RN
10,300	12	55	40	1,9	45	102	M25210300RT	M25210300RN
10,320	11	51	31	1,9	63	96	TFM65210300	–
10,400	12	55	40	1,9	45	102	M25210400RT	M25210400RN
10,500	12	55	40	1,9	45	102	M25210500RT	M25210500RN

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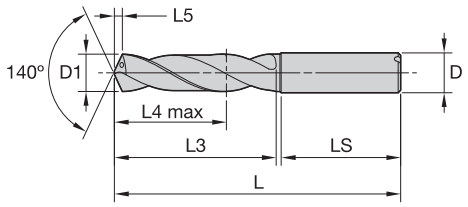


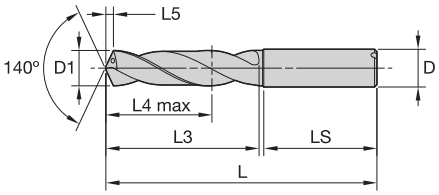
	P				M		S			H		
	3	4	5	6	1	2	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
10,600	12	55	40	1,9	45	102	M25210600RT	M25210600RN
10,700	12	55	40	1,9	45	102	M25210700RT	M25210700RN
10,716	11	51	32	2,0	61	96	TFM65210500	–
10,800	12	55	40	2,0	45	102	M25210800RT	M25210800RN
10,900	12	55	40	2,0	45	102	M25210900RT	M25210900RN
11,000	12	55	40	2,0	45	102	M25211000RT	M25211000RN
11,100	12	55	40	2,0	45	102	M25211100RT	M25211100RN
11,113	11	51	33	2,0	60	96	TFM65211000	–
11,200	12	55	40	2,0	45	102	M25211200RT	M25211200RN
11,300	12	55	40	2,1	45	102	M25211300RT	M25211300RN
11,400	12	55	40	2,1	45	102	M25211400RT	M25211400RN
11,500	12	55	40	2,1	45	102	M25211500RT	M25211500RN
11,509	13	54	35	2,1	65	102	TFM65211500	–
11,600	12	55	40	2,1	45	102	M25211600RT	M25211600RN
11,700	12	55	40	2,1	45	102	M25211700RT	M25211700RN
11,800	12	55	40	2,1	45	102	M25211800RT	M25211800RN
11,900	12	55	40	2,2	45	102	M25211900RT	M25211900RN
11,908	13	54	36	2,2	64	102	TFM65211900	–
12,000	12	55	40	2,2	45	102	M25212000RT	M25212000RN
12,304	13	54	37	2,2	62	102	TFM65212100	–
12,500	14	60	43	2,3	45	107	M25212500RT	M25212500RN
12,700	13	54	38	2,3	61	102	TFM65213000	–
13,000	14	60	43	2,4	45	107	M25213000RT	M25213000RN
13,500	14	60	43	2,5	45	107	M25213500RT	M25213500RN
14,000	14	60	43	2,6	45	107	M25214000RT	M25214000RN
14,288	14	59	43	2,6	62	107	TFM65214000	–
14,500	16	65	45	2,6	48	115	M25214500RT	M25214500RN
15,000	16	65	45	2,7	48	115	M25215000RT	M25215000RN
15,500	16	65	45	2,8	48	115	M25215500RT	M25215500RN
15,875	16	72	48	2,9	65	115	TFM65216000	–
16,000	16	65	45	2,9	48	115	M25216000RT	M25216000RN
16,500	18	73	51	3,0	48	123	M25216500RT	M25216500RN
17,000	18	73	51	3,1	48	123	M25217000RT	M25217000RN
17,463	17	72	52	3,2	68	123	TFM65217400	–
17,500	18	73	51	3,2	48	123	M25217500RT	M25217500RN
18,000	18	73	51	3,3	48	123	M25218000RT	M25218000RN
18,500	20	79	55	3,4	50	131	M25218500RT	M25218500RN
19,000	20	79	55	3,5	50	131	M25219000RT	M25219000RN
19,050	19	76	57	3,5	69	129	TFM65219000	–
19,500	20	79	55	3,6	50	131	M25219500RT	M25219500RN
20,000	20	79	55	3,6	50	131	M25220000RT	M25220000RN

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	P				M		S			H		
	3	4	5	6	1	2	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
2,779	8	50	14	0,5	75	91	TFM66207100	–
3,000	6	28	23	0,5	36	66	M26203000RT	M26203000RN
3,100	6	28	23	0,6	36	66	M26203100RT	M26203100RN
3,175	5	27	16	0,6	51	70	TFM66203000	–
3,200	6	28	23	0,6	36	66	M26203200RT	M26203200RN
3,300	6	28	23	0,6	36	66	M26203300RT	M26203300RN
3,400	6	28	23	0,6	36	66	M26203400RT	M26203400RN
3,500	6	28	23	0,6	36	66	M26203500RT	M26203500RN
3,600	6	28	23	0,7	36	66	M26203600RT	M26203600RN
3,700	6	28	23	0,7	36	66	M26203700RT	M26203700RN
3,800	6	36	29	0,7	36	74	M26203800RT	M26203800RN
3,900	6	36	29	0,7	36	74	M26203900RT	M26203900RN
3,962	5	27	20	0,7	48	70	TFM66204000	–
4,000	6	36	29	0,7	36	74	M26204000RT	M26204000RN
4,100	6	36	29	0,7	36	74	M26204100RT	M26204100RN
4,200	6	36	29	0,8	36	74	M26204200RT	M26204200RN
4,300	6	36	29	0,8	36	74	M26204300RT	M26204300RN
4,400	6	36	29	0,8	36	74	M26204400RT	M26204400RN
4,500	6	36	29	0,8	36	74	M26204500RT	M26204500RN
4,600	6	36	29	0,8	36	74	M26204600RT	M26204600RN
4,700	6	36	29	0,9	36	74	M26204700RT	M26204700RN
4,763	5	35	24	0,9	48	74	TFM66205000	–
4,800	6	44	35	0,9	36	82	M26204800RT	M26204800RN
4,900	6	44	35	0,9	36	82	M26204900RT	M26204900RN

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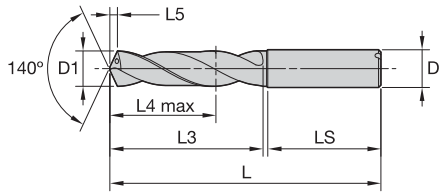

	P				M		S			H		
	3	4	5	6	1	2	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
5,000	6	44	35	0,9	36	82	M26205000RT	M26205000RN
5,100	6	44	35	0,9	36	82	M26205100RT	M26205100RN
5,159	6	43	26	0,9	54	82	TFM66205160	–
5,200	6	44	35	0,9	36	82	M26205200RT	M26205200RN
5,300	6	44	35	1,0	36	82	M26205300RT	M26205300RN
5,400	6	44	35	1,0	36	82	M26205400RT	M26205400RN
5,410	6	43	27	1,0	52	82	TFM66205410	–
5,500	6	44	35	1,0	36	82	M26205500RT	M26205500RN
5,556	6	43	28	1,0	52	82	TFM66205500	–
5,600	6	44	35	1,0	36	82	M26205600RT	M26205600RN
5,700	6	44	35	1,0	36	82	M26205700RT	M26205700RN
5,800	6	44	35	1,1	36	82	M26205800RT	M26205800RN
5,900	6	44	35	1,1	36	82	M26205900RT	M26205900RN
5,944	6	43	30	1,1	50	82	TFM66206250	–
6,000	6	44	35	1,1	36	82	M26206000RT	M26206000RN
6,100	8	53	43	1,1	36	91	M26206100RT	M26206100RN
6,200	8	53	43	1,1	36	91	M26206200RT	M26206200RN
6,300	8	53	43	1,1	36	91	M26206300RT	M26206300RN
6,350	8	43	32	1,2	48	82	TFM66205950	–
6,400	8	53	43	1,2	36	91	M26206400RT	M26206400RN
6,500	8	53	43	1,2	36	91	M26206500RT	M26206500RN
6,528	8	50	33	1,2	56	91	TFM66206530	–
6,600	8	53	43	1,2	36	91	M26206600RT	M26206600RN
6,700	8	53	43	1,2	36	91	M26206700RT	M26206700RN
6,800	8	53	43	1,2	36	91	M26206800RT	M26206800RN
6,900	8	53	43	1,3	36	91	M26206900RT	M26206900RN
7,000	8	53	43	1,3	36	91	M26207000RT	M26207000RN
7,100	8	53	43	1,3	36	91	M26207100RT	M26207100RN
7,145	8	50	36	1,3	53	91	TFM66207300	–
7,200	8	53	43	1,3	36	91	M26207200RT	M26207200RN
7,300	8	53	43	1,3	36	91	M26207300RT	M26207300RN
7,400	8	53	43	1,3	36	91	M26207400RT	M26207400RN
7,500	8	53	43	1,4	36	91	M26207500RT	M26207500RN
7,541	8	50	38	1,4	51	91	TFM66207500	–

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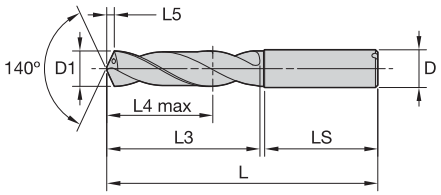

	P				M		S			H		
	3	4	5	6	1	2	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
7,600	8	53	43	1,4	36	91	M26207600RT	M26207600RN
7,700	8	53	43	1,4	36	91	M26207700RT	M26207700RN
7,800	8	53	43	1,4	36	91	M26207800RT	M26207800RN
7,900	8	53	43	1,4	36	91	M26207900RT	M26207900RN
7,938	8	50	40	1,4	49	91	TFM66208000	–
8,000	8	53	43	1,5	36	91	M26208000RT	M26208000RN
8,100	10	61	49	1,5	40	103	M26208100RT	M26208100RN
8,200	10	61	49	1,5	40	103	M26208200RT	M26208200RN
8,300	10	61	49	1,5	40	103	M26208300RT	M26208300RN
8,400	10	61	49	1,5	40	103	M26208400RT	M26208400RN
8,433	10	60	42	1,5	58	103	TFM66208430	–
8,500	10	61	49	1,5	40	103	M26208500RT	M26208500RN
8,600	10	61	49	1,6	40	103	M26208600RT	M26208600RN
8,700	10	61	49	1,6	40	103	M26208700RT	M26208700RN
8,733	10	60	44	1,6	57	103	TFM66208500	–
8,800	10	61	49	1,6	40	103	M26208800RT	M26208800RN
8,900	10	61	49	1,6	40	103	M26208900RT	M26208900RN
9,000	10	61	49	1,6	40	103	M26209000RT	M26209000RN
9,100	10	61	49	1,7	40	103	M26209100RT	M26209100RN
9,129	10	60	46	1,7	55	103	TFM66208900	–
9,200	10	61	49	1,7	40	103	M26209200RT	M26209200RN
9,300	10	61	49	1,7	40	103	M26209300RT	M26209300RN
9,347	10	60	47	1,7	54	103	TFM66209350	–
9,400	10	61	49	1,7	40	103	M26209400RT	M26209400RN
9,500	10	61	49	1,7	40	103	M26209500RT	M26209500RN
9,525	11	60	48	1,7	53	103	TFM66210000	–
9,600	10	61	49	1,7	40	103	M26209600RT	M26209600RN
9,700	10	61	49	1,8	40	103	M26209700RT	M26209700RN
9,800	10	61	49	1,8	40	103	M26209800RT	M26209800RN
9,900	10	61	49	1,8	40	103	M26209900RT	M26209900RN
9,921	11	66	50	1,8	59	111	TFM66210100	–
10,000	10	61	49	1,8	40	103	M26210000RT	M26210000RN
10,100	12	71	56	1,8	45	118	M26210100RT	M26210100RN
10,200	12	71	56	1,9	45	118	M26210200RT	M26210200RN
10,300	12	71	56	1,9	45	118	M26210300RT	M26210300RN
10,320	11	66	52	1,9	57	111	TFM66210300	–
10,400	12	71	56	1,9	45	118	M26210400RT	M26210400RN
10,500	12	71	56	1,9	45	118	M26210500RT	M26210500RN

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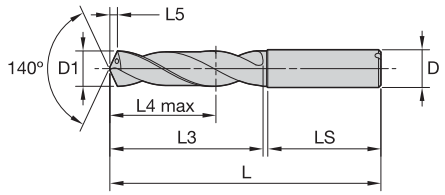


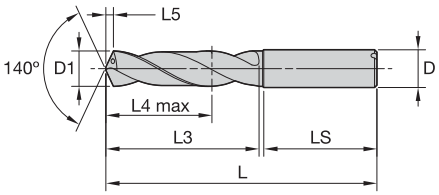
	P				M		S			H		
	3	4	5	6	1	2	2	3	4	1	2	3
TiAlN	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	TiAlN-RT	TiAlN-RN
10,600	12	71	56	1,9	45	118	M26210600RT	M26210600RN
10,700	12	71	56	1,9	45	118	M26210700RT	M26210700RN
10,716	11	66	54	2,0	55	111	TFM66210500	–
10,800	12	71	56	2,0	45	118	M26210800RT	M26210800RN
10,900	12	71	56	2,0	45	118	M26210900RT	M26210900RN
11,000	12	71	56	2,0	45	118	M26211000RT	M26211000RN
11,100	12	71	56	2,0	45	118	M26211100RT	M26211100RN
11,113	11	66	56	2,0	53	111	TFM66211000	–
11,200	12	71	56	2,0	45	118	M26211200RT	M26211200RN
11,300	12	71	56	2,1	45	118	M26211300RT	M26211300RN
11,400	12	71	56	2,1	45	118	M26211400RT	M26211400RN
11,500	12	71	56	2,1	45	118	M26211500RT	M26211500RN
11,509	13	70	58	2,1	58	118	TFM66211500	–
11,600	12	71	56	2,1	45	118	M26211600RT	M26211600RN
11,700	12	71	56	2,1	45	118	M26211700RT	M26211700RN
11,800	12	71	56	2,1	45	118	M26211800RT	M26211800RN
11,900	12	71	56	2,2	45	118	M26211900RT	M26211900RN
11,908	13	70	60	2,2	56	118	TFM66211900	–
12,000	12	71	56	2,2	45	118	M26212000RT	M26212000RN
12,304	13	70	62	2,2	54	118	TFM66212100	–
12,500	14	77	60	2,3	45	124	M26212500RT	M26212500RN
12,700	13	70	64	2,3	52	118	TFM66213000	–
13,000	14	77	60	2,4	45	124	M26213000RT	M26213000RN
13,500	14	77	60	2,5	45	124	M26213500RT	M26213500RN
14,000	14	77	60	2,6	45	124	M26214000RT	M26214000RN
14,288	14	76	71	2,6	50	124	TFM66214000	–
14,500	16	83	63	2,6	48	133	M26214500RT	M26214500RN
15,000	16	83	63	2,7	48	133	M26215000RT	M26215000RN
15,500	16	83	63	2,8	48	133	M26215500RT	M26215500RN
15,875	16	82	79	2,9	51	133	TFM66216000	–
16,000	16	83	63	2,9	48	133	M26216000RT	M26216000RN
16,500	18	93	71	3,0	48	143	M26216500RT	M26216500RN
17,000	18	93	71	3,1	48	143	M26217000RT	M26217000RN
17,463	17	92	87	3,2	53	143	TFM66217400	–
17,500	18	93	71	3,2	48	143	M26217500RT	M26217500RN
18,000	18	93	71	3,3	48	143	M26218000RT	M26218000RN
18,500	20	101	77	3,4	50	153	M26218500RT	M26218500RN
19,000	20	101	77	3,5	50	153	M26219000RT	M26219000RN
19,050	19	95	95	3,5	50	148	TFM66219000	–
19,500	20	101	77	3,6	50	153	M26219500RT	M26219500RN
20,000	20	101	77	3,6	50	153	M26220000RT	M26220000RN

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance

D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	P		M			K			N					S			
	5	6	1	2	3	1	2	3	1	2	4	5	6	1	2	3	4
K20F-DCF	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF "A" Shank	K20F-DCF "E" Shank
3,000	6	20	14	0,5	36	62	412522-000300	412520-000300
3,100	6	20	14	0,6	36	62	412522-000310	412520-000310
3,200	6	20	14	0,6	36	62	412522-000320	412520-000320
3,250	6	20	14	0,6	36	62	412522-000325	–
3,300	6	20	14	0,6	36	62	412522-000330	412520-000330
3,400	6	20	14	0,6	36	62	412522-000340	412520-000340
3,500	6	20	14	0,6	36	62	412522-000350	412520-000350
3,600	6	20	14	0,7	36	62	412522-000360	–
3,700	6	20	14	0,7	36	62	412522-000370	412520-000370
3,800	6	24	17	0,7	36	66	412522-000380	412520-000380
3,900	6	24	17	0,7	36	66	412522-000390	412520-000390
4,000	6	24	17	0,7	36	66	412522-000400	412520-000400
4,100	6	24	17	0,7	36	66	412522-000410	412520-000410
4,200	6	24	17	0,8	36	66	412522-000420	412520-000420
4,300	6	24	17	0,8	36	66	412522-000430	412520-000430
4,400	6	24	17	0,8	36	66	412522-000440	–
4,500	6	24	17	0,8	36	66	412522-000450	412520-000450
4,600	6	24	17	0,8	36	66	412522-000460	412520-000460
4,650	6	24	17	0,8	36	66	412522-000465	–
4,700	6	24	17	0,9	36	66	412522-000470	412520-000470
4,800	6	28	20	0,9	36	66	412522-000480	412520-000480
4,900	6	28	20	0,9	36	66	412522-000490	412520-000490
5,000	6	28	20	0,9	36	66	412522-000500	412520-000500
5,100	6	28	20	0,9	36	66	412522-000510	412520-000510

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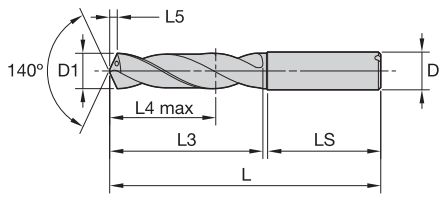

	P		M			K			N					S			
	5	6	1	2	3	1	2	3	1	2	4	5	6	1	2	3	4
K20F-DCF	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF "A" Shank	K20F-DCF "E" Shank
5,200	6	28	20	0,9	36	66	412522-000520	412520-000520
5,300	6	28	20	1,0	36	66	412522-000530	412520-000530
5,400	6	28	20	1,0	36	66	412522-000540	412520-000540
5,500	6	28	20	1,0	36	66	412522-000550	412520-000550
5,550	6	28	20	1,0	36	66	412522-000555	412520-000555
5,600	6	28	20	1,0	36	66	412522-000560	412520-000560
5,700	6	28	20	1,0	36	66	412522-000570	–
5,800	6	28	20	1,1	36	66	412522-000580	412520-000580
5,900	6	28	20	1,1	36	66	412522-000590	412520-000590
6,000	6	28	20	1,1	36	66	412522-000600	412520-000600
6,100	8	34	24	1,1	36	79	412522-000610	412520-000610
6,200	8	34	24	1,1	36	79	412522-000620	412520-000620
6,300	8	34	24	1,1	36	79	412522-000630	412520-000630
6,400	8	34	24	1,2	36	79	412522-000640	412520-000640
6,500	8	34	24	1,2	36	79	412522-000650	412520-000650
6,600	8	34	24	1,2	36	79	412522-000660	412520-000660
6,700	8	34	24	1,2	36	79	412522-000670	–
6,800	8	34	24	1,2	36	79	412522-000680	412520-000680
6,900	8	34	24	1,3	36	79	412522-000690	412520-000690
7,000	8	34	24	1,3	36	79	412522-000700	412520-000700
7,100	8	41	29	1,3	36	79	412522-000710	412520-000710
7,200	8	41	29	1,3	36	79	412522-000720	412520-000720
7,300	8	41	29	1,3	36	79	412522-000730	–
7,400	8	41	29	1,3	36	79	412522-000740	412520-000740

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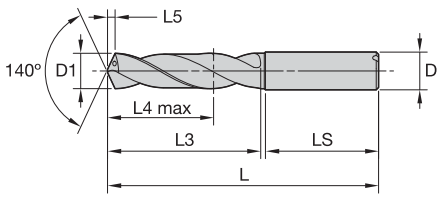

	P		M			K			N					S			
	5	6	1	2	3	1	2	3	1	2	4	5	6	1	2	3	4
K20F-DCF	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF "A" Shank	K20F-DCF "E" Shank
7,500	8	41	29	1,4	36	79	412522-000750	412520-000750
7,600	8	41	29	1,4	36	79	412522-000760	–
7,700	8	41	29	1,4	36	79	412522-000770	412520-000770
7,800	8	41	29	1,4	36	79	412522-000780	412520-000780
7,900	8	41	29	1,4	36	79	412522-000790	412520-000790
8,000	8	41	29	1,5	36	79	412522-000800	412520-000800
8,100	10	47	35	1,5	40	89	412522-000810	412520-000810
8,200	10	47	35	1,5	40	89	412522-000820	412520-000820
8,300	10	47	35	1,5	40	89	412522-000830	412520-000830
8,400	10	47	35	1,5	40	89	412522-000840	–
8,500	10	47	35	1,5	40	89	412522-000850	412520-000850
8,600	10	47	35	1,6	40	89	412522-000860	412520-000860
8,700	10	47	35	1,6	40	89	412522-000870	412520-000870
8,800	10	47	35	1,6	40	89	412522-000880	412520-000880
8,900	10	47	35	1,6	40	89	412522-000890	412520-000890
9,000	10	47	35	1,6	40	89	412522-000900	412520-000900
9,100	10	47	35	1,7	40	89	412522-000910	412520-000910
9,200	10	47	35	1,7	40	89	412522-000920	412520-000920
9,300	10	47	35	1,7	40	89	412522-000930	412520-000930
9,400	10	47	35	1,7	40	89	412522-000940	–
9,500	10	47	35	1,7	40	89	412522-000950	412520-000950
9,600	10	47	35	1,7	40	89	412522-000960	412520-000960
9,700	10	47	35	1,8	40	89	412522-000970	412520-000970
9,800	10	47	35	1,8	40	89	412522-000980	412520-000980
9,900	10	47	35	1,8	40	89	412522-000990	–
10,000	10	47	35	1,8	40	89	412522-001000	412520-001000
10,100	12	55	40	1,8	45	102	412522-001010	–
10,200	12	55	40	1,9	45	102	412522-001020	412520-001020
10,300	12	55	40	1,9	45	102	412522-001030	412520-001030
10,400	12	55	40	1,9	45	102	412522-001040	412520-001040
10,500	12	55	40	1,9	45	102	412522-001050	412520-001050
10,600	12	55	40	1,9	45	102	412522-001060	412520-001060

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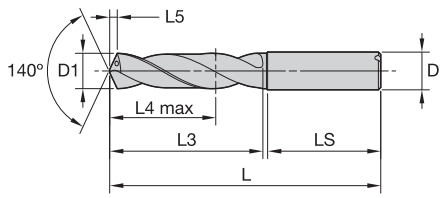


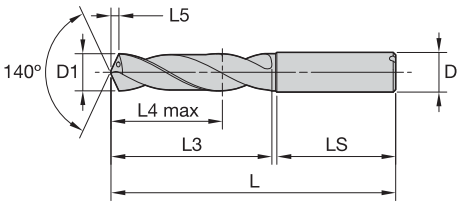
	P		M			K			N					S			
	5	6	1	2	3	1	2	3	1	2	4	5	6	1	2	3	4
K20F-DCF	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF "A" Shank	K20F-DCF "E" Shank
10,700	12	55	40	1,9	45	102	412522-001070	–
10,800	12	55	40	2,0	45	102	412522-001080	412520-001080
10,900	12	55	40	2,0	45	102	412522-001090	–
11,000	12	55	40	2,0	45	102	412522-001100	412520-001100
11,100	12	55	40	2,0	45	102	412522-001110	–
11,200	12	55	40	2,0	45	102	412522-001120	412520-001120
11,300	12	55	40	2,1	45	102	412522-001130	412520-001130
11,400	12	55	40	2,1	45	102	412522-001140	–
11,500	12	55	40	2,1	45	102	412522-001150	412520-001150
11,600	12	55	40	2,1	45	102	412522-001160	–
11,700	12	55	40	2,1	45	102	412522-001170	–
11,800	12	55	40	2,1	45	102	412522-001180	412520-001180
11,900	12	55	40	2,2	45	102	412522-001190	–
12,000	12	55	40	2,2	45	102	412522-001200	412520-001200
12,500	14	60	43	2,3	45	107	412522-001250	412520-001250
12,800	14	60	43	2,3	45	107	412522-001280	–
13,000	14	60	43	2,4	45	107	412522-001300	412520-001300
13,500	14	60	43	2,5	45	107	412522-001350	–
13,800	14	60	43	2,5	45	107	412522-001380	412520-001380
14,000	14	60	43	2,5	45	107	412522-001400	412520-001400
14,500	16	65	45	2,6	48	115	412522-001450	–
14,800	16	65	45	2,7	48	115	412522-001480	–
15,000	16	65	45	2,7	48	115	412522-001500	412520-001500
15,500	16	65	45	2,8	48	115	412522-001550	–
15,800	16	65	45	2,9	48	115	412522-001580	412520-001580
16,000	16	65	45	2,9	48	115	412522-001600	412520-001600
16,500	18	73	51	3,0	48	123	412522-001650	–
16,800	18	73	51	3,1	48	123	412522-001680	–
17,000	18	73	51	3,1	48	123	412522-001700	–
17,500	18	73	51	3,2	48	123	412522-001750	–
17,800	18	73	51	3,2	48	123	412522-001780	412520-001780
18,000	18	73	51	3,3	48	123	412522-001800	412520-001800
18,500	20	79	55	3,4	50	131	412522-001850	–
18,800	20	79	55	3,4	50	131	412522-001880	–
19,000	20	79	55	3,5	50	131	412522-001900	–
19,500	20	79	55	3,5	50	131	412522-001950	412520-001950
19,800	20	79	55	3,6	50	131	412522-001980	–
20,000	20	79	55	3,6	50	131	412522-002000	412520-002000

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	P		M			K			N					S			
	5	6	1	2	3	1	2	3	1	2	4	5	6	1	2	3	4
K20F-DCF	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

							K20F-DCF	K20F-DCF
D1	D	L3	L4 max	L5	LS	L	“A” Shank	“E” Shank
3,000	6	28	23	0,5	36	66	412527-000300	412525-000300
3,100	6	28	23	0,6	36	66	412527-000310	412525-000310
3,200	6	28	23	0,6	36	66	412527-000320	412525-000320
3,250	6	28	23	0,6	36	66	412527-000325	412525-000325
3,300	6	28	23	0,6	36	66	412527-000330	412525-000330
3,400	6	28	23	0,6	36	66	412527-000340	412525-000340
3,500	6	28	23	0,6	36	66	412527-000350	412525-000350
3,600	6	28	23	0,7	36	66	412527-000360	412525-000360
3,700	6	28	23	0,7	36	66	412527-000370	412525-000370
3,800	6	36	29	0,7	36	74	412527-000380	412525-000380
3,900	6	36	29	0,7	36	74	412527-000390	412525-000390
4,000	6	36	29	0,7	36	74	412527-000400	412525-000400
4,100	6	36	29	0,7	36	74	412527-000410	412525-000410
4,200	6	36	29	0,8	36	74	412527-000420	412525-000420
4,300	6	36	29	0,8	36	74	412527-000430	412525-000430
4,400	6	36	29	0,8	36	74	412527-000440	412525-000440
4,500	6	36	29	0,8	36	74	412527-000450	412525-000450
4,600	6	36	29	0,8	36	74	412527-000460	412525-000460
4,650	6	36	29	0,8	36	74	412527-000465	412525-000465
4,700	6	36	29	0,9	36	74	412527-000470	412525-000470
4,800	6	44	35	0,9	36	82	412527-000480	412525-000480
4,900	6	44	35	0,9	36	82	412527-000490	412525-000490
5,000	6	44	35	0,9	36	82	412527-000500	412525-000500
5,100	6	44	35	0,9	36	82	412527-000510	412525-000510

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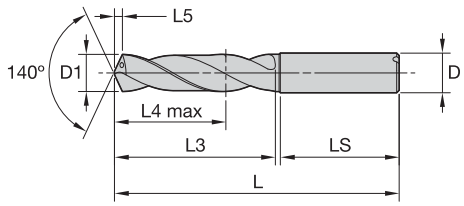

	P		M			K			N					S			
	5	6	1	2	3	1	2	3	1	2	4	5	6	1	2	3	4
K20F-DCF	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF "A" Shank	K20F-DCF "E" Shank
5,200	6	44	35	0,9	36	82	412527-000520	412525-000520
5,300	6	44	35	1,0	36	82	412527-000530	412525-000530
5,400	6	44	35	1,0	36	82	412527-000540	412525-000540
5,500	6	44	35	1,0	36	82	412527-000550	412525-000550
5,550	6	44	35	1,0	36	82	412527-000555	412525-000555
5,600	6	44	35	1,0	36	82	412527-000560	412525-000560
5,700	6	44	35	1,0	36	82	412527-000570	412525-000570
5,800	6	44	35	1,1	36	82	412527-000580	412525-000580
5,900	6	44	35	1,1	36	82	412527-000590	412525-000590
6,000	6	44	35	1,1	36	82	412527-000600	412525-000600
6,100	8	53	43	1,1	36	91	412527-000610	412525-000610
6,200	8	53	43	1,1	36	91	412527-000620	412525-000620
6,300	8	53	43	1,1	36	91	412527-000630	412525-000630
6,400	8	53	43	1,2	36	91	412527-000640	412525-000640
6,500	8	53	43	1,2	36	91	412527-000650	412525-000650
6,600	8	53	43	1,2	36	91	412527-000660	412525-000660
6,700	8	53	43	1,2	36	91	412527-000670	412525-000670
6,800	8	53	43	1,2	36	91	412527-000680	412525-000680
6,900	8	53	43	1,3	36	91	412527-000690	412525-000690
7,000	8	53	43	1,3	36	91	412527-000700	412525-000700
7,100	8	53	43	1,3	36	91	412527-000710	412525-000710
7,200	8	53	43	1,3	36	91	412527-000720	412525-000720
7,300	8	53	43	1,3	36	91	412527-000730	412525-000730
7,400	8	53	43	1,3	36	91	412527-000740	412525-000740
7,500	8	53	43	1,4	36	91	412527-000750	412525-000750
7,600	8	53	43	1,4	36	91	412527-000760	412525-000760
7,700	8	53	43	1,4	36	91	412527-000770	412525-000770
7,800	8	53	43	1,4	36	91	412527-000780	412525-000780

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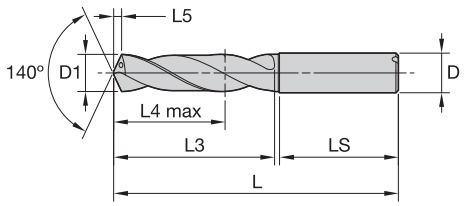

	P		M			K			N					S			
	5	6	1	2	3	1	2	3	1	2	4	5	6	1	2	3	4
K20F-DCF	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*

M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.

For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF “A” Shank	K20F-DCF “E” Shank
7,900	8	53	43	1,4	36	91	412527-000790	412525-000790
8,000	8	53	43	1,5	36	91	412527-000800	412525-000800
8,100	10	61	49	1,5	40	103	412527-000810	412525-000810
8,200	10	61	49	1,5	40	103	412527-000820	412525-000820
8,300	10	61	49	1,5	40	103	412527-000830	412525-000830
8,400	10	61	49	1,5	40	103	412527-000840	412525-000840
8,500	10	61	49	1,5	40	103	412527-000850	412525-000850
8,600	10	61	49	1,6	40	103	412527-000860	412525-000860
8,700	10	61	49	1,6	40	103	412527-000870	412525-000870
8,800	10	61	49	1,6	40	103	412527-000880	412525-000880
8,900	10	61	49	1,6	40	103	412527-000890	412525-000890
9,000	10	61	49	1,6	40	103	412527-000900	412525-000900
9,100	10	61	49	1,7	40	103	412527-000910	412525-000910
9,200	10	61	49	1,7	40	103	412527-000920	412525-000920
9,300	10	61	49	1,7	40	103	412527-000930	412525-000930
9,400	10	61	49	1,7	40	103	412527-000940	412525-000940
9,500	10	61	49	1,7	40	103	412527-000950	412525-000950
9,600	10	61	49	1,7	40	103	412527-000960	412525-000960
9,700	10	61	49	1,8	40	103	412527-000970	412525-000970
9,800	10	61	49	1,8	40	103	412527-000980	412525-000980
9,900	10	61	49	1,8	40	103	412527-000990	412525-000990
10,000	10	61	49	1,8	40	103	412527-001000	412525-001000
10,100	12	71	56	1,8	45	118	412527-001010	412525-001010
10,200	12	71	56	1,9	45	118	412527-001020	412525-001020
10,300	12	71	56	1,9	45	118	412527-001030	412525-001030
10,400	12	71	56	1,9	45	118	412527-001040	412525-001040
10,500	12	71	56	1,9	45	118	412527-001050	412525-001050
10,600	12	71	56	1,9	45	118	412527-001060	412525-001060
10,700	12	71	56	1,9	45	118	412527-001070	412525-001070
10,800	12	71	56	2,0	45	118	412527-001080	412525-001080
10,900	12	71	56	2,0	45	118	412527-001090	412525-001090
11,000	12	71	56	2,0	45	118	412527-001100	412525-001100

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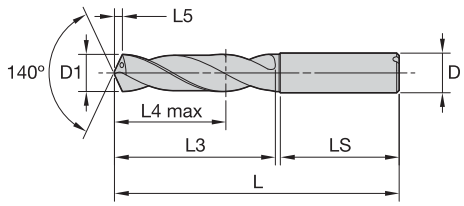


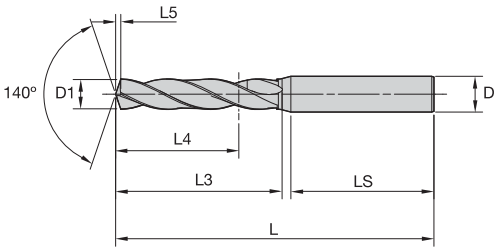
	P		M			K			N					S			
	5	6	1	2	3	1	2	3	1	2	4	5	6	1	2	3	4
K20F-DCF	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF "A" Shank	K20F-DCF "E" Shank
11,100	12	71	56	2,0	45	118	412527-001110	412525-001110
11,200	12	71	56	2,0	45	118	412527-001120	412525-001120
11,300	12	71	56	2,1	45	118	412527-001130	412525-001130
11,400	12	71	56	2,1	45	118	412527-001140	412525-001140
11,500	12	71	56	2,1	45	118	412527-001150	412525-001150
11,600	12	71	56	2,1	45	118	412527-001160	412525-001160
11,700	12	71	56	2,1	45	118	412527-001170	412525-001170
11,800	12	71	56	2,1	45	118	412527-001180	412525-001180
11,900	12	71	56	2,2	45	118	412527-001190	412525-001190
12,000	12	71	56	2,2	45	118	412527-001200	412525-001200
12,500	14	77	60	2,3	45	124	412527-001250	412525-001250
12,800	14	77	60	2,3	45	124	412527-001280	412525-001280
13,000	14	77	60	2,4	45	124	412527-001300	412525-001300
13,500	14	77	60	2,5	45	124	412527-001350	412525-001350
13,800	14	77	60	2,5	45	124	412527-001380	412525-001380
14,000	14	77	60	2,5	45	124	412527-001400	412525-001400
14,500	16	83	63	2,6	48	133	412527-001450	412525-001450
14,800	16	83	63	2,7	48	133	412527-001480	412525-001480
15,000	16	83	63	2,7	48	133	412527-001500	412525-001500
15,500	16	83	63	2,8	48	133	412527-001550	412525-001550
15,800	16	83	63	2,9	48	133	412527-001580	412525-001580
16,000	16	83	63	2,9	48	133	412527-001600	412525-001600
16,500	18	93	71	3,0	48	143	412527-001650	412525-001650
16,800	18	93	71	3,1	48	143	412527-001680	412525-001680
17,000	18	93	71	3,1	48	143	412527-001700	412525-001700
17,500	18	93	71	3,2	48	143	412527-001750	412525-001750
17,800	18	93	71	3,2	48	143	412527-001780	412525-001780
18,000	18	93	71	3,3	48	143	412527-001800	412525-001800
18,500	20	101	77	3,4	50	153	412527-001850	412525-001850
18,800	20	101	77	3,4	50	153	412527-001880	412525-001880
19,000	20	101	77	3,5	50	153	412527-001900	412525-001900
19,500	20	101	77	3,5	50	153	412527-001950	412525-001950
19,800	20	101	77	3,6	50	153	412527-001980	412525-001980
20,000	20	101	77	3,6	50	153	412527-002000	412525-002000

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	P		M			K			N					S			
	5	6	1	2	3	1	2	3	1	2	4	5	6	1	2	3	4
K20F-DCF	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

							K20F-DCF	K20F-DCF
D1	D	L3	L4 max	L5	LS	L	"A" Shank	"E" Shank
3,000	6	32	27	0,5	36	70	412834-000300	412833-000300
3,300	6	32	27	0,6	36	70	412834-000330	412833-000330
3,500	6	32	27	0,6	36	70	412834-000350	412833-000350
3,700	6	32	27	0,7	36	70	412834-000370	412833-000370
3,800	6	42	35	0,7	36	80	412834-000380	412833-000380
4,000	6	42	35	0,7	36	80	412834-000400	412833-000400
4,200	6	42	35	0,8	36	80	412834-000420	412833-000420
4,500	6	42	35	0,8	36	80	412834-000450	412833-000450
4,700	6	42	35	0,9	36	80	412834-000470	412833-000470
4,800	6	54	45	0,9	36	92	412834-000480	412833-000480
5,000	6	54	45	0,9	36	92	412834-000500	412833-000500
5,500	6	54	45	1,0	36	92	412834-000550	412833-000550
5,800	6	54	45	1,1	36	92	412834-000580	412833-000580
6,000	6	54	45	1,1	36	92	412834-000600	412833-000600

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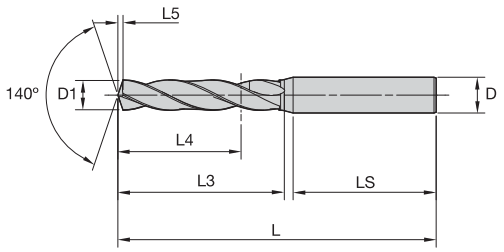


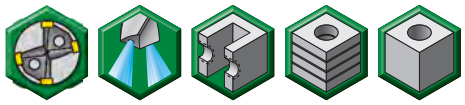
	P		M			K			N					S			
	5	6	1	2	3	1	2	3	1	2	4	5	6	1	2	3	4
K20F-DCF	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

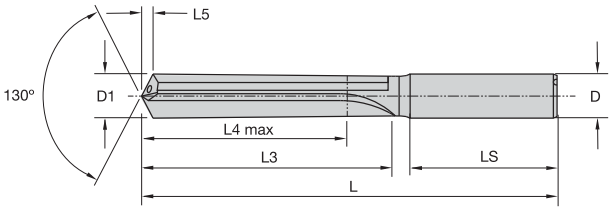
P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B109.

D1	D	L3	L4 max	L5	LS	L	K20F-DCF “A” Shank	K20F-DCF “E” Shank
6,500	8	62	52	1,2	36	100	412834-000650	412833-000650
6,800	8	62	52	1,2	36	100	412834-000680	412833-000680
7,000	8	70	60	1,3	36	108	412834-000700	412833-000700
7,500	8	70	60	1,4	36	108	412834-000750	412833-000750
7,800	8	70	60	1,4	36	108	412834-000780	412833-000780
8,000	8	70	60	1,5	36	108	412834-000800	412833-000800
8,500	10	80	68	1,5	40	122	412834-000850	412833-000850
9,000	10	80	68	1,6	40	122	412834-000900	412833-000900
9,500	10	88	76	1,7	40	130	412834-000950	412833-000950
9,800	10	88	76	1,8	40	130	412834-000980	412833-000980
10,000	10	88	76	1,8	40	130	412834-001000	412833-001000
10,200	12	105	90	1,9	45	152	412834-001020	412833-001020
10,500	12	105	90	1,9	45	152	412834-001050	412833-001050
10,800	12	105	90	2,0	45	152	412834-001080	412833-001080
11,000	12	105	90	2,0	45	152	412834-001100	412833-001100
11,500	12	105	90	2,1	45	152	412834-001150	412833-001150
11,800	12	105	90	2,1	45	152	412834-001180	412833-001180
12,000	14	105	90	2,2	45	152	412834-001200	412833-001200
12,500	14	123	106	2,3	45	170	412834-001250	412833-001250
12,800	14	123	106	2,3	45	170	412834-001280	412833-001280
13,000	14	123	106	2,4	45	170	412834-001300	412833-001300
13,500	14	123	106	2,5	45	170	412834-001350	412833-001350
13,800	14	123	106	2,5	45	170	412834-001380	412833-001380
14,000	14	123	106	2,5	45	170	412834-001400	412833-001400
14,500	16	142	122	2,6	48	192	412834-001450	412833-001450
14,800	16	142	122	2,7	48	192	412834-001480	412833-001480
15,000	16	142	122	2,7	48	192	412834-001500	412833-001500
15,500	16	142	122	2,8	48	192	412834-001550	412833-001550
15,800	16	142	122	2,9	48	192	412834-001580	412833-001580
16,000	16	142	122	2,9	48	192	412834-001600	412833-001600

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.





Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	K			N		
	1	2	3	1	2	3
Uncoated	●	●	●	●	●	●
TiAlN	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

							K20F	K20F-TiAlN
D1	D	L3	L4 max	L5	LS	L	Uncoated	TiAlN
5,000	6	44	30	1,2	36	82	012535-000500	412535-000500
5,500	6	44	30	1,3	36	82	012535-000550	412535-000550
5,800	6	44	30	1,4	36	82	012535-000580	412535-000580
6,000	6	44	30	1,4	36	82	012535-000600	412535-000600
6,500	8	53	37	1,5	36	91	012535-000650	412535-000650
6,800	8	53	37	1,6	36	91	012535-000680	412535-000680
7,000	8	53	37	1,6	36	91	012535-000700	412535-000700
7,500	8	53	37	1,7	36	91	012535-000750	412535-000750
7,800	8	53	37	1,8	36	91	012535-000780	412535-000780
8,000	8	53	37	1,9	36	91	012535-000800	412535-000800
8,500	10	61	43	2,0	40	103	012535-000850	412535-000850
8,800	10	61	43	2,1	40	103	012535-000880	412535-000880
9,000	10	61	43	2,1	40	103	012535-000900	412535-000900
9,200	10	61	43	2,1	40	103	–	412535-000920
9,500	10	61	43	2,2	40	103	012535-000950	412535-000950
9,800	10	61	43	2,3	40	103	012535-000980	412535-000980
10,000	10	61	43	2,3	40	103	012535-001000	412535-001000
10,200	12	71	51	2,4	45	118	012535-001020	412535-001020

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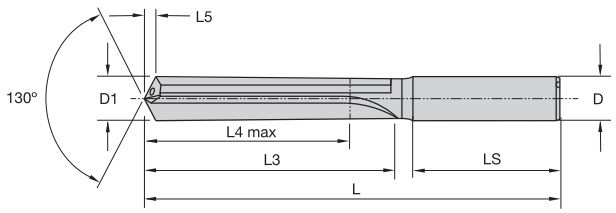


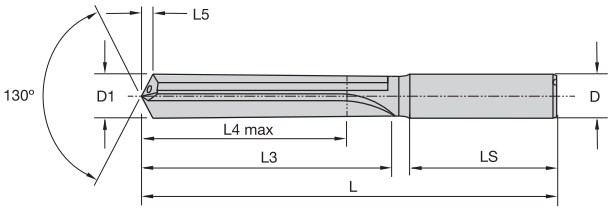
	K			N		
	1	2	3	1	2	3
Uncoated	●	●	●	●	●	●
TiAlN	●	●	●			●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

							K20F	K20F-TiAlN
D1	D	L3	L4 max	L5	LS	L	Uncoated	TiAlN
10,500	12	71	51	2,4	45	118	012535-001050	412535-001050
10,800	12	71	51	2,5	45	118	012535-001080	412535-001080
11,000	12	71	51	2,6	45	118	012535-001100	412535-001100
11,500	12	71	51	2,7	45	118	012535-001150	412535-001150
11,800	12	71	51	2,8	45	118	012535-001180	412535-001180
12,000	12	71	51	2,8	45	118	012535-001200	412535-001200
12,500	14	77	56	2,9	45	124	012535-001250	412535-001250
12,800	14	77	56	3,0	45	124	012535-001280	412535-001280
13,000	14	77	56	3,0	45	124	012535-001300	412535-001300
13,500	14	77	56	3,1	45	124	012535-001350	412535-001350
13,800	14	77	56	3,2	45	124	012535-001380	412535-001380
14,000	14	77	56	3,3	45	124	012535-001400	412535-001400
14,500	16	83	60	3,4	48	133	012535-001450	412535-001450
14,800	16	83	60	3,5	48	133	012535-001480	412535-001480
15,000	16	83	60	3,5	48	133	012535-001500	412535-001500
15,500	16	83	60	3,6	48	133	012535-001550	412535-001550
15,800	16	83	60	3,7	48	133	012535-001580	412535-001580
16,000	16	83	60	3,7	48	133	012535-001600	412535-001600
16,500	18	93	69	3,8	48	143	012535-001650	412535-001650
17,000	18	93	69	4,0	48	143	012535-001700	412535-001700
17,500	18	93	69	4,1	48	143	012535-001750	412535-001750
17,800	18	93	69	4,2	48	143	012535-001780	412535-001780
18,000	18	93	69	4,2	48	143	012535-001800	412535-001800
18,500	20	101	76	4,3	50	153	012535-001850	412535-001850
19,000	20	101	76	4,4	50	153	012535-001900	412535-001900
19,500	20	101	76	4,5	50	153	012535-001950	412535-001950
19,800	20	101	76	4,6	50	153	012535-001980	412535-001980
20,000	20	101	76	4,7	50	153	012535-002000	412535-002000

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	K		N		
	1	3	1	2	3
Uncoated	●	●	●	●	●
TiAlN	●	●	●		

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

							K20F	K20F-TiAlN
D1	D	L3	L4 max	L5	LS	L	Uncoated	TiAlN
5,000	6	60	46	1,2	36	98	012536-000500	412536-000500
5,500	6	60	46	1,3	36	98	012536-000550	412536-000550
5,800	6	60	46	1,4	36	98	012536-000580	412536-000580
6,000	6	60	46	1,4	36	98	012536-000600	412536-000600
6,500	8	76	60	1,5	36	114	012536-000650	412536-000650
6,800	8	76	60	1,6	36	114	012536-000680	412536-000680
7,000	8	76	60	1,6	36	114	012536-000700	412536-000700
7,500	8	76	60	1,7	36	114	012536-000750	412536-000750
7,800	8	76	60	1,8	36	114	012536-000780	412536-000780
8,000	8	76	60	1,9	36	114	012536-000800	412536-000800
8,500	10	92	74	2,0	40	134	012536-000850	412536-000850
8,800	10	92	74	2,1	40	134	012536-000880	412536-000880
9,000	10	92	74	2,1	40	134	012536-000900	412536-000900
9,200	10	92	74	2,1	40	134	012536-000920	412536-000920
9,500	10	92	74	2,2	40	134	012536-000950	412536-000950
9,800	10	92	74	2,3	40	134	012536-000980	412536-000980
10,000	10	92	74	2,3	40	134	012536-001000	412536-001000
10,200	12	108	88	2,4	45	155	012536-001020	412536-001020

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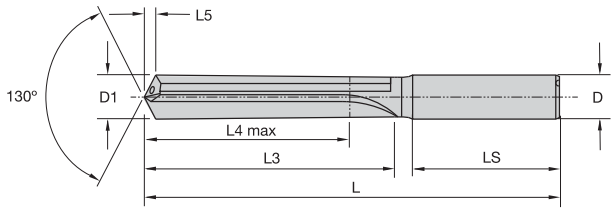


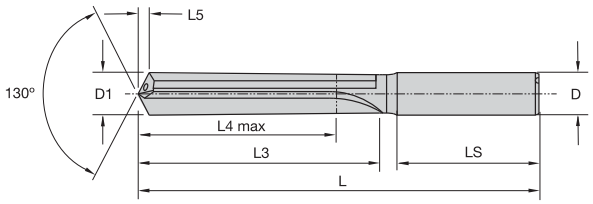
	K		N		
	1	3	1	2	3
Uncoated	●	●	●	●	●
TiAlN	●	●	●		

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

D1	D	L3	L4 max	L5	LS	L	K20F Uncoated	K20F-TiAlN TiAlN
10,500	12	108	88	2,4	45	155	012536-001050	412536-001050
10,800	12	108	88	2,5	45	155	012536-001080	412536-001080
11,000	12	108	88	2,6	45	155	012536-001100	412536-001100
11,500	12	108	88	2,7	45	155	012536-001150	412536-001150
11,800	12	108	88	2,8	45	155	012536-001180	412536-001180
12,000	12	108	88	2,8	45	155	012536-001200	412536-001200
12,500	14	125	104	2,9	45	172	012536-001250	412536-001250
12,800	14	125	104	3,0	45	172	012536-001280	412536-001280
13,000	14	125	104	3,0	45	172	012536-001300	412536-001300
13,500	14	125	104	3,1	45	172	012536-001350	412536-001350
13,800	14	125	104	3,2	45	172	012536-001380	412536-001380
14,000	14	125	104	3,3	45	172	012536-001400	412536-001400
14,500	16	143	120	3,4	48	193	012536-001450	412536-001450
14,800	16	143	120	3,5	48	193	012536-001480	412536-001480
15,000	16	143	120	3,5	48	193	012536-001500	412536-001500
15,500	16	143	120	3,6	48	193	012536-001550	412536-001550
15,800	16	143	120	3,7	48	193	012536-001580	412536-001580
16,000	16	143	120	3,7	48	193	012536-001600	412536-001600
16,500	18	160	136	3,8	48	210	012536-001650	412536-001650
17,000	18	160	136	4,0	48	210	012536-001700	412536-001700
17,500	18	160	136	4,1	48	210	012536-001750	412536-001750
17,800	18	160	136	4,2	48	210	012536-001780	412536-001780
18,000	18	160	136	4,2	48	210	012536-001800	412536-001800
18,500	20	177	152	4,3	50	229	012536-001850	412536-001850
19,000	20	177	152	4,4	50	229	012536-001900	412536-001900
19,500	20	177	152	4,5	50	229	012536-001950	412536-001950
19,800	20	177	152	4,6	50	229	012536-001980	412536-001980
20,000	20	177	152	4,7	50	229	012536-002000	412536-002000

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	K		N		
	1	3	1	2	3
Uncoated	●	●	●	●	●
TiAlN	●	●	●		

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

							K20F	K20F-TiAlN
D1	D	L3	L4 max	L5	LS	L	Uncoated	TiAlN
3,000	6	48	38	0,7	36	86	012537-000300	412537-000300
3,300	6	52	42	0,8	36	90	012537-000330	412537-000330
3,500	6	52	42	0,8	36	90	012537-000350	412537-000350
3,700	6	52	42	0,9	36	90	012537-000370	412537-000370
3,800	6	61	48	0,9	36	100	012537-000380	412537-000380
4,000	6	61	48	0,9	36	100	012537-000400	412537-000400
4,200	6	61	48	1,0	36	100	012537-000420	412537-000420
4,500	6	67	54	1,0	36	105	012537-000450	412537-000450
4,800	6	82	68	1,1	36	121	012537-000480	412537-000480
5,000	6	82	68	1,2	36	121	012537-000500	412537-000500
5,500	6	82	68	1,3	36	121	012537-000550	412537-000550
5,800	6	82	68	1,4	36	121	012537-000580	412537-000580
6,000	6	82	68	1,4	36	121	012537-000600	412537-000600
6,500	8	106	90	1,5	36	146	012537-000650	412537-000650
6,800	8	106	90	1,6	36	146	012537-000680	412537-000680
7,000	8	106	90	1,6	36	146	012537-000700	412537-000700
7,500	8	106	90	1,7	36	146	012537-000750	412537-000750
7,800	8	106	90	1,8	36	146	012537-000780	412537-000780
8,000	8	106	90	1,9	36	146	012537-000800	412537-000800
8,500	10	130	112	2,0	40	175	012537-000850	412537-000850

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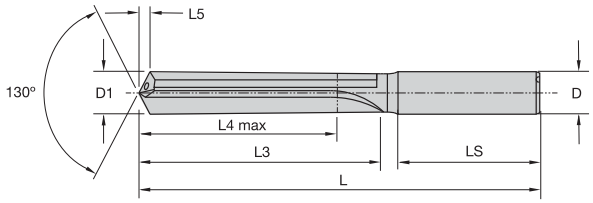


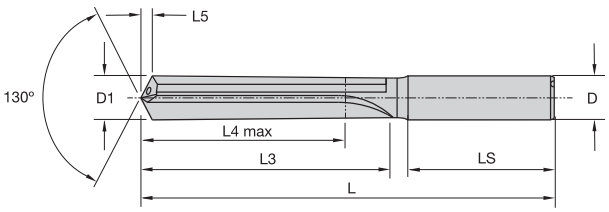
	K		N		
	1	3	1	2	3
Uncoated	●	●	●	●	●
TiAlN	●	●	●		

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

D1	D	L3	L4 max	L5	LS	L	K20F Uncoated	K20F-TiAlN TiAlN
8,800	10	130	112	2,1	40	175	012537-000880	412537-000880
9,000	10	130	112	2,1	40	175	012537-000900	412537-000900
9,200	10	130	112	2,1	40	175	012537-000920	412537-000920
9,500	10	130	112	2,2	40	175	012537-000950	412537-000950
9,800	10	130	112	2,3	40	175	012537-000980	412537-000980
10,000	10	130	112	2,3	40	175	012537-001000	412537-001000
10,200	12	159	139	2,4	45	209	012537-001020	412537-001020
10,500	12	159	139	2,4	45	209	012537-001050	412537-001050
10,800	12	159	139	2,5	45	209	012537-001080	412537-001080
11,000	12	159	139	2,6	45	209	012537-001100	412537-001100
11,500	12	159	139	2,7	45	209	012537-001150	412537-001150
11,800	12	159	139	2,8	45	209	012537-001180	412537-001180
12,000	12	159	139	2,8	45	209	012537-001200	412537-001200
12,500	14	183	162	2,9	45	233	012537-001250	412537-001250
12,800	14	183	162	3,0	45	233	012537-001280	412537-001280
13,000	14	183	162	3,0	45	233	012537-001300	412537-001300
13,500	14	183	162	3,1	45	233	012537-001350	412537-001350
13,800	14	183	162	3,2	45	233	012537-001380	412537-001380
14,000	14	183	162	3,3	45	233	012537-001400	412537-001400
14,500	16	207	184	3,4	48	260	012537-001450	412537-001450
14,800	16	207	184	3,5	48	260	012537-001480	412537-001480
15,000	16	207	184	3,5	48	260	012537-001500	412537-001500
15,500	16	207	184	3,6	48	260	012537-001550	412537-001550
15,800	16	207	184	3,7	48	260	012537-001580	412537-001580
16,000	16	207	184	3,7	48	260	012537-001600	412537-001600
16,500	18	231	207	3,8	48	284	012537-001650	412537-001650
17,000	18	231	207	4,0	48	284	012537-001700	412537-001700
17,500	18	231	207	4,1	48	284	012537-001750	412537-001750
17,800	18	231	207	4,2	48	284	012537-001780	412537-001780
18,000	18	231	207	4,2	48	284	012537-001800	412537-001800
18,500	20	255	230	4,3	50	308	012537-001850	412537-001850
19,000	20	255	230	4,4	50	308	012537-001900	412537-001900
19,500	20	255	230	4,5	50	308	012537-001950	412537-001950
19,800	20	255	230	4,6	50	308	012537-001980	412537-001980
20,000	20	255	230	4,7	50	308	012537-002000	412537-002000

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance			
D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	H			
	1	2	3	4
K10F-DCHP	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

							K10F-DCHP
D1	D	L3	L4 max	L5	LS	L	K10F-DCHP
5,000	6	60	46	1,2	36	98	**412518-000500**
5,500	6	60	46	1,3	36	98	**412518-000550**
5,800	6	60	46	1,4	36	98	**412518-000580**
6,000	6	60	46	1,4	36	98	**412518-000600**
6,500	8	76	60	1,5	36	114	**412518-000650**
6,800	8	76	60	1,6	36	114	**412518-000680**
7,000	8	76	60	1,6	36	114	**412518-000700**
7,500	8	76	60	1,7	36	114	**412518-000750**
7,800	8	76	60	1,8	36	114	**412518-000780**
8,000	8	76	60	1,9	36	114	**412518-000800**
8,500	10	92	74	2,0	40	134	**412518-000850**
8,800	10	92	74	2,1	40	134	**412518-000880**
9,000	10	92	74	2,1	40	134	**412518-000900**
9,200	10	92	74	2,1	40	134	**412518-000920**

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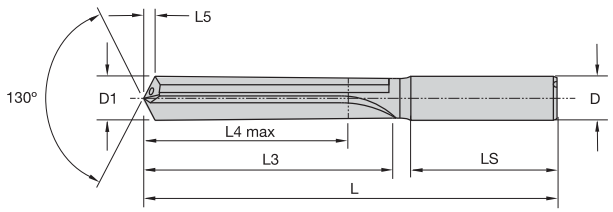


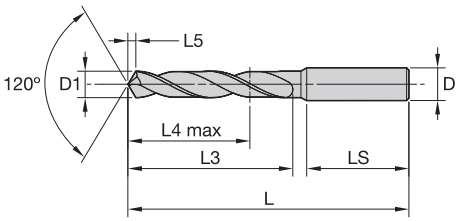
	H			
	1	2	3	4
K10F-DCHP	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

D1	D	L3	L4 max	L5	LS	L	K10F-DCHP K10F-DCHP
9,500	10	92	74	2,2	40	134	**412518-000950**
9,800	10	92	74	2,3	40	134	**412518-000980**
10,000	10	92	74	2,3	40	134	**412518-001000**
10,200	12	108	88	2,4	45	155	**412518-001020**
10,500	12	108	88	2,4	45	155	**412518-001050**
10,800	12	108	88	2,5	45	155	**412518-001080**
11,000	12	108	88	2,6	45	155	**412518-001100**
11,500	12	108	88	2,7	45	155	**412518-001150**
11,800	12	108	88	2,8	45	155	**412518-001180**
12,000	12	108	88	2,8	45	155	**412518-001200**
12,500	14	125	104	2,9	45	172	**412518-001250**
12,800	14	125	104	3,0	45	172	**412518-001280**
13,000	14	125	104	3,0	45	172	**412518-001300**
13,500	14	125	104	3,1	45	172	**412518-001350**
13,800	14	125	104	3,2	45	172	**412518-001380**
14,000	14	125	104	3,3	45	172	**412518-001400**
14,500	16	143	120	3,4	48	193	**412518-001450**
14,800	16	143	120	3,5	48	193	**412518-001480**
15,000	16	143	120	3,5	48	193	**412518-001500**
15,500	16	143	120	3,6	48	193	**412518-001550**
15,800	16	143	120	3,7	48	193	**412518-001580**
16,000	16	143	120	3,7	48	193	**412518-001600**

- Standard items listed. Additional diameters and lengths made to order.
- For information about Custom Solutions, such as multi-step drills, see page B129.
- For information about Reconditioning Services, see page B138.



Tolerance

D1	Tolerance m7	D	Tolerance h6
>3 to 6	0,004/0,016	6	0,000/-0,008
>6 to 10	0,006/0,021	8 to 10	0,000/-0,009
>10 to 18	0,007/0,025	12 to 18	0,000/-0,011
>18 to 21	0,008/0,029	20	0,000/-0,013

	N	
	1	2
TiCN	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

D1	D	L3	L4 max	L5	LS	L	TiCN
3,000	6	20	14	0,9	36	62	**TCM25903000**
3,100	6	20	14	0,9	36	62	**TCM25903100**
3,200	6	20	14	0,9	36	62	**TCM25903200**
3,300	6	20	14	1,0	36	62	**TCM25903300**
3,400	6	20	14	1,0	36	62	**TCM25903400**
3,500	6	20	14	1,0	36	62	**TCM25903500**
3,600	6	20	14	1,0	36	62	**TCM25903600**
3,700	6	20	14	1,1	36	62	**TCM25903700**
3,800	6	24	17	1,1	36	66	**TCM25903800**
3,900	6	24	17	1,1	36	66	**TCM25903900**
4,000	6	24	17	1,2	36	66	**TCM25904000**
4,100	6	24	17	1,2	36	66	**TCM25904100**
4,200	6	24	17	1,2	36	66	**TCM25904200**
4,300	6	24	17	1,2	36	66	**TCM25904300**
4,400	6	24	17	1,3	36	66	**TCM25904400**
4,500	6	24	17	1,3	36	66	**TCM25904500**
4,600	6	24	17	1,3	36	66	**TCM25904600**
4,700	6	24	17	1,4	36	66	**TCM25904700**
4,800	6	28	20	1,4	36	66	**TCM25904800**
4,900	6	28	20	1,4	36	66	**TCM25904900**

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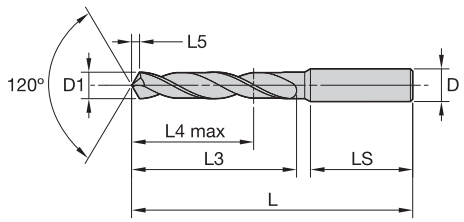

	N	
	1	2
TiCN	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

D1	D	L3	L4 max	L5	LS	L	TiCN
5,000	6	28	20	1,4	36	66	**TCM25905000**
5,100	6	28	20	1,5	36	66	**TCM25905100**
5,200	6	28	20	1,5	36	66	**TCM25905200**
5,300	6	28	20	1,5	36	66	**TCM25905300**
5,400	6	28	20	1,6	36	66	**TCM25905400**
5,500	6	28	20	1,6	36	66	**TCM25905500**
5,600	6	28	20	1,6	36	66	**TCM25905600**
5,700	6	28	20	1,6	36	66	**TCM25905700**
5,800	6	28	20	1,7	36	66	**TCM25905800**
5,900	6	28	20	1,7	36	66	**TCM25905900**
6,000	6	28	20	1,7	36	66	**TCM25906000**
6,100	8	34	24	1,8	36	79	**TCM25906100**
6,200	8	34	24	1,8	36	79	**TCM25906200**
6,300	8	34	24	1,8	36	79	**TCM25906300**
6,400	8	34	24	1,8	36	79	**TCM25906400**
6,500	8	34	24	1,9	36	79	**TCM25906500**
6,600	8	34	24	1,9	36	79	**TCM25906600**
6,700	8	34	24	1,9	36	79	**TCM25906700**
6,800	8	34	24	2,0	36	79	**TCM25906800**
6,900	8	34	24	2,0	36	79	**TCM25906900**
7,000	8	34	24	2,0	36	79	**TCM25907000**
7,100	8	41	29	2,1	36	79	**TCM25907100**
7,200	8	41	29	2,1	36	79	**TCM25907200**
7,300	8	41	29	2,1	36	79	**TCM25907300**
7,400	8	41	29	2,1	36	79	**TCM25907400**
7,500	8	41	29	2,2	36	79	**TCM25907500**
7,600	8	41	29	2,2	36	79	**TCM25907600**
7,700	8	41	29	2,2	36	79	**TCM25907700**

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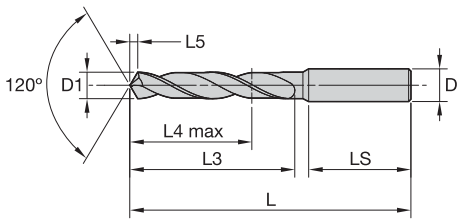

	N	
	1	2
TiCN	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

D1	D	L3	L4 max	L5	LS	L	TiCN
7,800	8	41	29	2,3	36	79	**TCM25907800**
7,900	8	41	29	2,3	36	79	**TCM25907900**
8,000	8	41	29	2,3	36	79	**TCM25908000**
8,100	10	47	35	2,3	40	89	**TCM25908100**
8,200	10	47	35	2,4	40	89	**TCM25908200**
8,300	10	47	35	2,4	40	89	**TCM25908300**
8,400	10	47	35	2,4	40	89	**TCM25908400**
8,500	10	47	35	2,5	40	89	**TCM25908500**
8,600	10	47	35	2,5	40	89	**TCM25908600**
8,700	10	47	35	2,5	40	89	**TCM25908700**
8,800	10	47	35	2,5	40	89	**TCM25908800**
8,900	10	47	35	2,6	40	89	**TCM25908900**
9,000	10	47	35	2,6	40	89	**TCM25909000**
9,100	10	47	35	2,6	40	89	**TCM25909100**
9,200	10	47	35	2,7	40	89	**TCM25909200**
9,300	10	47	35	2,7	40	89	**TCM25909300**
9,400	10	47	35	2,7	40	89	**TCM25909400**
9,500	10	47	35	2,7	40	89	**TCM25909500**
9,600	10	47	35	2,8	40	89	**TCM25909600**
9,700	10	47	35	2,8	40	89	**TCM25909700**
9,800	10	47	35	2,8	40	89	**TCM25909800**
9,900	10	47	35	2,9	40	89	**TCM25909900**
10,000	10	47	35	2,9	40	89	**TCM25910000**
10,100	12	55	40	2,9	45	102	**TCM25910100**
10,200	12	55	40	2,9	45	102	**TCM25910200**
10,300	12	55	40	3,0	45	102	**TCM25910300**
10,400	12	55	40	3,0	45	102	**TCM25910400**
10,500	12	55	40	3,0	45	102	**TCM25910500**
10,600	12	55	40	3,1	45	102	**TCM25910600**
10,700	12	55	40	3,1	45	102	**TCM25910700**

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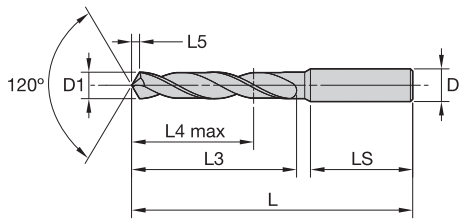


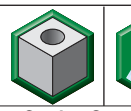
	N	
	1	2
TiCN	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B110.

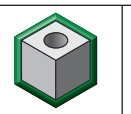
D1	D	L3	L4 max	L5	LS	L	TiCN
10,800	12	55	40	3,1	45	102	**TCM25910800**
10,900	12	55	40	3,1	45	102	**TCM25910900**
11,000	12	55	40	3,2	45	102	**TCM25911000**
11,100	12	55	40	3,2	45	102	**TCM25911100**
11,200	12	71	40	3,2	45	118	**TCM25911200**
11,300	12	55	40	3,3	45	102	**TCM25911300**
11,400	12	55	40	3,3	45	102	**TCM25911400**
11,500	12	55	40	3,3	45	102	**TCM25911500**
11,600	12	55	40	3,4	45	102	**TCM25911600**
11,700	12	55	40	3,4	45	102	**TCM25911700**
11,800	12	55	40	3,4	45	102	**TCM25911800**
11,900	12	55	40	3,4	45	102	**TCM25911900**
12,000	12	55	40	3,5	45	102	**TCM25912000**
12,500	14	60	43	3,6	45	107	**TCM25912500**
13,000	14	60	43	3,8	45	107	**TCM25913000**
13,100	14	60	43	3,8	45	107	**TCM25913100**
13,500	14	60	43	3,9	45	107	**TCM25913500**
14,000	14	60	43	4,0	45	107	**TCM25914000**
14,500	16	65	45	4,2	48	115	**TCM25914500**
15,000	16	65	45	4,3	48	115	**TCM25915000**
15,500	16	65	45	4,5	48	115	**TCM25915500**
16,000	16	65	45	4,6	48	115	**TCM25916000**
16,500	18	73	51	4,8	48	123	**TCM25916500**
16,800	18	73	51	4,9	48	123	**TCM25916800**
17,000	18	73	51	4,9	48	123	**TCM25917000**
17,500	18	73	51	5,1	48	123	**TCM25917500**
18,000	18	73	51	5,2	48	123	**TCM25918000**
18,500	20	79	55	5,3	50	131	**TCM25918500**
19,000	20	79	55	5,5	50	131	**TCM25919000**
19,500	20	79	55	5,6	50	131	**TCM25919500**
20,000	20	79	55	5,8	50	131	**TCM25920000**
20,500	22	83	55	5,9	50	133	**TCM25920500**

Series H101 H102 H103 H104 • Deep Hole SC Drills • Through Coolant Applications



Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate (Fz) 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P	1	90	-	130	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	2	80	-	115	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	3	70	-	110	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	4	65	-	95	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
K	1	105	-	145	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	2	85	-	120	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	3	100	-	140	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38

Series 412820 412825 412533 412822 412827 412534 • K20F-DCF • Through Coolant Applications



Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate (Fz) 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P	1	90	-	130	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	2	80	-	115	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	3	70	-	110	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	4	65	-	95	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
K	1	105	-	145	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	2	85	-	120	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	3	100	-	140	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38

Series 252 262 652 662 • Through Coolant Applications

Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate (Fz) 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P	3	40	-	70	mm/r	0,05 - 0,06	0,06 - 0,08	0,09 - 0,12	0,12 - 0,16	0,15 - 0,20	0,18 - 0,24	0,24 - 0,32	0,30 - 0,40
	4	25	-	40	mm/r	0,04 - 0,05	0,05 - 0,06	0,07 - 0,09	0,10 - 0,12	0,12 - 0,15	0,14 - 0,18	0,19 - 0,24	0,24 - 0,30
	5	45	-	60	mm/r	0,03 - 0,04	0,04 - 0,05	0,05 - 0,07	0,07 - 0,10	0,09 - 0,12	0,11 - 0,14	0,14 - 0,19	0,18 - 0,24
	6	40	-	50	mm/r	0,03 - 0,04	0,04 - 0,05	0,05 - 0,07	0,07 - 0,10	0,09 - 0,12	0,11 - 0,14	0,14 - 0,19	0,18 - 0,24
M	1	40	-	50	mm/r	0,04 - 0,05	0,05 - 0,06	0,07 - 0,10	0,10 - 0,13	0,12 - 0,16	0,14 - 0,19	0,19 - 0,26	0,24 - 0,32
	2	30	-	45	mm/r	0,04 - 0,05	0,05 - 0,06	0,07 - 0,10	0,10 - 0,13	0,12 - 0,16	0,14 - 0,19	0,19 - 0,26	0,24 - 0,32
S	2	10	-	15	mm/r	0,03 - 0,04	0,04 - 0,05	0,05 - 0,07	0,07 - 0,10	0,09 - 0,12	0,11 - 0,14	0,14 - 0,19	0,18 - 0,24
	3	35	-	50	mm/r	0,03 - 0,04	0,04 - 0,05	0,05 - 0,07	0,07 - 0,10	0,09 - 0,12	0,11 - 0,14	0,14 - 0,19	0,18 - 0,24
	4	25	-	40	mm/r	0,02 - 0,03	0,03 - 0,04	0,05 - 0,07	0,06 - 0,09	0,08 - 0,11	0,10 - 0,13	0,13 - 0,18	0,16 - 0,22
H	1	25	-	40	mm/r	0,04 - 0,05	0,05 - 0,06	0,07 - 0,09	0,10 - 0,12	0,12 - 0,15	0,14 - 0,18	0,19 - 0,24	0,24 - 0,30
	2	10	-	35	mm/r	0,03 - 0,04	0,04 - 0,05	0,06 - 0,08	0,08 - 0,10	0,10 - 0,13	0,12 - 0,16	0,16 - 0,21	0,20 - 0,26
	3	7	-	12	mm/r	0,02 - 0,03	0,02 - 0,04	0,03 - 0,06	0,04 - 0,08	0,05 - 0,10	0,06 - 0,12	0,08 - 0,16	0,10 - 0,20

Series 412520 412522 412525 412527 412833 412834 • Grade K20-DCF

Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate (Fz) 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
P	5	45	-	60	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	6	35	-	45	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
M	1	30	-	40	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	2	30	-	40	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	3	25	-	35	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
K	1	110	-	150	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	2	90	-	125	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	3	100	-	130	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
N	1	145	-	205	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	2	205	-	255	mm/r	0,15 - 0,18	0,18 - 0,20	0,20 - 0,30	0,30 - 0,35	0,35 - 0,40	0,40 - 0,45	0,45 - 0,50	0,50 - 0,55
	4	100	-	125	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
	5	110	-	185	mm/r	0,10 - 0,15	0,15 - 0,20	0,20 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,33	0,33 - 0,36	0,36 - 0,38
S	1	45	-	65	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	2	30	-	50	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	3	45	-	60	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22
	4	40	-	50	mm/r	0,03 - 0,04	0,04 - 0,06	0,06 - 0,10	0,10 - 0,12	0,12 - 0,15	0,15 - 0,18	0,18 - 0,20	0,20 - 0,22

Series 012535 012536 012537 • K20F-Uncoated • Through Coolant Applications

Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate (Fz) 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
K	1	70	-	125	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	2	60	-	110	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	3	80	-	115	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
N	1	110	-	180	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	2	130	-	220	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	3	155	-	240	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34

Series 412535 412536 412537 • Grade K20F-TiAlN • Through Coolant Applications

Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate (Fz) 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
K	1	85	-	140	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34
	2	70	-	120	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
	3	80	-	130	mm/r	0,05 - 0,10	0,10 - 0,16	0,16 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,24	0,24 - 0,26	0,26 - 0,28
N	3	165	-	250	mm/r	0,08 - 0,12	0,12 - 0,18	0,18 - 0,20	0,20 - 0,22	0,22 - 0,25	0,25 - 0,28	0,28 - 0,30	0,30 - 0,34

Series 412518 • Hard Materials • Grade 10F-DCHP • Through Coolant Applications

Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate (Fz) 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
H	1	20	-	25	mm/r	0,02 - 0,03	0,03 - 0,04	0,04 - 0,05	0,05 - 0,06	0,06 - 0,07	0,07 - 0,08	0,08 - 0,10	0,10 - 0,12
	2	18	-	22	mm/r	0,005 - 0,01	0,01 - 0,015	0,015 - 0,02	0,02 - 0,025	0,025 - 0,03	0,03 - 0,04	0,04 - 0,05	0,05 - 0,08
	3	15	-	20	mm/r	0,005 - 0,01	0,01 - 0,015	0,015 - 0,02	0,02 - 0,025	0,025 - 0,03	0,03 - 0,04	0,04 - 0,05	0,05 - 0,08
	4	20	-	25	mm/r	0,02 - 0,03	0,03 - 0,04	0,04 - 0,05	0,05 - 0,06	0,06 - 0,07	0,07 - 0,08	0,08 - 0,10	0,10 - 0,12

Series 159 259 559 659 • Through Coolant Applications

Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate (Fz) 3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
N	1	240	-	260	mm/r	0,07 - 0,08	0,09 - 0,10	0,13 - 0,15	0,18 - 0,20	0,22 - 0,25	0,26 - 0,30	0,35 - 0,40	0,44 - 0,50
	2	220	-	240	mm/r	0,06 - 0,07	0,08 - 0,09	0,12 - 0,14	0,16 - 0,18	0,20 - 0,23	0,24 - 0,28	0,32 - 0,37	0,40 - 0,46

For flood coolant applications, reduce speed by 20%.

High-Speed Reamers (HSR™)

WIDIA-Rübig high-performance reaming tools are high-quality products used across many industrial sectors.

This product combines high-performance micrograin substrates, specific coatings, and extremely unequal flutes for outstanding machining results. HSR leads and lapped grinding of surface of rake, clearance, and relief angle will increase your productivity.

You specify the diameter and the required tolerance, and we will manufacture the HSR Reamer to your specifications. Ø 2, 3, 4, 5, 6, 8, 10, 12, 14, 16, 20, and 25mm for hole tolerance H7 are available in-stock.

Ordering example for HSR Reamers:

1. Indication of order code, e.g., 05/02.27.
2. Indication of tool diameter
   - with tolerance, e.g., Ø 8,05 (+0,005/-0,001).
     or
   - based on workpiece e.g., Ø 10 F7.

Application Example

We delivered what our competitors couldn't with our HSR™ Geometry and double tool life.

Another customer's tough challenge is solved...

Challenge:

- High productivity needed as well as tool life.

Application Details:

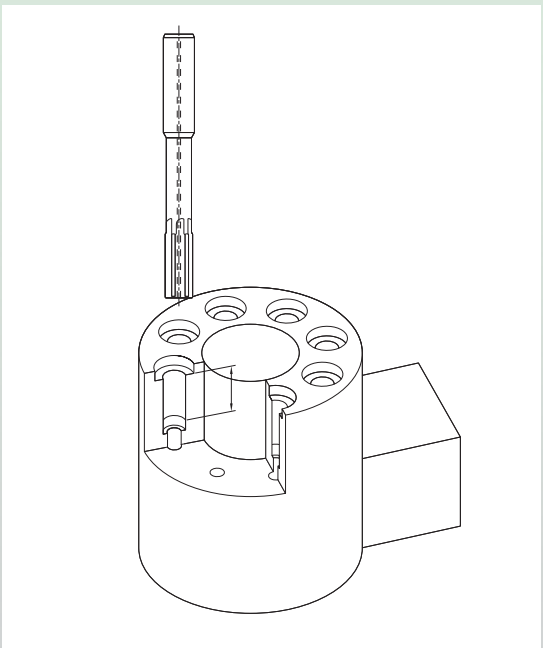
- Material: GG 25 Cr (Material Group K1)
- Coolant: Emulsion approximately 6%
- Workpiece: Hydraulic component
- Cutting Data: Vc = 70 m/min; F = 0,7 mm/rev
- Data: depth of cut = 28mm
- Tolerance: IT9; range 0,036mm

Solution:

- Solid Carbide — HSR — Reamer
- Catalog Series: 450270
- Diameter: 8

Result:

— number of holes = 3,000
— tool life = double tool life over competition 84 m



Reaming Tools

Reaming Tools **B113–B137**

Best Tool Selector Guide • Reaming **B114–B115**
Precision Hole Finishing • Multi-Blade Reaming **B116–B117**
How to Order Reamers **B118**

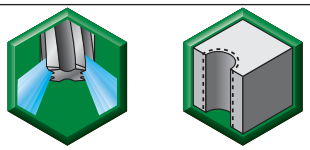
HSR™ Reamers

Reamers • Helical Flute • Solid Carbide
Through Holes • K10 • 1,40mm–10,0mm B119–B120
Helical Flute • Solid Carbide
Through Holes • K10F/K10F-DCFD • 1,40mm–14,15mm B121
Helical Flute • Solid Carbide
Through Holes • K10F/K10F-DCFD • 4,80mm–14,15mm B122
Helical Flute • Carbide-Tipped
Through Holes • K10F/K10F-DCFD • 14,0mm–32,0mm B123
Helical Flute • Cermet-Tipped
Through Holes • CERMET-DCFD • 14,0mm–20,0mm B124
Straight Flute • Solid Carbide
Blind Holes • K10F/K10F-DCFD • 1,40mm–4,15mm B125
Straight Flute • Solid Carbide
Blind Holes • K10F/K10F-DCFD • 4,16mm–14,15mm B126
Straight Flute • Carbide-Tipped
Blind Holes • K10F/K10F-DCFD • 14,0mm–32,0mm B127
Straight Flute • Cermet-Tipped
Blind Holes • CERMET-DCFD • 14,0mm–20,0mm B128

Application Data

Precision Hole Finishing • Multi-Blade Reamers
Series 050221 . . . . . B130
Series 050227 • Series 450227 . . . . . B131
Series 050271 • Series 450271 . . . . . B132
Series 050281 • Series 450281 . . . . . B133
Series 456681 • Series 050222 . . . . . B134
Series 450222 • Series 050270 . . . . . B135
Series 450270 • Series 050280 . . . . . B136
Series 450280 • Series 456680 . . . . . B137

Custom Reaming Tools **B139–B140**

Series = standard				
	Flood Coolant Through Holes		**Through Coolant Through Holes**	
P Steel	450227	1,4mm–14,15mm	450271 450281	4,8mm–14,15mm 14,0mm–32,0mm
M Stainless Steel	450227	1,4mm–14,15mm	450271 450281	4,8mm–14,15mm 14,0mm–32,0mm
K Cast Iron	450227	1,4mm–14,15mm	450271 450281	4,8mm–14,15mm 14,0mm–32,0mm
N Non-Ferrous	050227	1,4mm–14,15mm	050271 050281	4,8mm–14,15mm 14,0mm–32,0mm
S Heat-Resistant Alloys, Titanium Alloys	450227	1,4mm–14,15mm	450271 450281	4,8mm–14,15mm 14,0mm–32,0mm

Series 050270/450270 have “axial” through coolant capability only.
Series 050281/450280 have axial and radial coolant options.

	Flood Coolant Blind Holes		**Through Coolant Blind Holes**	
	450222	1,4mm–4,15mm	450270	4,16mm–14,15mm
			450280	14,0mm–32,0mm
	450222	1,4mm–4,15mm	450270	4,16mm–14,15mm
			450280	14,0mm–32,0mm
	450222	1,4mm–4,15mm	450270	4,16mm–14,15mm
			450280	14,0mm–32,0mm
	050222	1,4mm–4,15mm	450270	4,16mm–14,15mm
			050280	14,0mm–32,0mm
	450222	1,4mm–4,15mm	450270	4,16mm–14,15mm
			450280	14,0mm–32,0mm

RMS™ Solid Carbide Reaming Tools

Primary Application

- Solid carbide reaming tools starting at 5,0mm in size with internal coolant supply available as standard.
- Ground to H7 tolerance class for use in most applications.
- Specific coatings and lead configurations available for high-speed machining of Steel, Stainless Steel, and Cast Iron.
- Uncoated micrograin substrates for machining Stainless Steel and Non-Ferrous materials at accelerated speeds.
- Unequal flutes for highest hole and surface quality.
- High-speed leads and lapped grinding of surface of rake, clearance, and relief angle increase productivity.

Features and Benefits

Lapped ground leads for high-speed cutting.

- Long tool life with increased hole and surface quality.

Reaming-specific grades and substrates.

- Highest metal removal rate (MRR) at increased speeds and feeds.

Radial coolant supply for through hole applications; axial coolant supply for blind holes.

- Achieve higher feed rates than conventional reaming tools.

Unequal flutes.

- Decreased run out and improved straightness compared to competitive tools.

Customization

- Diameters starting at 1,40mm up to 14,15mm available with and without internal coolant in 0,001mm steps.
- Intermediate diameters of standard program with short delivery time.
- Solid cermet reaming tools and tooling for heat-resistant materials are available on request.

RMB Carbide- and Cermet-Tipped Reaming Tools

Primary Application

- Achieve solid carbide and solid cermet metal removal rates from 14,0mm up to 32,0mm with no customization required.
- Ground to H7 tolerance class to address most applications.
- Specific coatings and lead configuration for high-speed machining of Steel, Stainless Steel, Cast Iron, and Non-Ferrous materials at accelerated speeds.
- Coated and uncoated micrograin substrate carbide and coated cermet specifically engineered for reaming.
- Unequal flutes deliver highest hole and surface quality.
- High-speed leads and lapped grinding of surface of rake, clearance, and relief angle increase productivity.

Features and Benefits

More flutes in this category of tools.

- Higher feed rate than conventional reaming tools.

Lapped ground leads for high-speed cutting.

- Long tool life with increased hole and surface quality.

Reaming-specific grades and substrates.

- Highest metal removal rate at higher speeds and feeds.

Unequal flutes.

- Decreased run out and improved straightness compared to other competitive tools.

Adjustment screw at straight-fluted HSR reamers to change internal coolant supply from axial to radial.

- Optimized coolant options for blind holes and blind hole applications with interrupted cut.

Customization

- Diameters up to 50,0mm available with and without internal coolant in 0,001mm steps.
- Intermediate diameters of standard program with short delivery time.
- HSR tooling for machining heat-resistant materials is available upon request.

3 Easy Steps to Order Reamers

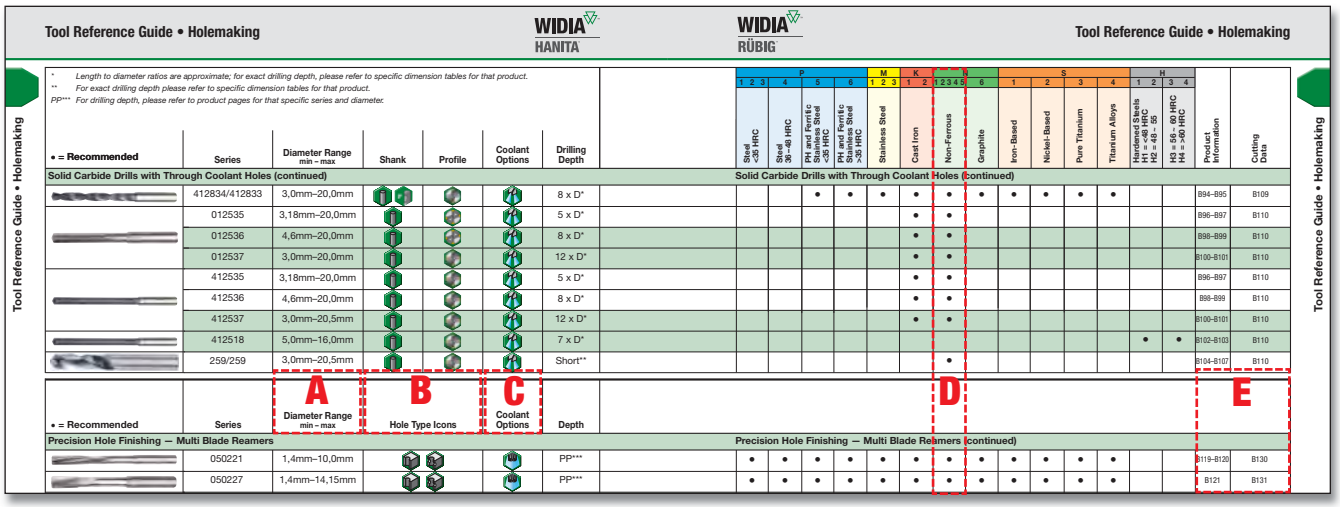
Step 1: Refer to the Holemaking Tool Overview on pages B4–B9. You will need to consider:

A Diameter of hole required? *Example: 10,52mm (See diameter range, column A).*

B Type of hole — blind or through? *Example: blind (See hole type icons, column B).*

C Coolant available? *Example: through (See coolant options, column C).*

D Workpiece Material? *Example: Non-Ferrous (See Workpiece Material grid, column D).*



Tool Reference Guide • Holemaking — WIDIA HANITA — WIDIA RÜBIG — Tool Reference Guide • Holemaking

* Length to diameter ratios are approximate; for exact drilling depth, please refer to specific dimension tables for that product.
** For exact drilling depth please refer to specific dimension tables for that product.
PP*** For drilling depth, please refer to product pages for that specific series and diameter.

• = Recommended	Series	Diameter Range min - max	Shank	Profile	Coolant Options	Drilling Depth	P 1 2 3 Steel <30 HRC	P 4 Steel 30 - 48 HRC	P 5 PH and Ferritic Stainless Steel 30 - 38 HRC	P 6 PH and Ferritic Stainless Steel >38 HRC	M 1 2 3 Stainless Steel	K 1 2 Cast Iron	N 1 2 3 4 5 Non-Ferrous	N 6 Graphite	S 1 Iron-Based	S 2 Nickel-Based	S 3 Pure Titanium	S 4 Titanium Alloys	H 1 2 Hardened Steels H1 = <48 HRC H2 = 48 - 55	H 3 4 H3 = 56 - 60 HRC H4 = >60 HRC	Product Information	Cutting Data
Solid Carbide Drills with Through Coolant Holes (continued)							**Solid Carbide Drills with Through Coolant Holes (continued)**															
	412834/412833	3,0mm–20,0mm				8 x D*			•	•	•	•	•	•	•	•	•	•			B94–B95	B109
	012535	3,18mm–20,0mm				5 x D*						•	•								B96–B97	B110
	012536	4,6mm–20,0mm				8 x D*						•	•								B98–B99	B110
	012537	3,0mm–20,0mm				12 x D*						•	•								B100-B101	B110
	412535	3,18mm–20,0mm				5 x D*						•	•								B96–B97	B110
	412536	4,6mm–20,0mm				8 x D*						•	•								B98–B99	B110
	412537	3,0mm–20,5mm				12 x D*						•	•								B100-B101	B110
	412518	5,0mm–16,0mm				7 x D*													•	•	B102-B103	B110
	259/259	3,0mm–20,5mm				Short**							•								B104-B107	B110
• = Recommended	Series	**A** Diameter Range min - max		**B** Hole Type Icons	**C** Coolant Options	Depth							**D**								**E**	
Precision Hole Finishing — Multi Blade Reamers							**Precision Hole Finishing — Multi Blade Reamers (continued)**															
	050221	1,4mm–10,0mm				PP***	•	•	•	•	•	•	•	•	•	•	•	•			B119–B120	B130
	050227	1,4mm–14,15mm				PP***	•	•	•	•	•	•	•	•	•	•	•	•			B121	B131

Step 2:

E Once you have narrowed your selection to a specific series, use the page references for the specific series of reamers *(See column E).*

Step 3:

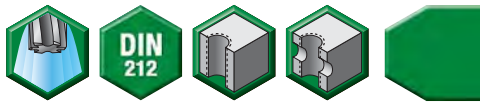
F Go to the referenced page and select the standard reamer closest to the exact reamer you would like to order from the series.

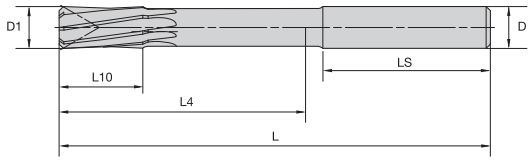
F

D1	D	L	L4	L10	LS	Z	K10F K10F	K10F-DCFD K10F-DCFD
2,00	3,00	48	15	6	28	4	050227-000200	450227-000200
3,00	3,00	48	15	6	28	4	050227-000300	450227-000300
4,00	4,00	54	21	8	28	4	050227-000400	450227-000400
5,00	6,00	74	32	12	36	4	050227-000500	450227-000500
6,00	6,00	74	33	12	36	4	050227-000600	450227-000600
8,00	8,00	91	50	16	36	6	050227-000800	450227-000800
10,00	10,00	103	58	20	40	6	050227-001000	450227-001000
12,00	12,00	118	68	24	45	6	050227-001200	450227-001200
14,00	14,00	132	81	28	45	6	050227-001400	450227-001400

G Use this chosen standard reamer as information for the Custom Solutions Reamer “Request for Quote” application and worksheet on pages B139–B140.

- Provide your exact hole diameter and tolerance when ordering, or use form on page B139.
- For information about Custom Solutions, see page B129.
- For information about Reconditioning Services, see page B138.





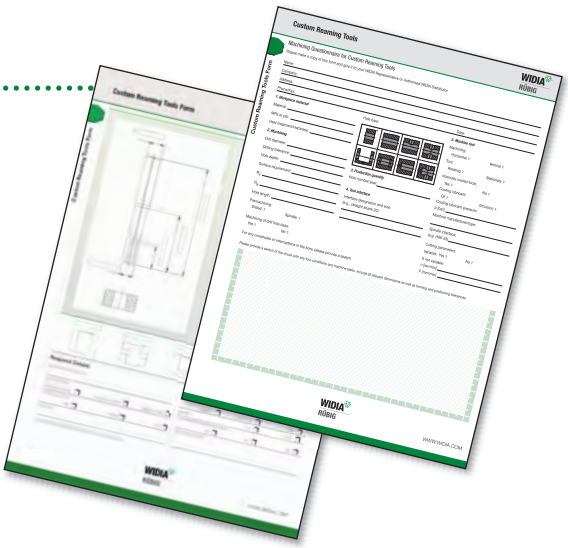
	P						M			K			N						S			
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	5	6	1	2	3	4
K10	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B130.

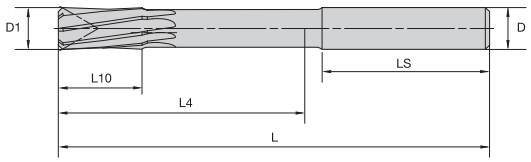
							K10 ≤H6
D1	D	L	L4	L10	LS	Z	Uncoated
1,40	1,40	40	18	8	22	3	**050221-000014**
1,50	1,50	40	18	8	22	3	**050221-000015**
1,60	1,60	43	20	9	23	3	**050221-000016**
1,80	1,80	46	22	10	24	4	**050221-000018**
2,00	2,00	49	24	11	25	4	**050221-000020**
2,20	2,20	53	26	12	27	4	**050221-000022**
2,50	2,50	57	28	14	29	4	**050221-000025**
2,80	2,80	61	32	15	29	4	**050221-000028**
3,00	3,00	61	32	15	29	6	**050221-000030**
3,20	3,20	65	35	16	30	6	**050221-000032**
3,50	3,50	70	40	18	30	6	**050221-000035**
4,00	4,00	75	41	19	32	6	**050221-000040**

(continued)



See pages B139–B140 for Custom Solutions Reamer "Request for Quote" application and worksheet!

(continued)



	P						M			K			N						S			
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	5	6	1	2	3	4
K10	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

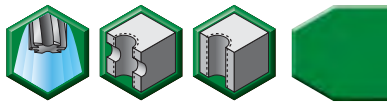
For material descriptions, see Inside Back Cover.
For application data, see page B130.

D1	D	L	L4	L10	LS	Z	K10 ≤H6 Uncoated
4,50	4,50	80	44	21	33	6	**050221-000045**
5,00	5,00	86	51	23	34	6	**050221-000050**
5,50	5,60	93	57	26	36	6	**050221-000055**
6,00	5,60	93	53	26	36	6	**050221-000060**
6,50	6,30	101	63	28	38	6	**050221-000065**
7,00	7,10	109	69	31	40	6	**050221-000070**
7,50	7,10	109	69	31	40	6	**050221-000075**
8,00	8,00	117	75	33	42	6	**050221-000080**
8,50	8,00	117	75	33	42	6	**050221-000085**
9,00	9,00	125	81	36	44	6	**050221-000090**
9,50	9,00	125	81	36	44	6	**050221-000095**
10,00	10,00	133	87	38	46	6	**050221-000100**

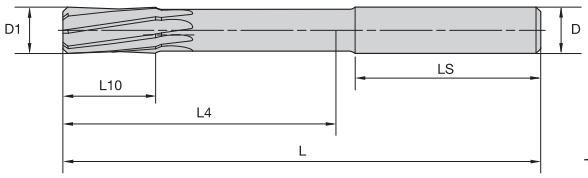
Dimensions for Custom Solution Reamers

D1min	D	L	L4	L10	LS	Z
1,40	1,40	40	—	8	22	3
1,50	1,50	40	—	8	22	3
1,60	1,60	43	—	9	23	3
1,80	1,80	46	—	10	24	4
2,00	2,00	49	—	11	25	4
2,20	2,20	53	—	12	27	4
2,50	2,50	57	—	14	29	4
2,80	2,80	61	—	15	29	4
3,00	3,00	61	—	15	29	6
3,20	3,20	65	—	16	30	6
3,50	3,50	70	40	18	30	6
4,00	4,00	75	41	19	32	6
4,50	4,50	80	44	21	33	6
5,00	5,00	86	51	23	34	6
5,50	5,60	93	57	26	36	6
6,00	5,60	93	53	26	36	6
6,50	6,30	101	63	28	38	6
7,00	7,10	109	69	31	40	6
7,50	7,10	109	69	31	40	6
8,00	8,00	117	75	33	42	6
8,50	8,00	117	75	33	42	6
9,00	9,00	125	81	36	44	6
9,50	9,00	125	81	36	44	6
10,00	10,00	133	87	38	46	6

The above dimensions are used when ordering custom solution reamers on this page unless otherwise specified.
Please see pages B118 and B139–B140 for information on ordering custom solutions.



- Standard reamers listed are ground to achieve a H7 tolerance hole. IT6 hole tolerance capability starting at diameter 10mm is available as Custom Solution. Additional diameters and lengths made to order.
- Provide your exact hole diameter and tolerance when ordering, or use form on page B139.
- For information about Custom Solutions, see page B129.
- For information about Reconditioning Services, see page B138.



	P						M			K			N						S			
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	5	6	1	2	3	4
K10F	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
K10F-DCFD	●	●	●	●	●	●	●	●	●	●	●	●							●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B131.

D1	D	L	L4	L10	LS	Z	K10F ≤H6 K10F	K10F-DCFD ≤H6 K10F-DCFD
2,00	3,00	48	15	6	28	4	050227-000200	450227-000200
3,00	3,00	48	15	6	28	4	050227-000300	450227-000300
4,00	4,00	54	21	8	28	4	050227-000400	450227-000400
5,00	6,00	74	32	12	36	4	050227-000500	450227-000500
6,00	6,00	74	33	12	36	4	050227-000600	450227-000600
8,00	8,00	91	50	16	36	6	050227-000800	450227-000800
10,00	10,00	103	58	20	40	6	050227-001000	450227-001000
12,00	12,00	118	68	24	45	6	050227-001200	450227-001200
14,00	14,00	132	81	28	45	6	050227-001400	450227-001400

Dimensions for Custom Solution Reamers

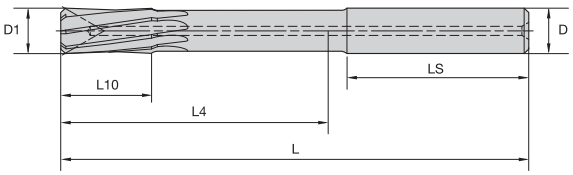
D1min	D1max	D	L	L4	L10	LS	Z
1,40	2,75	3,00	48	15	6	28	4
2,76	3,15	3,00	48	15	8	28	4
3,16	4,15	4,00	54	21	8	28	4
4,16	4,79	6,00	74	32	10	36	4
4,80	5,79	6,00	74	32	12	36	4
5,80	6,15	6,00	74	33	12	36	4
6,16	7,15	8,00	91	49	16	36	4
7,16	7,69	8,00	91	49	16	36	6
7,70	8,15	8,00	91	50	16	36	6
8,16	9,59	10,00	103	57	20	40	6
9,60	10,15	10,00	103	58	20	40	6
10,16	11,59	12,00	118	67	24	45	6
11,60	12,15	12,00	118	68	24	45	6
12,60	14,15	14,00	132	81	28	45	6

The above dimensions are used when ordering custom solution reamers on this page unless otherwise specified.
Please see pages B118 and B139–B140 for information on ordering custom solutions.

HSR Reamers • Helical Flute • Solid Carbide

Through Holes • K10F/K10F-DCFD • 4,80mm–14,15mm

- Standard reamers listed are ground to achieve a H7 tolerance hole. IT6 capability is available. Additional diameters and lengths made to order.
- Provide your exact hole diameter and tolerance when ordering, or use form on page B139.
- For information about Custom Solutions, see page B129.
- For information about Reconditioning Services, see page B128.



	P						M			K			N						S			
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	5	6	1	2	3	4
K10F	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
K10F-DCFD	●	●	●	●	●	●	●	●	●	●	●	●							●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

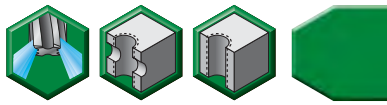
For material descriptions, see Inside Back Cover.
For application data, see page B132.

D1	D	L	L4	L10	LS	Z	K10F ≤H6 K10F	K10F-DCFD ≤H6 K10F-DCFD
5,00	6,00	74	32	12	36	4	**050271-000500**	**450271-000500**
6,00	6,00	74	33	12	36	4	**050271-000600**	**450271-000600**
8,00	8,00	91	50	16	36	6	**050271-000800**	**450271-000800**
10,00	10,00	103	58	20	40	6	**050271-001000**	**450271-001000**
12,00	12,00	118	68	24	45	6	**050271-001200**	**450271-001200**
14,00	14,00	132	81	28	45	6	**050271-001400**	**450271-001400**

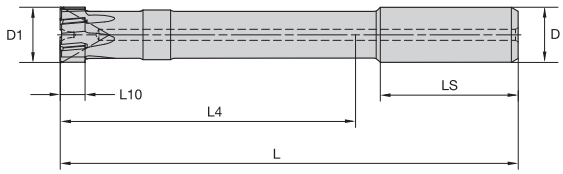
Dimensions for Custom Solution Reamers

D1min	D1max	D	L	L4	L10	LS	Z
4,80	5,79	6,00	74	32	12	36	4
5,80	6,15	6,00	74	33	12	36	4
6,16	7,15	8,00	91	49	16	36	4
7,16	7,69	8,00	91	49	16	36	6
7,70	8,15	8,00	91	50	16	36	6
8,16	9,59	10,00	103	57	20	40	6
9,60	10,15	10,00	103	58	20	40	6
10,16	11,59	12,00	118	67	24	45	6
11,60	12,15	12,00	118	68	24	45	6
12,16	14,15	14,00	132	81	28	45	6

The above dimensions are used when ordering custom solution reamers on this page unless otherwise specified.
Please see pages B118 and B139–B140 for information on ordering custom solutions



- Standard reamers listed are ground to achieve a H7 tolerance hole. IT6 capability is available. Additional diameters and lengths made to order.
- Provide your exact hole diameter and tolerance when ordering, or use form on page B139.
- For information about Custom Solutions, see page B129.
- For information about Reconditioning Services, see page B138.



	P						M			K			N						S			
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	5	6	1	2	3	4
K10F	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
K10F-DCFD	●	●	●	●	●	●	●	●	●	●	●	●							●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B133.

D1	D	L	L4	L10	LS	Z	K10F ≤H6 K10F	K10F-DCFD ≤H6 K10F-DCFD
14,00	16,00	145	90,0	9	48	6	050281-001400	450281-001400
16,00	20,00	157	100,0	9	50	6	050281-001600	450281-001600
18,00	20,00	171	114,0	9	50	6	050281-001800	450281-001800
20,00	20,00	200	143,0	9	50	6	050281-002000	450281-002000
22,00	20,00	210	153,0	11	50	6	050281-002200	450281-002200
24,00	20,00	210	153,0	11	50	6	050281-002400	450281-002400
25,00	20,00	210	153,0	11	50	6	050281-002500	450281-002500
26,00	25,00	240	177,0	11	56	8	050281-002600	450281-002600
28,00	25,00	240	177,0	11	56	8	050281-002800	450281-002800
30,00	25,00	270	207,0	11	56	8	050281-003000	450281-003000
32,00	25,00	270	207,0	11	56	8	–	450281-003200

Dimensions for Custom Solution Reamers

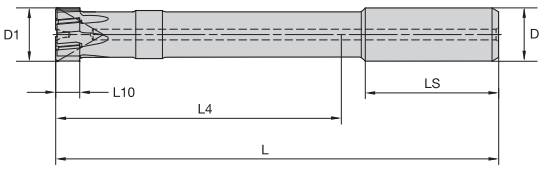
D1min	D1max	D	L	L4	L10	LS	Z
14,00	15,99	16	145	97	9	48	6
16,00	17,99	20	157	107	9	50	6
18,00	19,99	20	171	121	9	50	6
20,00	21,99	20	200	150	9	50	6
22,00	25,99	20	210	160	11	50	6
26,00	29,99	25	240	184	11	56	6
30,00	32,00	25	270	214	11	56	6

The above dimensions are used when ordering custom solution reamers, unless otherwise specified.
Please see pages B118 and B139–B140 for information on custom solutions.

HSR Reamers • Helical Flute • Cermet-Tipped

Through Holes • CERMET-DCFD • 14,0mm–20,0mm

- Standard reamers listed are ground to achieve a H7 tolerance hole. IT6 capability is available. Additional diameters and lengths made to order.
- Provide your exact hole diameter and tolerance when ordering, or use form on page B139.
- For information about Custom Solutions, see page B129.
- For information about Reconditioning Services, see page B138.



	P					
	1	2	3	4	5	6
CERMET-DCFD	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

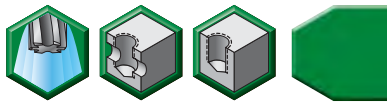
For material descriptions, see Inside Back Cover.
For application data, see page B134.

							CERMET-DCFD
D1	D	L	L4	L10	LS	Z	TiAlN
14,00	16,00	145	76	8	49	6	**456681-001400**
15,00	16,00	145	76	8	49	6	**456681-001500**
16,00	20,00	157	86	8	51	6	**456681-001600**
17,00	20,00	157	86	10	51	6	**456681-001700**
18,00	20,00	171	100	10	51	6	**456681-001800**
19,00	20,00	171	100	10	51	6	**456681-001900**
20,00	20,00	200	129	10	51	6	**456681-002000**

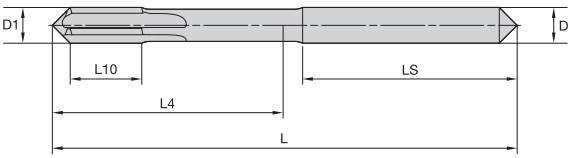
Dimensions for Custom Solution Reamers

D1min	D1max	D	L	L4	L10	LS	Z
14,00	15,99	16	145	97	9	48	6
16,00	17,99	20	157	107	9	50	6
18,00	19,99	20	171	121	9	50	6
20,00	21,99	20	200	150	9	50	6
22,00	25,99	20	210	160	11	50	6
26,00	29,99	25	240	184	11	56	6
30,00	32,00	25	270	214	11	56	6

The above dimensions are used when ordering custom solution reamers on this page unless otherwise specified.
Please see pages B118 and B139–B140 for information on ordering custom solutions.



- Standard reamers listed are ground to achieve a H7 tolerance hole. IT6 capability is available. Additional diameters and lengths made to order.
- Provide your exact hole diameter and tolerance when ordering, or use form on page B139.
- For information about Custom Solutions, see page B129.
- For information about Reconditioning Services, see page B128.



	P						M			K			N					S			
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	5	6	1	2	3	4
K10F	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
K10F-DCFD	●	●	●	●	●	●	●	●	●	●	●	●							●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B134 and page B135.

D1	D	L	L4	L10	LS	Z	K10F ≤H6 K10F	K10F-DCFD ≤H6 K10F-DCFD
2,00	3,00	48	15	6	28	4	**050222-000200**	**450222-000200**
3,00	3,00	48	15	8	28	4	**050222-000300**	**450222-000300**
4,00	4,00	54	21	8	28	4	**050222-000400**	**450222-000400**

Dimensions for Custom Solution Reamers

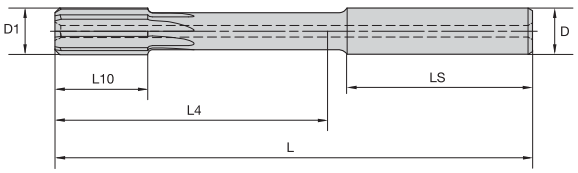
D1min	D1max	D	L	L4	L10	LS	Z
1,4	2,75	3,00	48	15	6	28	4
2,76	3,15	3,00	48	15	8	28	4
3,16	4,15	4,00	54	21	8	28	4

The above dimensions are used when ordering custom solution reamers on this page unless otherwise specified.
Please see pages B118 and B139–B140 for information on ordering custom solutions

HSR Reamers • Straight Flute • Solid Carbide

Blind Holes • K10F/K10F-DCFD • 4,16mm–14,15mm

- Standard reamers listed are ground to achieve a H7 tolerance hole. IT6 capability is available. Additional diameters and lengths made to order.
- Provide your exact hole diameter and tolerance when ordering, or use form on page B139.
- For information about Custom Solutions, see page B129.
- For information about Reconditioning Services, see page B138.



	P						M			K			N						S			
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	5	6	1	2	3	4
K10F	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
K10F-DCFD	●	●	●	●	●	●	●	●	●	●	●	●							●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

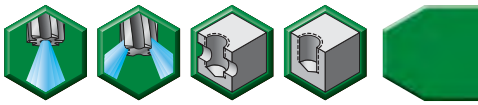
For material descriptions, see Inside Back Cover.
For application data, see page B135 and page B136.

D1	D	L	L4	L10	LS	Z	K10F ≤H6 K10F	K10F-DCFD ≤H6 K10F-DCFD
5,00	6,00	74	32	12	36	4	050270-000500	450270-000500
6,00	6,00	74	33	12	36	4	050270-000600	450270-000600
8,00	8,00	91	50	16	36	6	050270-000800	450270-000800
10,00	10,00	103	58	20	40	6	050270-001000	450270-001000
12,00	12,00	118	68	24	45	6	050270-001200	450270-001200
14,00	14,00	132	81	28	45	6	050270-001400	450270-001400

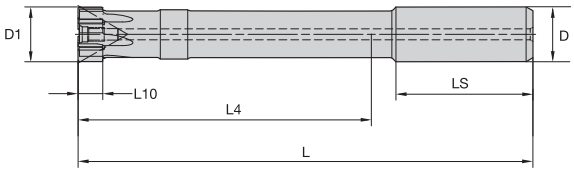
Dimensions for Custom Solution Reamers

D1min	D1max	D	L	L4	L10	LS	Z
4,16	4,79	6,00	74	32	10	36	4
4,80	5,79	6,00	74	32	12	36	4
5,80	6,15	6,00	74	33	12	36	4
6,16	7,15	8,00	91	49	16	36	4
7,16	7,69	8,00	91	49	16	36	6
7,70	8,15	8,00	91	50	16	36	6
8,16	9,59	10,00	103	57	20	40	6
9,60	10,15	10,00	103	58	20	40	6
10,16	11,59	12,00	118	67	24	45	6
11,60	12,15	12,00	118	68	24	45	6
12,16	14,15	14,00	132	81	28	45	6

The above dimensions are used when ordering custom solution reamers on this page unless otherwise specified.
Please see pages B118 and B139–B140 for information on ordering custom solutions



- Standard reamers listed are ground to achieve a H7 tolerance hole. IT6 capability is available. Additional diameters and lengths made to order.
- Provide your exact hole diameter and tolerance when ordering, or use form on page B139.
- For information about Custom Solutions, see page B129.
- For information about Reconditioning Services, see page B138.



	P						M			K			N						S			
	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4	5	6	1	2	3	4
K10F	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
K10F-DCFD	●	●	●	●	●	●	●	●	●	●	●	●							●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B136 and page B137.

D1	D	L	L4	L10	LS	Z	K10F ≤H6 K10F	K10F-DCFD ≤H6 K10F-DCFD
14,00	16,00	145	90	9	48	6	050280-001400	450280-001400
16,00	20,00	157	100	9	50	6	050280-001600	450280-001600
18,00	20,00	171	114	9	50	6	050280-001800	450280-001800
20,00	20,00	200	143	9	50	6	050280-002000	450280-002000
22,00	20,00	210	153	11	50	6	050280-002200	450280-002200
24,00	20,00	210	153	11	50	6	050280-002400	450280-002400
25,00	20,00	210	153	11	50	6	050280-002500	450280-002500
26,00	25,00	240	177	11	56	8	050280-002600	450280-002600
28,00	25,00	240	177	11	56	8	050280-002800	450280-002800
30,00	25,00	270	207	11	56	8	050280-003000	450280-003000
32,00	25,00	270	207	11	56	8	050280-003200	450280-003200

Dimensions for Custom Solution Reamers

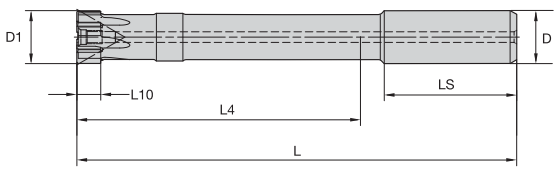
D1min	D1max	D	L	L4	L10	LS	Z
14,00	15,99	16,00	145	97	9	48	6
16,00	17,99	20,00	157	107	9	50	6
18,00	19,99	20,00	171	121	9	50	6
20,00	21,99	20,00	200	150	9	50	6
22,00	25,99	20,00	210	160	11	50	6
26,00	29,99	25,00	240	184	11	56	8
30,00	32,00	25,00	270	214	11	56	8

The above dimensions are used when ordering custom solution reamers on this page unless otherwise specified.
Please see pages B118 and B139–B140 for information on ordering custom solutions

HSR Reamers • Straight Flute • Cermet-Tipped

Blind Holes • CERMET-DCFD • 14,0mm–20,0mm

- Standard reamers listed are ground to achieve a H7 tolerance hole. IT6 capability is available. Additional diameters and lengths made to order.
- Provide your exact hole diameter and tolerance when ordering, or use form on page B139.
- For information about Custom Solutions, see page B129.
- For information about Reconditioning Services, see page B138.



	P					
	1	2	3	4	5	6
CERMET-DCFD	●	●	●	●	●	●

P - Steels *K - Cast Iron* *S - High-Temp Alloys*
M - Stainless Steels *N - Non-Ferrous* *H - Hard Materials*

For material descriptions, see Inside Back Cover.
For application data, see page B137.

D1	D	L	L4	L10	LS	Z	CERMET-DCFD TiAlN
14,00	16,00	145	76	8	49	6	**456680-001400**
15,00	16,00	145	76	8	49	6	**456680-001500**
16,00	20,00	157	86	8	51	6	**456680-001600**
17,00	20,00	157	86	10	51	6	**456680-001700**
18,00	20,00	171	100	10	51	6	**456680-001800**
19,00	20,00	171	100	10	51	6	**456680-001900**
20,00	20,00	200	129	10	51	6	**456680-002000**

Dimensions for Custom Solution Reamers

D1min	D1max	D	L	L4	L10	LS	Z
14,00	15,99	16,00	145	97	9	48	6
16,00	17,99	20,00	157	107	9	50	6
18,00	19,99	20,00	171	121	9	50	6
20,00	21,99	20,00	200	150	9	50	6
22,00	25,99	20,00	210	160	11	50	6
26,00	29,99	25,00	240	184	11	56	8
30,00	32,00	25,00	270	214	11	56	8

The above dimensions are used when ordering custom solution reamers on this page unless otherwise specified.
Please see pages B118 and B139–B140 for information on ordering custom solutions.

Solid Carbide Drills and Reamer Custom Solutions

Choose WIDIA-Rübig Custom Solutions for decades of proven performance!

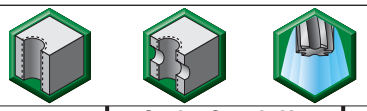
Solid Carbide Drills

Custom drills from WIDIA-Rübig are available in High-Speed Steel (HSS-E), Powdered Metal, Carbide-Tipped, Solid Carbide, Cermet, and PCD-Tipped, enabling you to choose the most effective substrate material for your application. Tools can be produced with or without internal coolant and with all coatings, such as TiN, TiCN, TiAlN, AlTiN, and diamond. Whether it be flat form or subland drills, helical or 4-land drills, WIDIA-Rübig Custom Solutions have decades of industry-proven capabilities.

Reaming

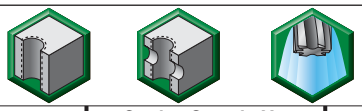
With our state-of-the-art CNC equipment and engineering processes, we can design complex geometries for reaming and countersinking. Special countersinks for pre-working and finishing operations minimize machining time and rationalize production. Our Custom Solution reamers deliver proven performance in applications that demand high surface qualities, narrow fit, alignment tolerances, and long tool life.

Series 050221 • Solid Carbide • Helical Flute • Grade K10



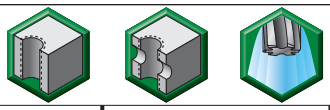
Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate per rev 1,40 - 3,15	3,16 - 4,80	4,81 - 7,15	7,16 - 9,59	9,60 - 12,70
P	1	20	-	30	mm/r	0,07 - 0,13	0,08 - 0,16	0,10 - 0,20	0,13 - 0,23	0,15 - 0,25
	2	20	-	20	mm/r	0,07 - 0,13	0,08 - 0,16	0,10 - 0,20	0,13 - 0,23	0,15 - 0,25
	3	10	-	20	mm/r	0,07 - 0,13	0,08 - 0,16	0,10 - 0,20	0,13 - 0,23	0,15 - 0,25
	4	10	-	10	mm/r	0,07 - 0,13	0,08 - 0,16	0,10 - 0,20	0,13 - 0,23	0,15 - 0,25
	5	10	-	10	mm/r	0,07 - 0,13	0,08 - 0,16	0,10 - 0,20	0,13 - 0,23	0,15 - 0,25
	6	10	-	10	mm/r	0,06 - 0,10	0,07 - 0,13	0,08 - 0,16	0,10 - 0,20	0,13 - 0,23
M	1	10	-	10	mm/r	0,07 - 0,13	0,08 - 0,16	0,10 - 0,20	0,13 - 0,23	0,15 - 0,25
	2	10	-	10	mm/r	0,07 - 0,13	0,08 - 0,16	0,10 - 0,20	0,13 - 0,23	0,15 - 0,25
	3	10	-	10	mm/r	0,07 - 0,13	0,08 - 0,16	0,10 - 0,20	0,13 - 0,23	0,15 - 0,25
K	1	10	-	20	mm/r	0,10 - 0,20	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45
	2	10	-	20	mm/r	0,10 - 0,20	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45
	3	10	-	20	mm/r	0,10 - 0,20	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45
N	1	30	-	30	mm/r	0,10 - 0,20	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45
	2	30	-	40	mm/r	0,10 - 0,20	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45
	3	30	-	40	mm/r	0,10 - 0,20	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45
	4	30	-	30	mm/r	0,10 - 0,20	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45
	5	20	-	30	mm/r	0,10 - 0,20	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45
	6	30	-	40	mm/r	0,10 - 0,20	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45
S	1	10	-	10	mm/r	0,07 - 0,13	0,08 - 0,16	0,10 - 0,20	0,13 - 0,23	0,15 - 0,25
	2	10	-	10	mm/r	0,07 - 0,13	0,08 - 0,16	0,10 - 0,20	0,13 - 0,23	0,15 - 0,25
	3	10	-	20	mm/r	0,07 - 0,13	0,08 - 0,16	0,10 - 0,20	0,13 - 0,23	0,15 - 0,25
	4	10	-	20	mm/r	0,07 - 0,13	0,08 - 0,16	0,10 - 0,20	0,13 - 0,23	0,15 - 0,25

Series 050227 • Solid Carbide • Helical Flute • Grade K10F



Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate per rev 1,40 - 3,15	3,16 - 4,80	4,81 - 7,15	7,16 - 9,59	9,60 - 12,70	12,70 - 15,00
P	1	30	-	40	mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,40 - 0,70	0,40 - 0,80	0,50 - 0,90
	2	30	-	40	mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,40 - 0,70	0,40 - 0,80	0,50 - 0,90
	3	30	-	30	mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,40 - 0,70	0,40 - 0,80	0,50 - 0,90
	4	20	-	30	mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,40 - 0,70	0,40 - 0,80	0,50 - 0,90
	5	10	-	20	mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,40 - 0,70	0,40 - 0,80	0,50 - 0,90
	6	10	-	20	mm/r	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65
M	1	10	-	20	mm/r	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65
	2	10	-	20	mm/r	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65
	3	10	-	10	mm/r	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65
K	1	20	-	30	mm/r	0,25 - 0,45	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
	2	20	-	30	mm/r	0,25 - 0,45	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
	3	20	-	30	mm/r	0,25 - 0,45	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
N	1	70	-	90	mm/r	0,25 - 0,45	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
	2	80	-	100	mm/r	0,25 - 0,45	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
	3	80	-	100	mm/r	0,25 - 0,45	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
	4	70	-	90	mm/r	0,25 - 0,45	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
	5	60	-	80	mm/r	0,25 - 0,45	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
	6	90	-	110	mm/r	0,25 - 0,45	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
S	1	10	-	20	mm/r	0,10 - 0,20	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45	0,30 - 0,50
	2	10	-	10	mm/r	0,10 - 0,20	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45	0,30 - 0,50
	3	20	-	30	mm/r	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65
	4	20	-	30	mm/r	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65

Series 450227 • Solid Carbide • Helical Flute • Grade K10F-DCFD



Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate per rev 1,40 - 3,15	3,16 - 4,80	4,81 - 7,15	7,16 - 9,59	9,60 - 12,70	12,70 - 15,00
P	1	60	-	80	mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,40 - 0,70	0,40 - 0,80	0,50 - 0,90
	2	60	-	80	mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,40 - 0,70	0,40 - 0,80	0,50 - 0,90
	3	60	-	70	mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,40 - 0,70	0,40 - 0,80	0,50 - 0,90
	4	40	-	60	mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,40 - 0,70	0,40 - 0,80	0,50 - 0,90
	5	20	-	30	mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,40 - 0,70	0,40 - 0,80	0,50 - 0,90
	6	20	-	30	mm/r	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65
M	1	10	-	20	mm/r	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65
	2	10	-	20	mm/r	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65
	3	10	-	20	mm/r	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65
K	1	50	-	70	mm/r	0,25 - 0,45	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
	2	50	-	70	mm/r	0,25 - 0,45	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
	3	50	-	70	mm/r	0,25 - 0,45	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
S	1	10	-	20	mm/r	0,10 - 0,20	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45	0,30 - 0,50
	2	10	-	20	mm/r	0,10 - 0,20	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45	0,30 - 0,50

Series 050271 • Solid Carbide • Helical Flute • Grade K10F

Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate per rev 3,16 - 4,80		4,81 - 7,15		7,16 - 9,59		9,60 - 12,70		12,70 - 15,00	
P	1	50	-	70	mm/r	0,20	- 0,40	0,30	- 0,50	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90
	2	40	-	60	mm/r	0,20	- 0,40	0,30	- 0,50	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90
	3	40	-	60	mm/r	0,20	- 0,40	0,30	- 0,50	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90
	4	30	-	40	mm/r	0,20	- 0,40	0,30	- 0,50	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90
	5	20	-	30	mm/r	0,20	- 0,40	0,30	- 0,50	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90
	6	10	-	20	mm/r	0,20	- 0,30	0,20	- 0,40	0,30	- 0,50	0,30	- 0,60	0,35	- 0,65
M	1	10	-	20	mm/r	0,20	- 0,30	0,20	- 0,40	0,30	- 0,50	0,30	- 0,60	0,35	- 0,65
	2	10	-	20	mm/r	0,20	- 0,30	0,20	- 0,40	0,30	- 0,50	0,30	- 0,60	0,35	- 0,65
	3	10	-	20	mm/r	0,20	- 0,30	0,20	- 0,40	0,30	- 0,50	0,30	- 0,60	0,35	- 0,65
K	1	30	-	50	mm/r	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90	0,60	- 1,05	0,60	- 1,20
	2	30	-	50	mm/r	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90	0,60	- 1,05	0,60	- 1,20
	3	30	-	50	mm/r	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90	0,60	- 1,05	0,60	- 1,20
N	1	130	-	150	mm/r	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90	0,60	- 1,05	0,60	- 1,20
	2	140	-	160	mm/r	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90	0,60	- 1,05	0,60	- 1,20
	3	140	-	160	mm/r	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90	0,60	- 1,05	0,60	- 1,20
	4	130	-	150	mm/r	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90	0,60	- 1,05	0,60	- 1,20
	5	120	-	140	mm/r	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90	0,60	- 1,05	0,60	- 1,20
	6	150	-	170	mm/r	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90	0,60	- 1,05	0,60	- 1,20
S	1	10	-	20	mm/r	0,15	- 0,30	0,20	- 0,30	0,20	- 0,40	0,25	- 0,45	0,30	- 0,50
	2	10	-	20	mm/r	0,15	- 0,30	0,20	- 0,30	0,20	- 0,40	0,25	- 0,45	0,30	- 0,50
	3	30	-	40	mm/r	0,20	- 0,30	0,20	- 0,40	0,30	- 0,50	0,30	- 0,60	0,35	- 0,65
	4	30	-	40	mm/r	0,20	- 0,30	0,20	- 0,40	0,30	- 0,50	0,30	- 0,60	0,35	- 0,65

Series 450271 • Solid Carbide • Helical Flute • Grade K10F-DCFD

Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate per rev 3,16 - 4,80		4,81 - 7,15		7,16 - 9,59		9,60 - 12,70		12,70 - 15,00	
P	1	110	-	130	mm/r	0,20	- 0,40	0,30	- 0,50	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90
	2	110	-	130	mm/r	0,20	- 0,40	0,30	- 0,50	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90
	3	100	-	120	mm/r	0,20	- 0,40	0,30	- 0,50	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90
	4	60	-	80	mm/r	0,20	- 0,40	0,30	- 0,50	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90
	5	30	-	50	mm/r	0,20	- 0,40	0,30	- 0,50	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90
	6	30	-	40	mm/r	0,20	- 0,30	0,20	- 0,40	0,30	- 0,50	0,30	- 0,60	0,35	- 0,65
M	1	30	-	40	mm/r	0,20	- 0,30	0,20	- 0,40	0,30	- 0,50	0,30	- 0,60	0,35	- 0,65
	2	30	-	40	mm/r	0,20	- 0,30	0,20	- 0,40	0,30	- 0,50	0,30	- 0,60	0,35	- 0,65
	3	20	-	30	mm/r	0,20	- 0,30	0,20	- 0,40	0,30	- 0,50	0,30	- 0,60	0,35	- 0,65
K	1	80	-	100	mm/r	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90	0,60	- 1,05	0,60	- 1,20
	2	80	-	100	mm/r	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90	0,60	- 1,05	0,60	- 1,20
	3	70	-	90	mm/r	0,35	- 0,65	0,40	- 0,80	0,50	- 0,90	0,60	- 1,05	0,60	- 1,20
S	1	30	-	40	mm/r	0,15	- 0,30	0,20	- 0,30	0,20	- 0,40	0,25	- 0,45	0,30	- 0,50
	2	20	-	30	mm/r	0,15	- 0,30	0,20	- 0,30	0,20	- 0,40	0,25	- 0,45	0,30	- 0,50

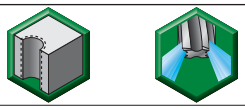
Series 050281 • Uncoated • Carbide-Tipped • Helical Flute • Grade K10F

Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate per rev 12,70 - 15,00			15,00 - 20,00			20,00 - 32,00		
P	1	50	-	70	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	2	40	-	60	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	3	40	-	60	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	4	30	-	40	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	5	20	-	30	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	6	10	-	20	mm/r	0,35	-	0,65	0,40	-	0,80	0,50	-	0,90
M	1	10	-	20	mm/r	0,35	-	0,65	0,40	-	0,80	0,50	-	0,90
	2	10	-	20	mm/r	0,35	-	0,65	0,40	-	0,80	0,50	-	0,90
	3	10	-	20	mm/r	0,35	-	0,65	0,40	-	0,80	0,50	-	0,90
K	1	30	-	50	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
	2	30	-	50	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
	3	30	-	40	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
N	1	130	-	150	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
	2	140	-	160	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
	3	140	-	160	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
	4	130	-	150	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
	5	120	-	140	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
	6	150	-	170	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
S	1	10	-	20	mm/r	0,30	-	0,50	0,30	-	0,60	0,35	-	0,65
	2	10	-	20	mm/r	0,30	-	0,50	0,30	-	0,60	0,35	-	0,65
	3	30	-	40	mm/r	0,35	-	0,65	0,40	-	0,80	0,50	-	0,90
	4	30	-	40	mm/r	0,35	-	0,65	0,40	-	0,80	0,50	-	0,90

Series 450281 • Coated • Carbide-Tipped • Helical Flute • Grade K10F-DCFD

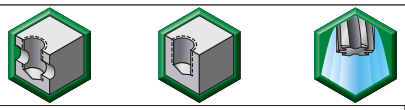
Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate per rev 12,70 - 15,00			15,00 - 20,00			20,00 - 32,00		
P	1	110	-	130	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	2	110	-	130	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	3	100	-	120	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	4	60	-	80	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	5	30	-	50	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	6	30	-	40	mm/r	0,35	-	0,65	0,40	-	0,80	0,50	-	0,90
M	1	30	-	40	mm/r	0,35	-	0,65	0,40	-	0,80	0,50	-	0,90
	2	30	-	40	mm/r	0,35	-	0,65	0,40	-	0,80	0,50	-	0,90
	3	20	-	30	mm/r	0,35	-	0,65	0,40	-	0,80	0,50	-	0,90
K	1	80	-	100	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
	2	80	-	100	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
	3	70	-	90	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
S	1	30	-	40	mm/r	0,30	-	0,50	0,30	-	0,60	0,35	-	0,65
	2	20	-	30	mm/r	0,30	-	0,50	0,30	-	0,60	0,35	-	0,65

Series 456681 • Cermet-Tipped • Helical Flute • Grade CERMET-DCFD



Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate per rev 12,70 - 15,00			15,00 - 20,00		
P	1	110	-	130	mm/r	0,50	-	0,90	0,60	-	1,05
	2	110	-	130	mm/r	0,50	-	0,90	0,60	-	1,05
	3	100	-	120	mm/r	0,50	-	0,90	0,60	-	1,05
	4	60	-	80	mm/r	0,50	-	0,90	0,60	-	1,05
	5	30	-	50	mm/r	0,50	-	0,90	0,60	-	1,05
	6	30	-	40	mm/r	0,35	-	0,65	0,40	-	0,80

Series 050222 • Solid Carbide • Straight Flute • Grade K10F



Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate per rev 1,40 - 3,15			3,16 - 4,80		
P	1	30	-	40	mm/r	0,20	-	0,30	0,20	-	0,40
	2	30	-	40	mm/r	0,20	-	0,30	0,20	-	0,40
	3	30	-	30	mm/r	0,20	-	0,30	0,20	-	0,40
	4	20	-	30	mm/r	0,20	-	0,30	0,20	-	0,40
	5	10	-	20	mm/r	0,20	-	0,30	0,20	-	0,40
	6	10	-	20	mm/r	0,15	-	0,30	0,20	-	0,30
M	1	10	-	20	mm/r	0,15	-	0,30	0,20	-	0,30
	2	10	-	20	mm/r	0,15	-	0,30	0,20	-	0,30
	3	10	-	10	mm/r	0,15	-	0,30	0,20	-	0,30
K	1	20	-	30	mm/r	0,25	-	0,45	0,35	-	0,65
	2	20	-	30	mm/r	0,25	-	0,45	0,35	-	0,65
	3	20	-	30	mm/r	0,25	-	0,45	0,35	-	0,65
N	1	70	-	90	mm/r	0,25	-	0,45	0,35	-	0,65
	2	80	-	100	mm/r	0,25	-	0,45	0,35	-	0,65
	3	80	-	100	mm/r	0,25	-	0,45	0,35	-	0,65
	4	70	-	90	mm/r	0,25	-	0,45	0,35	-	0,65
	5	60	-	80	mm/r	0,25	-	0,45	0,35	-	0,65
	6	90	-	110	mm/r	0,25	-	0,45	0,35	-	0,65
S	1	10	-	20	mm/r	0,10	-	0,20	0,15	-	0,30
	2	10	-	10	mm/r	0,10	-	0,20	0,15	-	0,30
	3	20	-	30	mm/r	0,15	-	0,30	0,20	-	0,30
	4	20	-	30	mm/r	0,15	-	0,30	0,20	-	0,30

Series 450222 • Solid Carbide • Straight Flute • Grade K10F-DCFD

Group		Cutting Speed - Vc Range - m/min Min		Max	Recommended Feed Rate per rev Tool Diameter	1,40 - 3,15		3,16 - 4,80	
P	1	60	-	80	mm/r	0,20	- 0,30	0,20	- 0,40
	2	60	-	80	mm/r	0,20	- 0,30	0,20	- 0,40
	3	50	-	70	mm/r	0,20	- 0,30	0,20	- 0,40
	4	40	-	60	mm/r	0,20	- 0,30	0,20	- 0,40
	5	20	-	30	mm/r	0,20	- 0,30	0,20	- 0,40
	6	20	-	30	mm/r	0,15	- 0,30	0,20	- 0,30
M	1	10	-	20	mm/r	0,15	- 0,30	0,20	- 0,30
	2	10	-	20	mm/r	0,15	- 0,30	0,20	- 0,30
	3	10	-	20	mm/r	0,15	- 0,30	0,20	- 0,30
K	1	50	-	70	mm/r	0,25	- 0,45	0,35	- 0,65
	2	50	-	70	mm/r	0,25	- 0,45	0,35	- 0,65
	3	50	-	70	mm/r	0,25	- 0,45	0,35	- 0,65
S	1	10	-	20	mm/r	0,10	- 0,20	0,15	- 0,30
	2	10	-	20	mm/r	0,10	- 0,20	0,15	- 0,30

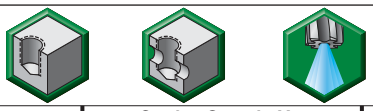
Series 050270 • Solid Carbide • Straight Flute • Grade K10F

Group		Cutting Speed - Vc Range - m/min Min		Max	Recommended Feed Rate per rev Tool Diameter	3,16 - 4,80	4,81 - 7,15	7,16 - 9,59	9,60 - 12,70	12,70 - 15,00	12,70 - 15,00
P	1	50	- 70		mm/r	0,20 - 0,40	0,30 - 0,50	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,50 - 0,90
	2	40	- 60		mm/r	0,20 - 0,40	0,30 - 0,50	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,50 - 0,90
	3	40	- 60		mm/r	0,20 - 0,40	0,30 - 0,50	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,50 - 0,90
	4	30	- 40		mm/r	0,20 - 0,40	0,30 - 0,50	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,50 - 0,90
	5	20	- 30		mm/r	0,20 - 0,40	0,30 - 0,50	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,50 - 0,90
	6	10	- 20		mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65	0,35 - 0,65
M	1	10	- 20		mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65	0,35 - 0,65
	2	10	- 20		mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65	0,35 - 0,65
	3	10	- 20		mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65	0,35 - 0,65
K	1	30	- 50		mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20	0,60 - 1,20
	2	30	- 50		mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20	0,60 - 1,20
	3	30	- 50		mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20	0,60 - 1,20
N	1	130	- 150		mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20	0,60 - 1,20
	2	140	- 160		mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20	0,60 - 1,20
	3	140	- 160		mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20	0,60 - 1,20
	4	130	- 150		mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20	0,60 - 1,20
	5	120	- 140		mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20	0,60 - 1,20
	6	150	- 170		mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20	0,60 - 1,20
S	1	10	- 20		mm/r	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45	0,30 - 0,50	0,30 - 0,50
	2	10	- 20		mm/r	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45	0,30 - 0,50	0,30 - 0,50
	3	30	- 40		mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65	0,35 - 0,65
	4	30	- 40		mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65	0,35 - 0,65

Series 450270 • Solid Carbide • Straight Flute • Grade K10F-DCFD

Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate per rev 3,16 - 4,80	4,81 - 7,15	7,16 - 9,59	9,60 - 12,70	12,70 - 15,00	12,70 - 15,00
P	1	110	-	130	mm/r	0,20 - 0,40	0,30 - 0,50	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,50 - 0,90
	2	110	-	130	mm/r	0,20 - 0,40	0,30 - 0,50	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,50 - 0,90
	3	100	-	120	mm/r	0,20 - 0,40	0,30 - 0,50	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,50 - 0,90
	4	60	-	80	mm/r	0,20 - 0,40	0,30 - 0,50	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,50 - 0,90
	5	30	-	50	mm/r	0,20 - 0,40	0,30 - 0,50	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,50 - 0,90
	6	30	-	40	mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65	0,35 - 0,65
M	1	30	-	40	mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65	0,35 - 0,65
	2	30	-	40	mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65	0,35 - 0,65
	3	20	-	30	mm/r	0,20 - 0,30	0,20 - 0,40	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65	0,35 - 0,65
K	1	80	-	100	mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20	0,60 - 1,20
	2	80	-	100	mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20	0,60 - 1,20
	3	70	-	90	mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20	0,60 - 1,20
S	1	30	-	40	mm/r	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45	0,30 - 0,50	0,30 - 0,50
	2	20	-	30	mm/r	0,15 - 0,30	0,20 - 0,30	0,20 - 0,40	0,25 - 0,45	0,30 - 0,50	0,30 - 0,50

Series 050280 • Uncoated • Carbide-Tipped • Straight Flute • Grade K10F



Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate per rev 12,70 - 15,00	15,00 - 20,00	20,00 - 32,00
P	1	50	-	70	mm/r	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
	2	40	-	60	mm/r	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
	3	40	-	60	mm/r	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
	4	30	-	40	mm/r	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
	5	20	-	30	mm/r	0,50 - 0,90	0,60 - 1,05	0,60 - 1,20
	6	10	-	20	mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90
M	1	10	-	20	mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90
	2	10	-	20	mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90
	3	10	-	20	mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90
K	1	30	-	50	mm/r	0,60 - 1,20	0,70 - 1,30	0,80 - 1,40
	2	30	-	50	mm/r	0,60 - 1,20	0,70 - 1,30	0,80 - 1,40
	3	30	-	40	mm/r	0,60 - 1,20	0,70 - 1,30	0,80 - 1,40
N	1	130	-	150	mm/r	0,60 - 1,20	0,70 - 1,30	0,80 - 1,40
	2	140	-	160	mm/r	0,60 - 1,20	0,70 - 1,30	0,80 - 1,40
	3	140	-	160	mm/r	0,60 - 1,20	0,70 - 1,30	0,80 - 1,40
	4	130	-	150	mm/r	0,60 - 1,20	0,70 - 1,30	0,80 - 1,40
	5	120	-	140	mm/r	0,60 - 1,20	0,70 - 1,30	0,80 - 1,40
	6	150	-	170	mm/r	0,60 - 1,20	0,70 - 1,30	0,80 - 1,40
S	1	10	-	20	mm/r	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65
	2	10	-	20	mm/r	0,30 - 0,50	0,30 - 0,60	0,35 - 0,65
	3	30	-	40	mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90
	4	30	-	40	mm/r	0,35 - 0,65	0,40 - 0,80	0,50 - 0,90

Series 450280 • Coated • Carbide-Tipped • Straight Flute • Grade K10F-DCFD

Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate per rev 12,70 - 15,00			15,00 - 20,00			20,00 - 32,00		
P	1	110	-	130	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	2	110	-	130	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	3	100	-	120	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	4	60	-	80	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	5	30	-	50	mm/r	0,50	-	0,90	0,60	-	1,05	0,60	-	1,10
	6	30	-	40	mm/r	0,35	-	0,65	0,40	-	0,80	0,50	-	0,90
M	1	30	-	40	mm/r	0,35	-	0,65	0,40	-	0,80	0,50	-	0,90
	2	30	-	40	mm/r	0,35	-	0,65	0,40	-	0,80	0,50	-	0,90
	3	20	-	30	mm/r	0,35	-	0,65	0,40	-	0,80	0,50	-	0,90
K	1	80	-	100	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
	2	80	-	100	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
	3	70	-	90	mm/r	0,60	-	1,20	0,70	-	1,30	0,80	-	1,40
S	1	30	-	40	mm/r	0,30	-	0,50	0,30	-	0,60	0,35	-	0,65
	2	20	-	30	mm/r	0,30	-	0,50	0,30	-	0,60	0,35	-	0,65

Series 456680 • Cermet-Tipped • Straight Flute • Grade CERMET-DCFD

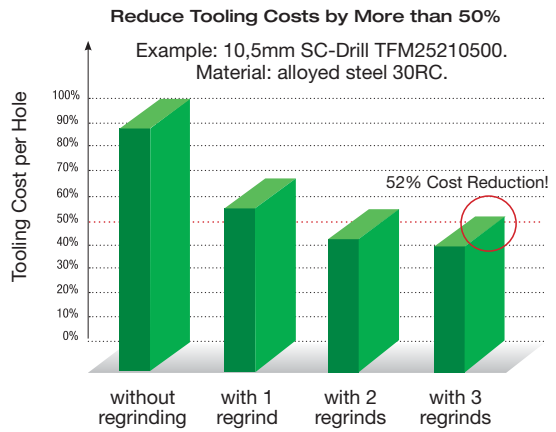
Group		Cutting Speed - Vc Range - m/min Min		Max	Tool Diameter	Recommended Feed Rate per rev 12,70 - 15,00			15,00 - 20,00		
P	1	110	-	130	mm/r	0,50	-	0,90	0,60	-	1,05
	2	110	-	130	mm/r	0,50	-	0,90	0,60	-	1,05
	3	100	-	120	mm/r	0,50	-	0,90	0,60	-	1,05
	4	60	-	80	mm/r	0,50	-	0,90	0,60	-	1,05
	5	30	-	50	mm/r	0,50	-	0,90	0,60	-	1,05
	6	30	-	40	mm/r	0,35	-	0,65	0,40	-	0,80

Anyone Can Regrind Your Tools — Only We Can Truly Recondition Them

Why recondition?

Our Reconditioning Services help optimize the total value of your metalcutting tools throughout their entire life cycle by giving them “like-new” performance characteristics — with rapid turnaround time — so the tools you need are always on-hand and perform just like new.

By sending your worn drills and end mills for reconditioning, you will get:



- Proprietary geometry.
- Certified coatings.
- Superior quality.
- Like-new performance.
- Fast turnaround time.
- Application support throughout the entire tool life cycle.

Tools can often be reconditioned up to five times.

Reconditioning Services make perfect sense

Our Reconditioning Services deliver considerable savings throughout the life of your cutting tools and can reduce your overall tooling costs by more than 50%.

How does it work?

Contact your Authorized Distributor to get started.

For facilities, or to find the nearest Distributor, visit www.widia.com.

Machining Questionnaire for Custom Reaming Tools

Please make a copy of this form and give it to your WIDIA Representative or Authorized WIDIA Distributor.

Name: _____

Company: _____

Address: _____

Phone/Fax: _____ Date: _____

1. Workpiece material

Material: _____

MPa or psi: _____

Heat treatment/Hardness: _____

2. Machining

Drill diameter: _____

Drilling tolerance: _____

Hole depth: _____

Surface requirement: _____

R_z: _____

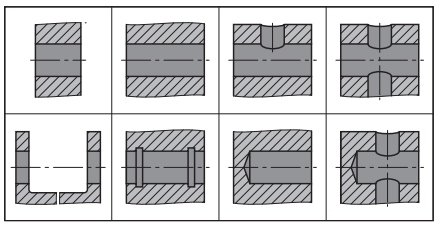
R_a: _____

Hole length: _____

Premachining:
Drilled: ❒ Spindle: ❒

Machining of drill hole base:
Yes ❒ No ❒

Hole type:



3. Production quantity

Hole number/year: _____

4. Tool interface

Interface designation and size:
(e.g., straight shank 20)

_____

_____

5. Machine tool

Machining:
Horizontal ❒ Vertical ❒

Tool:
Rotating ❒ Stationary ❒

Internally cooled tools:
Yes ❒ No ❒

Cooling lubricant:
Oil ❒ Emulsion ❒

Cooling lubricant pressure:
p [bar]: _____

Machine manufacturer/type:

_____

Spindle interface:
(e.g., HSK 63) _____

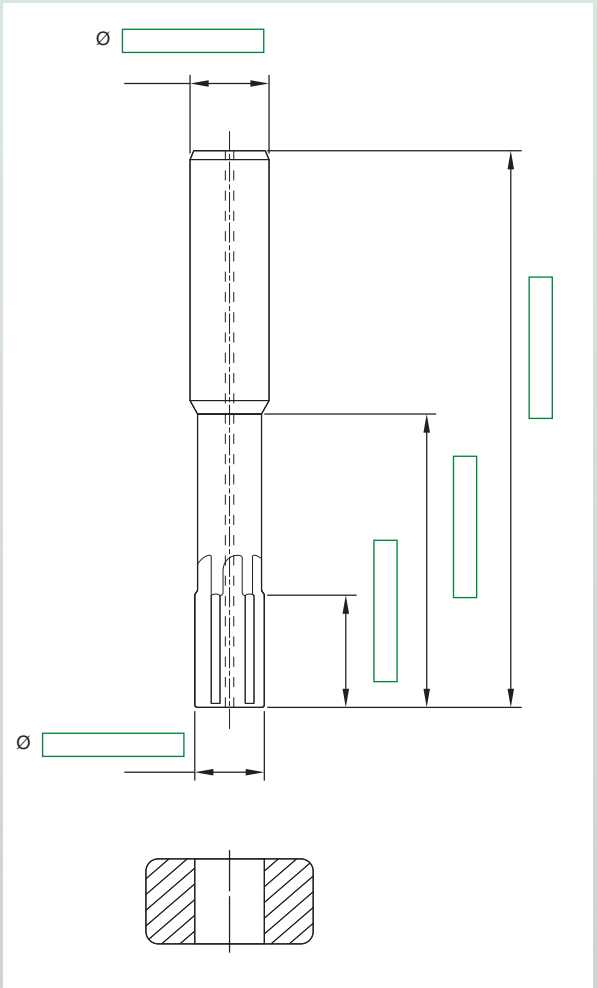
Cutting parameters:
Variable: Yes ❒ No ❒

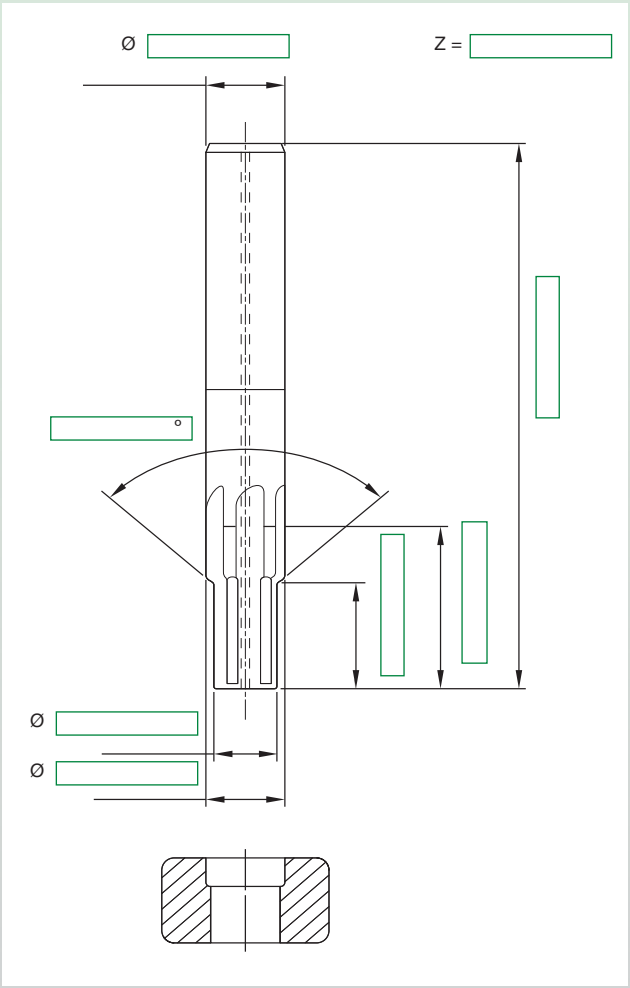
If not variable:
n [rev/min] _____
F [mm/min] _____

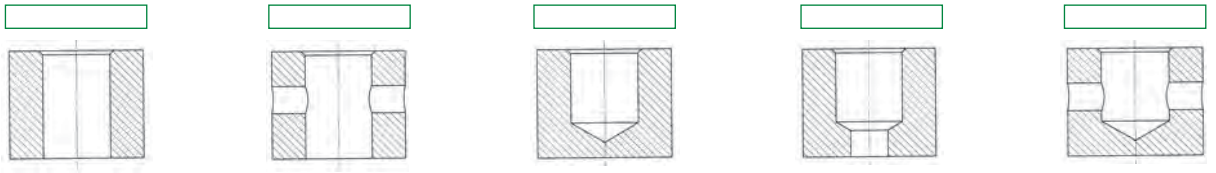
For any crossholes or interruptions in the bore, please provide a sketch.

Please provide a sketch of the chuck with any foul conditions and machine tasks. Include all relevant dimensions, as well as forming and positioning tolerances.

Custom Reaming Tools Form







Required Details:

Material to Be Worked:

Type of Tool:

Right Hand Spiral ❒ Left Hand Spiral ❒ Straight Fluted ❒

Internal Coolant:

Yes ❒ MMKS ❒ No ❒

Fixture:

Grade:

HM/TCT ❒ PKD/PCD ❒ CBN ❒

Coating: No ❒ DCFD ❒

Shank According to DIN 6535:

HA ❒ HB ❒ HE ❒

Other Information:

Custom Solution Reamers — Available Upon Request

Custom Solutions

Introduction to Custom Solutions C2
Benefits of Custom Solutions C3
Solid End Mill Custom Solutions C4
Form Tools Custom Solutions C5
Carbide Drill Custom Solutions C6
Reamer Custom Solutions C7
PCD-Tipped Custom Solutions C8
PCD Tooling C9

Custom Solutions

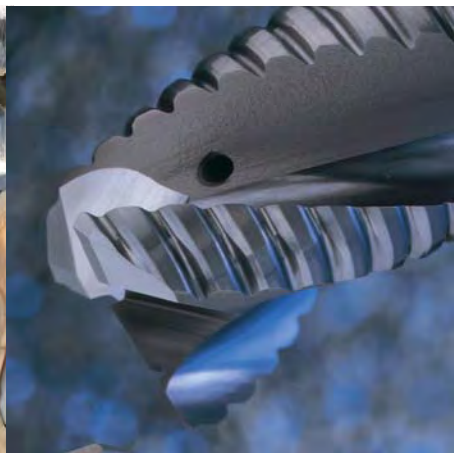
Don't settle for conventional geometries from your local grind shop. WIDIA-Hanita brand products provide innovative, high-performance geometries for your custom solution tooling.

Our Custom Solutions department is dedicated entirely to the design and manufacture of special milling solutions for highly demanding operations and focused manufacturing. Our factory engineers, production experts, and field application engineers are available to work with our customers throughout the world to design solutions to provide maximum productivity and throughput.

Unique advantages, such as in-house PVD high-quality coating facilities (TiN, TiCN, TiAlN, AlTiN, Z-coat), a wide range of raw materials (HSS, HSS-E, HSS-Powder; Solid Carbide, Brazed Carbide), and capabilities for a large selection of diameters 0,25mm to 75mm, places WIDIA-Hanita as the preferred brand for high-quality and specific application special tools.

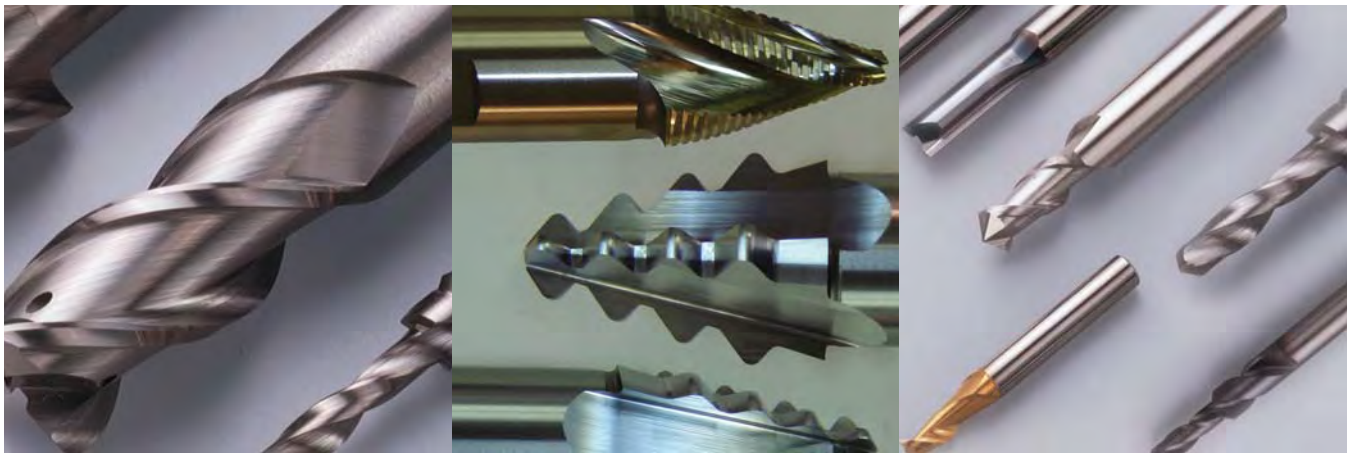
We specialize in designing and manufacturing blueprint specials in the following tool styles:

- End Mills
- Form Cutters
- Christmas Tree Cutters
- Arbor-Style Milling Cutters
- Carbide Drills (straight and step)
- Routers
- Reamers
- Counterbores
- Tapered Tools



Benefits of WIDIA-Hanita Brand Custom Solutions

- Development, design, and production of different types of cutting tools for milling, drilling, reaming, counterboring, and operations.
- Services provided by one engineering department fully integrated with all WIDIA-Hanita focused factories.
- Capabilities with all common cutting materials, such as High-Speed Steel (HSS-E), Powdered Metal, Solid Carbide, Carbide-Tipped, Cermet, PCD, and CBN, with or without internal coolant.
- Dimensions from 0,4mm up to 500mm and tool lengths up to 1.000mm max.
- Complete tool competence from one source — from construction, application engineering, development, and production, through tool reconditioning services.
- Exceptional consistency and compliance to specifications and tool performance.



Solid End Mill Custom Solutions

Fast response and superior performance when you need it.

We provide exceptional application and design engineering services. Whether you need tools produced according to a blueprint, a finished part, or a drawing, assistance in process development, or expertise in optimizing an application, our world-renowned Advanced Engineering Team is available.

Our engineering departments are fully integrated with specialized production cells located in our focused factories throughout the world. ISO Certified manufacturing facilities, with state-of-the-art CNC equipment, simulation capability, CAD/CAM production, and inspection processes, ensure that customers receive the highest-quality product with accurate compliance to specifications and repeatability for future production.

Custom Solution Services:

- Blueprint Specials
- Complex Geometries
- Form Tools
- Modified Standards
- Application Engineering and Optimization
- Tool Design
- Project Development

Contact your local Distributor for more information.

Form Tools Custom Solutions

Form tools designed and manufactured to your exact specifications.

Form tools, which are optically ground on our state-of-the-art CNC machines, complete the large product range of WIDIA-Hanita. Monobloc form tools are available in all common materials with complex and exact forms for internal or external machining.

To find the Authorized WIDIA-Hanita Distributor nearest you, use the Distributor Finder at ***www.widia.com.***

Carbide Drill Custom Solutions

Choose WIDIA-Rübig Custom Solutions for decades of proven performance.

Custom drills from WIDIA-Rübig are available in High-Speed Steel (HSS-E), Powdered Metal, Carbide-Tipped, Solid Carbide, Cermet, and PCD-Tipped, enabling you to choose the most effective substrate material for your application. Tools can be produced with or without internal coolant and with all coatings such as TiN, TiCN, TiAlN, AlTiN, and diamond. Whether it be flat form or subland drills, helical or 4-land drills, WIDIA-Rübig Custom Solutions have decades of industry-proven capabilities.

visit www.widia.com

Reamer Custom Solutions

Custom Solution Tools • Countersinking and Reaming.

With our state-of-the-art CNC equipment and engineering processes, we can design complex geometries for reaming and countersinking. Special countersinks for pre-working and finishing operations minimize machining time and rationalize production. Our custom solution reamers deliver proven performance in applications that demand high surface qualities, narrow fit, alignment tolerances, and long tool life.

visit www.widia.com

PCD-Tipped Custom Solutions

Increase tool life up to 300 times part per tool with PCD solutions!

Our PCD-tipped tools are ideal for machining aluminium and magnesium alloys, copper, and brass, as well as glass-fiber and carbon-fiber reinforced plastics — with a cutting speed between 250 and 3.000 m/min.

The utilization of Polycrystalline Diamond (PCD)–tipped tooling has expanded rapidly over the past 10 years within multiple industries. These tools have displaced traditional carbide and High-Speed Steel (HSS) tooling. The economic savings of utilizing PCD tooling for machining non-ferrous materials can be categorized in five key areas:

- Longer tool life enabling increased machine utilization and overall increased production.
- Higher productivity through increased metal removal rates.
- Superior surface finishes.
- Precise tolerance control.
- Strong resistance to abrasive wear, even when cutting speeds are extremely high.

In most cases where PCD tools have been evaluated against carbide tooling, customers have realized significant increases in tool life up to 300 times part per tool. This dramatic increase in tool life significantly decreases machine downtime, thereby increasing production throughput and lowering overall manufacturing costs per unit.

Global Capabilities and Local Service

WIDIA CLAPPDICO

WIDIA RÜBIG

PCD Tooling Is Making a Big Impact in Technical Markets

Automotive

An industry segment which utilizes PCD and PCBN tooling in the machining of Aluminium, Powdered Metals, Hardened Steel, and Iron materials.

Telecommunications

A swiftly growing industry which incorporates the usage of PCD in the machining of Plastics, Fiberboard, Bronze, Brass, and Zinc materials.

Electronics

A growing and competitive industry which incorporates the usage of PCD in the machining of Plastics, Aluminium, Glass, and Copper materials.

Aerospace

An industry that has just begun to unlock the economic potential of PCD and PCBN tooling in the machining of target materials such as Phenolics, Graphite Composites, and Aluminiums.

Contact your local WIDIA Distributor for more information.

Outstanding Service and Support that Separates WIDIA-Hanita Products from the Competition

In addition to the outstanding performance we provide with superior tools, WIDIA-Hanita products offer the highest-quality support and program services as well.

- Our regional Customer Service teams are considered by our Distributors to be the finest in the industry and are experienced and trained to help with orders, quotations, expediting, processing Custom Solution requests, and connecting with the right people.

- Our unique Customer Application Support (CAS) teams are available to many parts of the world on a 24/7 basis, helping to select the correct tool, providing technical information and recommended parameters, and identifying item conversions from the competition to WIDIA-Hanita products.

- Our Advanced Engineering teams, specializing in specific product groups (end mills, drills, reamers, etc.), work with our customers to optimize application productivity and provide development on complex tool designs.

- Our local field application specialists are technical experts who work with our Distributors to assist customers with tool selection, training, tool tests, and productivity gain reporting.

- We offer reconditioning services that provide “like-new” performance that cannot be matched by the competition.

- Our recycling services turn your scrap carbide into cash.

…and that’s only the beginning.

We understand that it takes more than great products to earn customer loyalty. We are committed to providing world-class support and program services that will earn, and keep, your business.

Service and Support

WIDIA-Hanita and WIDIA-Rübig Tool Reconditioning D2–D3

Sustainable Engineering D4

WIDIA-Hanita and WIDIA-Rübig on the Web D5

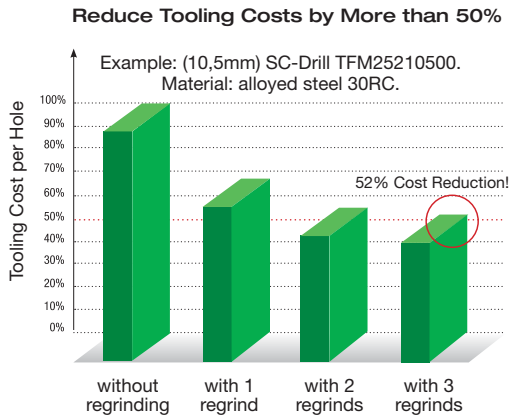
Customer Application Support D6–D7

Anyone Can Regrind Your Tools — Only We Can Truly Recondition Them

Why recondition?

Our Reconditioning Services help optimize the total value of your metalcutting tools throughout their entire life cycle by giving them “like-new” performance characteristics — with rapid turnaround time — so the tools you need are always on-hand and perform just like new.

By sending your worn drills and end mills for reconditioning, you will get:



- Proprietary geometry.
- Certified coatings.
- Superior quality.
- Like-new performance.
- Fast turnaround time.
- Application support throughout the entire tool life cycle.

Tools can often be reconditioned up to five times.

Reconditioning Services make perfect sense.

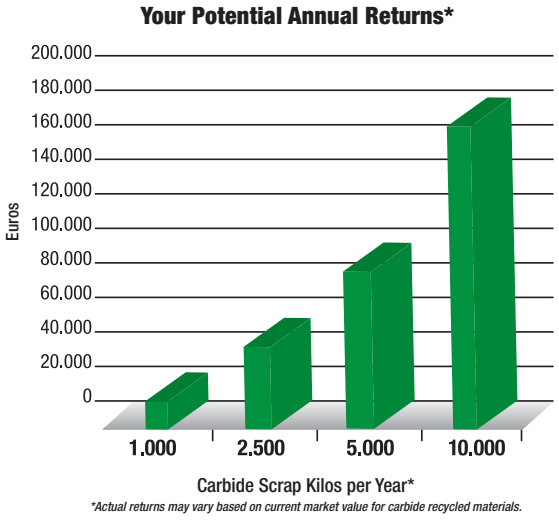
Our Reconditioning Services deliver considerable savings throughout the life of your cutting tools and can reduce your overall tooling costs by more than 50%.

How does it work?

Contact your Authorized Distributor to get started.

For facilities, or to find the nearest Distributor, visit www.widia.com.

Get Cash or Credit for Your Used Carbide



Actual returns may vary based on current market value for carbide recycled materials.

Why recycle?

It's the right thing to do!

It's easy for your company to be environmentally conscious with our Carbide Recycling Program.

By sending us your used carbide tools, you help preserve and protect the environment and ensure that these products are responsibly recycled.

It's profitable!

Not only does WIDIA-Hanita make it easy for your company to be environmentally conscious, we offer an added incentive — it is profitable.

Through our Carbide Recycling Program, get the full value of your investment in metalcutting tools, improve profitability, and reduce your overall tooling spend. When you send us your used carbide, we will reward you with cash or credit. (Credit offer valid in U.S.A. only.)

It's EASY!

Our Carbide Recycling Program is available on the Web and is easy to use. You can request a quote, arrange to send us your used carbide, and check the status of your shipment. To find out more, please contact your Authorized Distributor.

Contact your local Distributor for more information.

Green Boxes for Green Companies.

The Green Box™ program is a safe and efficient way for you to package and ship your spent carbide tools to an authorized recycling location.

Qualified used carbide includes: mixed coated and uncoated metalcutting tools free of chips, oil, and steel contamination. Material must be free of braze.

Sustainable Engineering

Environmental Responsibility

We are deeply committed to designing and manufacturing environmentally responsible products that deliver high performance and proven value. With decades of experience in tooling and manufacturing, the synergies of superior engineering, leading technology, and customized solutions, we offer some of the most effective opportunities for sustainable manufacturing in the industry. Our comprehensive range of products and excellent customer service make us your complete supplier of sustainable tooling solutions.

Sustainable Engineering

Leading the way with innovation, engineering, and service in standard and custom tooling. A proven methodology and partnership. Successful project engineering requires planning, teamwork, and disciplined execution. Through our extensive experience in developing and implementing new project engineering strategies, we have pioneered a proven methodology to help you manufacture new products and bring them to market quickly. Service deliverables are carefully outlined and jointly agreed to before the project begins. We formally evaluate progress and results with you throughout the project through our stage-gate management systems.

We can provide your engineering teams and machine tool builders with process engineering support, advanced metalcutting technologies, and project management expertise to help you achieve your sustainability goals. With our best-in-class process, you'll experience accelerated time-to-market, lower overall costs, and reduced risks to implement new technologies.

On the Web

Fast, Free, and Easy Registration

You can easily register with www.WIDIA.com to obtain full access to the features of the site.

Find a Local Authorized WIDIA Distributor in Your Area

WIDIA delivers world-class products and services that make us a premier tooling manufacturer globally. Our distributors know us, and more importantly, they know you. They know better than anyone in the industry how to put the global power of WIDIA to work for you — in your industry, in your region, and for your business.

Contact Us

Our customers are important to us. We want to provide you the best customer service in the industry.
If you have a comment or question, please send it to us. We strive to respond to all inquiries within 24 hours.

WIDIA Products

Whether your operation is turning, milling, or holemaking, WIDIA has the high-performance tooling you need.
We offer standard and custom solutions for the general engineering market.

Customer Application Support:

Austria	**Phone:**	**0800 291630**
	Fax:	0800 291631
Belgium	**Phone:**	**0800 80410**
	Fax:	0800 80411
Denmark	**Phone:**	**80889295**
	Fax:	80889297
Finland	**Phone:**	**0800919413**
	Fax:	0800919415
France	**Phone:**	**0805540379**
	Fax:	0805540029
Germany	**Phone:**	**0800 1015774**
	Fax:	0800 0007531
Italy	**Phone:**	**800 916568**
	Fax:	800 917749
Netherlands	**Phone:**	**0800 0201131**
	Fax:	0800 0201135
North America	**Phone:**	**877 724 4040**
Norway	**Phone:**	**80010081**
	Fax:	800 10001
Poland	**Phone:**	**00800 4411943**
	Fax:	00800 4411940
South Africa	**Phone:**	**0800 981644**
	Fax:	0800 981645
Sweden	**Phone:**	**020798794**
	Fax:	020790477
United Kingdom	**Phone:**	**0800 028 2996**
	Fax:	0800 028 5721

Visit www.widia.com

Customer Application Support

Get fast and reliable answers to your toughest metalcutting problems.

Our Customer Application Support (CAS) Team is the metalworking industry's leading help-desk resource for tooling application solutions and problem resolution!

- Easy access to proven metalworking expertise.
- Service level excellence.
- Best-in-class application support tools and technology.

Service Level Excellence:

- Fast telephone response.
- Quick technical solutions.
- Efficient case management.

Services Provided:

- Tooling selection.
- Operating parameters.
- Trouble-shooting.
- Process optimization.
- Hardware support.

Best-in-Class Support Tools and Technology:

- Tooling performance experts.
- Materials database.
- Application calculators.

Customer Application Support

Easy Access to Proven Metalworking Expertise!

WIDIA Customer Application Engineers assist customers and engineering groups throughout the world with expert tool selection and application recommendations for the entire range of WIDIA tooling.

Convenient Access Options:

Originating Country	Language	Phone	Fax	Email
Australia	English	001-724-539-6921	001-724-539-6830	ap.techsupport@widia.com
Austria	German	0800 291630	0800 291631	eu.techsupport@widia.com
Belgium	English/French	0800 80410	0800 80411	eu.techsupport@widia.com
China	English	001-724-539-6921	001-724-539-6830	ap.techsupport@widia.com
Denmark	English	808 89295	808 89297	na.techsupport@widia.com
Finland	English	0800 919413	0800 919415	na.techsupport@widia.com
France	French	080 5540 379	080 5540 029	eu.techsupport@widia.com
Germany	German	0800 1015774	0800 0007531	eu.techsupport@widia.com
India	English	001-724-539-6921	001-724-539-6830	ap.techsupport@widia.com
Israel	English	1809 449907	1809 439845	na.techsupport@widia.com
Italy	Italian	800 916568	800 917749	eu.techsupport@widia.com
Japan	English	001-724-539-6921	001-724-539-6830	ap.techsupport@widia.com
Korea (South)	English	001-724-539-6921	001-724-539-6830	ap.techsupport@widia.com
Malaysia	English	001-724-539-6921	001-724-539-6830	ap.techsupport@widia.com
Netherlands	English	0800 0201131	0800 0201135	na.techsupport@widia.com
New Zealand	English	001-724-539-6921	001-724-539-6830	ap.techsupport@widia.com
Norway	English	800 10081	800 10001	na.techsupport@widia.com
Poland	Polish	00800 4411943	00800 4411940	eu.techsupport@widia.com
Singapore	English	001-724-539-6921	001-724-539-6830	ap.techsupport@widia.com
South Africa	English	0800 981644	0800 981645	na.techsupport@widia.com
Sweden	English	020798794	020790477	na.techsupport@widia.com
Taiwan	English	001-724-539-6921	001-724-539-6830	ap.techsupport@widia.com
Thailand	English	001-724-539-6921	001-724-539-6830	ap.techsupport@widia.com
United Kingdom	English	0800 028 2996	0800 028 5721	na.techsupport@widia.com
USA	English	888 539 5145	724-539-6830	na.techsupport@widia.com

WIDIA

Technical Information

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Stainless Steel
M1 . . . . . E47–E48
M2 . . . . . E49
M3 . . . . . E49

Cast Iron
K1 . . . . . E50
K2 . . . . . E50
K3 . . . . . E51

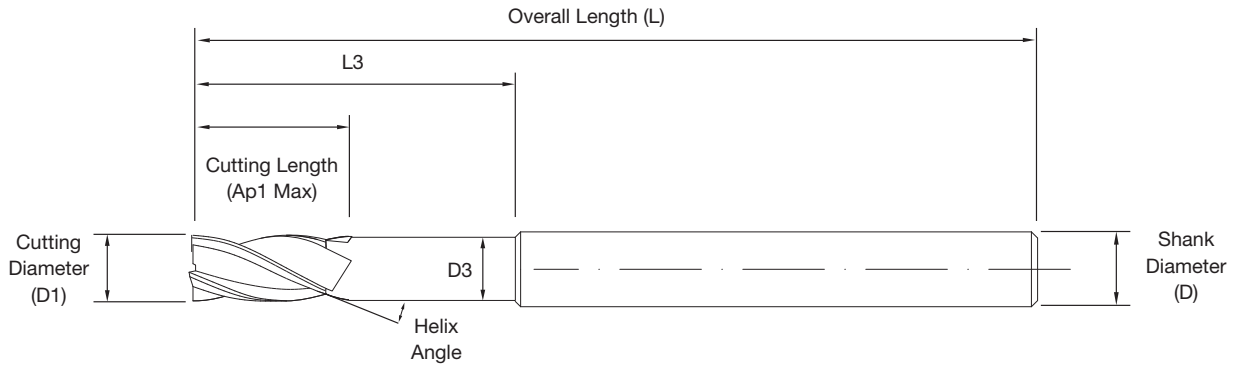
Non-Ferrous
N1 . . . . . E52
N2 . . . . . E53–E54
N3 . . . . . E55
N4 . . . . . E55
N5 . . . . . E56–E57
N6 . . . . . E57

High-Temperature Alloys
S1 . . . . . E58
S2 . . . . . E59–E61
S3 . . . . . E61
S4 . . . . . E62

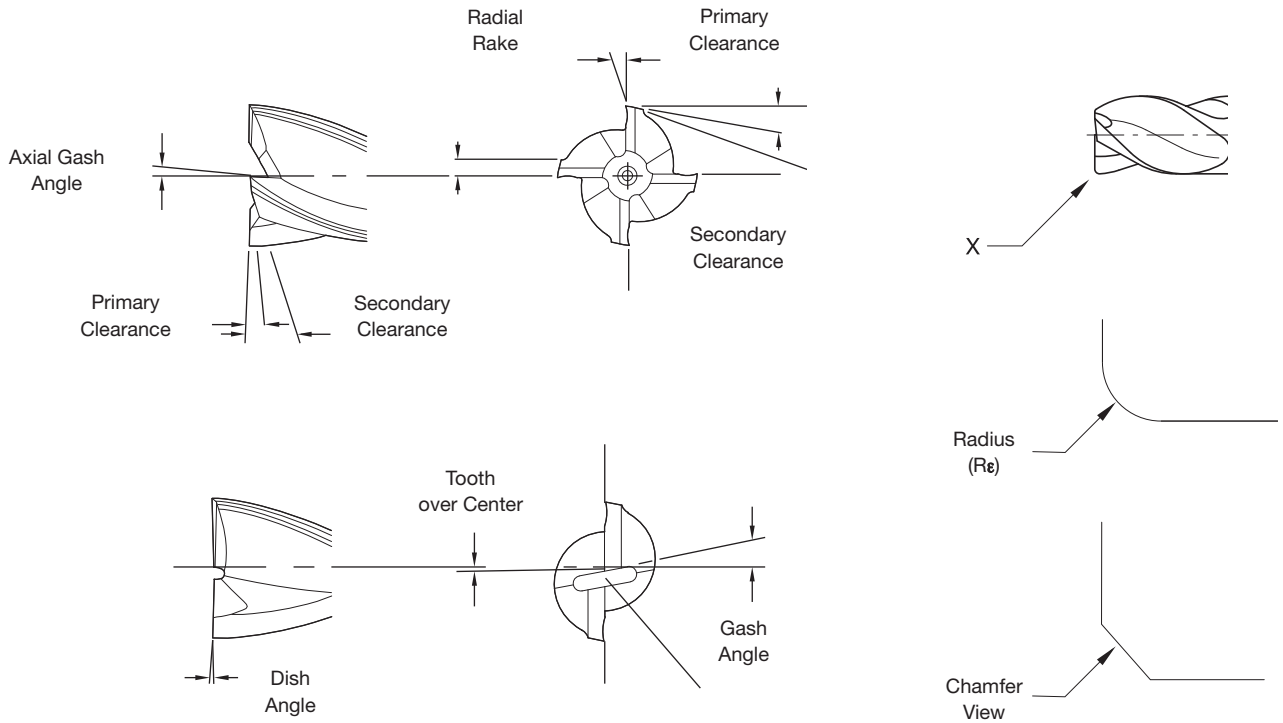
Hardened Steels and Irons
H1 . . . . . E62
H2 . . . . . E63
H3 . . . . . E63
H4 . . . . . E63

The Anatomy of an End Mill

Use this diagram when describing features of an End Mill.

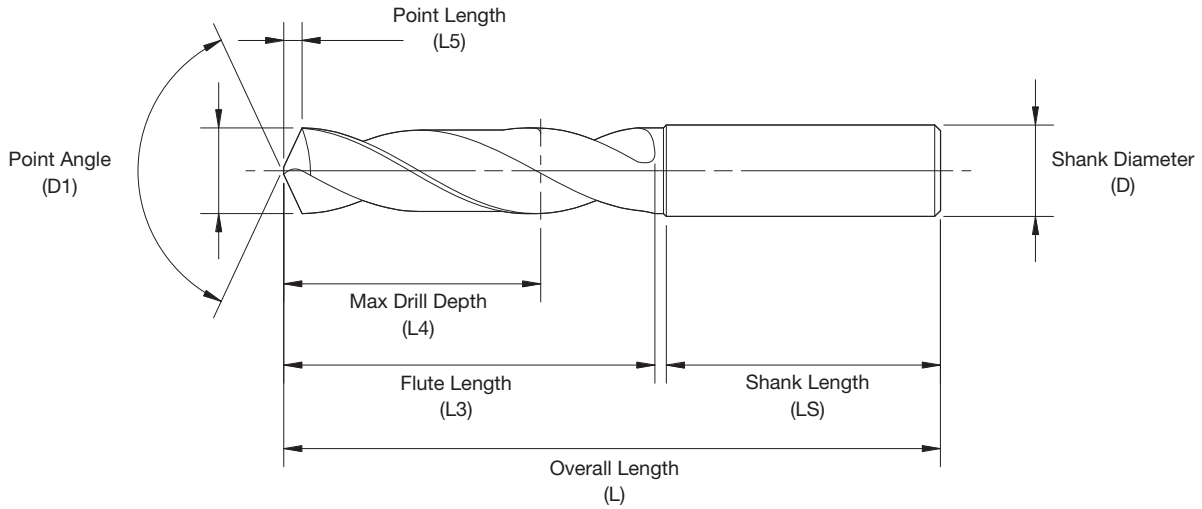


Side View *End View* *Corner Condition*

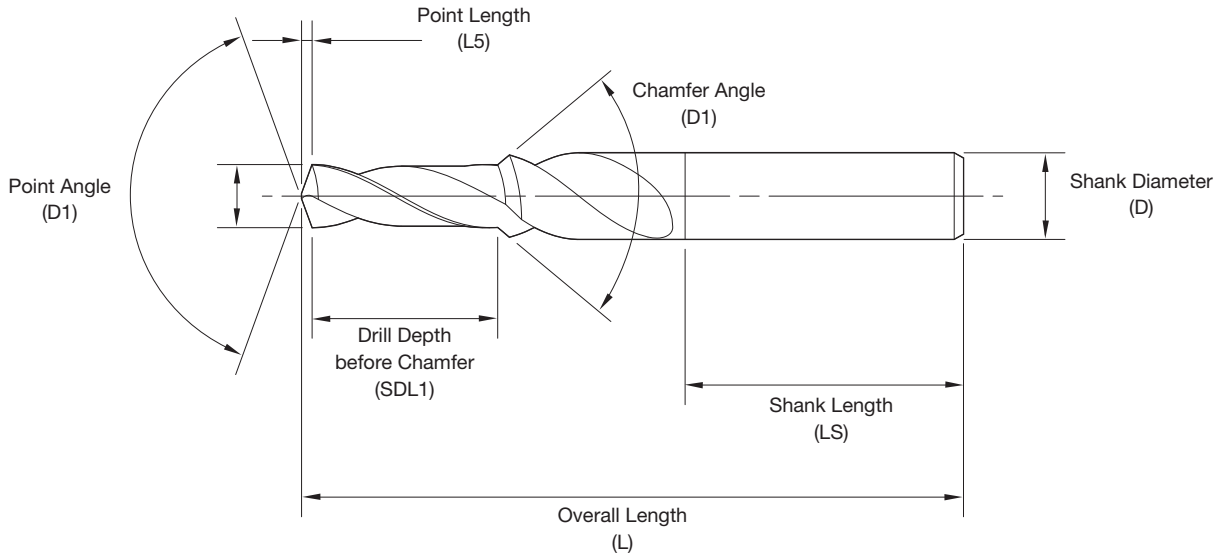


The Anatomy of a Drill

Use this diagram when describing features of a Solid Carbide Drill.

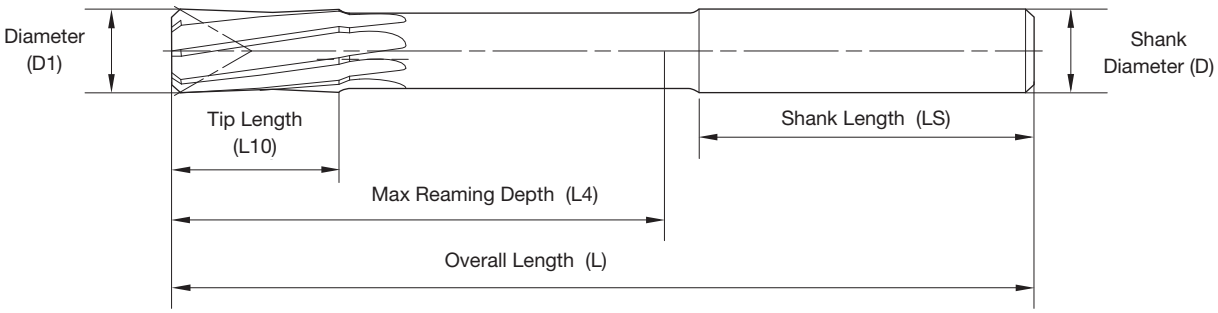


Use this diagram when describing features of a Solid Carbide Step Drill.

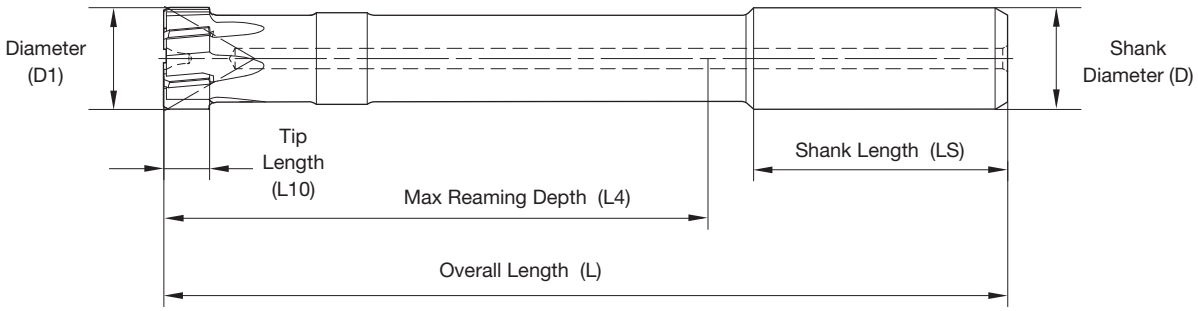


The Anatomy of a Reamer

Use this diagram when describing features of a Solid Carbide Reamer.

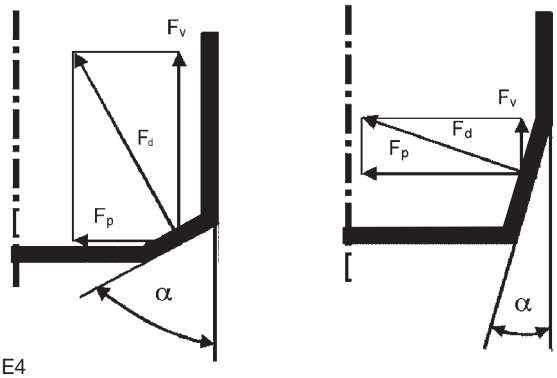


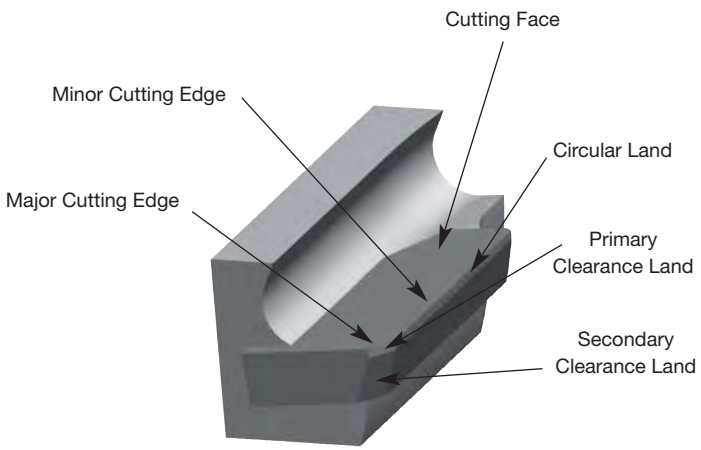
Use this diagram when describing features of a Brazed-Tipped Reamer.



Reamers • Function Surfaces

Fp = passive force = radial force
Fv = penetrative force
Fd = resultant force





Tolerance Charts

Tolerances • Shafts:

Nominal Size (mm)

Tolerances	0,0–3,0	3,0–6,0	6,0–10,0	10,0–18,0	18,0–30,0	30,0–50,0	50,0–80,0
e8	-14 -28	-20 -38	-25 -47	-32 -59	-40 -73	-50 -89	-60 -106
h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16	0 -19
h7	0 -10	0 -12	0 -15	0 -18	0 -21	0 -25	0 -30
h8	0 -14	0 -18	0 -22	0 -27	0 -33	0 -39	0 -46
h9	0 -25	0 -30	0 -36	0 -43	0 -52	0 -62	0 -74
h10	0 -40	0 -48	0 -58	0 -70	0 -84	0 -100	0 -120
h11	0 -60	0 -75	0 -90	0 -110	0 -130	0 -160	0 -190
k8	+14 0	+18 0	+22 0	+27 0	+33 0	+39 0	+46 0
k9	+25 0	+30 0	+36 0	+43 0	+52 0	+62 0	+74 0
k10	+40 0	+48 0	+58 0	+70 0	+84 0	+100 0	+120 0
m7	+12 +2	+16 +4	+21 +6	+25 +7	+29 +8	+34 +9	+41 +11

Tolerances • Holes:

Nominal Size (mm)

Tolerances	0,0–3,0	3,0–6,0	6,0–10,0	10,0–18,0	18,0–30,0	30,0–50,0	50,0–80,0
P9	-6 -31	-12 -40	-15 -51	-18 -61	-22 -74	-26 -88	-32 -106
H6	+6 0	+8 0	+9 0	+11 0	+13 0	+16 0	+19 0
H7	+10 0	+12 0	+15 0	+18 0	+21 0	+25 0	+30 0
H8	+14 0	+18 0	+22 0	+27 0	+33 0	+39 0	+46 0
H9	+25 0	+30 0	+36 0	+43 0	+52 0	+62 0	+74 0
H10	+40 0	+48 0	+58 0	+70 0	+84 0	+100 0	+120 0
H11	+60 0	+75 0	+90 0	+110 0	+130 0	+160 0	+190 0
H12	+0,1 0	+0,12 0	+0,15 0	+0,18 0	+0,21 0	+0,25 0	+0,3 0
H13	+0,14 0	+0,18 0	+0,22 0	+0,27 0	+0,33 0	+0,39 0	+0,46 0
k10	+40 0	+48 0	+58 0	+70 0	+84 0	+100 0	+120 0
m7	+12 +2	+16 +4	+21 +6	+25 +7	+29 +8	+34 +9	+41 +11

Reamers • Manufacturing Tolerances

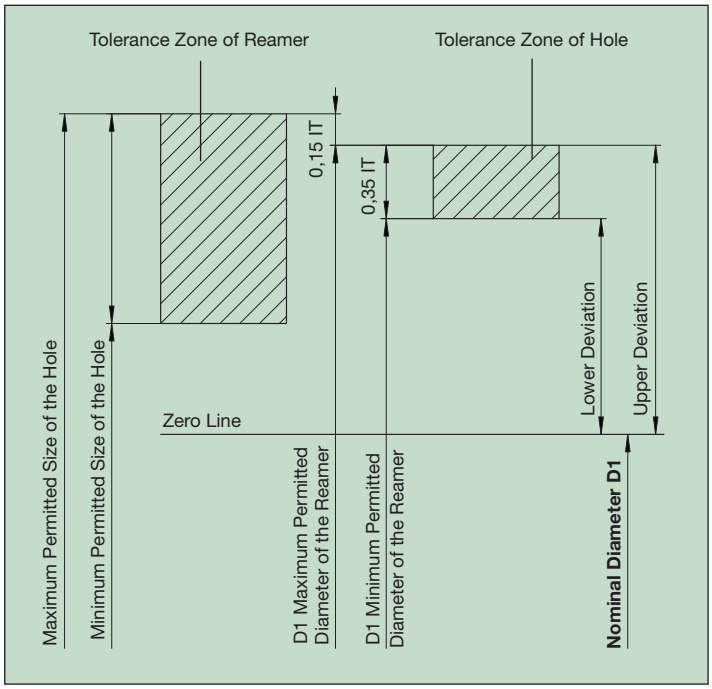
Excerpt from DIN 1420:

Principles for the determination of the manufacturing tolerances of reamers.

The manufacturing tolerances indicated in this standard are assigned to certain tolerance zones of the holes to be reamed. Generally, they ensure that the reamed hole lies within the relevant tolerance zone and that the reamer can be used most economically. Besides the manufacturing tolerance, it has to be considered that the size of the reamed hole also depends on other factors, e.g., angle on the edge, lead angle of the reamer, clamping of the workpiece, toolholder, condition of the machine tool, lubrication, and material of the workpiece to be reamed in. Therefore, special cases can occur where other manufacturing tolerances are more favorable. With regard to an economic way of manufacturing and storekeeping, as well as the possibility to have interchangeable reamers of different manufacturers, other manufacturing tolerances should only be required in exceptional cases.

Determination of the maximum and minimum permitted sizes of reamers:

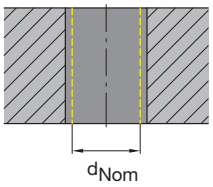
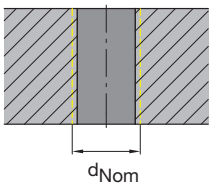
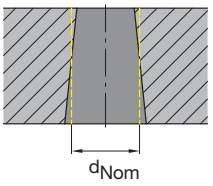
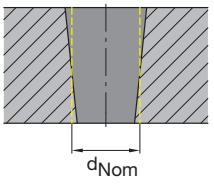
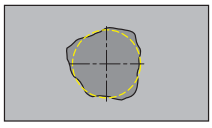
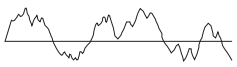
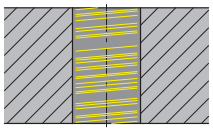
The maximum permitted diameter, D1max, of the reamer is 15% of the respective drilling tolerance (0,15 IT) below the maximum permitted size of the hole (see picture). Here, the value 0,15 IT is rounded to the next highest whole or half µm value so that the results for D1max are even µm values. The minimum permitted diameter, D1min, of the reamer is 35% of the respective hole tolerance (0,35 IT) below the maximum permitted diameter of the reamer D1max.



Description (excerpt):

In special cases, reamers with maximum and minimum sizes, which differ from the standard, are ordered, the ISO-symbol for the drilling tolerance zone has to be replaced by the upper and lower deviation of the reamer in µm, e.g., for a reamer with a nominal diameter of 20mm, upper deviation = + (p) 25 µm and lower deviation = + (p) 15 µm: reamer 20 p 25 p 15 DIN…
In the description, the plus sign is replaced by a “p,” and the minus sign is replaced by an “m.”

Causes of and remedies for reaming problems:

Problem	Cause	Possible Remedy
Hole diameter too large 	1. Reaming tool running out-of-center. 2. Concentricity of pilot hole and ream machining unsatisfactory. 3. Built-up edge. 4. Unsuitable cooling lubricant. 5. Reaming tool diameter too large.	• Use equalizing adapter. • Realign, use floating head. • Change cooling lubricant. • Change cutting speed. • Measure reamers and send for repairs.
Hole diameter too small 	1. Reamer worn. 2. Unsuitable cooling lubricant. 3. Reaming allowance too small.	• Replace and refit tool. • Change cooling lubricant. • Increase reaming allowance.
Conical hole profile wider towards drill runout 	1. Concentricity of pilot hole and reaming unsatisfactory. 2. Positioning accuracy of pilot hole to reaming.	• Realign, use equalizing adapter. • Correct positioning accuracy.
Conical hole profile wider at drill entry point 	1. Concentricity of pilot hole and reaming unsatisfactory. 2. Reaming tool skim cutting with ledger.	• Realign, use floating head. • Securely clamp reaming tool axially.
Hole out-of-center and/or showing chatter marks 	1. Reaming tool running out-of-center. 2. Slanted cutting surface/asymmetrical cutting. 3. Workpiece twisted.	• Use equalizing adapter. • Spot face as drilling preparation. • Take the direction of impact into account when clamping the workpiece.
Surface quality does not meet specification 	1. Tool cutters worn. 2. Reaming tool running out-of-center. 3. Incorrect technology data (cutting parameters). 4. Inadequate chip evacuation.	• Use equalizing adapter. • Realign, use floating head. • Change cooling lubricant. • Change cutting speed. • Measure reamers and send for repairs.
Feed grooves 	1. Built-up edge.	• Change cooling lubricant. • Change cutting speed.

Hardness Conversion Chart

Conversion table for hardness and tensile strength.[1]

Tensile Strength Rm N/mm²	Vickers Hardness HV (F 98 N)	Brinell Hardness² HB	Rockwell Hardness HRC	HRA	HRB³	HRF³
255	80	76,0	–	–	–	–
285	90	85,5	–	–	48,0	82,6
320	100	95,0	–	–	56,2	87,0
350	110	105,0	–	–	62,3	90,5
385	120	114,0	–	–	66,7	93,6
415	130	171,0	–	–	71,2	96,4
450	140	181,0	–	–	75,0	99,0
480	150	190,0	–	–	78,7	[101,4]
510	160	199,0	–	–	81,7	[103,6]
545	170	209,0	–	–	85,0	[105,5]
575	180	171,0	–	–	87,1	[107,2]
610	190	181,0	–	–	89,5	[108,7]
640	200	190,0	–	–	91,5	[110,1]
675	210	199,0	–	–	93,5	[111,3]
705	220	209,0	–	–	95,0	[112,4]
740	230	219,0	–	–	96,7	[113,4]
770	240	228,0	20,3	60,7	98,1	[114,3]
800	250	238,0	22,2	61,6	99,5	[115,1]
835	260	247,0	24,0	62,4	[101]	–
865	270	257,0	25,6	63,1	[102]	–
900	280	266,0	27,1	63,8	[104]	–
930	290	276,0	28,5	64,5	[105]	–
965	300	285,0	29,8	65,2	–	–
1030	320	304,0	32,2	66,4	–	–
1095	340	323,0	34,4	67,6	–	–
1155	360	266,0	36,6	68,7	–	–
1220	380	276,0	38,8	69,8	–	–
1290	400	285,0	40,8	70,8	–	–
1350	420	304,0	42,7	71,8	–	–
1420	440	323,0	44,5	72,8	–	–
1485	460	342,0	46,1	73,6	–	–
1555	480	361,0	47,7	74,5	–	–
1595	490	380,0	48,4	74,9	–	–
1665	510	399,0	49,8	75,7	–	–
1740	530	418,0	51,1	76,4	–	–
1810	550	523,0	52,3	77,0	–	–
1880	570	542,0	53,6	77,8	–	–
1955	590	561,0	54,7	78,4	–	–
2030	610	580,0	55,7	78,9	–	–
2105	630	599,0	56,8	79,5	–	–
2180	650	618,0	57,8	80,0	–	–
–	670	636,0	58,8	80,6	–	–
–	690	–	59,7	81,1	–	–
–	720	–	61,0	81,8	–	–
–	760	–	62,5	82,6	–	–
–	800	–	64,0	80,0	–	–
–	840	–	65,3	80,6	–	–
–	880	–	66,4	81,1	–	–
–	920	–	67,5	81,8	–	–
–	940	–	68,0	82,6	–	–

[1] Only for unalloyed and alloyed steels and cast steel in heat-molded or heat-treated condition. Great tolerances are to be expected when using in high-alloyed and/or strain-hardened steels.

[2] Maximum load 30 ($F=9{,}81 \times 30 \times D^2$), calculated out of $HB=0{,}95 \times HV$.

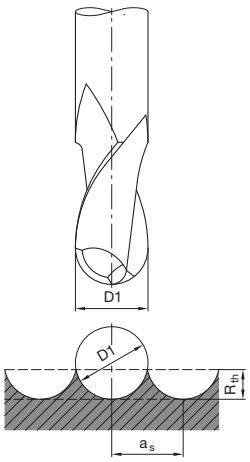
[3] Figures in brackets are excluded from the standardized range.

Calculation Formula for Contouring

Calculating the row distance a_s

D_1 = Cutting edge diameter [mm]
R_{th} = Theoretical raw depth [mm]
a_S = Row distance

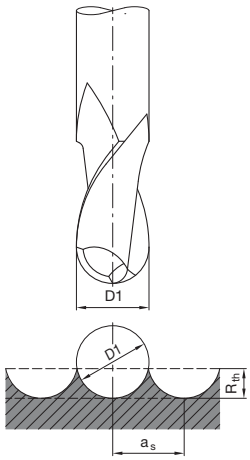
$$R_{th} = \frac{D_1}{2} - \frac{\sqrt{D_1^2 - a_s^2}}{4}$$



Calculating the theoretical raw depth R_{th}

D_1 = Cutting edge diameter [mm]
R_{th} = Theoretical raw depth [mm]
a_S = Row distance

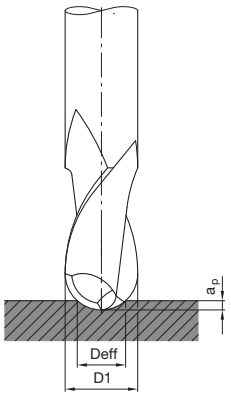
$$a_s = 2\sqrt{R_{th}(D_1 - R_{th})}$$



Calculating the effective diameter D_{eff}

D_1 = Cutting edge diameter [mm]
D_{eff} = Effective diameter [mm]
a_p = Axial adjustment depth

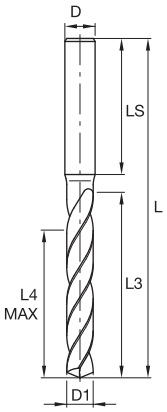
$$D_{eff} = 2\sqrt{a_p (D_1 - a_p)}$$



Cutting problems in solid carbide milling	Suggested remedy
Splintering of the cutting edge (thermal load)	– Decrease feed per tooth. – Increase cutting speed.
Crumbling of the cutting edge (mechanical load)	– Check rigidity of machine, workpiece, and workpiece clamping. – Reduce feed per tooth. – Shorten protrude length. – Climb milling. – Check tool clamping. – Check spindle movement.
Mill breakage	– Ensure free cutting process. – Increase cutting speed. – Reduce feed rate and cutting depth. – Check tool clamping. – Shorten protrude length. – Reduce cutting depth. – Improve chip evacuation.
Heavy crater wear	– Reduce cutting speed. – Use more wear-resistant carbide grade.
Heavy flank wear	– Increase feed per tooth. – Reduce cutting speed. – Use coated version. – Use more wear-resistant carbide grade.
Edge build-up	– Increase cutting speed and/or feed rate. – Improve cooling.
Vibrations (chatter)	– Check clamping and machine stability. – Select a different cutting geometry. – Check alignment of milling cutter and workpiece. – Climb milling.
Poor surface finish	– Reduce feed per tooth. – Check clamping and machine stability. – Increase cutting speed. – Select a different cutting geometry with larger twist angle. – Use milling cutter with more teeth.
Splintering on the workpiece	– Reduce feed per tooth. – Use milling cutter with more teeth.
Chip build-up	– Use tool with larger chip chambers (fewer teeth). – Modify cutting geometry. – Modify cutting values. – Reduce cutting depth. – Use milling cutter with fewer teeth.

High-Performance Solid Carbide Drills

Dimensions to DIN and Factory Standard

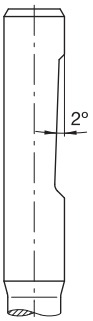


NOTE:
Solid Carbide drills from WIDIA-Rübig in short and regular lengths conform to DIN 6537. Drills with long lengths conform to WIDIA-Hanita factory standard.

Solid Carbide Drills with diameter D1>20mm (not DIN 6537) are also standardized to factory standard.

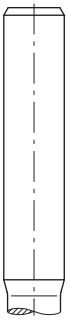
shank designs to DIN 6535

form HE, straight design A



shank form marking on WIDIA-Rübig Solid Carbide Drills

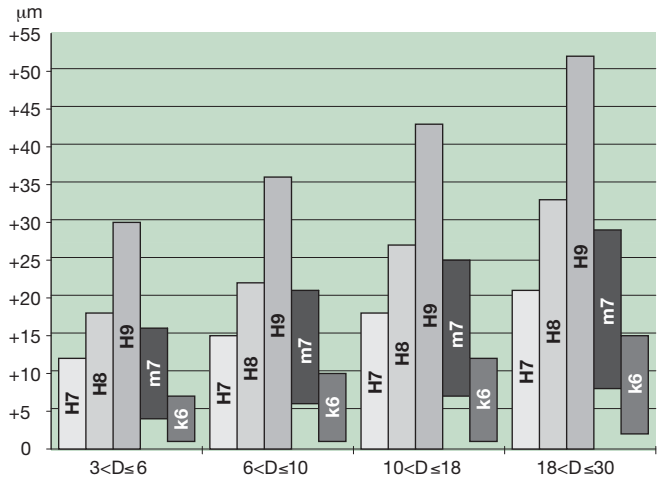
form HA, straight design A



Dimensions for WIDIA-Rübig High-Performance Solid Carbide Drills

	to DIN 6535		SHORT approx.. 3 x D	D1≤20mm to DIN 6537K D1>20mm to factory standard		REGULAR approx.. 5 x D	D1≤20mm to DIN 6537L D1>20mm to factory standard		LONG approx.. 8 x D	to factory standard	
D1	D	LS	L	L3	L4max	L	L3	L4 max	L	L3	L4 max
-3,75	6	36	62	20	14	66	28	23	78	40	33
-4,75	6	36	66	24	17	74	36	29	87	49	41
-6,00	6	36	66	28	20	82	44	35	94	56	48
-7,00	8	36	79	34	24	91	53	43	105	67	57
-8,00	8	36	79	41	29	91	53	43	110	72	61
-10,00	10	40	89	47	35	103	61	49	122	80	68
-12,00	12	45	102	55	40	118	71	56	141	94	79
-14,00	14	45	107	60	43	124	77	60	155	108	91
-16,00	16	48	115	65	45	133	83	63	171	121	101
-18,00	18	48	123	73	51	143	93	71	185	135	113
-20,00	20	50	131	79	55	153	101	77	200	148	124
-22,00	20	50	141	86	60	167	112	85	217	162	136
-25,00	25	56	153	95	65	184	126	98	238	180	150

Tolerances of Drills and Holes



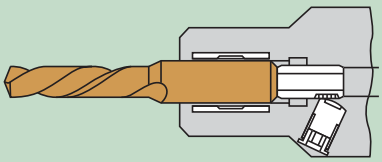
High-Performance Solid Carbide Drills with tolerance of m7 create holes with tolerances of H9. H8 can be achieved in very good conditions. The drill should be used for holes in H8. In favorable conditions, H7 can be achieved. Solid Carbide Drills with H7 create holes in K9–K11. Other drilling tolerances require special Solid Carbide Drill versions.

Tolerances of diameter D1 on:
Spiral Flute
GGX Drill

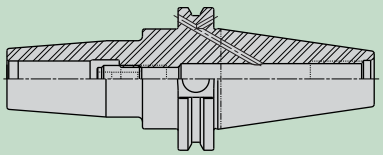
Toolholding Systems

As with any drilling system, components of the entire system contribute to the quality of the machined hole, not just the drill itself. For maximum efficiency and accuracy, the following toolholding systems are your best choices:

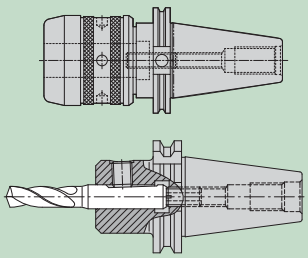
First Choice
Hydraulic chucks



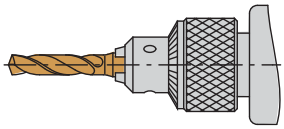
Second Choice
Shrink Fit

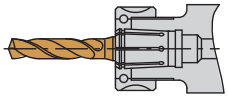


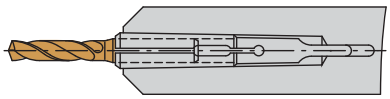
Third Choice
Powergrip milling chucks with collets

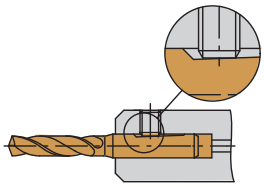


Not Recommended







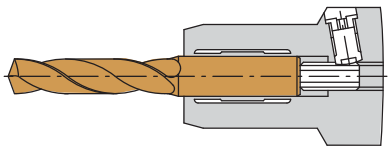


Clamping Chuck

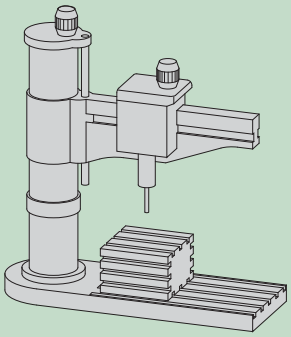
Use of all-purpose drilling chuck collets, clamping sleeves, and Weldon clamping chucks should be avoided because they do not absorb cutting forces reliably nor provide sufficient precision of concentricity.

Highly Recommended

Hydraulic chucks ensure a secure torque transmission with excellent concentricity.



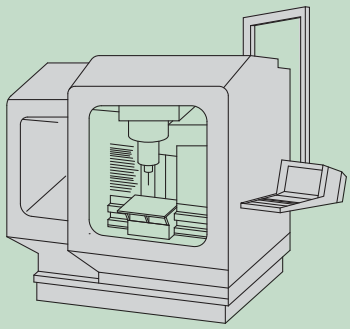
Not Recommended



Machine

Solid Carbide Drills have a rigidity five times higher than conventional High-Speed Steel Drills. This enables the machining of close-tolerance holes with a position accuracy of ± .001. However, it also means that drills require rigid machine tools with good spindles.

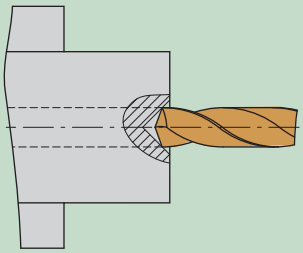
Rigid Machine Tool Recommended



Toolholding Systems

As with any drilling system, components of the entire system contribute to the quality of the machined hole, not just the drill itself. For maximum efficiency and accuracy, the following toolholding systems are your best choices:

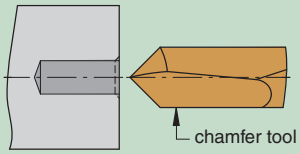
Wrong



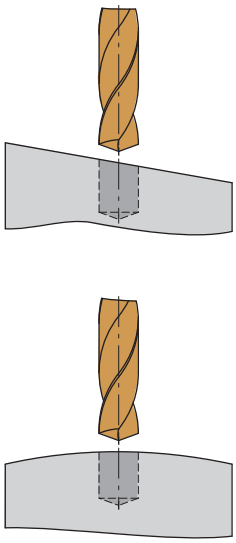
Drilling and Chamfering

Drill into the solid first, then chamfer.

Correct



Wrong



Drilling on Inclined Surfaces

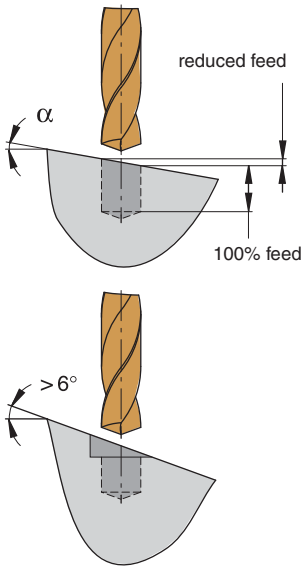
When drilling on inclined or curved surfaces, use a lower feed than the standard value. The reduction of feed required is dependent on the inclination angle of the workpiece surface and the drill type (see table).

reduced feed (% of standard value)

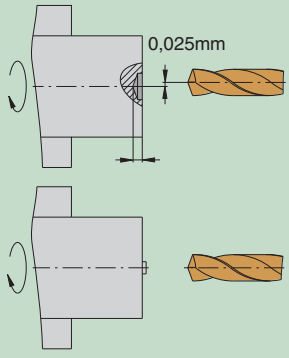
inclination α	3 x D SHORT	5 x D LONG	<5 x D
1°	100%	80%	premachine
2°	80–50%	80–50%	premachine
3°	65%	50%	premachine
4°	50%	premachine	premachine
6°	30%	premachine	premachine

Premachining usually done with end mill operation.

Correct



Wrong



Drilling on Turning Machines

When drilling on turning machines, the drill must be on center. The tolerance range of the center position should not exceed ±.001.

On bar-turning lathes, do not drill into center stub or bur. Cut-off tools must be mounted precisely to eliminate center stub or bur.

Do not drill into preexisting holes.

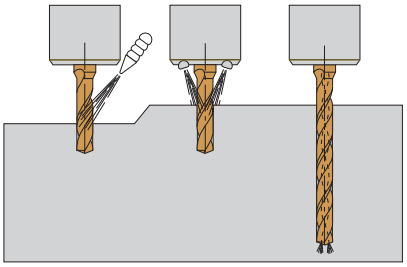
Hole Depths Greater than 3 x D

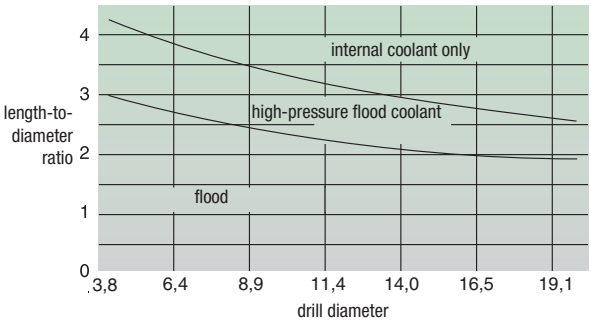
Hole depths that are deeper than three times the drill diameter may require a speed reduction. A 15% lower speed is suggested. Refer to the application pages B53–B57 and B108–B110 for recommended operating parameters.

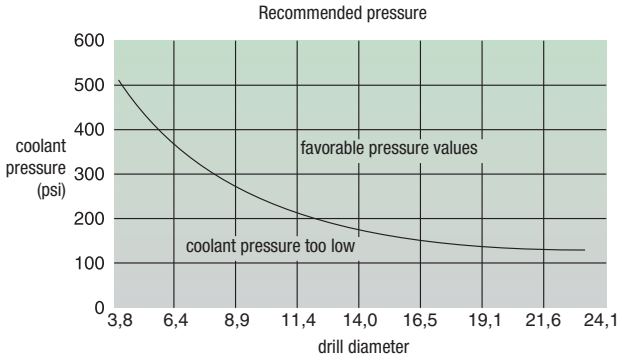
Coolant

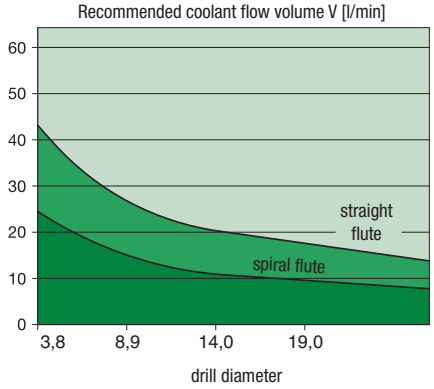
- To optimize their performance, drills must be adequately cooled. With the proper coolant flow, better tool life and higher maximum effective cutting speeds can be reached.
- If not properly cooled, the drill will heat up rapidly. This causes the drill diameter to expand, which in turn may cause the drill to seize inside the hole.
- Solid carbide drills with internal coolant channels require deeper drilling depths to be effective. The higher the coolant pressure, the better the drilling results. Drill life and hole quality improve with ample coolant flow.
- When using drills without internal coolant flow, try to get at least one coolant jet as parallel to the drill as possible.
- For short-hole applications, drills without internal coolant may often provide better tool life. The tool is more solid, and it does not suffer from thermal shock at the cutting edge.
- It is important to use high coolant concentration to provide lubricity, which will aid in tool life, chip evacuation, and finer surface finishes.
- High-pressure coolant, either through the tool or through a line adjacent and parallel to the tool, should always be considered for increased tool life and production.
- Do not use multi-coolant lines. Use one line with 100% of the flow capacity to evacuate the chips from the hole.

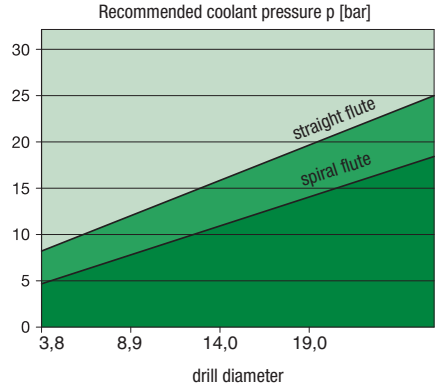
Coolant requirement for carbide drills





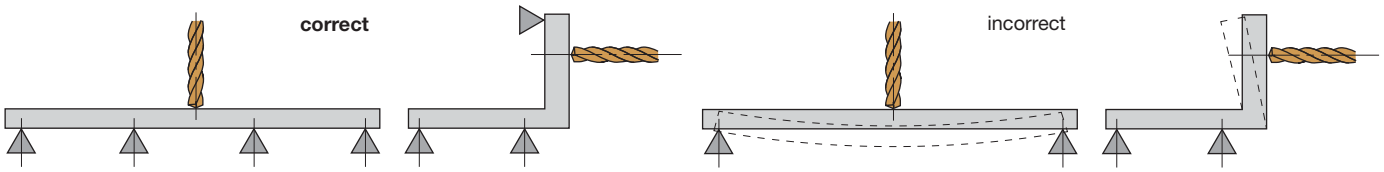


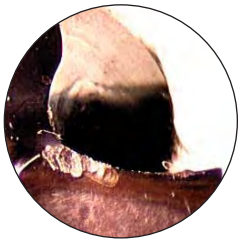
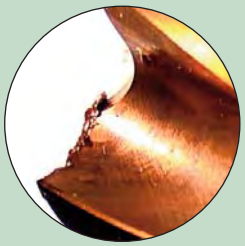
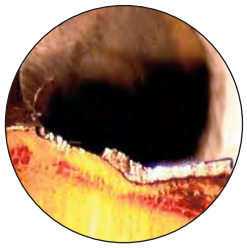
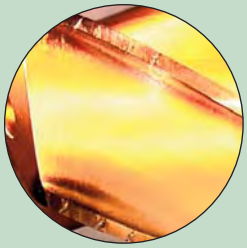


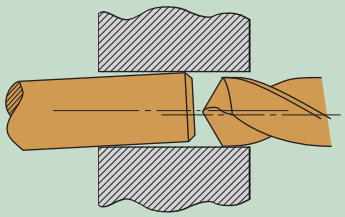
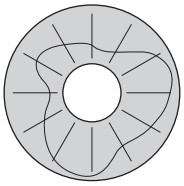
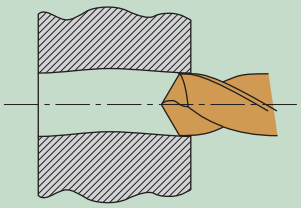


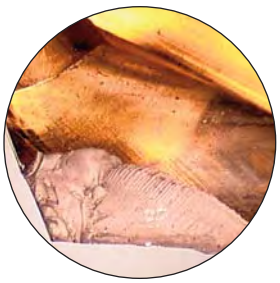
Workpiece Rigidity

Because solid carbide drills have much higher penetration rates, it is important that the workpiece has adequate support.



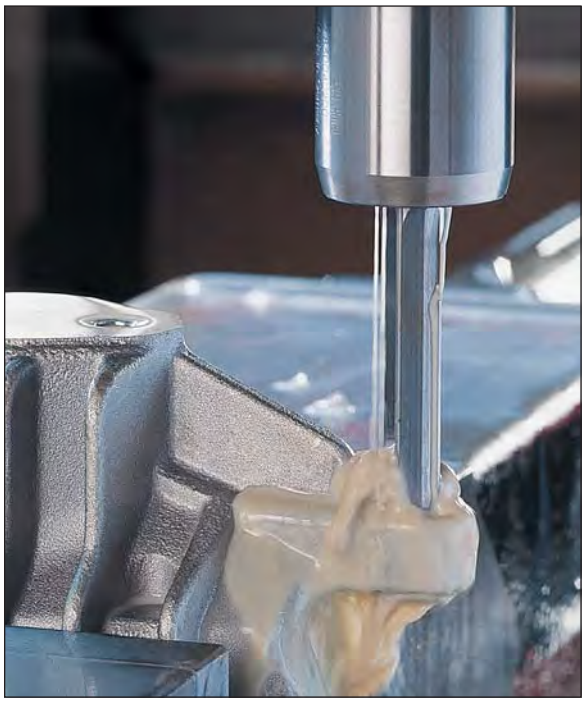
problem	source	solution
heavy wear on the cutting corners	insufficient coolant	• Check cooling lubricant. In the case of internal coolant supply, increase coolant pressure. In the case of external coolant supply, adjust positioning of coolant jet. Cool from both sides.
	workpiece movement	• Stabilize workpiece chucking and check stability of machine tool.
	wrong drill	• Check drill type, drilling depth, cooling system, and workpiece material.
	cutting conditions	• Reduce cutting speed, increase feed.
splintering on the chisel edge 	clamping chuck	• Check clamping accuracy. Use hydraulic clamping chuck or high-precision chucking system.
	cutting conditions	• Increase feed.
built-up edge 	insufficient coolant	• Check cooling lubricant. In the case of internal coolant supply, increase coolant pressure. In the case of external coolant supply, adjust positioning of coolant jet. Cool from both sides.
	cutting conditions	• Increase speed 20–30%.
splintering on the cutting edges 	clamping chuck	• Check clamping accuracy and torque transmission. Use hydraulic clamping chuck or high-precision chucking system.
	cutting conditions caused by built-up edge	• Check cutting values, and possibly increase cutting speed. • Examine regularly for built-up edge.
thermal checking/comb cracking 	cutting conditions	• Inconsistent/insufficient coolant supply.

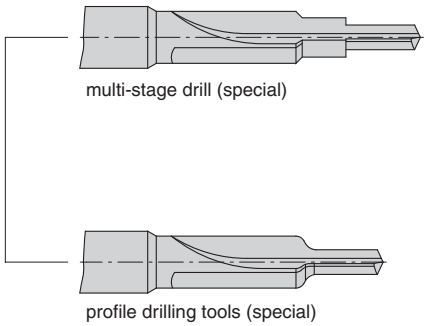
problem	source	solution
hole too big 	cutting conditions	• Check cutting values, increase cutting speed, or reduce feed.
	clamping chuck	• Check clamping accuracy and torque transmission. Use hydraulic clamping chuck or high-precision chucking system.
	wrong drill	• Check drill diameter. Please notice that drills are ground to a positive tolerance. Check concentric running.
hole too small 	insufficient coolant	• Check cooling lubricant. In the case of internal coolant supply, increase coolant pressure. In the case of external coolant supply, adjust positioning of coolant jet. Cool from both sides.
	cutting conditions	• Reduce cutting speed, increase feed.
	wrong drill	• Check cutting-edge diameter.
hole not cylindrical 	clamping chuck	• Check clamping accuracy and torque transmission. Use hydraulic clamping chuck or high-precision chucking system.
	workpiece movement	• Stabilize workpiece chucking and check stability of machine tool.
	wrong drill	• Check drill type and drilling depth. Use longer drills.
	cutting conditions	• Reduce feed at entry.

problem	source	solution
drill breakage	clamping chuck	• Check clamping accuracy and torque transmission. Use hydraulic clamping chuck or high-precision chucking system.
	workpiece movement	• Stabilize workpiece chucking and check stability of machine tool.
	wrong drill	• Check drill type, drilling depth, cooling system, and workpiece material.
	insufficient coolant	• Check cooling lubricant. In the case of internal coolant supply, increase coolant pressure. In the case of external coolant supply, adjust positioning of coolant jet. Cool from both sides.
	cutting conditions	• Check cutting values and possibly reduce feed.
	clamping chuck	• Check torque transmission. Use hydraulic clamping chuck or high-precision chucking system.
splintering on the cutting corners 	workpiece movement	• Stabilize workpiece chucking and check stability of machine tool.
	wrong drill	• Check drill type, drilling depth, cooling system, and workpiece material. Possibly, use longer drill.
	insufficient coolant	• Check cooling lubricant. In the case of internal coolant supply, increase coolant pressure. In the case of external coolant supply, adjust positioning of coolant jet. Cool from both sides.
	cutting conditions	• Check cutting values and possibly reduce feed.

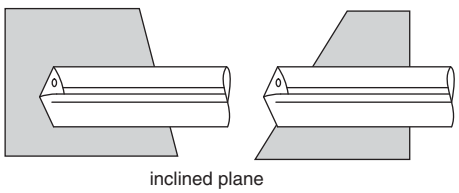
Fast, Tough, and Economical

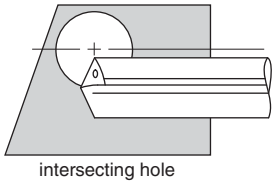
GGX Solid Carbide Drills are high-performance tools whose capacity can be fully utilized with the help of appropriate clamping fixtures. Hydraulic chucks are an ideal solution. They increase the productivity to the maximum level. Optimal concentricity and safe transmission of torque result in excellent repeatability and longer drill life. The simple handling of the adapters enables an easy length adjustment, even in the machine. Tool presetting costs are minimized.

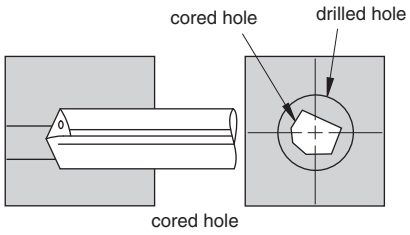




The excellent stability of the GGX drill enables it to be used for drilling through inclined planes, intersecting holes, and cored holes.







Material Group	Description	Content	Tensile Strength RM (MPa)*	Hardness (HB)	Hardness (HRC)	DIN Standards
P1	Low-Carbon Steels, Long Chipping	C <.25%	<530	<125	—	P St 37-3, C 15, GS-38 Cq10
P2	Low-Carbon Steels, Free Machining, Short Chipping	C <.25%	<650	<220	<25	33 Mn 6, 9 SMn 28, 20 Mn 5, 17 Cr 3
P3	Medium-, High-Plain Carbon Steels, Low-Alloyed	C >.25%	600–850	<330	<35	C 75, Ck 45, C 70 W1, 90 MnCrV 8, 42 CrMo 4 16MnCr5, ST52
P4	Alloyed, Tempered Carbon Steels, Tool	C >.25 %	800–1100	350–450	35–48	100 Cr 6, 105 MnCr4, 51 CrMnV 4, 105 WCr 6, 100 Cr 2
P5	Ferritic, Martensitic, PH Stainless Steels	C = 0–.4%	600–850	<330	<35	X 6 Cr 13, X 10 Cr 13, X 20 Cr 13, X 12 CrMoS 17, X 20 CrMo 13
P6	High-Strength Ferritic, Martensitic, PH Stainless Steels	C = .1–.6%	900–1350	350–450	35–48	X 40 CrMoV 5 1, H1, X 155 CrVMo 12 1, S 6-5-2-5, X 45 Cr 13, X 120 Mn12
M1	Austenitic Stainless Steel	C = .05–.15%	<650	130–200	—	X 5 CrNi 18 10, GX 6 CrNiMo 18 10, X 6 CrNiMoTi 17 12 2, X 8 CrNiMoAl 15 7 2
M2	High-Strength Austenitic Stainless, Cast Stainless Steels	C = .05–.15%	500–700	150–230	<25	X 2 CrNiMo 13 4, X 10 CrNi18 9, X 5 CrNiCuNb 17 4 4
M3	Duplex Steel	C = .05–.2%	<900	135–275	<30	X 2 CrNiMoN 23 15, X 20 CrNiSi 25 4, GX 40 CrNiSi 27 4, X 2 CrNiMoN 22 5 3
K1	Gray Cast, Low-Strength Ductile Irons	—	150–400	120–290	<32	GG-10, GG-15, GG-20, GG -25, GG- 40
K2	Low-, Medium-Strength CGI, Ductile Irons	—	400–600	130–260	<28	GGG-35.3, GGG- 40.3, GGG-70
K3	High-Strength Ductile, Austempered Ductile Iron	—	600–900	180–350	<38	GTW-35-04, GTW-65, GTS-35-10, GTS-45-06
N1	Wrought Aluminium Alloys	—	<520	60–90	—	Al99.5, AlCuMgPb, AlMg 1, SG-AlMg 5
N2	Cast Aluminium	Si <12.2%	<350	70–100	—	G-AlSi 9 Mg, G-AlSi 10 Mg, G-AlSi 10 Mg(Cu), SG-AlSi 12, G-AlSi 7 Mg
N3	Cast Aluminiums	Si >12.2%	200–320	60–120	—	G-AlSi17Cu4Mg, GK-AlSi18CuNiMg, GK-AlSi21CuNiMg
N4	MMCs (Aluminium-Based Metal Matrix)	—	<700	210	—	GFK, CFK
N5	Copper, Copper Alloys	—	200–650	60–200	—	CuZn 20, CuSn 2, CuNi 18 Zn 19 Pb
N6	Carbon, Graphite Composites	—	600–1500	—	—	Graphite, CFK, CFRP
S1	Iron-Based, Heat-Resistant Alloys	—	500–1200	160–260	—	X 2 NiCrAlTi 32 20, X 1 NiCrMoCu 32 28 7, X 12 NiCr 36 18, x 12 NiCrSi 35 16
S2	Nickel-Based or Cobalt-Based, Heat-Resistant Alloys	—	1000–1450	250–450	25–48	X 12 CrNiMn 18 88, Alloy 222 (Ni99,7Mg0,07), NiCr 20 Mo, NiCr 19 FeNbMo
S3	Titanium	—	900–1600	300–400	33–43	Ti 3, Ti 4, TiAl 3 V2.5
S4	Titanium Alloys	—	900–1600	300–400	33–43	TiAl 5 Fe 2,5, TiAl 6 V 4, TiAl 4 Mo 4 Sn 2
H1	Hardened Steels, Irons	—	—	<460	<48	—
H2	Hardened Steels, Irons	—	—	460–560	48–55	—
H3	Hardened Steels, Irons	—	—	560–650	56–60	—
H4	Hardened Steels, Irons	—	—	>650	>60	—

* 1 MPa = 145 psi

Workpiece Material Conversion Table • P1

P1 Low-Carbon Steels, Long Chipping — Content: C <.25% — Tensile Strength RM (MPa)*: <530 — Hardness (HB): <125

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.0044	A 570 Gr. 40	St 44-2	4360-43 B	SM 41 B	K 02502	S 275 JR	E 28-2	Fe 430 BFN	1412
1.0123		QSt 37-3		SWRCH 12R					
1.0128		QSt 44-2							
1.0133		QSt 44-3							
1.0135		P St 44-3							
1.0146		P St 44-2							
1.0176		P St 37-3							
1.0301	1010	C 10	045 M 10	S 10 C	G10100	C 10	XC 10	C 10	
1.0310		C10D		SWRM 10		C 10 D	FM 10	C 10 D	
1.0311		C12D		SWRM 12		C 12 D		C 12 D	
1.0352		P 245 G H (Schiffkessel Blech)				P 245 GH			
1.0401	1015	C 15	080 M 15	S 15 C	G10170	C 15	C 12	C 15	1350
1.0402	1020	C 22	050 A 20	S 22 C	G10200	1 C 22	C 20	C 20	1450
1.0407		LSt 45.8				C 16		C 16	
1.0413		C15D		SWRM 15		C 15 D	FM 15	C 15 D	
1.0414		C20D		SWRM 20		C 20 D	FM 20	C 20 D	
1.0415		C26D		SWRH 27		C 26 D	FM 26	C 26 D	
1.0416		C18D		SWRM 17		C 18 D	FM 18	C 18 D	
1.0420		GS-38	A1			GE 200	230-400M		1306
1.0425		P 265 GH	151-400	SG 30	K02801	P 265 GH	A42CP	P 265 GH	1430
1.0446		GS-45	A1	SC 450	J03001	GE 230	E23-45M		1305
1.0453	1018	C16.8	080 A 17		G10180				
1.0492		11 Mn 4 Si							
1.0494		11 Mn 4 Al							
1.0495		21 Mn 5							
1.0496		12 Mn 6							
1.087		17 MnV 7							
1.1101		Alfrig 35 N						C1	
1.1108		10 Mn 4							
1.1109		12 Mn 5							
1.1114		C10D2				C 10 D 2	FM 10	C 10 D 2	
1.1117		8 Mn 4							
1.1120		GS-20 Mn 5		SMnC 420	H15220				
1.1121	1010	Ck 10	040 A 10	S 10 C	G10100	2 C 10	XC 10	C 10	1265
1.1122		Cq 10 (C 10 C)		SWRCH 10 K		C 10 KD			
1.1123		7 Mn 6							
1.1124		C12D2				C 12 D 2		C 12 D 2	
1.1125		7 Mn 7							
1.1126		C15D2				C 15 D 2	FM 15	C 15 D 2	

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.1129		C 18D2				C 18 D 2	FM 18	C 18 D 2	
1.1131		GS-16 Mn 5				G 17 Mn 5	G 17 Mn 5	G17Mn5	
1.1132		Cq 15		SWRCH 15K		C 15 KD			
1.1134		Ck 19 (C 19 E)							
1.1135		C 16 E Al/ Ck 16 Al							
1.1137		C20D2				C 20 D 2	FM 20	C20D 2	
1.1139		C26D2				C 26 D 2	FM 26	C26D 2	
1.1141	1015	Ck 15	080 M 15	S 15 C	G 10150	2 C 15	XC 15	C 15	1370
1.1148		C 16 E	C 16 E			C 16 E	XC 18		
1.1149		Cm 22	070 M 20	C 22 R (3 C 22)		3 C 22	XC 18 u	C 22 R	
1.1151	1023	Ck 22	050 A 20	S 22 C	G10230	2 C 22	XC 25	C 20	
1.1152		Cq 22		SWRCH 20K		C 21 KD		CB 20 FF	
1.1176	1038 H	Ck 38			G 10380		XF 38		
1.1185		C2D1				C 2 D 1		C 2 D 1	
1.1301		19 MnVS 6				19 MnVS 6			
1.5418		GS-20 MnMo 53							
1.5475		GS-20 MnNb 5							
1.5485		GS-20 MnNiTi 53							
1.5508	1021	22 B 2		SWRCHB 220	G10210	C 22 BE 69	21 B 3		
1.5523	15B21 H	19 MnB 4 420	170 H 20	SWRCHB	H15211	19 MnB 4	20 MB 5		
1.6219		G 22 MnNi 5							
1.6916		GS-12 MnCrNiMo 53							
1.7353		GS-12 CrMo 19 5	B 5						
1.7387		G 12 CrMo 9 10			S50480				
1.7903		GS-18 MnCrMo 63							
1.7906		GS-19 MnCrMo 63							
1.7909		GS-20 MnCrMo 63							
1.8958		S 235 J 0 W (Allwesta 360)	S 235 J 0 W	SMA 400 BW		S 235 J0 W	S 235 J 0 W		
1.8959		S 355 J 0 W (Allwesta 510)	WR 50 B	SMA 490 BW		S 235 J0 W	E24W-3	S 235 J0 W	
1.8960		WTSt 37-2/ S235JRW	WR 50 B	SMA 41 A	K11538	S 235 JR W	E 24 W-2		
1.8961		WTSt 37-3	WR 50 C	SMA 50 A	S 235 J2 W	S 235 J 2 W	Fe 360 D FF		

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

AISI — American Iron and Steel Institute
AFNOR — French National Organization for Standardization
AMS — Aerospace Material Specifications
ASTM — American Society of Mechanical Engineers
BS — British Standards
DIN — German Institute for Standardization
EN — European Standards
JIS — Japanese Industrial Standards
SAE — Society of Automotive Engineers
SIS — Swedish Standards Institute
UNI — Italian Organization for Standardization
UNS — Unified Numbering System

Workpiece Material Conversion Table • P2

P2 Low-Carbon Steels, Free Machining, and Short Chipping — Content: C <.25% — Tensile Strength RM (MPa)*: <650 — Hardness (HB): <220

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.0030		St 00							
1.0034		R St 34-2/ S 205 G2T	34/20CR		K02502				
1.0035		St 33	HR 15	SS 330	K01400		A 33	Fe 320	
1.0036	A 570 Gr. 33	USt 37-2	4360-40 B	SS 34	K 02502	S 235 JR G1	E 24-2	Fe 360 BFU	1311
1.0037		St 37-2	HS 37/23	STKR 400	K02702	S 235 JR	E 28-2	Fe 430 C	1412
1.0038	A 570 Gr. 36	R St 37-2/ S235 JRG2	4260-40 C	SS 34	K 02502	S235 JR G 2	E 24-2 NE	Fe 360 BFN	1312
1.0040		USt 42-2		SS 41			HS 18-0-2-10		
1.0055	1013	USt 34-1			G10130				1233
1.0057		R St 34-1							
1.0065		USt 37-1							
1.0067		R St 37-1							
1.0075		USt 42-1							
1.0077		R St 42-1			K02507				
1.0159		ZSt 37-2							
1.0161		S235J2G3/ Fe 360 D1	S 235 J 2 G 3		K01501	S 235 J2 G3	E 24-4	S 235 J2G3	1313
1.0165		RZSt 37-2							
1.0167		R St 37-2 Cu3				S 235 JRG Cu 2			
1.0171		S 235 J 2 G 3 CuC				S 235 J 2 G 3 Cu C			
1.0201		USt 36-1							
1.0209		St 35-3							
1.0216		USt 38-1							
1.0218		R St 41-2							
1.0302		C 10 Pb				C 10 GPb			
1.0303		QSt 32-3		SWR CH6R		CB 4 FF KD		CB 4 F U	
1.0305		St 35.8		STPT 38	K01201				
1.0306		Fe P 06 G							
1.0307		StE 210.7						Fe 34	
1.0312		R St 15	FeP05			Fe P05	FeP05	FeP05	
1.0314		D 6-2	0 1 5 A 03	SWRM 6	G10050	C 4 D		3 CD 5	
1.0315		St 37.8		STB 35				Fe 37	
1.0320		St 22					F d 2 / C 08 RR		
1.0321		USt 23							
1.0322		USD 8							
1.0325		R R SD 8							
1.0326		R St 28/ 180G2T				180 G 2 T			
1.0327		St 24					Fd 4/ C 05 RR		
1.0330		St 12	DC 01/ Fe P01	SPCC		Fe P01	DC 01/fe P01	DC 01/ FeP0 1	
1.0331		Ro St 2				DC 01 GT			
1.0332	1008	DD 11 (StW 22)	HR 3	SPHD		DD 11	1 C		
1.0333		St 13	CR 3	SPCD					
1.0334		USt W 23		SPHE		DD 12 G 1			
1.0335		D D 13 (StW 24)	H S 3	SPHE		D D 13	3C		
1.0336		USt 4/DC 04 G				D C 04 G 1			
1.0337		Ro St 4/ DC 04 GT				DC 04 GT			

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.0338		St 4	DC 04/ FeP04	SPCE		Fe P04	Fe 14	DC04/ FeP04	
1.0340		M 2 (ArmcoEisen)							
1.0341		St S ch St r							
1.0343		D 20 EK							
1.0344		DC01Cu				DC 01 Cu			
1.0346		A St 35			K02202				
1.0347		RR St 3	CR 3	SPCD		Fe P03	F 13	DC 03/ FeP 03	
1.0348		U H I/P 195GH		SGV 480		P 195 Gh			
1.0349		ZStE 250 i							
1.0353		St 13 Cu 3							
1.0354		St 14 Cu 3				DC 04 Cu			
1.0355		Fe P 05 G							
1.0358		St 05 Z							
1.0359		RR St 23							
1.0361		VH 280-50							
1.0362		VH 370-50							
1.0363		VH 430-50							
1.0364		VH 330-65							
1.0365		VH 420-65							
1.0366		VH 500-65							
1.0367		400-100 TF 180							
1.0369		VH 1100-65							
1.0370									
1.0371		T 50							
1.0372		T 52							
1.0373		DR 550							
1.0374		DR 620							
1.0375		T 57							
1.0376		DR 660							
1.0377		T 61							
1.0378		T 65							
1.0379		TH 55							
1.0380									
1.0382		T 580							
1.0383		T 690							
1.0389		DD 14	1 CR			DD 14	DD 14		
1.0390		DC 01 EK							
1.0391		DC 12 EK							
1.0392		DC 04 EK							
1.0393		DC 13 ED							
1.0394		DC 04 ED							
1.0395		ZStE 180 BH							
1.0396		ZStE 220 BH							
1.0397		ZStE 220 P							
1.0398			3 CR			D D 12	D D 12		
1.0399		DC 03 ED							
1.0400		ZStE 260 BH							
1.0403		C 15 Pb/ C15GPb				C 15 GPb			
1.0404		C 22 Pb				C 22 GPb			
1.0410		H-40							
1.0417		ZStE 260 P							

Workpiece Material Conversion Table • P2

P2 Low-Carbon Steels, Free Machining, and Short Chipping Content: C <.25% Tensile Strength RM (MPa)*: <650 Hardness (HB): <220

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.0419		RSt 44-2	440		G10160				
1.0423		P265 NB		SG 295		P 265 NB	BS 2		
1.0424	1513	P265	HR 40/30		G15130		12 M 5		
1.0427		C 22.3				C 22 G 1			
1.0428		BSt 420 S				Fe B 400			
1.0432		C 21		SFVC 1	K03504	P 305 GH			
1.0439	1012	B 500 H		S 12 C	G10120	B 500 B	XC 12	B 500 B	1332
1.0447		H IV L/ Z St E 280 i							
1.0464		BSt 500 G				B 500 G 1			
1.0465		BSt 500 P (BSt 500 G2)				B 500 G 2			
1.0466		BSt 500 M (BSt500 G 3)				B 500 G 3			
1.0467		C 14/15 Mn 3			N08020				
1.0475		Schiffbaustahl GL-D (S 235 J 2)			K02104				
1.0476		Schiffbaustahl GL-E (S 235 J 4)			K01801				
1.0478		P285 QH				P 285 QH			
1.0498		St 42.8		STPT 42				Fe 42	
1.0525		33 Mn 6							
1.0643		70 Mn3							
1.0660		St 140/160							
1.0662		St 150/170							
1.0664		St 160/180							
1.0702	1110	U 10 S 10		SUM 12	G11100				
1.0703		R 10 S 10/ C 10 RG 2				C 10 RG 2			
1.0706		U 10 S 6							
1.0708		C 7 RG 1							
1.0709		R 7 S 6/ C 7 RG 2				C 7 RG 2			
1.0710		15 S 10/ 15 S 20							
1.0711	B 1112 9 S 20	220 M 07	SUM 21	G 11120			CF 9 S 22		
1.0715	1213	9 SMn 28/ 11 SMn 30	230 M 07	SUM 22	G 12130	11 SMn 28	S 250	CF 9 SMn 28	1912

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.0718	12L13	9 SMnPb 28		SUM 22 L	G 12134	11 SMnPb 28	S 250 Pb	CF 9 SMnPb 28	1914
1.0719		11 30 HD							
1.0720		11 SMnPbBiTe 30							
1.0721	1108	10 S 20	210 M 15		G 11080	10 S 20	10 F 1	CF 10 S 20	
1.0722	11L08	10 SPb 20			G 11084	10 SPb 20	10 Pb F 2	CF 10 SPb 20	
1.0723		15 S 22/ 15 S 20	En32M	SUM 32		15 S 22			1922
1.0725		15 SMn 13	15 SMn 13			15 SMn 13	15 SMn 13		
1.0736	1215	9 SMn 36/ 11 S Mn 37	240 M 07	SUM 25	G 12150	11 SMn 37	S 300	CF 9 SMn 36	
1.0737	12L14	9 SMnPb 36/ 11 SMnPb 37			G 12144	11 SMnPb 37	S 300 Pb SMnPb 36	CF 9	1926
1.0738		11 SMnPbTe 37	11 SMn 37			11 SMn 37			
1.0739		11 SMnPbBi 37							
1.0753		15 SPb 20/ 15 SPb 22				15 SPb 22			
1.0754		22 SPb 20							
1.0764		36 SMn 14	36SMn14			36SMn14	36SMn14		
1.0877		C 2							
1.0878		C 5							
1.1133	1022	20 Mn 5	120 M 19	SMn 420	G 10220	20 Mn 5	20 M 5	G 22 Mn 3	
1.1142		GC 16 E/ GS-Ck 16				GC 16 E			
1.1177		Ck 38 Pb				25 Mn 4			
1.5506		17 MnB 3	Sep-00						
1.6220		G 20 Mn 5				G 20 Mn 5		G 20 Mn 5	
1.7015	5015	15 Cr 3	523 M15	SCr 415 H	G50150	15 Cr 2	12 C 3		
1.7016	5117	17 Cr 3	17 Cr 3		G51170	(15 Cr 2 KD)	18 C 3		
1.7211	4118	23 CrMoB 4		SCM 21 H	G41180	20 MoCr 4			
1.8970		StE 385.7							
1.8971		StE 385.7 TM							

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

AISI — American Iron and Steel Institute
AFNOR — French National Organization for Standardization
AMS — Aerospace Material Specifications
ASTM — American Society of Mechanical Engineers
BS — British Standards
DIN — German Institute for Standardization
EN — European Standards
JIS — Japanese Industrial Standards
SAE — Society of Automotive Engineers
SIS — Swedish Standards Institute
UNI — Italian Organization for Standardization
UNS — Unified Numbering System

Workpiece Material Conversion Table • P3

P3 Medium to High Plain-Carbon Steels and Alloy Steels Content: C > .25% Tensile Strength RM (MPa)*: 600-850 Hardness (HB): < 330

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.0045		F 2172	En 50 B	SM 490 YA		S 1207	E36-2	Fe 510 BFN	
1.0050	A 570 Gr. 50	St 50-2	4360-50 B	SS 50		E 295	A 50-2	Fe 490	2172
1.0052		St 50-1							
1.0060		St 60-2	4360-55 E	SM 58		E 335	A 60-2	Fe 60-2	1650
1.0062		St 60-1							
1.0114		S 235 JO/ Fe 360 C	En 40C			S 235 JO	E24-3	Fe 360 CFN	
1.0116	A 570 Gr. 36	St 37-3	4360-40 C		K01501	S 235 J2 G3	Fe 360 D1 (2); E 24-3	Fe 360 D1 (2)	1312
1.0123		QSt 37-3		SWRCH 12R					
1.0128		QSt 44-2							
1.0129		ZSt 44-2							
1.0133		QSt 44-3							
1.0135		P St 44-3							
1.0136		St 42-3							
1.0140		S 275 JOC							
1.0141		S 275 J2 G3C							
1.0142		S 275 J2 G4C							
1.0143		S 275 JO	En43C; S275JO			S 275 JO/ Fe 430 C	S 275 JO; E 28-3	S275JO; Fe430CFN	
1.0144	A 573 Gr. 70	St 44-3	4360-43 C	SM 41 B		S 275 J2 G3 (4)	Fe 430 D1 (2); E 28-4	Fe 430 D FF	1414
1.0145		S 275 J2 G4/ Fe 430 D 2	S 275 J2 G4			S 275 J2 G4	E28-4; S 275 J2 G4	S 275 J2	1414 G4
1.0146		P St 44-2							
1.0149		Ro St 44-2	43C			S 275 JO H		S 275 JO H	
1.0153		ZSt 44-3							
1.0168		ZSt 37-3							
1.0176		P St 37-3							
1.0179		S 275 JR Cu							
1.0219		St 41-3							
1.0254		St 37.0		STPG 38		P 235 T1			
1.0300		C4D				C 4 D	FM 5	C 4 D	
1.0304		C9D		SWRM 8		C 9 D	FM 9	C 9 D	
1.0308		St 37-2	360.0000	STKM 12 A	K02504	S 235 JR	E 24-2	Fe 360	1412
1.0313		C7D	C 7 D	SWRM 8	G10060	C 7 D	FM 8	C 7 D	
1.0319		L 210 GA				L 210 GA	TS E 220 class 2		
1.0323		USD 7/C 8 G1 W				C 8 G 1 W			
1.0324		RSD 7/C8G2W				C 8 G 2 W			
1.0339		RSD 10 Si/ C10WSi				C 10 W Si			
1.0345		P235 GH	P 235 GH	SPV 50	K02503	P 235 GH	A 37 CP	Fe E 235	1330
1.0351		RRSD 10/ C10 W				C 10 W			
1.0405		St 45.8		STB 410	K02727				
1.0406	1025	C 25	070 M 26	S 22 C	G10250	1 C 25	C 25	C 25	
1.0409		St E 320.7							
1.0411		C 25 Pb				C 25 GPb			
1.0412		27 MnSi 5							
1.0418		L 245 MB	430.0000		K03006	L 245 MB	L 245 MB		
1.0421		St 52.0		STPG 42					
1.0422		R 0550							
1.0426		P310 NB	224-410	SG 325	K02100	P280GH	BS 2	P 275 N	2103
1.0429		L 290 MB				L290MB	L 290 MB		
1.0430		St E 320.7 TM							
1.0431		B St 42/50 RK							
1.0433		B St 42/50 RU							
1.0434									
1.0435		H III/P285NH		Sm 38		P 285 NH			
1.0436		P310 NB	224-430	SG 325	K02100	P305GH	P 275 N	P 275 N	2103
1.0437		A St 41	P 275 N	STK 400	K02100	S 275 N	BS 3	P 275 N	2103
1.0438		B 500 A		SD 490		B 500 A		B 500 A	
1.0440	1044	GL-A							
1.0441		Schiffbaustahl GL-A							
1.0442		Schiffbaustahl GL-B (S 235 J 0)							
1.0443		GS-45		SC 450					
1.0444		ZStE 300 BH							
1.0445		H IV/P295NH		SG 37	K03102			Fe 460-2 KW	
1.0448		ZStE 300 P/ H 300 P							
1.0457		StE 240.7				L 245 NB	L 245 NB		
1.0458		HIII/L 235 GA				L 235 GA			
1.0459		L 245 GA/ RRStE 240.7				L 245 GA	TS E 250		
1.0460		C 22 8				P 250 GH			
1.0461		St E255			K01800				
1.0462		WStE 255			K01800				
1.0463		TStE 255			K11535				
1.0468		15 Mn 3 Al				C 14 GAl			
1.0469		21 Mn 4						20 Mn 4	
1.0470		21Mn4Al							
1.0473		19 Mn 6/ P 355 GH	P 355 GH	SGV 46	K03300	P355GH	A 52 CP	Fe E355-2	2101
1.0474		Schiffbaustahl GL-D (S 235 J)							
1.0479		13 Mn 6							
1.0480		H 260/ZSt E 260	H 240 LA			H 240 LA	E 240 C		
1.0481		17 Mn 4/ P 295 GH	224-460B	SG 37	K03501	P 295 GH	A 48 CP	Fe E 295	2102
1.0482		19 Mn 5	224-460	SG 37	K 03102		A 52 CP; AP; FP	Fe460-2 KW	
1.0483		L 290 AG				L290GA	TS E 290		
1.0484		L 290 NB				L290NB	L 290 NB		
1.0485		21 Mn 6			K12320				
1.0486		St E 285	P 275 N	SM 41 A	K 01802	P 275 N	P 275 N	Fe E 285 KG	
1.0487		W St E 285	P 275 N		K 01802	P 275 NH	P 275 N	Fe E 285 KW	
1.0488		T St E 285	P 275 NL 1	SLA 235 A	K 01803	P 275 NL 1	P 275 NL 1	Fe E 285 KT	
1.0489		H 300/ZSt E 300	H280LA			H 280 LA	E 280 C		
1.0492		11 Mn 4 Si							
1.0493		S 275 NH	S 275 NH			S 275 NH		S 275 NH	
1.0494		11 Mn 4 Al							
1.0495		21 Mn 5							
1.0496		12 Mn 6							

Workpiece Material Conversion Table • P3

P3 Medium to High Plain-Carbon Steels and Alloy Steels Content: C >.25% Tensile Strength RM (MPa)*: 600-850 Hardness (HB): <330

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.0497		S 275 NLH	S275NLH			S 275 NLH		S275NLH	
1.0499		L 360 GA				L 360 GA			
1.0501	1035	C 35	060 A 35	S 35 C	G 10350	1 C 35	CC 35	C 35	1550
1.0502		C 35 Pb/ C 35 GPb				C 35 Pb			
1.0503	1045	C 45	080 M 46	S 45 C	G 10450	1 C 45	CC 45	C 45	1650
1.0505		St E 315/ P 315N		SM 50 A	K11506	P 315 N		Fe E 315 KG	
1.0506		W St E 315		SNC 1	K02404	P 315 NH		Fe E 315 KW	2107
1.0507		St 55		STKM 16A				Fe 540	
1.0508		T St E315		SLA 325 A	K02404	P 315 NL			2106
1.0509		S 355 K2 G3 Cu/ (St 55.4)							
1.0510		32 Mn 4							
1.0511	1040	C 40	080 M 40	S 40 C	G 10 400	1 C 40	C 40	C 40	
1.0512		C 40 Pb				C 40 G Pb			
1.0516		C38D		SWRH 37		C 38 D	FM 38	C 38 D	
1.0517		C48D		SWRH 48		C 48 D	FM 48	C 48 D	
1.0518		C56D				C 56 D	FM 56	C 56 D	
1.0519	1046	S 355 K 2 G 4 Cu			G10460	S 355 K2 G4 Cu			
1.0520		31 Mn 4							
1.0521		StSch 700 (R 0 700)				R 0700			
1.0524		StSch800 (R 0 800)				R 0800			
1.0526		Cf 45 Pb						C 46	
1.0527		C 56						C 56	
1.0528	1030	C30	080 M 30	SUP 7	G 10 300	1 C 30	C C 32	C 30	
1.0530		C32D		SWRH 32	K02701	C 32 D	FM 32	C 32 D	
1.0532		GL-A 40 (S 390 G 1 S)				S 390 G 1 S			
1.0535	1055	C 55	070 M 55	S 55 C	J05000	1 C 55	C 55	C 55	1655
1.0539		S 355 NH	S 355 NH			S 355 NH		S 355 NH	
1.0540	1050	C 50	080 M 50	S 50 C	G 10 500	1 C 50	C 50	C 50	1674
1.0541		C42D		SWRH 42 B		C 42 D	FM 42	C 42 D	
1.0542	1551	C 50 Pb			G15510	C 50 G Pb			
1.0544		Schienen 60 F (R 0600/St Sch 60)				R 0600			
1.0547		S 355 J0 H	50 C			S 355 J0 H		S 355 J0 H	
1.0548		ZStE 340/H 340	H 320 L A			H 320 LA	E 315 C		
1.0549		S 335 NLH	50 EE			S 355 N LH		S 355 N L H	
1.0550		ZStE 380/H 380	H 360 L A			H 360 LA	E 355 C		
1.0551		S 355 J R C							
1.0552		GS-52	A2			GE 260			
1.0553		S 355 J0	En 50 C; S 355 J0	SM 520 M		S 355 J0	S 355 J0; E 36-3	S 355 J0; Fe 510 C FN	
1.0554		GS-70	50 C			S 355 J0 C	E 36-3	Fe 510 C	
1.0555		GS-62				S 355 G0 1			
1.0556		ZStE 420/H 420	46/40HR,	HS, CS		H 400 LA	H 400 LA		
1.0557		P355 NB		SG 365		P 355 NB	BS 4		
1.0558		GS-60	A3			GE 300	320-560M	C 45	1606
1.0559		GS-62.3				S 355 G0 2			

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.0560		GL-E - 40 (S 390 G 3 S)				S 390 G 3 S			
1.0561	1037	36 Mn4	170 H 36		G10370				
1.0562	A 633 Gr. C	St E 355	P 355 N	SM 50 YB	K12000	P 355 N	E 355 R/FP	Fe E 355 KG	2132
1.0564		N 80							
1.0565		W St E 355	P 355 NH		K01600	P 355 NH	P 355 NH	Fe E 355 KW	
1.0566		T St E355	P 355 NL1	SLA 37		P 355 NL1	P 355 NL1	Fe E 355 KT	
1.0567		32 Mn 3							
1.0570		St 52-3	4360-50 B	SM 50 YB		S 355 J 2 G 3	E 36-3	Fe 510 B	2132
1.0571		P355 QH1	P 355 QH			P 355 QH	P 355 QH		
1.0572		PSt 52-3 (S 355 J2 G3 F)				S 355 J2 G3 F			FE 510 C
1.0573		QSt 52-3 (S355J2G3C)							
1.0574		ZStE 460/ H 460							
1.0577		S 355 J 2 G 4	S 355 J 2 G 4			S 355 J 2 G 4	S 355 J 2 G 4	S 355 J 2 G 4	
1.0578		L 360 MB				L 360 MB	L 360 MB		
1.0580		St 52	CFS5						
1.0581		St 52.4		STS 49					
1.0582		L 360 NB/ StE 360.7				L360NB	L 360 NB		
1.0585		S 355 J 2 G 3 Cu/St 52-3 Cu3				S 355 J2 G3 Cu + CR			
1.0586		C50D				C 50 D	FM 50	C 50 D	
1.0587		QSt 52-3 Cu 3				S 355 J2 G3 Cu C			
1.0588		D 53-2		SWRH 52 B		C 52 D	FM 52	C 52 D	
1.0591		FStE 355 OS 3/ S355G03			K12000	S 355 G03			
1.0592		S 355 J 2 G 4 Cu				S 355 J2 G4 Cu			
1.0593		S 355 K2 G3 C							
1.0594		S 355 K2 G4 C							
1.0595		S355k2G3/ Fe 510 DD1 (MULTIST)	S 355 K 2 G 3	SM 520 C	K02505	S 355 K 2 G 3	E36-4	S 355 K 2 G 3	
1.0596		S355K2G4/ Fe 510 DD 2 (MULTIS)	S 355 K 2 G 4			S 355 K 2 G 4	S 355 K 2 G 4	S 355 K 2 G 4	
1.0597		ZSt 52-3							
1.0598		C 30 Pb				C 3 0 GPb			
1.0601	1060	C 60	080 A 62	S 60 C-CSP	G 10600	1 C 60	AF 70 C 55	C 60	
1.0602		C 60 Pb				C 60 GPb			
1.0605	1074	C 75	CS 80		G10740	1 CS 75	C 75	C 75	
1.0606		C 67 GPb/ C 67 Pb				C 67 GPb			
1.0607		C 75 GPb/ C 75 Pb				C 75 GPb			
1.0609	1059	C58D		S 58 C	G10590	C 58 D	FM 58	C 58 D	
1.0610		C60D				C 60 D	FM 60	C 60 D	
1.0611		C62D		SWRH62B		C 62 D	FM 62	C 62 D	
1.0612		C66D				C 66 D	FM 66	C 66 D	

Workpiece Material Conversion Table • P3

P3 Medium to High Plain-Carbon Steels and Alloy Steels Content: C >.25% Tensile Strength RM (MPa)*: 600-850 Hardness (HB): <330

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.0613		C68D		SWRH 67 B		C 68 D	FM 68	C 68 D	
1.0614	1075	C76D			G10750	C 76 D	FM 76	C 76 D	
1.0615		C70D				C 70 D	FM 70	C 70 D	
1.0616	1080	C86D	CS 80		G10860	C 86 D	FM 86	C 86 D	
1.0617		C72D		SWRH 72 B		C 72 D	FM 72	C 72 D	
1.0618	1095	C92D	95 CS		G10950	C 92 D		C 92 D	
1.0619		GS-C 25		SCPH 1		GP 240 GH	GP 240 GH	GP 240 Gh	
1.0620	1078	C78D		SWRH 77 B	G10780	C 78 D	FM 78	C 78 D	
1.0621		GP 240 GR				GP 240 GR	GP 240 GR	GP 240 GR	
1.0622		C80D				C 80 D	FM 80	C 80 D	
1.0623		StSch 900 A (R 0900)				R 0900			
1.0624		StSch 900 B (R 0900 Mn)				R 0900 Mn			
1.0625	1345	StSch 90 C/ GP 280 GH			G13450	GP 280 GH	GP 280 GH	GP 280 GH	
1.0626		C82D		SWRH 82 B		C 82 D	FM 82	C 82 D	
1.0628		C88D				C 88 D		C 88 D	
1.0631		StSch 1200 (R 1200)				R 1200			
1.0633		ZSt 70-2							
1.0724		22 S 20/22 S 20					20 F 2		
1.0726	1140	35 S 20	212 M 36		G 11400	35 S 20	35 MF 4		1957
1.0727	1146	45 S 20	212 M 44		G 11460	45 S 20	45 MF 4		1973
1.0728	1151	60 S 20			G11510	60 S 20	60 MF 4		
1.0729		70 S 20							
1.0756		35 SPb 20	35 SPb 20			35 SPb 20	35 SPb 20		
1.0757		45 SPb 20				46 SPb 20			
1.0758		60 SPb 20							
1.0759		70 SPb 20							
1.0760		38 SMn 28	38 SMn 28			38 SMn 28	38 SMn 28		
1.0761		38 SMnPb 28	38 SMnPb 28			38 SMnPb 28	38 SMnPb 28		
1.0762		44 SMn 28	44 SMn 28			44 SMn 28	44 SMn 28		
1.0763		44 SMnPb 28	44 SMnPb 28			44 SMnPb 28	44 SMnPb 28		
1.0765		36 SMnPb 14	36 SMnPb 14			36 SMnPb 14	36 SMnPb 14		
1.0870		17 MnV 7							
1.0871		28 MnB 5							
1.0900		38 Si 6							
1.0901		38 Si 2							
1.0902		46 Si 7					45 S 7		
1.0903	9255	51 Si 7	250 A 53		G92550		51 S 7	48 Si 7	2090
1.0904	9255	55 Si 7	250 A 53	SKH 1; SKT 4	G92550	55 NiCrMoV 7	55 S 7	55 Si 8	2085
1.0905		38 Si 3							
1.0908		60 SiMn 5							
1.0915		StSch 1100 (R 1100 Cr)				R 1100 Cr			
1.0961	9262	60 SiCr 7	250 A 61	SUP 7	G92620	60 SiCr 8	60 SC 7	60 SiCr 8	
1.0966		QSt E 690 TM (S 700 MC)				S 700 MC	S 690 MC	S 700 MC	
1.0970		QSt E 260 TM/ 5260 MC				S 260 MC	41 S 7	Fe E 275 TM	
1.0971		QSt E 260 N 7 S 260 NC		AE 275 NC		S 260 NC		S 260 NCX	
1.0972	S 315	QSt E 300 TM/ S 315 MC	43 F35 HR, HS, CS			S 315 MC	E 315 D		MC
1.0973		QSt E 300 N 7/ S 315 NC		AE 340 NC		S 315 NC		S 315 NC	
1.0974		QSt E340 TM	HR 40/30			S 340 MC	E 335 D		
1.0975		QSt E340 N				S 340 NC		Fe E 355 TD	
1.0976		QSt E 360TM				S 355 MC	E 355 D	Fe E 355 TM	
1.0977		QSt E360 N				S 355 NC		Fe E 355 TD	
1.0978		QSt E380 TM				S 380 MC	E 390 D		
1.0979		QSt E380 N				S 380 NC		Fe E 380 TD	
1.0980		QSt E420 TM	HR 50 F 45			S 420 MC	E 430 D	Fe E 420 TM	
1.0981		QSt E 420 N				S 420 NC		Fe E 420 TD	
1.0982		QSt E 460 TM	50/45 HR			S 460 MC	E 445 D		
1.0983		QSt E 460 N				S 460 NC		Fe E 460 TD	
1.0984		QSt E500 TM				S 500 MC	E 490 D	Fe E 490 TM	2662
1.0985		QSt E500 N				S 500 NC			
1.0986		QSt E550 TM	60/55 HS			S 550 MC	E 560 D	Fe E 560 TM	
1.0987		QSt E550 N				S 550 NC			
1.1008		Ck 8							
1.1009		C 7 K/Ck 7							
1.1010		C 5 E/Ck 5							
1.1102		FStE 355 OS 3/ S355G04				S 355 G04			
1.1103		EStE 255							
1.1104		EStE 285	P 275 NL 2	STK 400		P 275 NL 2	P 275 NL 2	P 275 NL 2	
1.1105		EStE 315				S 315 NL 1			
1.1106		EStE 355	P 355 NL 2	STK 500		P 355 NL 2	P 355 NL 2	P 355 NL 2	
1.1110		C3D2				C 3 D 2	FM 5	C 3 D 2	
1.1111		C5D2				C 5 D 2	FM 6	C 5 D 2	
1.1112		USD 5/C 8 E1 W				C 8 E 1 W			
1.1113		C8D2				C 8 D 2	FM 8	C 8 D 2	
1.1115		C 10 E W/RSD 11				C 10 EW			
1.1116		USD 6/C 8 E2 W				C 8 E 2 W			
1.1117		8 Mn 4							
1.1123		7 Mn 6							
1.1125		7 Mn 7							
1.1127	1141	36 Mn 6	212 M 36	S Mn 443	G 11410				
1.1128	1548	46 Mn 5			G15480				
1.1135		C 16 E Al/ Ck 16 Al							
1.1136		G 24 Mn 4/ GS 24 Mn 4				G 24 Mn 4			
1.1140		C 15 R	C 15 R			C 15 R	C 15 R		
1.1143		C32D2				C 32 D 2	FM 32	C 32 D 2	
1.1145		C36D2				C 36 D 2	FM 36	C 36 D 2	
1.1146	1033	30Mn4			G10330				
1.1150		C38D2				C 38 D 2	FM 38	C 38 D 2	
1.1153		C40D2				C 40 D 2	FM 40	C 40 D 2	
1.1154		C42D2				C 42 D 2	FM 42	C 42 D 2	
1.1157	1039	40 Mn 4	150 M 36		G10390		35 M 5		
1.1158	1025	Ck 25	070 M 26	S 25 C	G10250	2 C 25	XC 25	C 25	
1.1160	1524	22 Mn 6		SS 41	G15240				
1.116	1524	22 Mn 6		SS 41	G15240				

Workpiece Material Conversion Table • P3

P3 Medium to High Plain-Carbon Steels and Alloy Steels Content: C >.25% Tensile Strength RM (MPa)*: 600-850 Hardness (HB): <330

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.1161	1526	26 Mn 5			G15260				
1.1161	1526	26 Mn 5			G15260				
1.1162		C46D2				C 46 D 2	FM 46	C46D 2	
1.1163		C 25 R	C 25 R			C 25 R	C 25 R	C 25 R	
1.1164		C48D2				C 48 D 2	FM 48	C48 D 2	
1.1165	1330	GS-30 Mn 5	120 M 36	SMn 433 H; SCMn 2	K13300		35 M 5		1330
1.1166	1536	34 Mn 5	En15B	SS 55	G15360				
1.1166	1536	34 Mn 5	En15B	SS 55	G15360				
1.1167	1335	36 Mn 5	150 M 36	SMn 438 (H)	G13350		40 M 5		2120
1.1168		G 40 Mn 5/ GS 40 Mn 5				G 40 Mn 5			
1.1169		20 Mn 6	150 M 19				20 M 5	20 Mn 6	
1.1170	1330	28 Mn 6	150 M 28	SCMn 1	G 13300	28 Mn 6	35 M 5	C 28 Mn	
1.1171		C50D2				C 50 D 2	FM 50	C50D 2	
1.1172	1030	Cq 35		F.1133 (C 35 DF)	G 10300	C 35 KD		CB 35	
1.1173	1034	Ck 34	080 M 34	S 34 C	G 10340	2 C 34		C 34	
1.1177		Ck 38 Pb				25 Mn 4			
1.1178	1030	Ck 30	080 M 30	S 30 C	G 10300	2 C 30	XC 32	C 30	
1.1179		C 30 R	C 30 R	C 30 R (3 C 30)		C 30 R	C 30 R	C 30 R	
1.1180	1035	Cm 35	080 M 36		G 10350	3 C 35	38 H1 k	C 35 R	1572-03
1.1181	1034	Ck 35	080 M 36	S 35 C	G 10340	2 C 35	XC 38 H1	C 35	1572
1.1182		Ck 35 Pb				S 355 G 13			
1.1183	1035	Cf 35	060 A 35	S 35 C	G 10350	C 35 G	XC 38 TS	C 35	1572
1.1184		Ck 36				S 355 G 14			
1.1186	1040	Ck 40	080 A 40	S 40 C	G 10400	2 C 40	XC 42 H1	C 40	
1.1187		C3D1				C 3 D 1		C 3 D 1	
1.1188						C 4 D 1		C 4 D 1	
1.1189		C40R/Cm 40	C 40 R			C 40 R	C 40 R	C 40	
1.1190		C 42 E Al/Ck 42 Al				S 355 G15			
1.1191	1045	Ck 45	080 M 46	S 45 C	G10450	2 C 45	XC 42	C 40	1672
1.1192	1045	Cq 45		SWRCH 45K	G10450	C 45 KD			
1.1193	1045	Cf 45	060 A 47	S 45 C	G10450	C 45 G	XC 42 TS	C 43	1672
1.1195		C 45 Epb/Ck 45 Pb							
1.1198		C 48 Emn/Ck 48 Mn							
1.1201	1045	Cm 45	080 M 46	S 50 C	G10450	3 C 45	XC 48 H1u	C 45 R	1672
1.1202		C52D2				C 52 D 2	FM 52	C 52 D 2	
1.1203	1055	Ck 55	070 M 55	S 55 C	G10550	2 C 55	XC 55 H1	C 55	1655
1.1205		C 53 R/Cm 53				C 53 R			
1.1206	1050	Ck 50	080 M 50	S 50 C	G10500	2 C 50	XC 48 H1	C 50	1674
1.1207		C 10 R	C 10 R			C 10 R	C 10 R		
1.1208		C 16 R	C 16 R			C 16 R	C 16 R		
1.1209	1055	Cm 55	070 M 55		G 10550	3 C 55	XC 55 H1	C 55 R	
1.1210	1053	Ck 53	En43C	S 53 C	G 10530				
1.1212		C58D2				C 58 D 2	FM 58	C 58 D 2	
1.1213	1050	Cf 53	060 A 57	S 50 C	G 10500	C 53 G	XC 48 TS	C 48	1674
1.1215		Cf 53 Pb						C 53	
1.1217		Ck 53 Pb				C 90 S			
1.1218		Cm 45 Pb							

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.1219		Cf 54							
1.1220		C56D2/D 55-2				C 56 D 2	FM 56	C 56 D 2	
1.1221	1060	Ck 60	060 A 62	S 58 C	G 10640	2 C 60	XC 60	C 60	1678
1.1222		C62D2				C 62 D 2	FM 62	C 62 D 2	
1.1223		Cm 60	C 60 R			3 C 60	C 60 R	C 60 R	
1.1225		Cm 60 Pb							
1.1226	1552	52 Mn 5			G15520				
1.1227		Ck 60 Pb							
1.1228		C60D2				C 60 D 2	FM 60	C 60 D 2	
1.1229		Cf 70 Pb							
1.1230	1065	FD (Federstahldraht)	095 A 65		G10650	C 68 D			
1.1231	1070	Ck 67	060 A 67	S 70 C-CSP	G 10700	C 67 S	XC 68	C 70	1770
1.1232		C68D2				C 68 D 2	FM 68	C 68 D 2	
1.1233		56 Mn 4							
1.1234	1069	Ck 68			G10690	C 70 D			
1.1235		37 Mn 6							
1.1236		C66D2				C 66 D 2	FM 66	C 66 D 2	
1.1237		C 70 D 3/SKD 70							
1.1238		C 80 D 3/SKD 80							
1.1240		65 Mn 4							
1.1241		C50R	C 50 R			C 50 R	FM 50	C 50 R	
1.1242		C72D2				C 72 D 2	FM 72	C 72 D 2	
1.1244		70 Mn 4							
1.1245		Ck 75 Pb							
1.1248	1080	Ck 75	060 A 78	C 75	G 10800	C 75 S	XC 75	C 75	1774
1.1249	1070	Cf 70			G 10700	C 70 G	XC 70		
1.1250		VD (Federstahldraht)			K06700				
1.1251		C70D2				C 70 D 2	FM 70	C 70 D 2	
1.1252		C78D2				C 78 D 2	FM 78	C 78 D 2	
1.1253		C76D2				C 76 D 2	FM 76	C 76 D 2	
1.1255		C80D2				C 80 D 2	FM 80	C 80 D 2	
1.1256		VD 66-3							
1.1257		VD 71-3							
1.1259		80 Mn 4							
1.1260	1566	66 Mn 4			G15660				
1.1262		C82D2				C 82 D 2	FM 82	C 82 D 2	
1.1265		C86D2				C 86 D 2	FM 86	C 86 D 2	
1.1267		Ck 85 Pb							
1.1269	1090	Ck 85		SK 5 - CSP	G 10900	C 85 S	XC 90	C 90	
1.1272		C88D2				C 88 D 2		C 88 D 2	
1.1273	1085	90 Mn 4	080 A 83	SUP4	G 10850				
1.1274	1095	Ck 101	060 A 96	SUP_4	G 10950	C 100 S	XC 100	C 100	1870
1.1282		C92D2				C 92 D 2		C 92 D 2	
1.1283		C98D2				C 98 D 2		C 98 D 2	
1.1304		46 MnVS 6				46 MnVS 6			
1.1305		46 MnVS 3				46 MnVS 3			
1.1331		WSt E 255 S							
1.1333		WSt E 285 S							
1.1335		WSt E315 S							
1.1337		WSt E 355							
1.1338		C 22.8 S							

Workpiece Material Conversion Table • P3

P3 Medium to High Plain-Carbon Steels and Alloy Steels Content: C >.25% Tensile Strength RM (MPa)*: 600-850 Hardness (HB): <330

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.1339		GS-C 25 S							
1.1380		St 835/1030							
1.1381		St 900/1100							
1.1520		C 70 W1				CT 70	C 70 E 2 U	C 70 K U	
1.1525	W 108	C 80 W1			T72301	C 80 U	Y1 90	C 80 KU	1880
1.1535		C 90 U				C90U			
1.1545	W 110	C 105 W1	B W 1 A		T72301	C 105 U	Y 105	C 100 KU	1880
1.1554		C 110 W				C 110 U			
1.1555		C 120 U				C120U			
1.1563	W 112	C 125 W				C 125 U			
1.1620		C 70 W2				C 70 U			
1.1625	T 8	C 80 W2	BW 1B	SKC 3	T12008		Y1 80	C 80 KU	
1.1645		C 105 W2		SK 3					
1.1654		C 110 W							
1.1663	W 112	C 125 W		SK 2	T72301	C 120 U	Y2 120	C 120 KU	
1.1673		C 135 W		SK 1			Y2 140	C 140 KU	
1.1730		C 45 W				C 45 U	Y3 42		
1.1740		C 60 W		SK 7			Y3 55		
1.1744	A-6	C 67 W			T30106		Y1 70		
1.1750	W 1	C 75 W	BW 1A						
1.1820		C 55 W							
1.1830	1084	C 85 W		SK 5	G10840	C 90 U	Y3 90		
1.2002		125 Cr 1				125 Cr 2	Y2 120 C		
1.2003		75 Cr 1							
1.2004		85 Cr 1					Y1 100 C 2		
1.2008		140 Cr 3		SKS 8		140 Cr 2	Y2 140 C		
1.2056	P21	90 Cr 3			T51621				
1.2057		105 Cr 4		SKC 11					
1.2063		145 Cr 6							
1.2067	L3	100 Cr 6	B L 3		T61203	102 Cr 6	Y 100 C 6	102 Cr 6 KU	
1.2101		62 SiMnCr 4							
1.2103	S2	58 SiCr 8	BS 2		T41902				
1.2162		21 MnCr 5		SCR 420 H		21 MnCr 5	20 NC 5		
1.2203		145 V 12							
1.2208		31 CrV 3				31 Cr V2			
1.2210	L-2	115 CrV 3			T61202	107 Cr V 3 KU	100 C 3	107 CrV 3 KU	
1.2235		80 CrV 2			T91905	80 Cr V 2			
1.2236		80 CrV 2 3							
1.2241	S6	51 CrMnV 4			T41906	51 CrMnV 4		51 CrMnV 4 KU	
1.2302		35 CrMo 7				35 CrMo 7			
1.2307		29 CrMoV 9							
1.2313		21 CrMo10							
1.2320		G 60 CrMoV 10 7							
1.2323		48 CrMoV 67					45 CDV 6		
1.2326		G 48 CrMoV 6 7							
1.2328		45 CrMoV 7							
1.2330	P-20	35 CrMo 4	BP 20		T51620		4135.0000	35 CrMo 4	
1.2332	4145	47CrMo 4			G41450		4142.0000		
1.2333		G 59 CrMoV 18 5							
1.2334		62 CrMoV 6							

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.2352		22 CrMoV 7							
1.2355		50 CrMoV 13 15				50 CrMoV 13-15			
1.2356		60 CrMoV 13 5							
1.2358		60 CrMoV 18 5							
1.2369		81 MoCrV 42 16							
1.2382		GX 155 CrVMo 121							
1.2414		120 W 4							
1.2419		105 WCr 6		SKS 31		105 WCr 5	(107 WCr 13)	107 WCr 5 KU	2140
1.2424		75 WCr 12							
1.2442	W 5	115 W 8			T72305				
1.2510	O 1	100 MnCrW 4	BO 1	SKS 3	T 31501	(95 Mn WCr 5)	90 MWCV 5	95 MnWCr 5 KU	2140
1.2516	A-10	120 WV 4	BF 1		T30110		110 WC 20	110 W 4 KU	
1.2519		110 WCrV 5							
1.2521		110 WCrV 8							
1.2542	S1	45 WCrV 7	BS 1		T 41901	45 WCrV 8	45 WCr V 8	45 WCrV 8 KU	2710
1.2549		50 WCrV 8				50WCrV8			
1.2550	S1	60 WCrV 7	BS1			60 WCrV 8	55 WC 20	55 WCrV 8 KU	
1.2552		80 WCrV 8							
1.2590		GS-80 CrVW 4 3							
1.2603		45 CrVMoW 5 8							
1.2604		73 WCrMoV 22							
1.2661		38 CrCoWV 18 17 17	38 CrCoWV			18-17-17			
1.2705		80 NiCr 11							
1.2708		54 NiCrMoS 6							
1.2710		45 NiCr 6							
1.2711		54 NiCrMoV 6					55 NCDV 6		
1.2713	L6	55 NiCrMoV 6	BH 224/5	SKT 4	T61206	55 NiCrMoV 7	55 NCDV 7	55 NiCrMoV 7 KU	
1.2714	P5	56 NiCrMoV 7			T51605	56 NiCrMoV 7		56 NiCrMoV 7 KU	
1.2718		55 NiCr 10							
1.2721		50 NiCr 13					55NCD13		
1.2726		26 NiCrMoV 5							
1.2735	P6	15 NiCr 14		SNC 22	T51606		10 NC 12		
1.2736		55 CrNiMo 4							
1.2737		28 NiCrV 5							
1.2738		40 CrMnNiMo 8 6 4				40 CrMnNi Mo 8-6-4			
1.2739		40 CrNiMoV 3 3 4							
1.2740		28 NiCrMoV 10							
1.2741		55 CrNiMoVS 4 2 4							
1.2742		55 CrNiMoV 4 2 4							
1.2743		60 NiCrMoV 12 4							
1.2744		57 NiCrMoV 7 7				55 NiCrMoV 7			
1.2745		14 NiCr 18							
1.2762		75 CrMoNiW 6 7							

Workpiece Material Conversion Table • P3

P3 Medium to High Plain-Carbon Steels and Alloy Steels Content: C >.25% Tensile Strength RM (MPa)*: 600-850 Hardness (HB): <330

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.2770		85 NiV 4							
1.2773		75 NiCrMo 5 3 3							
1.2778		GS-20 MoNi 33 13							
1.2823		70 Si 7							
1.2824		70 MnMoCr 8				70 MnMoCr 8			
1.2825		95 MnWCr 5				95 MnWCr 5			
1.2826		60 MnSi 4					60 MSC 4		
1.2833	W 210	100 V 1	BW 2	SKS 43	T72302	100 V 2	Y1 105 V	102 V 2 KU	
1.2838		145 V 33							
1.2840							20 MV 6		
1.2842	O 2	90 MnCrV 8	BO 2		T31502	90 Mn V 8	90 MV 8	90 MnVCr 8 KU	
1.2851		34 CrAl 6							
1.3433		GS-60 CrSi 5							
1.3502		85 Cr 2							
1.3505	E 52100	100 Cr 6	535 A 99	SUJ 2	G52986	100 Cr 6	100 C 6	100 Cr 6	2258
1.3514		101 Cr 6						102 Cr 6 KU	
1.3515		20 MnCr 4 2							
1.3518		100 CrMnSi 4 4							
1.3519		100 CrMnSi 6 6							
1.3520		100 CrMn 6			K19195	100 CrMn 6	100 CM 6		
1.3523		19 MnCr 5							
1.3531		16 CrNiMo 6	820A16				16 NCD 6	16NiCrMo6	
1.3532		16 NiCrMo 16 5							
1.3536		100 CrMn 7 3				100 CrMnMo 7	100 CD 7		
1.3537		100 CrMo 7		SUS 4	K19965	100 CrMo 7	100 CD 7	100CrMo7	
1.3539		100 CrMnMo 8					100 CrMnMo 8		
1.3555		13 MoCrNi 42 16 14							
1.3559		20 Cr 3							
1.3561	5046	44 Cr 2			H50460	46 Cr 1 KD	44 Cr 2		
1.3563	4142	43 CrMo 4			G41420		43 Cr Mo 4		
1.3565	4147	48 CrMo 4	817 M 40	SNC 836	H41470		48 CrMo 4		
1.3566		15 CrMo 4							
1.3567		20 CrMo 4							
1.3570		20 MnCrMo 4 2							
1.3576		20 NiCrMo 7							
1.3821		8 SiCr 7 3							
1.4475		GX 150 CrNiMo CuN 41 6 2							
1.4700		8 CrSi 7 7							
1.5021		48 Si 7							
1.5022		38 Si 6							
1.5023		38 Si 7							
1.5024		46 Si 7				45 Si	46 S 7		
1.5025	9259 H	51 Si 7				50 Si 7		48 Si 7	2090
1.5026		55 Si 7	250 A 53		G92550	56 Si 7	55 S 7	55 Si 8	2085
1.5027	9260	60 Si 7	251 A 60		G92600	60 Si 7	60 S 7	60 Si 7	
1.5028		65 Si 7		SUP 7					
1.5029		71 Si 7							
1.5069		36 Mn 7							
1.5085		51 Mn 7							
1.5086		12 Mn 8				11 Mn 8 KE			
1.5092	9262	60 SC 7			G92620	60 SiCr 8	61 SC 7	60 SiCr 8	
1.5120		38 MnSi 4							
1.5121		46 MnSi 4							
1.5122 F.130.A		37 MnSi 5					38 MS 5		
1.5131		50 MnSi 4			K04800				
1.5141		53 MnSi 4							
1.5142		60 SiMn 5							
1.5213		15 MnV 5							
1.5216		17 MnV 6							
1.5223		42 MnV 7							
1.5225		51 MnV 7							
1.5243		42 MnSiV 3 3							
1.5310		8 SiTi 4							
1.5402		15 MnMoV 4 5				15 MnMoV 4-5	15 MDV 4.05		
1.5404		21 MoV 5 3							
1.5406		17 MoV 8 4							
1.5415	A 204 Gr. A	15 Mo 3	1501	STFA 12 -240	K11820	16 Mo 3	15 D3	16 Mo 3 KW	2912
1.5419	4419	GS-22 Mo 4	243-430	SCPH 11	G44190	G 20 Mo 5	G20Mo5	G 22 Mo 5	
1.5421		20 MnMo 3 5			K12121				
1.5422		G 18 Mo 5				G18Mo5		G 18 Mo5	
1.5423	4520	16 Mo 5	1503-245-420	SBC 690	K11522			16 Mo 5	
1.5425		11 MnMo 4 5			K11123	11 MnMo 45 KE			
1.5426		13 MnMo 6 5			K11424	11 MnMo 65 KE			
1.5427		13 MnMo 8 5			K11423	11 MnMo 85 KE			
1.5428		13 MnMo 12 5							
1.5432	4037	42 MnMo 7	En 16		G40370				
1.5437		70 MoMn 10 4							
1.5472		6 CuNb 15 5							
1.5509		23 B 2							
1.5510		28 B 2		SWRCHB 26		C 30 B	20 B 3		
1.5511		35 B 2		SWRCHB 237		C 35 B	35 B 3		
1.5524		37 MnB 4							
1.5525		20 MnB 4							
1.5527		40 MnB 4	170 H 41	SWRCHB 437					
1.5528		22 MnB 5							
1.5530	15B21 H		20 MnB 5		SWRCHB 620	20 MnB 5	20 MnB 5	20 MnB 5	
1.5532	15B37 H	38 Mn B 5		SWRCHB 737		38 Mn B 5	38 Mn B 5	38 MnB 5	
1.5535		23 MnB 4							
1.5537		36 MnB 4							
1.5538		37 MnB 5							
1.5622	A 350 -LF 5	14 Ni 6		SL2N26	K22103	FeE 285 Ni 6	15 N 6	14 Ni 6	
1.5633		24 Ni 8		SCPL 21	J22501	G 9 Ni 10	22 N 8	G9Ni10	
1.5637	A 350 -LF 5	10 Ni 14	503	SL 3 N 26	K31718	12 Ni 14	12Ni14	18 Ni 14 KT	

Workpiece Material Conversion Table • P3

P3 Medium to High Plain-Carbon Steels and Alloy Steels Content: C > .25% Tensile Strength RM (MPa)*: 600-850 Hardness (HB): < 330

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.5639	A16 2317	Ni 14		SHY 70	K31918		3.5 Ni		
1.5713	P3	10 NC 6			T51603	15 NiCr 6	10 NC 6		
1.5714		16 NiCr 4	16 NiCr 4			16 NiCr 4	16 NiCr 4		
1.5715		16 NiCrS 4	16NiCrS4			16 NiCrS 4	16 NiCrS 4		
1.5732	3415	14 NiCr 10		SNC 415 H			14 NC 12	16 NiCr 11	
1.5733		14 NiCrPb 10							
1.5752	E 3310	14 NiCr 14	655 M 13	SNC 815 H	G33106	13 NiCr 12	16 NC 11	16 NiCr 11	
1.5805		10 NiCr 5 4	10NiCr5-4			10 NiCr 5-4	10 NiCr 5-4		
1.5807		15NiCr 6 4							
1.5860		14 NiCr 18							
1.5918		17 CrNi 6 6	17 CrNi 6-6			17 CrNi 6-6	16 CN 6		
1.5919		15 CrNi 6	S107	SNCM 420	H43200	14 CrNi 6	16 NC 6	16 CrNi 4	
1.5920		18 CrNi 8					20 NC 6		
1.6211		16 MnNi 6 3							
1.6213		12 MnNi 6 3				FeE 285 Ni 2			
1.6215		9 MnNi 4							
1.6216		17 MnNi 4							
1.6218		9 MnNi 6							
1.6308		18 MnMoNi 5 5				18 MnMoNi 5-5			
1.6311		20 MnMoNi 4 5		SQV 2 B	K12539	20 MnMoNi 4-5			
1.6312		10 NiMnMo 6 5			K11160				
1.6313		10 NiMnMoCr 6 6							
1.6342		12 MnNiMoV 5 4							
1.6343		12 MnNiMo 5 5							
1.6347		26 NiMoV 14 4							
1.6348		20 NiMoV 14 5							
1.6511	9840	36 CrNiMo 4	816 M 40		G98400	36 CrNiMo 4	40 NCD 3	38 NiCrMo 4 KB	
1.6513		28 NiCrMo 4							
1.6522		20 NiCrMo 2	605 M 36				20 NiCrMo 2		
1.6523	8620	21 NiCrMo 2	805 M 20	SNCM 220 H	G86200	20 NiCrMo 2 KD	20 NCD 2	20 NiCrMo 2	2506
1.6526		20 NiCrMoS 2 2				20 NiCrMoS 2-2	20 NiCrMoS 2-2		
1.6527		20 NiCrMo 3							
1.6540		23 MnNiCrMo 5 3							
1.6542		24 MnNiCrMo 6 2							
1.6543	8622	21 NiCrMo 2 2	805A20	SNCM 220 H	G86220	20 NiCrMo 2 KD	22 NCD 2		2506
1.6545	8630	27 CrNiMo 2			G86300	30 NiCrMo 2 KD	30 NCD 2	30 NiCrMo 2 KB	
1.6546	8640	40 NiCrMo 2 KB	7	SNCM 240	G86400	40 NiCrMo 2 KD	40 NCD 2	4 0NiCrMo 2 KB	
1.6562	E 4340	40 NiCrMo 7	817 M 40		G43406			40NiCrMo7	
1.6563		41 NiCrMo 7 3 2				41NiCrMo7-3-2	41NiCrMo7-3-2		

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.6565	4340	40 NiCrMo 6	818M40	SNCM 349	G43400				
1.6571		20 NiCrMoS 6-4				20 NiCrMoS 6-4	20 NiCrMoS 6-4		
1.6580		30 CrNiMo 8	823 M 30	SNCM 431		30 CrNiMo 8 KD	30 CND 8	30 NiCrMo 8	3524
1.6582	4340	34 CrNiMo 6	817 M 40	SNCM 447	G43370	34 CrNiMo 6	35 NCD 6	35 NiCrMo 6 KB	2541
1.6583		35 CrNiMo 6							
1.6585		29 CrNiMo 8							
1.6586		31 CrNiMo 8			K23550				
1.6587		17 CrNiMo 6	820 A 16	SNCM 815		17 CrNiMo 7	18 NCD 6	18 NiCrMo 7	2523
1.6589		34 CrNiMo 6 S							
1.6655		32 NiCrMo 12 5			K34035		30 NCD 12		
1.6658								15NiCrMo 10-6	
1.6723		15 NiCrMo 16 5	835 M 15				15 NiCrMo 16-5		
1.6732		28 NiCrMo 5 5							
1.6738		40 NiCrMo 18 6							
1.6745		40 NiMoCr 10 5	4S.99						
1.6752		22 NiMoCr 67							
1.6755	4718	22 NiMoCr 4 7			G47180				
1.6757		20 NiMoCr 6 5							
1.6758		23 MnNiMoCr 5 4							
1.6782		16 NiCrMO 12 6					16 NCD 13		
1.6918		15 MnNiMoV 5 3							
1.6920		15 MnCrMoNiV 5 3				15 MnCrMo NiV 5-3			
1.6932		28 NiCrMoV 8 5				28 NiCrMoV 8-5			
1.6935		35 CrNiMoV 8							
1.6950		20 NiCrMoV 14 6							
1.6951		32 NiCrMoV 14 5							
1.6952		24 NiCrMoV 14 6							
1.6955		32 NiCrMoV 10							
1.6956		33 NiCrMoV 14 5				33 NiCrMoV 14-5	30 NCD 15		
1.7001		38 Cr 1						38 Cr 1 KB	
1.7002		46 Cr 1							
1.7003	50B 40	38 Cr 2	120 M 36	SMn 438	G50401	38 Cr 2 KD	38 C 2	38 Cr 2	
1.7005		45 Cr 2				45 Cr 2		45 Cr 2	
1.7006	5045	46 Cr 2	605 M 36	SMn 443	H51500	46 Cr 2 KD	42 C 2	45 Cr 2	
1.7007	50B 40	37 CrB 1	120 M 36	SMnC 3 H	H50401	38 Cr 2		35 CB 1	
1.7012		13 Cr 2							
1.7014		17 CrS 3	17 CrS3			17 CrS 3	17 CrS 3		
1.7015	5015	15 Cr 3	523 M15	SCr 415 H	G50150	15 Cr 2	12 C 3		
1.7016	5117	17 Cr 3	17 Cr 3		G51170	(15 Cr 2 KD)	18 C 3		
1.7017		60 Cr 3							

Workpiece Material Conversion Table • P3

P3 Medium to High Plain-Carbon Steels and Alloy Steels Content: C >.25% Tensile Strength RM (MPa)*: 600-850 Hardness (HB): <330

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.7020		32 Cr 2							
1.7021		32 CrS 2							
1.7027		20 Cr 4							
1.7028		20 CrS 4							
1.7030	5130	28 Cr 4	530 A 30		G51300	28 Cr 4	30 CD 4		
1.7033	5130 H	34 Cr 4	530 A 32	SCr 430 H	G51300	34 Cr 4 KD	32 C 4	34 Cr 4 KB	
1.7034	5132 H	37 Cr 4	530 A 36	SCr 435 H	G51320	37 Cr 4	38 C 4	36 CrMn 4	
1.7035	5140	41 Cr 4	530 M 40	SCr 440 H	G51400	41 Cr 4	42 C 4	41 Cr 4	
1.7036		28 CrS 4				28CrS4	28CrS4		
1.7037		34 CrS 4	34 CrS 4			34 CrS 4	34 CrS 4	34 CrS 4	
1.7039		41 CrS 4	41 CrS 4			41 CrS 4	41 CrS 4	41 CrS 4	2245
1.7043		38 Cr 4				38 Cr 4		38 Cr 4	
1.7045	5140	42 Cr 4	530 A 40	SCr 440		40 NiCrMo 3	42 C 4 TS	40 NiCrMo 3	2245
1.7072		36 CrB 2							
1.7075		46 CrB 2							
1.7076		32 CrB 4							
1.7077		36 CrB 4							
1.7102		54 SiCr 6					54 SC 6		
1.7103		67 SiCr 5				67 SiCr 5		67 SiCr 5	
1.7104		55 SiCr 6 3							
1.7106		55 SiCr 7							
1.7108	9262	60 SiCr 7				60 SiCr 8			
1.7116		42 MnNiCrB 4 3							
1.7117		52 SiCrNi 5					52 SCN 5		
1.7121		20 CrMnS 3 3							
1.7131	5115	16 MnCr 5	527 M 17	SCR 415	G 51150	16 MnCr 5 KD	16 MC 5	16 MnCr 5	2173
1.7137		60 MnCrB 3							
1.7138	50 B 50 H	52 MnCrB 3		SUP 11	H50501				
1.7139		16 MnCrS 5							
1.7146		20 MnCrPb 5							
1.7147	5120	20 MnCr 5		SMnC 420 H	G51200	20 MnCr 5	20 MC 5	20 MnCr 5	
1.7149		20 MnCrS 5				20 MnCrS 5			
1.7160		16 MnCrB 5	16MnCrB5			16MnCrB5	16MnCrB5		
1.7176	5155	55 Cr 3	527 A 60	SUP 9 (A)	G51550	55 Cr 3	55 C 3	55 Cr 3	2253
1.7186		20 MnCr B5							
1.7190		35 CrSi 84							
1.7211	4118	23 CrMoB 4		SCM 21 H	G41180	20 MoCr 4			
1.7213		25 CrMoS 4	25 CrMoS 4			25 CrMoS 4	25 CD 4u	25 CrMoS 4	
1.7218	4130	25 CrMo 4	708 A 25	SCM 420	G41300	25 CrMo 4 KD	25 CD 4	25 CrMo 4 (KB)	2225
1.7220	4137	34CrMo4	708 A 37	SCM 435 H	H41350	34 CrMo 4 KD	35 CD 4	35 CrMo 4	2234
1.7223	4142	41 CrMo 4	708 M 40	SCM 440	G41420	41 CrMo 4	42 CD 4 TS	41 CrMo 4	2244
1.7225	4140	42 CrMo 4	708 A 42	SCM 440 H	G41400	42 CrMo 4	42 CD 4	42 CrMo 4	2244
1.7226		34 CrMoS 4	708 A 37			34 CrMoS 4	34 CD	34 CrMoS 4	2234
1.7227		42 CrMoS 4	708 H 42			42 CrMoS 4	42 CD	42 CrMoS 4	2244
1.7228	4150	50 CrMo 4	708 A 47	SCM 445 H	G41500	50 CrMo 4		50 CrMo 4	
1.7233		42 CrMo 5 6				42CrMo5-6	42CrMo5-6		
1.7242		16 CrMo 4	18 CrMo4	SCM 418 H		18 CrMo 4	15 CD 3.5	18 CrMo 4	
1.7243		18 CrMo 4	18CrMo4	SCM 418		18CrMo4	18CD4	18 CrMo 4	

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.7244		18 CrMoS 4	18CrMoS4			18CrMoS4	18CrMoS4		
1.7255		23 CrMo 5							
1.7258		24 CrMo 5		SCM 822 H					
1.7259		26 CrMo 7							
1.7262		15 CrMo 5		SCM 415 H			12 CD 4		
1.7264		20 CrMo 5		SCM 421			18 CD 4		
1.7271		23 CrMoB 3 3							
1.7272		31 CrMoB 2 1							
1.7273		24 CrMo 10							
1.7276		10 CrMo 11					12 CD 10		
1.7281		16 CrMo 9 3					20 CD 8		
1.7305		12 CrMo 11 10							
1.7311		20 CrMo 2							
1.7315		37 CrMo 3							
1.7319		20 MoCrS 3				20 MoCrS 3	20 MoCrS 3		
1.7320		20 MoCr 3				20 MoCr 3	20 MoCr 3		
1.7321		20 MoCr 4		SCM 21 H		20 MoCr 4			
1.7323		20 MoCrS 4				20 MoCrS 4			
1.7325		25 MoCr 4						20 NiCrMo 2	
1.7326		25 MoCrS 4							
1.7333		22 CrMoS 3 5				22 CrMoS 3-5	22 CrMoS 3-5		
1.7335	A182 -F11	13 CrMo 4 4	1501-621	SFVA F 12	K11562	13 CrMo 4-5	15 CD 4.05	14 CrMo 4 5	2216
1.7337	A 387 Gr. 12 Cl. 2	16 CrMo 4 4			K11564			A 18 CrMo 4 5 KW	
1.7339		11 CrMo 5 5			K22094				
1.7340		UP S4 CrMo 1							
1.7341		GS-34 CrMo 4 4							
1.7346		11 CrMo 4 5							
1.7350		22 CrMo 44							
1.7356		7 CrMo 7 5							
1.7357		5 5	B 2	SCPH 21	J11872	5 5-5	G 17 CrMo 5-5	G17CrMo	
1.7358		12 CrMo 8 5			K21509				
1.7360		31 CrMo 12 5							
1.7361		32 CrMo 12	722 M 24			32 CrMo 12	30 CD 12	32 CrMo 12	2240
1.7362		12 CrMo 19 5	3606-625	SCMV 6	K41545	X 12 CrMo 5	Z 10 CD 5.05	16 CrMo 20 5	
1.7363		GS-12 CrMo 19 5		SCPH 61	J42045	GX 12 CrMo 5			
1.7373		X 7 CrMo 6 1	B 5		S50281	CM 5-IG			
1.7374		CM 5-UP							
1.7375		12 CrMo 9 10					12 CrMo 9-10		
1.7379		GS-18 CrMo 9 10		SCPH 32		G 17 CrMo 9 10			
1.7380	A182 -F22	10 CrMo 9 10	1502-622	SCMV 4	J21890	10 CrMo 9 10	10 CD 9.10	12 CrMo 9 10	2218
1.7381		12 CrMo 12 10							
1.7383		11 CrMo 9 10	11 CrMo 9-10	SCMV 4		11 CrMo 9-10	10 CD 9.10	11 CrMo 9-10	
1.7384		7 CrM0 11 10	A 33						
1.7385		6 CrMo 9 10							
1.7386		X 12 CrMo 9 1	629-590 S690G2QL	STFA 26	S50488	X 10 CrMo VNb 9-1			

Workpiece Material Conversion Table • P3

P3 Medium to High Plain-Carbon Steels and Alloy Steels Content: C > .25% Tensile Strength RM (MPa)*: 600–850 Hardness (HB): < 330

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.7388		SG-CrMo 9			S50480				
1.7706		GS-17 CrMoV 5 11		SCPH 23	J21610	G 17 CrMoV 5 10	G17CrMoV5-G 10	17 CrMoV 5 10	
1.7707		30 CrMo V9				30 CrMoV 9			
1.7709		21 CrMoV 5 7			K14073	21 CrmoV 5-7	20 CDV 5.07		
1.7715		14 MoV 6 3	1503-660-460		K11591	14 MoV 6-3			
1.7720		G 12 MoCrV 5 2				G 12 MoCrV 5-2	G12MoCrV 5-2	G12MoCrV 5-2	
1.7728		16 CrMoV 4							
1.7729		20 CrMoVTiB 4-10				20 CrMoVTiB 4-10	20 CrMoVTiB 4-10		
1.7734		15 CrMoV 6							
1.7735		14 CrMoV 6 9							
1.7737		45 CrMoV 6 7					45 CDV 4		
1.7745		15 CrMoV 5 10							
1.7766		17 CrMoV 10							
1.7779		20 CrMoV 13 5							
1.7792		580 CrM0V 4							
1.8062		46 SiCrMo 6 3					45 SCD 6		
1.8075		10 CrSiMoV 7							
1.8159	6150	50 CrV 4	735 A 50	SUP 10	G61500	51 CrV 4	50 CV 4	50 CrV 4	2230
1.8161		58 CrV 4							
1.8404	5150	60 MnCrTi 4	BW 2		G51500				
1.8405		70 MnCrTi 8							
1.8425		110 MnCrTi 8							
1.8504		34 CrAl 6							
1.8506		34 CrAlS 5			K23745				
1.8507	A 355 Cl.D	34 CrAlMo 5	905 M 31		K23510	(34 CrAl Mo 5)	30 CAD 6.12	34 CrAlMo 7	
1.8515		31 CrMo 12	722 M 24			31 CrMo 12	30 CD 12	31 CrMo 12	2240
1.8519		31 CrMoV 9			K42544	31 CrMoV 9		31 CrMoV 10	
1.8564			4S.106						
1.8599		8 CrMo 16							
1.8701		20 MnCr 5 3							
1.8702		21 MnCr 5 4							
1.8706		21 MnCr 7 5							
1.8708		20 MnCrNiMo 6 3							
1.8716		16 MnCrMo 3 2							
1.8717		16 MnCrMo 4 3							
1.8719		15 MnCrMo 3 2							
1.8720		18 MnCr 5 3							
1.8801		S 355 G2 N							
1.8802		S 355 G3 N							
1.8803		S 355 G4 M							
1.8804		S 355 G5 M							
1.8805		S 355 G6 M							
1.8806		S 355 G11 NM							
1.8807		13 MnNiMo 5 4							
1.8808		S 355 G7 M							
1.8809		S 355 G12 NM							
1.8810		S 355 G8 MN							
1.8811		S 355 G8 M							
1.8813		S 355 G10 M							
1.8814		S 355 G1 N							

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.8819		PS 275 TMK	S 275 ML			S 275 ML	S 275 ML	S 275 ML	
1.8822		S 355 G1 M				S 355 G 1 M			
1.8829		S 500 M				S 500 m			
1.8830		S 420 G1 M				P 550 M			
1.8838		BTStE 460 TM	S 460 ML			S 460 ML	E 460	S 460 ML	
1.8839		S 500 ML				S 500 ML			
1.8843		S 275 MH				S 275 MH		S 275 MH	
1.8844		S 275 MLH				S 275 MLH		S 275 MLH	
1.8845		S 355 MH				S 355 MH		S 355 MH	
1.8846		S 355 MLH				S 355 MLH		S 355 MLH	
1.8847		S 420 MH				S 420 MH		S 420 MH	
1.8848		S 420 MLH				S 420 MLH		S 420 MLH	
1.8849		S 460 MH				S 460 MH		S 460 MH	
1.8850		S 460 MLH				S 460 MLH		S 460 MLH	
1.8851		S 420 G3 M							
1.8852		S 420 G6 Q							
1.8853		FStE 355 OS 4/ S420G5Q				S 420 G 2			
1.8857		S 420 G2 M							
1.8859		S 420 G4 M							
1.8861		St835/1030							
1.8863		54SICR7							
1.8878		P 550 QL				P 550 QL			
1.8883		S 460 G3 M							
1.8884		S 460 G6 Q							
1.8885		S 460 G5 Q							
1.8887		S 460 G2 N							
1.8889		S 460 G4 M							
1.8900		St E 380		SM 50 B		S 380 N		Fe E 390 KG	
1.8901		StE 460	S 460 N			S 460 N	E 460	S 460N	
1.8902	A 633 Gr. E	St E 420	S 420 N	SM 50 C	K02002	FeE 420 KGN	E 420-I	Fe E 420 KG	2143
1.8903		TStE 460	S 460 L			S 460 NL	E460	S 460 NL	
1.8904		S 550 Q				S 550 Q	E 550	S 550 Q	
1.8905	A 633 Gr. E	St E 460	P 460 N	SM 53 B	K02900	P 460 N	E 460-I	Fe E 460 KG	2143
1.8906		BGH 8906	55 F			S 460 QL	S 460 QL	S 460 QL	
1.8907		St E 500		SM 58	K02001				
1.8908		S 460 Q	55 F			S 460 Q	E 460	S 460 Q	
1.8910		TStE 380/ S380NL				S 380 NL		Fe E 390 KT	2117
1.8911		EStE 380/ S380NL1							
1.8912		S 420 NL/ TStE 420	S 420 NL	STK 540	K02002	S 420 NL	E 420 T-I	Fe E 420 KT	
1.8913		EStE 420/ S420NL1		STK 540					
1.8914		S 620 Q				S 620 Q	E 620	S 620 Q	
1.8915		T St E 460/ P460NL1	P 460 NL 1		K02900	P 460 NL1	E 460 T-I	Fe E 460 KT	
1.8916		S 460 QL1	55 F			S 460 QL 1			
1.8917		T St E 500			K02001		E 500 T-I		
1.8918		EStE 460/ P460NI2	P 460 NL 2			P 460 NL 2	P 460 NL 2	P 460 NL 2	
1.8919		EStE 500/S500 NL1					S 500 NL 1		
1.8920		TStE 690 VA/ S690G1QL				S 690 G 1 QL			

Workpiece Material Conversion Table • P3

P3 Medium to High Plain-Carbon Steels and Alloy Steels Content: C >.25% Tensile Strength RM (MPa)*: 600-850 Hardness (HB): <330

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.8921		TStE 690 VB/			K11646	S 690 G 2 QL			
1.8922		S 690 G 4 QL/ TStE 690 VC				S 690 G 4 QL			
1.8923		S 590 QL/ TStE 590 V				S 590 QL			
1.8924		S 500 Q (StE 500 V)				S 500 Q	E 500	S 500 Q	2614
1.8925		S 890 QL 1 (EStE 90 V)				S 890 QL 1			
1.8928		S 690 QL (TStE 690 V)		SHY 685 NS		S 690 QL			
1.8929		TStE 690 VD/ S690G3QL				S 690 G 3 QL			
1.8930		WSt E 380/ P380Nh				P 380 NH		Fe E 390 KW	2116
1.8931		S 690 Q/ StE 690 V		SHY 685 N		S 690 Q	E 690	S 690 Q	
1.8932		WSt E 420/ P420NH	S 420 NL	STK 540	K02002	S 420 NL	S 420 NL	Fe E 420 KW	
1.8933		S 960 QL/ TStE 960 V				S 960 QL			
1.8934		S 960 QL 1							
1.8935		WSt E 460/ P460NH	P 460 NH		K02900	P 460 NH	P 460 NH	Fe E 460 KW	
1.8936		P420 QH				P 420 QH			
1.8937		WSt E 500/ P500NH			K02001				
1.8938		TStE 770 V/ S770QL				S 770 QL			
1.8939		EStE 790 V/ S790QL1				S 790 QL 1			
1.8940		S 890 Q				S 890 Q	S 890 Q	S 890 Q	
1.8941		S 960 Q				S 960 Q	E 960 T-II	S 960 Q	
1.8944		S 550 G 1 QL 1/ EStE 550 VA				S 550 G 1 QL 1			
1.8945		S 355 J 0 WP	WR 50 A			S 355 J0 WP	E 36 W-A3	S 355 J0 WP	
1.8946		S 355 J 2 WP	S 355 J 2 WP			S 355 J2 WP	E36W-A4	S 355 J2 WP	
1.8947		L 415 QB				L 415 QB	L 415 QB		

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.8948		L 360 QB				L 360 QB	L 360 QB		
1.8952		L 450 QB				L 450 QB	L 450 QB		
1.8953		S 460 NH (FGS 47)				S 460 NH		S 460 NH	
1.8954		EStE620VA/ S 620 G 1 QL 1				S 620 G 1 QL 1			
1.8955		L 485 QB				L 485 QB	L 485 QB		
1.8956		S 460 NLH / FG S 47				S 460 NLH		S460NLH	
1.8957		L 555 QB				L 555 QB	L 555 QB		
1.8962		9 CrNiCuP 3 2 4	WR 50 A	SPA-H	K11430				
1.8963		WTSt 52-3	WR 50 C	SMA 58 W	K11430	S 355 J 2 G 1 W	E 36 W-A2		
1.8964		EStE 690 VA				S 690 G1 QL1			
1.8965		S 355 J 2 G 2 W	S 355 J 2 G 2 W			S 355 J 2 G 2 W	S 355 J 2 G 2 W	S 355 J 2 G 2 W	
1.8966		S 355 K 2 G 1 W	S 355 K 2 G 1 W	SMA 490 CW		S 355 K2 G1 W	S 355 K2 G1 W	S 355 K 2 G 1 W	
1.8967		S 355 K 2 G 2 W	S 355 K 2 G 2 W			S 355 K2G2 W	S 355 K 2 G 2 W	S 355 K 2 G 2 W	
1.8968		L 515 MB							
1.8969		QStE 600 TM/ S 600 MC				S 600 MC	E 620 D	S 600 MC	
1.8972		StE 415.7/ L 415 NB				L 415 NB	L 415 NB		
1.8973		StE 415.7 TM/ L 415 MB				L 415 MB	L 415 MB		
1.8974		S 700 MC (QStE 690 TM)				S 700 MC	E 690 D	S 700 MC	
1.8975		L 450 MB/StE 445.7 TM				L 450 MB	L 450 MB		
1.8976		S 650 MC (QStE 650 TM)				S 650 MC	E 620 D	S 650 MC	
1.8977		L 485 MB/StE 480.7 TM				L 485 MB	L 485 MB		
1.8978		StE 550.7 TM/ L 555 MB				L 555 MB	L 555 MB		
1.8989		22 MnCrMoV 6							

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

AISI — American Iron and Steel Institute
AFNOR — French National Organization for Standardization
AMS — Aerospace Material Specifications
ASTM — American Society of Mechanical Engineers
BS — British Standards
DIN — German Institute for Standardization
EN — European Standards
JIS — Japanese Industrial Standards
SAE — Society of Automotive Engineers
SIS — Swedish Standards Institute
UNI — Italian Organization for Standardization
UNS — Unified Numbering System

Workpiece Material Conversion Table • P4

P4 Alloy Steels and Tool Steels — **Content: C >.25%** — **Tensile Strength RM (MPa)*: 800-1100** — **Hardness (HB): 350-450**

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.0319		L 210 GA				L 210 GA	TS E 220 class 2		
1.0418		L 245 MB	430		K03006	L 245 MB	L 245 MB		
1.0429		L 290 MB				L290MB	L 290 MB		
1.0457		StE 240.7				L 245 NB	L 245 NB		
1.0458		HIII/L 235 GA				L 235 GA			
1.0459		L 245 GA/ RRStE 240.7				L 245 GA	TS E 250		
1.0470		21Mn4Al							
1.0479		13 Mn 6							
1.0480		H 260/ ZSt E 260	H 240 LA			H 240 LA	E 240 C		
1.0483		L 290 AG				L290GA	TS E 290		
1.0484		L 290 NB				L290NB	L 290 NB		
1.0485		21 Mn 6			K12320				
1.0489		H 300/ ZSt E 300	H280LA			H 280 LA	E 280 C		
1.0491		TStE 275 (S 275 NL)	40EE			S 275 NL	S 275 NL	S 275 NL	
1.0499		L 360 GA				L 360 GA			
1.0519	1046	S 355 K 2 G 4 Cu			G10460	S 355 K2 G4 Cu			
1.0545		S 335 N (StE 355)	50 E			S 355 N	E 355	S 355 N	2134
1.0546		S 355 NL (TStE 355)	50 E E			S 355 NL	E 355	S 355 N L	2135
1.0548		ZStE 340/ H 340	H 320 L A		H 320 LA	E 315 C			
1.0550		ZStE 380/ H 380	H 360 L A			H 360 LA	E 355 C		
1.0556		ZStE 420/ H 420	46/40 HR, HS, CS			H 400 LA	H 400 LA		
1.0574		ZStE 460/ H 460							
1.0585		S 355 J 2 G 3 Cu/St 52-3 Cu3				S 355 J2 G3 Cu + CR			
1.0587		QSt 52-3 Cu 3				S 355 J2 G3 Cu C			
1.0729		70 S 20							
1.0900		38 Si 6							
1.0901		38 Si 2							
1.0902		46 Si 7					45 S 7		
1.0903	9255	51 Si 7	250 A 53		G92550		51 S 7	48 Si 7	2090
1.0904	9255	55 Si 7	250 A 53	SKH 1; SKT 4	G92550	55 NiCrMoV 7	55 S 7	55 Si 8	2085
1.0905		38 Si 3							
1.0906		65 Si 7	250 A 61						
1.0908		60 SiMn 5							
1.0924		65 SiMn 5							
1.0961	9262	60 SiCr 7	250 A 61	SUP 7	G92620	60 SiCr 8	60 SC 7	60 SiCr 8	
1.0966		QSt E 690 TM (S 700 MC)				S 700 MC	S 690 MC	S 700 MC	
1.0971		QSt E 260 N 7 S 260 NC		AE 275 NC		S 260 NC		S 260 NCX	
1.0972		QSt E 300 TM/ S 315 MC	43 F35 HR, HS, CS			S 315 MC	E 315 D	S 315 MC	

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.0973		QSt E 300 N 7/ S 315 NC		AE 340 NC		S 315 NC		S 315 NC	
1.0974		QSt E340 TM	HR 40/30			S 340 MC	E 335 D		
1.0975		QSt E340 N				S 340 NC		Fe E 355 TD	
1.0976		QSt E 360TM				S 355 MC	E 355 D	Fe E 355 TM	
1.0977		QSt E360 N				S 355 NC		Fe E 355 TD	
1.0978		QSt E380 TM				S 380 MC	E 390 D		
1.0979		QSt E380 N				S 380 NC		Fe E 380 TD	
1.0980		QSt E420 TM	HR 50 F 45			S 420 MC	E 430 D	Fe E 420 TM	
1.0981		QSt E 420 N				S 420 NC		Fe E 420 TD	
1.0982		QSt E 460 TM	50/45 HR			S 460 MC	E 445 D		
1.0983		QSt E 460 N				S 460 NC		Fe E 460 TD	
1.0984		QSt E500 TM				S 500 MC	E 490 D	Fe E 490 TM	2662
1.0985		QSt E500 N				S 500 NC			
1.0986		QSt E550 TM	60/55 HS			S 550 MC	E 560 D	Fe E 560 TM	
1.0987		QSt E550 N				S 550 NC			
1.1128	1548	46 Mn 5			G15480				
1.1136		G 24 Mn 4/ GS 24 Mn 4				G 24 Mn 4			
1.1197		25 MnV 5							
1.1199		49 MnVS 3	280 M 01						
1.1226	1552	52 Mn 5			G15520				
1.1235		37 Mn 6							
1.1302		30 MnVS 6				30 MnVS 6			
1.1303		38 MnVS 6				38 MnVS 6			
1.1304		46 MnVS 6				46 MnVS 6			
1.1305		46 MnVS 3				46 MnVS 3			
1.1335		WSt E315 S							
1.1337		WSt E 355							
1.2058		39 Cr 4							
1.2063		145 Cr 6							
1.2067	L3	100 Cr 6	B L 3		T61203	102 Cr 6	Y 100 C 6	102 Cr 6 KU	
1.2101		62 SiMnCr 4							
1.2108		90 CrSi 5		SFVC 2A		P 280 GH		C 100 KU	2092
1.2109		125 CrSi 5							
1.2125	5160	65 MnCr 4	En48		G51600				
1.2127		105 MnCr 4		SUJ 3				100 CrMn 4 KU	
1.2129		200 CrMn 8				G 200 CrMn 8			
1.2162		21 MnCr 5		SCR 420 H		21 MnCr 5	20 NC 5		
1.2203		145 V 12							
1.2206	O 6	140 CrV 1			T31506		130 C 3		
1.2208		31 CrV 3				31 Cr V2			
1.2210	L-2	115 CrV 3			T61202	107 Cr V 3 KU	100 C 3	107 CrV 3 KU	
1.2235		80 CrV 2			T91905	80 Cr V 2			
1.2236		80 CrV 2 3							
1.2241	S6	51 CrMnV 4			T41906	51 CrMnV 4		51 CrMnV 4 KU	
1.2242		59 CrV 4							

Workpiece Material Conversion Table • P4

P4 Alloy Steels and Tool Steels — **Content: C >.25%** — **Tensile Strength RM (MPa)*: 800-1100** — **Hardness (HB): 350-450**

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.2243		61 CrSiV 5							
1.2248		38 SiCrV 6							
1.2249		45 SiCrV 6							
1.2302		35 CrMo 7				35 CrMo 7			
1.2303	L 7	100 CrMo 5							
1.2305		102 CrMo 6							
1.2307		29 CrMoV 9							
1.2311	P20	40 CrMnMo 7	BP20					35 CrMo 8 KU	
1.2312		40 CrMnMoS 8 6					40 CMD 8		
1.2313		21 CrMo10							
1.2320		G 60 CrMoV 10 7							
1.2323		48 CrMoV 67					45 CDV 6		
1.2326		G 48 CrMoV 6 7							
1.2328		45 CrMoV 7							
1.2329		46 CrSiMoV 7							
1.2330	P-20	35 CrMo 4	BP 20		T51620		4135	35 CrMo 4	
1.2332	4145	47CrMo 4			G41450		4142		
1.2333		G 59 CrMoV 18 5							
1.2334		62 CrMoV 6							
1.2355		50 CrMoV 13 15				50 CrMoV 13-15			
1.2356		60 CrMoV 13 5							
1.2358		60 CrMoV 18 5							
1.2369		81 MoCrV 42 16							
1.2382		GX 155 CrVMo 121							
1.2414		120 W 4							
1.2419		105 WCr 6		SKS 31		105 WCr 5	(107 WCr 13)	107 WCr 5 KU	2140
1.2424		75 WCr 12							
1.2442	W 5	115 W 8			T72305				
1.2510	O 1	100 MnCrW 4	BO 1	SKS 3	T 31501	(95 MnWCr 5)	90 MWCV 5	95 MnWCr 5 KU	2140
1.2511		80 WCrV 3							
1.2515		100 WV 4		SKS 21					
1.2516	A-10	120 WV 4	BF 1		T30110		110 WC 20	110 W 4 KU	
1.2519		110 WCrV 5							
1.2521		110 WCrV 8							
1.2542	S1	45 WCrV 7	BS 1		T 41901	45 WCrV 8	45 WCr V 8	45 WCrV 8 KU	2710
1.2549		50 WCrV 8				50WCrV8			
1.2550	S1	60 WCrV 7	BS1			60 WCrV 8	55 WC 20	55 WCrV 8 KU	
1.2552		80 WCrV 8							
1.2562		142 WV 13							
1.2603		45 CrVMoW 5 8							
1.2604		73 WCrMoV 22							
1.2661		38 CrCoWV 18 17 17				38 CrCoWV 18-17-17			
1.2705		80 NiCr 11							
1.2708		54 NiCrMoS 6							
1.2710		45 NiCr 6							

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.2711		54 NiCrMoV 6					55 NCDV 6		
1.2713	L6	55 NiCrMoV 6	BH 224/5	SKT 4	T61206	55 NiCrMoV 7	55 NCDV 7	55 NiCrMoV 7 KU	
1.2714	P5	56 NiCrMoV 7			T51605	56 NiCrMoV 7		56 NiCrMoV 7 KU	
1.2718		55 NiCr 10							
1.2721		50 NiCr 13					55NCD13		
1.2726		26 NiCrMoV 5							
1.2735	P6	15 NiCr 14		SNC 22	T51606		10 NC 12		
1.2736		55 CrNiMo 4							
1.2737		28 NiCrV 5							
1.2738		40 CrMnNiMo 8 6 4				40 CrMnNiMo 8-6-4			
1.2739		40 CrNiMoV 3 3 4							
1.2740		28 NiCrMoV 10							
1.2741		55 CrNiMoVS 4 2 4							
1.2742		55 CrNiMoV 4 2 4							
1.2743		60 NiCrMoV 12 4							
1.2744		57 NiCrMoV 7 7				55 NiCrMoV 7			
1.2745		14 NiCr 18							
1.2747		28 NiMo 1 7							
1.2762		75 CrMoNiW 6 7							
1.2766		35 NiCrMo 16							
1.2768		25 NiCrMo 12							
1.2770		85 NiV 4							
1.2773		75 NiCrMo 5 3 3							
1.2778		GS-20 MoNi 33 13							
1.2823		70 Si 7							
1.2824		70 MnMoCr 8				70 MnMoCr 8			
1.2825		95 MnWCr 5				95 MnWCr 5			
1.2826		60 MnSi 4					60 MSC 4		
1.2833	W 210	100 V 1	BW 2	SKS 43	T72302	100 V 2	Y1 105 V	102 V 2 KU	
1.2834		105 V				105 V			
1.2838		145 V 33							
1.2840							20 MV 6		
1.2842	O 2	90 MnCrV 8	BO 2		T31502	90 Mn V 8	90 MV 8	90 MnVCr 8 KU	
1.2851		34 CrAl 6							
1.2891		34 CrAlNi 7							
1.3501	E 50100	100 Cr 2			G50986		100 C 2		
1.3503	E 51100	105 Cr 4			G51986				
1.3505	E 52100	100 Cr 6	535 A 99	SUJ 2	G52986	100 Cr 6	100 C 6	100 Cr 6	2258
1.3514		101 Cr 6						102 Cr 6 KU	

Workpiece Material Conversion Table • P4

P4 Alloy Steels and Tool Steels — **Content: C >.25%** — **Tensile Strength RM (MPa)*: 800-1100** — **Hardness (HB): 350-450**

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.3515		20 MnCr 4 2							
1.3518		100 CrMnSi 4 4							
1.3519		100 CrMnSi 6 6							
1.3520		100 CrMn 6			K19195	100 CrMn 6	100 CM 6		
1.3523		19 MnCr 5							
1.3531		16 CrNiMo 6	820A16				16 NCD 6	16NiCrMo6	
1.3532		16 NiCrMo 16 5							
1.3536		100 CrMn 7 3				100 CrMnMo 7	100 CD 7		
1.3537		100 CrMo 7		SUS 4	K19965	100 CrMo 7	100 CD 7	100CrMo7	
1.3539		100 CrMnMo 8					100 CrMnMo 8		
1.3555		13 MoCrNi 42 16 14							
1.3559		20 Cr 3							
1.3565	4147	48 CrMo 4	817 M 40	SNC 836	H41470		48 CrMo 4		
1.3566		15 CrMo 4							
1.3567		20 CrMo 4							
1.3570		20 MnCrMo 4 2							
1.3576		20 NiCrMo 7							
1.4475		GX 150 CrNiMoCuN 41 6 2							
1.4560		X 3 CrNiCu 19 9 2				S 124 M	PHYHQ 4560	304 RH1	
1.4700		8 CrSi 7 7							
1.5021		48 Si 7							
1.5022		38 Si 6							
1.5023		38 Si 7							
1.5024		46 Si 7				45 Si	46 S 7		
1.5025	9259 H	51 Si 7				50 Si 7		48 Si 7	2090
1.5026		55 Si 7	250 A 53		G92550	56 Si 7	55 S 7	55 Si 8	2085
1.5027	9260	60 Si 7	251 A 60		G92600	60 Si 7	60 S 7	60 Si 7	
1.5028		65 Si 7		SUP 7					
1.5067	1335	30 Mn 7			G13350				
1.5085		51 Mn 7							
1.5086		12 Mn 8				11 Mn 8 KE			
1.5094		38 MnS 6				38 MnS 6			
1.5111		9 MnSi 5							
1.5112		10 MnSi 5				9 MnSi 53 KE			
1.5120		38 MnSi 4							
1.5121		46 MnSi 4							
1.5122 F.130.A		37 MnSi 5					38 MS 5		
1.5125		11 Mn Si 6				10 MN Si 63 KE			
1.5126		12 MnSi 5							
1.5128		10 MnSi 44							
1.5130		10 MN Si 7				10 Mn Si 74 KE			
1.5142		60 SiMn 5							
1.5213		15 MnV 5							
1.5216		17 MnV 6							
1.5217		20 MnV 6			K02304				
1.5218		22 MnV 6							
1.5219		41 MnVS 5							

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.5223		42 MnV 7							
1.5225		51 MnV 7							
1.5231		38 MnSiVS 5							
1.5232		27 MnSiVS 6							
1.5233		44 MnSiVS 6							
1.5243		42 MnSiV 3 3							
1.5309		8 MnTi 4							
1.5402		15 MnMoV 4 5				15 MnMo V 4-5	15 MDV 4.05		
1.5403		17 MnMoV 6 4	1501-261	SBV 3	K12766				
1.5407		10 MnMoCrV 4 7							
1.5408		30 MoB 1							
1.5419	4419	GS-22 Mo 4	243-430	SCPH 11	G44190	G 20 Mo 5	G20Mo5	G 22 Mo 5	
1.5420		27 MnMo 33 Pb							
1.5421		20 MnMo 3 5			K12121				
1.5422		G 18 Mo 5				G18Mo5		G 18 Mo5	
1.5424		10 MnMo 4 5							
1.5425		11 MnMo 4 5			K11123	11 MnMo 45 KE			
1.5426		13 MnMo 6 5			K11424	11 MnMo 65 KE			
1.5427		13 MnMo 8 5			K11423	11 MnMo 85 KE			
1.5428		13 MnMo 12 5							
1.5432	4037	42 MnMo 7	En 16		G40370				
1.5437		70 MoMn 10 4							
1.5465		26 MnMoB 6 4							
1.5472		6 CuNb 15 5							
1.5473		6 Nb 5							
1.5520		17 MnB 4							
1.5524		37 MnB 4							
1.5526		30 MnB 4							
1.5527		40 MnB 4	170 H 41	SWRCHB 437					
1.5528		22 MnB 5							
1.5531	15B 28 H	30 Mn B 5		SWRCHB 634			30 Mn B 5	30 Mn B 5	
1.5532	15B 37 H	38 Mn B 5		SWRCHB 737		38 Mn B 5	38 Mn B 5	38 MnB 5	
1.5535		23 MnB 4							
1.5536		27 MnB 4							
1.5538		37 MnB 5							
1.5622	A 350 -LF 5	14 Ni 6		SL2N26	K22103	FeE 285 Ni 6	15 N 6	14 Ni 6	
1.5634		75 Ni 8							
1.5639	A2317	16 Ni 14		SHY 70	K31918		3.5 Ni		
1.5710	3135	36 NiCr 6	640 A 35	SNC 236	K22033		30 NC 6		
1.5714		16 NiCr 4	16 NiCr 4			16 NiCr 4	16 NiCr 4		
1.5715		16 NiCrS 4	16NiCrS4			16 NiCrS 4	16 NiCrS 4		
1.5732	3415	14 NiCr 10		SNC 415 H			14 NC 12	16 NiCr 11	
1.5733		14 NiCrPb 10							
1.5736	3435	36 NiCr 1 0		SNC 631 H			30 NC 11	35 NiCr 9	
1.5737		30 NiCr 11					30NC12		
1.5752	E	14 NiCr 14	655 M 13	SNC	G33106	13 NiCr 12	16 NC 11	16 NiCr 11	

Workpiece Material Conversion Table • P4

P4 Alloy Steels and Tool Steels						Content: C >.25%				Tensile Strength RM (MPa)*: 800–1100						Hardness (HB): 350–450			
Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS	Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
			3310			815 H				1.6582	4340	34 CrNiMo 6	817 M 40	SNCM 447	G43370	34 CrNiMo 6	35 NCD 6	35 NiCrMo 6 KB	2541
1.5755		31 NiCr 14	653 M 31	SNC 836			18 NC 13			1.6583		35 CrNiMo 6							
1.5807		15NiCr 6 4								1.6585		29 CrNiMo 8							
1.5808		26 NiCr 64								1.6586		31 CrNiMo 8			K23550				
1.5815		36 NiCr 6 4								1.6587		17 CrNiMo 6	820 A 16	SNCM 815		17 CrNiMo 7	18 NCD 6	18 NiCrMo 7	2523
1.5860		14 NiCr 18								1.6589		34 CrNiMo 6 S							
1.5918		17 CrNi 6 6	17 CrNi 6-6			17 CrNi 6-6	16 CN 6			1.6655		32 NiCrMo 12 5			K34035		30 NCD 12		
1.5919		15 CrNi 6	S107	SNCM 420	H43200	14 CrNi 6	16 NC 6	16 CrNi 4		1.6658								15NiCrMo 10-6	
1.5920		18 CrNi 8					20 NC 6			1.6723		15 NiCrMo 16 5	835 M 15				15 NiCrMo 16-5		
1.6211		16 MnNi 6 3								1.6732		28 NiCrMo 5 5							
1.6213		12 MnNi 6 3				FeE 285 Ni 2				1.6738		40 NiCrMo 18 6							
1.6215		9 MnNi 4								1.6739		30 NiCrMo 9 5							
1.6216		17 MnNi 4								1.6743		32 NiCrMo 10 4	826 M 31						
1.6218		9 MnNi 6								1.6745		40 NiMoCr 10 5	4S.99						
1.6222		9 NiMn 5			K10940					1.6746		32 NiCrMo 14 5	830 M 31				35 NCD 14		
1.6223		11 NiMn 84								1.6747		30 NiCrMo 16 6					35 NCD 16		
1.6225		11 NiMn 54								1.6752		22 NiMoCr 67							
1.6227		11 NiMn 9 4			K21010					1.6755	4718	22 NiMoCr 4 7			G47180				
1.6310		20 MnMoNi 5 5					18 MND 5			1.6757		20 NiMoCr 6 5							
1.6341		11 NiMoV 5 3								1.6758		23 MnNiMoCr 5 4							
1.6342		12 MnNiMoV 5 4								1.6782		16 NiCrMO 12 6					16 NCD 13		
1.6343		12 MnNiMo 5 5								1.6785		3 NiMoCr 12 20							
1.6347		26 NiMoV 14 4								1.6918		15 MnNiMoV 5 3							
1.6348		20 NiMoV 14 5								1.6919		11 NiMnCrMo 5 5							
1.6368		15 NiCuMoNb 5	3604-591	SBV 2	K12039					1.6920		15 MnCrMoNiV 5 3				15 MnCrMoNiV 5-3			
1.6369		15 NiCuMoNb 5 S								1.6932		28 NiCrMoV 8 5				28 NiCrMoV 8-5			
1.6511	9840	36 CrNiMo 4 4 KB	816 M 40		G98400	36 CrNiMo 4	40 NCD 3	38 NiCrMo		1.6935		35 CrNiMoV 8							
1.6513		28 NiCrMo 4								1.6946		30 CrMoNiV 5.11 V							
1.6522		20 NiCrMo 2	605 M 36				20 NiCrMo 2			1.6947		30 NiCrMo 14 5							
1.6523	8620	21 NiCrMo 2	805 M 20	SNCM 220 H	G86200	20 NiCrMo 2 KD	20 NCD 2	20 NiCrMo 2	2506	1.6948		26 NiCrMoV 11 5							
1.6526		20 NiCrMoS 2 2				20 NiCrMoS 2-2	20 NiCrMoS 2-2			1.6949		35 NiCrMoV 11 5						30NiCrMoV 12	
1.6527		20 NiCrMo 3								1.6950		20 NiCrMoV 14 6							
1.6540		23 MnNiCrMo 5 3								1.6951		32 NiCrMoV 14 5							
1.6542		24 MnNiCrMo 6 2								1.6953		26 NiCrMo 14 5					25NCD15		
1.6543	8622	21 NiCrMo 2 2	805A20	SNCM 2 KD	G86220	20 NiCrMo 220 H	22 NCD 2		2506	1.6955		32 NiCrMoV 10							
1.6545	8630	27 CrNiMo 2			G86300	30 NiCrMo 2 KD	30 NCD 2	30 NiCrMo 2 KB		1.6956		33 NiCrMoV 14 5				33 NiCrMoV 14-5	30 NCD 15		
1.6546	8640	40 NiCrMo 7 2 KB		SNCM 240	G86400	40 NiCrMo 2 KD	40 NCD 2	4 0NiCrMo 2 KB		1.6957		26 NiCrMoV 14 5							
1.6562	E4340	40 NiCrMo 7	817 M 40		G43406			40NiCrMo7		1.6959		35 NiCrMoV 12 5							
1.6563		41 NiCrMo 7 3 2				41NiCrMo 7-3-2	41NiCrMo 7-3-2			1.6971		79 Ni 1							
1.6565	4340	40 NiCrMo 6	818M40	SNCM	G43400 349														
1.6571		20 NiCrMoS 6 4				20 NiCrMoS 6-4	20 NiCrMoS 6-4												
1.6580		30 CrNiMo 8	823 M 30 431	SNCM		30 CrNiMo 8 KD	30 CND 8	30 NiCrMo 8	3524										
1.6581		32 NiCrMo 8 5																	

Workpiece Material Conversion Table • P4

P4 Alloy Steels and Tool Steels — **Content: C >.25%** — **Tensile Strength RM (MPa)*: 800–1100** — **Hardness (HB): 350–450**

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.6972		83 Ni 1							
1.7001		38 Cr 1						38 Cr 1 KB	
1.7002		46 Cr 1							
1.7003	50 B40	38 Cr 2	120 M 36	SMn 438	G50401	38 Cr 2 KD	38 C 2	38 Cr 2	
1.7005		45 Cr 2				45 Cr 2		45 Cr 2	
1.7006	5045	46 Cr 2	605 M 36	SMn 443	H51500	46 Cr 2 KD	42 C 2	45 Cr 2	
1.7007	50 B40	37 CrB 1	120 M 36	SMnC 3 H	H50401	38 Cr 2		35 CB 1	
1.7012		13 Cr 2							
1.7014		17 CrS 3	17 CrS3			17 CrS 3	17 CrS 3		
1.7017		60 Cr 3							
1.7020		32 Cr 2							
1.7021		32 CrS 2							
1.7023		38 CrS 2	38 CrS 2			38 CrS 2	38 C 2u	38 CrS 2	
1.7025		46 CrS 2	46 CrS 2	46 CrS 2		46 CrS 2	46 CrS 2	46 CrS 2	
1.7027		20 Cr 4							
1.7028		20 CrS 4							
1.7030	5130	28 Cr 4	530 A 30		G51300	28 Cr 4	30 CD 4		
1.7033	5130 H	34 Cr 4	530 A 32	SCr 430 H	G51300	34 Cr 4 KD	32 C 4	34 Cr 4 KB	
1.7034	5132 H	37 Cr 4	530 A 36	SCr 435 H	G51320	37 Cr 4	38 C 4	36 CrMn 4	
1.7035	5140	41 Cr 4	530 M 40	SCr 440 H	G51400	41 Cr 4	42 C 4	41 Cr 4	
1.7036		28 CrS 4				28CrS4	28CrS4		
1.7037		34 CrS 4	34 CrS 4			34 CrS 4	34 CrS 4	34 CrS 4	
1.7038	5135	37 CrS 4	37 CrS 4			37 CrS 4	38 C 4 u	37 CrS 4	
1.7039		41 CrS 4	41 CrS 4			41 CrS 4	41 CrS 4	41 CrS 4	2245
1.7043		38 Cr 4				38 Cr 4		38 Cr 4	
1.7045	5140	42 Cr 4	530 A 40	SCr 440		40 NiCrMo 3	42 C 4 TS	40 NiCrMo 3	2245
1.7072		36 CrB 2							
1.7075		46 CrB 2							
1.7076		32 CrB 4							
1.7077		36 CrB 4							
1.7102		54 SiCr 6					54 SC 6		
1.7103		67 SiCr 5				67 SiCr 5		67 SiCr 5	
1.7104		55 SiCr 6 3							
1.7105		65 SiCr 5 2							
1.7106		55 SiCr 7							
1.7107		65 SiCr 7							
1.7108	9262	60 SiCr 7				60 SiCr 8			
1.7116		42 MnNiCrB 4 3							
1.7117		52 SiCrNi 5					52 SCN 5		
1.7121		20 CrMnS 3 3							
1.7131	5115	16 MnCr 5	527 M 17	SCR 415	G 51150	16 MnCr 5 KD	16 MC 5	16 MnCr 5	2173
1.7135		8 MnCrB 3							
1.7137		60 MnCrB 3							
1.7138	50 B 50 H	52 MnCrB 3		SUP 11	H50501				
1.7139		16 MnCrS 5							
1.7146		20 MnCrPb 5							
1.7147	5120	20 MnCr 5		SMnC 420 H	G51200	20 MnCr 5	20 MC 5	20 MnCr 5	

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.7148		30 MnCrB 4 2							
1.7149		20 MnCrS 5				20 MnCrS 5			
1.7160		16 MnCrB 5	16MnCrB5			16MnCrB5	16MnCrB5		
1.7162		17 MnCrB 5 5							
1.7176	5155	55 Cr 3	527 A 60	SUP 9 (A)	G51550	55 Cr 3	55 C 3	55 Cr 3	2253
1.7182		27 MnCrB 5 2				27 MnCrB 5-2	27 MnCrB 5-2	27 MnCrB 5-2	
1.7185		33 MnCrB 5 2				33 MnCrB 5-2	32MCB5	33 MnCrB 5-2	
1.7186		20 MnCr B5							
1.7189		39 MnCrB 6 2				39 MnCrB 6-2	39 MnCrB 6-2	39 MnCrB 6-2	
1.7190		35 CrSi 84							
1.7213		25 CrMoS 4	25 CrMoS 4			25 CrMoS 4	25 CD 4u	25 CrMoS 4	
1.7214		25 CrMo 4						25 CrMo 4 F	
1.7217		25 CrMoPb 4							
1.7218	4130	25 CrMo 4	708 A 25	SCM 420	G41300	25 CrMo 4 KD	25 CD 4	25 CrMo 4 (KB)	2225
1.7219		26 CrMo 4			K13047				
1.7220	4137	34CrMo4	708 A 37	SCM 435 H	H41350	34 CrMo 4 KD	35 CD 4	35 CrMo 4	2234
1.7222		42 CrMoPb 4							
1.7223	4142	41 CrMo 4	708 M 40	SCM 440	G41420	41 CrMo 4	42 CD 4 TS	41 CrMo 4	2244
1.7225	4140	42 CrMo 4	708 A 42	SCM 440 H	G41400	42 CrMo 4	42 CD 4	42 CrMo 4	2244
1.7226		34 CrMoS 4	708 A 37			34 CrMoS 4	34 CD	34 CrMoS 4	2234
1.7227		42 CrMoS 4	708 H 42			42 CrMoS 4	42 CD	42 CrMoS 4	2244
1.7228	4150	50 CrMo 4	708 A 47	SCM 445	G41500 H	50 CrMo 4		50 CrMo 4	
1.7233		42 CrMo 5 6				42CrMo5-6	42CrMo5-6		
1.7243		18 CrMo 4	18CrMo4	SCM 418		18CrMo4	18CD4	18 CrMo 4	
1.7244		18 CrMoS 4	18CrMoS4			18CrMoS4	18CrMoS4		
1.7255		23 CrMo 5							
1.7262		15 CrMo 5		SCM 415 H			12 CD 4		
1.7264		20 CrMo 5		SCM 421			18 CD 4		
1.7271		23 CrMoB 3 3							
1.7272		31 CrMoB 2 1							
1.7305		12 CrMo 11 10							
1.7311		20 CrMo 2							
1.7315		37 CrMo 3							
1.7319		20 MoCrS 3				20 MoCrS 3	20 MoCrS 3		
1.7320		20 MoCr 3				20 MoCr 3	20 MoCr 3		
1.7321		20 MoCr 4		SCM 21 H		20 MoCr 4			
1.7323		20 MoCrS 4				20 MoCrS 4			
1.7325		25 MoCr 4						20 NiCrMo 2	
1.7326		25 MoCrS 4							
1.7335	A182 -F11	13 CrMo 4 4	1501-621	SFVA F 12	K11562	13 CrMo 4-5	15 CD 4.05	14 CrMo 4 5	2216
1.7339		11 CrMo 5 5			K22094				
1.7340		UP S4 CrMo 1							
1.7341		GS-34 CrMo 4 4							
1.7346		11 CrMo 4 5							
1.7356		7 CrMo 7 5							

Workpiece Material Conversion Table • P4

P4 Alloy Steels and Tool Steels — **Content: C >.25%** — **Tensile Strength RM (MPa)*: 800-1100** — **Hardness (HB): 350-450**

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.7357		GS-17 CrMo 55	B 2	SCPH 21	J11872	G 17 CrMo 5 5	G17CrMo5-5	G 15 CrMo 5 5	
1.7360		31 CrMo 12 5							
1.7361		32 CrMo 12	722 M 24			32 CrMo 12	30 CD 12	32 CrMo 12	2240
1.7363		GS-12 CrMo 19 5		SCPH 61	J42045	GX 12 CrMo 5			
1.7379		GS-18 CrMo 9 10		SCPH 32		G 17 CrMo 9 10			
1.7380	A182 -F22	10 CrMo 9 10	1502-622	SCMV 4	J21890	10 CrMo 9 10	10 CD 9.10	12 CrMo 9 10	2218
1.7383		11 CrMo 9 10	11 CrMo 9-10	SCMV 4		11 CrMo 9-10	10 CD 9.10	11 CrMo 9-10	
1.7384		7 CrM0 11 10	A 33						
1.7385		6 CrMo 9 10							
1.7386		X 12 CrMo 9 1	629-590	STFA 26	S50488	X 10 CrMoVNb 9-1			
1.7389		GX 12 CrMo 101							
1.7503		67 Cr V22							
1.7700							100 HLES		
1.7706		GS-17 CrMoV 5 11		SCPH 23	J21610	G 17 CrMoV 5 10	G17CrMoV 5-10	G 17 CrMoV 5 10	
1.7707		30 CrMo V9				30 CrMoV 9			
1.7711		40 CrMoV 47	1506-670-860	SNB 21-1-5	K14072	40 CrMoV 4-6	42 CDV 4		
1.7715		14 MoV 6 3	1503-660-460		K11591	14 MoV 6-3			
1.7720		G 12 MoCrV 5 2				G 12 MoCrV 5-2	G12MoCrV5-2	G12MoCrV 5-2	
1.7725		GS-30 CrMoV 6 4							
1.7733		24 CrMoV 5 5					20 CDV 6	24 CrMoV 5 5	
1.7734		15 CrMoV 6							
1.7735		14 CrMoV 6 9							
1.7737		45 CrMoV 6 7					45 CDV 4		
1.7741		42 CrMoV 73							
1.7745		15 CrMoV 5 10							
1.7755		GS-45 CrMoV 10 4							
1.7756		GS-36 CrMoV 104				G 36 CrMoV 10 4			
1.7792		580 CrM0V 4							
1.8062		46 SiCrMo 6 3					45 SCD 6		
1.8070		21 CrMoV 5 11						21 CrMoV 5 11	
1.8075		10 CrSiMoV 7							
1.8150		67 CrV 2							
1.8159	6150	50 CrV 4	735 A 50	SUP 10	G61500	51 CrV 4	50 CV 4	50 CrV 4	2230
1.8161		58 CrV 4							
1.8212		21 CrVMoW 12							
1.8401	5130	30 MnCrTi 4	En18A		G51300		28 C 4		
1.8404	5150	60 MnCrTi 4	BW 2		G51500				
1.8405		70 MnCrTi 8							
1.8425		110 MnCrTi 8							
1.8500							100 HLES		
1.8504		34 CrAl 6							

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.8506		34 CrAlS 5			K23745				
1.8507	A 355 Cl.D	34 CrAlMo 5	905 M 31		K23510	34 CrAlMo 5	30 CAD 6.12	34 CrAlMo 7	
1.8509	E 71400	41 CrAlMo 7	905 M 39	SACM 645	J24056	41 CrAlMo 7	40 CAD 6. 12	41 CrAlMo 7	2940
1.8515		31 CrMo 12	722 M 24			31 CrMo 12	30 CD 12	31 CrMo 12	2240
1.8519		31 CrMoV 9			K42544	31 CrMoV 9		31 CrMoV 10	
1.8521		15 CrMoV 59							
1.8523		39 CrMoV 13 9	897 M 39			39 CrMoV 13 9		36 CrMoV 13 9	
1.8550		34 CrAlNi 7			K52440	34 CrAlMo 5			
1.8564			4S.106						
1.8599		8 CrMo 16							
1.8701		20 MnCr 5 3							
1.8702		21 MnCr 5 4							
1.8706		21 MnCr 7 5							
1.8708		20 MnCrNiMo 6 3							
1.8715		17 MnCr 5 3							
1.8716		16 MnCrMo 3 2							
1.8717		16 MnCrMo 4 3							
1.8719		15 MnCrMo 3 2							
1.8720		18 MnCr 5 3							
1.8721		26 MnCr 6 3							
1.8722		24 MnCr 5 5							
1.8734		28 MnCr 4 3							
1.8807		13 MnNiMo 5 4							
1.8812		18 MnMoV 5 2		SG 30	K12003				
1.8815		18 MnMoV 6 3	591						
1.8818		PS 275 TM	S 275 M			S 275 M	S 275 M	S 275 M	
1.8823		DI-MC 355 B				S 355 M	E 355	S 355 M	
1.8825		DI-MC 420 B	S 420 M			S 420 M	E 420	S 420 M	
1.8827		S 460 M	S 460 M			S 460 M	E460; S460M	S460M	
1.8834		BTStE 355 TM	S 355 ML			S 355 ML	E 355	S 355 ML	
1.8836		BTStE 420 TM	S 420 MI			S 420 ML	E 420	S 420 ML	
1.8863		54SICR7							
1.8886		14 MnTi 5							
1.8900		St E 380		SM 50 B		S 380 N		Fe E 390 KG	
1.8902 420 KG	A 633 2143	Gr. E	St E 420	S 420 N	SM 50 C	K02002	FeE 420 KGN	E 420-I	Fe E
1.8904		S 550 Q				S 550 Q	E 550	S 550 Q	
1.8905	A 633 Gr. E	St E 460	P 460 N	SM 53 B	K02900	P 460 N	E 460-I	Fe E 460 KG	2143
1.8906		BGH 8906	55 F			S 460 QL	S 460 QL	S 460 QL	
1.8907		St E 500		SM 58	K02001				
1.8910		TStE 380/ S380NL				S 380 NL		Fe E 390 KT	2117
1.8911		EStE 380/ S380NL1							
1.8912		S 420 NL/ TStE 420	S 420 NL	STK 540	K02002	S 420 NL	E 420 T-I	Fe E 420 KT	
1.8913		EStE 420/ S420NL1		STK 540					
1.8914		S 620 Q				S 620 Q	E 620	S 620 Q	
1.8915		T St E 460/ P460NL1	P 460 NL 1		K02900	P 460 NL1	E 460 T-I	Fe E 460 KT	

Workpiece Material Conversion Table • P4

P4 Alloy Steels and Tool Steels		Content: C >.25%		Tensile Strength RM (MPa)*: 800-1100		Hardness (HB): 350-450			
Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.8916		S 460 QL1	55 F			S 460 QL 1			
1.8917		T St E 500			K02001		E 500 T-I		
1.8918		EStE 460/ P460Nl2	P 460 NL 2			P 460 NL 2	P 460 NL 2	P 460 NL 2	
1.8919		EStE 500/ S500NL1				S 500 NL 1			
1.8920		TStE 690 VA/ S690G1QL				S 690 G 1 QL			
1.8921		TStE 690 VB/ S690G2QL			K11646	S 690 G 2 QL			
1.8922		S 690 G 4 QL/ TStE 690 VC				S 690 G 4 QL			
1.8923		S 590 QL/ TStE 590 V				S 590 QL			
1.8924		S 500 Q (StE 500 V)				S 500 Q	E 500	S 500 Q	2614
1.8925		S 890 QL 1 (EStE 90 V)				S 890 QL 1			
1.8928		S 690 QL (TStE 690 V)		SHY 685 NS		S 690 QL			
1.8929		TStE 690 VD/				S 690 G 3 QL			
1.8930		WSt E 380/ P380Nh				P 380 NH		Fe E 390 KW	2116
1.8931		S 690 Q/ StE 690 V		SHY 685 N		S 690 Q	E 690	S 690 Q	
1.8932		WSt E 420/	S 420 NL	STK 540	K02002	S 420 NL	S 420 NL	Fe E 420	
		P420NH						KW	
1.8935		WSt E 460/ P460NH	P 460 NH		K02900	P 460 NH	P 460 NH	Fe E 460 KW	
1.8936		P420 QH				P 420 QH			
1.8937		WSt E 500/ P500NH			K02001				
1.8938		TStE 770 V/ S770QL				S 770 QL			
1.8939		EStE 790 V/ S790QL1				S 790 QL 1			
1.8940		S 890 Q				S 890 Q	S 890 Q	S 890 Q	
1.8941		S 960 Q				S 960 Q	E 960 T-II	S 960 Q	
1.8944		S 550 G 1 QL 1/ EStE 550 VA				S 550 G 1 QL 1			
1.8954		EStE620VA/ S 620 G 1 QL 1				S 620 G 1 QL 1			
1.8964		EStE 690 VA				S 690 G1 QL1			
1.8969		QStE 600 TM/ S 600 MC				S 600 MC	E 620 D	S 600 MC	
1.8974		S 700 MC (QStE 690 TM)				S 700 MC	E 690 D	S 700 MC	
1.8976		S 650 MC (QStE 650 TM)				S 650 MC	E 620 D	S 650 MC	
1.8981		17 MnCrTi 6							
1.8989		22 MnCrMoV 6							

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

AISI — American Iron and Steel Institute
AFNOR — French National Organization for Standardization
AMS — Aerospace Material Specifications
ASTM — American Society of Mechanical Engineers
BS — British Standards
DIN — German Institute for Standardization
EN — European Standards
JIS — Japanese Industrial Standards
SAE — Society of Automotive Engineers
SIS — Swedish Standards Institute
UNI — Italian Organization for Standardization
UNS — Unified Numbering System

Workpiece Material Conversion Table • P5

P5 Ferritic, Martensitic, and PH Stainless Steels | **Content: C=0-.4%** | **Tensile Strength RM (MPa)*: 600-850** | **Hardness (HB): <330**

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.3542		X 65 Cr 14							
1.3811		X 10 Cr 25							
1.3936		X 2 NiCoTiNb 42 3 2							
1.3937		X 68 NiMnCrVNb 12 5							
1.3950		GX 5 CrNiMo 18 15							
1.4000	403	X 6 Cr 13	403 S 17	SUS 403	S 40300	X 6 Cr 13	Z 6 C 13	X 6 Cr 13	2301
1.4001	410 S	X 7 Cr 14							
1.4002	405	X 6 CrAl 13	405 S 17	SUS 405	S 40500	X 6 CrAl 13	Z 6 CA 13	X 6 CrAl 13	2302
1.4005	416	X 12 CrS 1 3	416 S 21	SUS 416	S 41600	X 12 CrS 13	Z 12 CF 13	X 12 CrS 13	2380
1.4006	410	X 10 Cr 13	410 S 21	SUS 410	S 41000	(X 12 Cr 13 KD)	Z 12 C 13	X 12 Cr 13	2302
1.4007		X 35 Cr 1 4							
1.4008	414	GX 8 CrNi 1 3	410 C 21	SCS 1	S41400	GX 7 CrNiMo 12-1	Z 12 CN 13 M	GX 12 Cr 13	
1.4011		GX 12 Cr 1 2				GX12Cr12	GX12Cr12		
1.4014		N 3 2 0 (LW)							
1.4016	430	X 6 Cr 17	430 S 15	SUS 430	S 43000	X 8 Cr 17	Z 8 C 17	X 8 Cr 17 KD	2320
1.4021	420	X 20 Cr 13	420 S 37	SUS 420 J1	S 42000	X 20 Cr 13	Z 20 C 13	X 20 Cr 13	2303
1.4024		X 15 Cr 13	420 S 29	SUS 410 J1	J91201	X 15 Cr 13	Z 12 C 13 M	X 12 Cr 13	
1.4027		GX 20 Cr 1 4	420 C 29	SCS 2			Z 20 C 13 M		
1.4028	420	X 30 Cr 13	420 S 45	SUS 420 J2	J91153	X 30 Cr 13	Z 30 C 13	X 30 Cr 13	2304
1.4029	416	X 29 CrS 13	416 S 37	SUS 416		X 29 CrS 13	Z29CF13	X 29 CrS 13	
1.4031	420	X 40 Cr 13		SUS 420	S42080	X 40 Cr 13	Z 40 C 14	X 40 Cr 14	2304
1.4034	420	X 45 Cr 13	(420 S45)			X 45 Cr 13	Z 40 C 14	X 40 Cr 14	
1.4057	431	X 19 CrNi 17 2	431 S 29	SUS 431	S 43100	X 19 CrNi 17 2	Z 15 CN 16.02	X 16 CrNi 16	2321
1.4059		GX 22 CrNi 17	ANC 2		J91803		Z 20 CN 17.2 M		
1.4085		GX 70 Cr 29							
1.4086		GX 120 Cr 29	425 C 11						
1.4104	430 F	X 12 CrMoS 17	441 S 29	SUS 430 F	S 43020	X 14 CrMoS 17	Z 10 CF 17	X 10 CrS 17	2383
1.4105	430	X 4 CrMoS 18		SUS 430 F		X 6 CrMoS 17	Z 6 CDF 18 - 02		
1.4106		X 10 CrMo 13			J91151				
1.4107		GX 8 CrNi 1 2				GX 8 CrNi 12	GX8CrNi 12	GX 8 CrNi 12	
1.4109	440A	X 65 CrMo 14		SUS 440 A	S44002	X 70 CrMo 15	Z 70 CD 14		
1.4110		X 55 CrMo 14					Z 50 CD 13		
1.4111		X 110 CrMoV 15		SUS 430 LX			Z 4 CN b 17	X 6 CrNb 17	
1.4112	440 B	X 90 CrMoV 18	409 S 1 9	SUS 440 B	S44003	X 90 CrMoV 18	Z 3 CT 1 2	X 6 Cr Ti 1 2	
1.4113	434	X 6 CrMo 17 1	434 S 17	SUS 434	S43400	(X 8 CrMo 17)	Z 8 CD 17.01	X 8 CrMo 17	2325
1.4115		X 20 CrMo 17 1							
1.4116		X 45 CrMoV 15				X 50 CrMoV 15	Z 50 CD 15	X 50 CrMo V 15	

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.4117		X 38 CrMoV 15							
1.4119		X 15 CrMo 13							
1.4120		X 20 CrMo 13					Z 20 CD 14		
1.4121		X 22 CrMoNiS 13 1							
1.4122		X 35 CrMo 17				X 39 CrMo 17 1	X39CrMo17-1	X 35 CrMo 17	
1.4125	440 C	X 105 CrMo 17		SUS 440 C	S44004	X 105 CrMo 17	Z 100 CD 17	X 105 CrMo 17	
1.4136		GX 70 CrMo 29 2					Z 60 CD x 29 2		
1.4138		GX 120 CrMo 29 2							
1.4302		X 5 CrNi 19 9	308 S 96		S30888	X 6CrNi 20 10 KE			
1.4305	303	X 10 CrNiS 18 9	303 S 21	SUS 303	S30300	X 10 CrNiS 18 9	Z 10 CNF 18.09	X 10 CrNiS 18 09	2346
1.4306	304 L	X 2 CrNi 19 11	304 C 12	SUS 304 L	S30403	(X 3 CrNi18 10 KD)	Z 2 CN 18.09 19 10	GX 2 CrNi	2352
1.4309		GX 2 CrNi 19 11	304 C 12		J92500	GX2CrNi 19-11	GX2CrNi19-11	GX2CrNi 19-11	
1.4313	CA 6 -NM	X 5 CrNi 134	425 C 11	SCS 5	J91540	X 3 CrNiMo 13 4	Z 4 CDN 13.4	X 6 CrNi 13 04	2385
1.4316		X 2 CrNi 19 9	308 S 92	SUS Y 308L	S30883	X 2 CrNi 20 10 KE	Z 2 CN 20.10		
1.4319		X 3 CrNiN 17 8	302 S 26	SUS 302	S20200			X 10 CrNi 18 09	
1.4321		X 2 NiCr 18 16					Z 3 CDT 18-02		
1.4332		X 2 CrNi 24 12	309 S 93			X 2 CrNi 24 13 KE	Z 2 CN 24-14		
1.4337		X 10 CrNi 30 9	312 S 94			X 12 CrNi 30 09 KE	Z 10 CN 31-10		
1.4340		GX 40 CrNi 27 4			J92615			GX 35 CrNi 28 05	
1.4347		GX 6 CrNiN 26 7				GX 6 CrNiN 26-7			
1.4351		X 3 CrNi 13 4			S41086	X 3 CrNi 14 04 KE			
1.4370		X 15 CrNiMn 18 8	307 S 98			X 15 CrNiMn 18 08 KE	Z 8 CNM 19-09-07		
1.4403		X 5 CrNiMo 19 11			S30882				
1.4405		GX 5 CrNiMo 16 5				GX 4 CrNiMo 16-5-1	GX4CrNiMo 16-5-1	G X 4 CrNiMo 16-5-1	
1.4407		GX 5 CrNiMo 13 4			J91550		Z 6 CND 16-05-01		
1.4409		GX 2 CrNiMo 19 11 2				GX 2 CrNiMo 19-11-2	GX 2 CrNiMo 19-11-2	GX 2 CrNiMo 19-11-2	
1.4416		ERO 4416 AHCRMo				GX 2 NiCrMoN 25-20-5	GX2NiCrMoN 25-20-5		
1.4417	S 31500	X 2 CrNiMoSi 19 5			S39215	GX 2 CrNiMoN 25-7-3	GX 2 CrNiMoN 25-7-3		2376

Workpiece Material Conversion Table • P5

P5 Ferritic, Martensitic, and PH Stainless Steels | **Content: C=0-.4%** | **Tensile Strength RM (MPa)*: 600-850** | **Hardness (HB): <330**

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.4418		X 4 CrNiMo 16 51				X 4 CrNiMo 16 5 1	Z 6 CND 16.05.01		2387
1.4419		X 38 CrMo 14							
1.4420		X 5 CrNiMo 18 11	315 S 16						2340l
1.4430		X 2 CrNiMo 19 12	316 S 93		S31683	x 2 CrNiMo 19 13 03 KE	Z 2 CND 19-12-03		
1.4437		GX 6 CrNiMo 18 12	317 C 12						
1.4440		X 2 CrNiMo 18 16 5			S31780				
1.4446		GX 2 CrNiMoN 17 1 3 4				GX 2 CrNiMoN 17 1 3 4			
1.4448		GX 6 CrNiMo 17 13	317 C 16		J93000				
1.4449	317	X 5 CrNiMo 17 13	317 S 16	SUS 317	S31700			X 5 CrNiMo 18 15	
1.4452		X 5 CrNiCuNb 16 4					Z7CNU16.04		
1.4455		X 2 CrNiMnMoN 20 16				X 2 CrNiMnMoN 20 15 08 KE			
1.4458	28 20	GX 2 NiCrMo 2				GX 2 NiCrMo 28-20-2	GX 2 NiCrMo 28-20-2	GX 2 NiCrMo 28-20-2	
1.4463		GX 6 CrNiMo 24 8 2							
1.4468		GX 2 CrNiMoN 25 6 3				GX 2 CrNiMoN 25-6-3	GX 2 CrNiMoN 25-6-3		
1.4469		GX 2 CrNiMoN 26 7 4			J93404	GX 2 CrNiMoN 26-7-4	GX 2 CrNiMoN 26-7-4	GX 2 CrNiMoN 26-7-4	
1.4470		GX 2 CrNiMoN 22 5 3				GX 2 CrNiMoN 22-5-3	GX 2 CrNiMoN 22-5-3	GX 2 CrNiMoN 22-5-3	
1.4502		X 8 CrTi 18				X 6 Cr 18 KE			
1.4505		X 5 NiCrMoCuNb 20 18							
1.4510	430 Ti	X 6 CrTi 17		SUS 430 LX	S 43036	X 8 CrTi 1 7	Z 8 CT 1 7	X 6 CrTi 17	
1.4511	430 Nb	X 6 CrNb 17		SUS 430 LX		X 3 CrNb 17	Z 8 CNb 17	X 6 CrNb 17	
1.4512	409	X 6 CrTi 12	409 S 19	SUH 409	S40900	X 5 CrTi 12	Z 6 CT 12	X 6 CrTi 12	
1.4514					S15789				
1.4517		GX 2 CrNiMoCuN 25 6 3 3				GX 2 CrNiMoCuN 25-6-3-3	GX 2 CrNiMoCuN 25-6-3-3	GX 2 CrNiMoCuN 25-6-3-3	
1.4519		X 2 CrNiMoCu 20 25	904 S 92						
1.4520		X 2 CrTi 17		SUS 430 LX		X 2 CrTi 17	F 20T	X 2 CrTi 17	
1.4523		X 8 CrMoTi 17				X 2 CrMoTiS 18 2	X2CrMoTiS 18-2		
1.4528		X 105 CrCoMo 18 2							

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.4531		GX 2 NiCrMoCuN 2018							
1.4535		X 90 CrCoMoV 17							
1.4536		GX 2 NiCrMoCuN 25 20			J94650	GX 2 CrNiMoCuN 25-20-6			
1.4543		X 3 CrNiCuTi 12 9						X 6 CrNiNb 18 11	
1.4551		X 5 CrNiNb 19 9		SUS Y 347	S34780	X 5 CrNiNb 20 10 KE	Z 6 CNNb 20-10		
1.4557		GX 2 CrNiMoCuN 20 18 6				GX 2 CrNiMoCuN 20-18-6	GX 2 CrNiMoCuN 20-18-6		
1.4567		X 3 CrNiCu 18 9 4	394 S 17	SUS XM7		X3CrNiCu 18-9-4	304CU	304K	
1.4576		X 5 CrNiMoNb 19 12	318 S 96		S31980	X 5 CrNiMoNb 19 12 03 KE	Z 4 CNDSNb 19-12-03		
1.4584		GX 2 NiCrMoCu 25 2 0 5				GX 2 NiCrMoCu 25-20-5	GX 2 NiCrMoCu 25-20-5		
1.4587		GX 2 NiCrMoCuN 29 25 5				GX 2 NiCrMoCuN 29-25-5	GX 2 NiCrMoCuN 29-25-5		
1.4588		GX 2 NiCrMoCuN 25 20 6				GX 2 NiCrMoCuN 25-20-6	GX 2 NiCrMoCuN 25-20-6		
1.4650		X 2 CrNiCu 19 10				X 2 CrNiCu 19-10	TX 304L		
1.4651		X 6 CrNiCuS 18 9 4							
1.4724	H-12	X 10 CrAl 13	BH 12	SUS 405	T20812	X 10 CrAl 13	Z 10 C 13	X 10 CrAl 12	
1.4729		GX 40 CrSi 13		SCH 1				GX 35 Cr 13	
1.4740		GX 40 CrSi 17						GX 35 Cr 17	
1.4742	430	X 10 CrAl 18	(430 S 15)	SUH 21	S43000		Z 10 CAS 18	(X 8 Cr 17)	
1.4745		GX 40 CrSi 23							
1.4747	HNV 6	X 80 CrNiSi 20	443 S 65	SUH 4	S65006	X 80 CrNiSi 20	Z 80 CSN 20.02	X 80 CrSiNi 20	
1.4762	446	X 10 CrAl 25		SUH 442	S44600	X 10 CrAl 24	Z 10 CAS 24	X 16 Cr 26	2322
1.4776		GX 40 CrSi 29	452 C 11	SCH 2	J92605			GX 35 Cr 28	
1.4871	EV 8	X 53 CrMnNiN 21 9	349 S 54	SUH 35	S63008	X 53 CrMnNiNS 21 - 9	Z 52 CMN 21.09	X 53 CrMnNiN 21 9	
1.4882		X 50 CrMnNiNbN 21 9				X 50 CrMnNiNbN 21-9	Z 50 CMNNb 21.09		
1.4923		X 22 CrMoV 12 1	762			X 22 CrMoV 12-1	Z 21 CDV 12	X 22 CrMoV 121	
1.4931		GX 22 CrMoV 12 1				G-X 22 CrMoV 12 1	GX23CrMoV 12-1	G X 23 CrMoV 12-1	
1.4946		GX 20 CrNiW 23 1 2 3							
1.6351		GX 2 NiCoMoTi 1 7 10							

Workpiece Material Conversion Table • P5

P5 Ferritic, Martensitic, and PH Stainless Steels	Content: C=0-.4%	Tensile Strength RM (MPa)*: 600-850	Hardness (HB): <330

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.6781		G 17 NiCrMo 13 6				G 17 NiCrMo 13-6	G17NiCrMo 13-6	G 17 NiCrMo 13-6	
1.6980		X 2 CrNiCoMo 12 8 5							
1.7365		GX 15 CrMo5				GX15CrMo5	GX15CrMo5	G X 15 CrMo 5	
1.7390		X 15 CrMo 5 1				X 15 CrMo 5-1	X 15 CrMo 5-1		
2.4537		G-NiMo 16 CrW							
2.4631		NiCr 20 TiAl	NA 20	NCF 80A			NC 20 TA	Nimonic 80A	
2.4697		G-NiCr 20 Mo 15 (CorresistG20/							
	XM-19				S20910				

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

AISI — American Iron and Steel Institute
AFNOR — French National Organization for Standardization
AMS — Aerospace Material Specifications
ASTM — American Society of Mechanical Engineers
BS — British Standards
DIN — German Institute for Standardization
EN — European Standards
JIS — Japanese Industrial Standards
SAE — Society of Automotive Engineers
SIS — Swedish Standards Institute
UNI — Italian Organization for Standardization
UNS — Unified Numbering System

Workpiece Material Conversion Table • P6

P6 High-Strength Ferritic, Martensitic, and PH Stainless Steels Content: C = .1–.6% Tensile Strength RM (MPa): 900-1350 Hardness (HB): 350-450*

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.0021		S 240 GP	S 240 GP			S 240 GP			
1.0023		S 270 GP	S 270 GP			S 270 GP			
1.0028		USt 34-2/ S 250 G1T				S 250 G 1 T			
1.0032		Ust 34-2/ S 250 GT	CEW2	STKM 13 B		S 250 GT			
1.0039		S 235 JRH	S 235 JRH			S235JRH	E 24-2	S 235 JRH	
1.0046		S 320 GP	S 320 GP			S 320 GP			
1.0083		S 355 GP	S 355 GP			S 355 GP			
1.0115		S 235 J0C							
1.0117		S 235 J2 G4	En 40 D			S 235 J2 G4	E24-4	Fe 360 D	
1.0118		S 235 J2 G3C							
1.0119		S 235 J2 G4C							
1.0120		St 37-2				S 235 JRC	E 24-2	S 235 JRC	
1.0121		S 235 JR G1C							
1.0138		Ro St 44-3	43D			S 275 J2 H	E 28-4	S 275 J 2H	
1.0160		S 235 JR G1F				S 235 JRG 1 F			
1.0162		S 235 J 0 Cu				S 235 J0 Cu			
1.0163		S 235 J 2 G 4 Cu				S 235 J 2 G 4 Cu			
1.0164		S 235 JR G1 CuC				S 235 JRG 1 CuC			
1.0166		S 235 J2 G3 Cu							
1.0169		St 37-2 Cu 3G (S 235 JRCu+CR)				S 235J R Cu+CR			
1.0211		St 30 Si	HF W2						
1.0212		St 30 Al							
1.0241		S 220 GD + Z							
1.0318		S 180 GT	CE W 1	STKM 12 B		S 180 GT			
1.0357		S 180 G1 T		STPL 450		S 180 G 1 T			
1.0408		S 45.4 GT	430		K03006	L 245 MB	L 245 MB		
1.0490		StE 285	43D			S 275 N	S 275 N	S 275 N	
1.0522		S 390 GP	S 390 GP			S 390 GP			
1.0523		S 430 GP	S 430 GP			S 430 GP			
1.0576		S 355 J2H (RoSt 52-3)	50D			S355J2H		S355J2H	
1.0960		S 320 MC							
1.0962		S 400 MC							
1.0963		S 600 MGC							
1.0964		S 750 MC							
1.0965		S 900 MC							
1.2080	D3	X 210 Cr 12	BD 3	SKD 1	T30403	X 210 Cr 1 2	Z 200 C 12	X 205 Cr 12 KU	
1.2082		X 21 Cr 13				X 21 Cr 1 3		X 21 Cr 13 KU	
1.2083	420	X 42 Cr 13		SUS 420 J2		X 42 Cr 1 3	Z 40 C 14	X 41 CR 13 KU	2314
1.2085		X 33 CrS 16							
1.2086		X 290 Cr 12							
1.2201		G-X 165 CrV 12							
1.2285		X 230 CrV 12 4							
1.2316	D-4	X 36 CrMo 17			T30404	X 36 CrMo 17	X38CrMo 16-1	X 38 CrMo 16 1 KU	
1.2341	P4	X 6 CrMo 4			T51604	X 6 CrMo 4		67 SiCr 5	

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.2342		X 35 CrMoV 5 1 1							
1.2343	H 11	X 38 CrMoV 5 H1	BH 11	SKD 6	T20811	X 38 CrMoV 5 H1	Z 38 CDV 5	X 37 CrMoV 5 1 KU	
1.2344	H 13	X 40 CrMoV 5 1	BH 13	SKD 61	T20813	X 40 CrMoV 5 1	Z 40 CDV 5	X 40 CrMoV 5 1 1 KU	2242
1.2345		X 50 CrVMo 5 1							
1.2347		X 40 CrMoVS 5 1							
1.2357		50 CrMoV 13 14							
1.2362		X 63 CrMoV 5 1							
1.2363	A-2 5 1	X 100 CrMoV	BA 2	SKD 12	T 30102	X 100 CrMoV 5 1	Z 100 CDV 5	X 100 KU CrMoV 5 1	2260
1.2365	H 10	X 32 CrMoV 3 3	BH 10	SKD 7	T 20810	X 32 CrMoV	32 DCV 28 12H-28	30 CrMoV 12 27 KU	
1.2367		X 38 CrMoV 5 3					Z 38 CDV 5-3		
1.2368		X 41 CrMoV 5 3 1							
1.2375		83 CrMoV 9							
1.2376		X 96 CrMoV 12							
1.2378	D-7	X 220 CrVMo 12 2			T30407				
1.2379	D2	X 155 CrVMo 12 1	BD 2	SKD 11	T 30402	X 153 CrMoV 12	Z 160 CDV 12	X 155 KU CrVMo 12 1	2310
1.2390		X 32 CrMoV 4 1							
1.2392		GX 28 CrMoV 5 1							
1.2398		X 70 CrVMo 8.2.2					X70		
1.2436		X 210 CrW 12		SKD 2		X 210 CrW 12	Z 210 CW1 2	X 215 CrW 121 KU	2312
1.2453		X 130 W 5							
1.2564		X 30 WCrV 4 1				30 WCrV 15 1			
1.2567		X 30 WCrV 53		SKD 4	T20814	X 30 WCrV 5 3	Z 32 WCV 5	X 30 WCrV 5 3 KU	
1.2581	H 21	X 30 WCrV 93	BH 21	SKD 5	T 20821	X 30 WCrV 9 3	Z 30 WCV 9	X 30 WCrV 9 3 KU	
1.2601		X 165 CrMoV 12				X 165 CrMoV 12		X 165 KU CrMoW 12	2310
1.2605		X 35 CrWMoV 5				X 35 CrWMoV 5			
1.2606	H 12	X 37 CrMoW 5 1	BH 12	SKD 62	T20812		Z 35 CWDV 5	X 35 CrMoW 05 KU	
1.2607		GX 37 CrMoW 5 1							
1.2622		X 60 WCrMoV 9 4							
1.2625		X 33 WCrVMo 12 12							
1.2631		X 50CrMoW 9 1 1							
1.2662		X 30 WCrCoV 9 3							
1.2678	H19	X 45 CrCoVW 5 5 5							

Workpiece Material Conversion Table • P6

P6 High-Strength Ferritic, Martensitic, and PH Stainless Steels Content: C = .1-.6% Tensile Strength RM (MPa)*: 900-1350 Hardness (HB): 350-450

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.2709		X 3 NiCoMoTi 18 9 5							
1.2731		X 50 NiCrWV 13 13							
1.2764		X 19 NiCrMo 4							
1.2767	A -9	X 45 NiCrMo 4			T30109	40 NiCrMo 4	Y 35 NCD 16	42 NiCrMo 15 7 KU	
1.2779		X 6 NiCrTi 26 15							
1.2786		X 13 NiCrSi 36 15				X 13 CrNiSi x 36 15	Z 15 NCS 37-18		
1.2787		X 23 CrNi 17	BM 2	SKH 9		(HS 6-5-2)	Z 85 WDCV 06-05-04-02	HS 6-5-2-2	2722
1.2790		72 SiNiCrMoV 54							
1.2880	D-5	X 165 CrCoMo 12			T30405				
1.2884		X 210 CrCoW 1 2							
1.2885		X 32 CrMoVoV 3 3 3	BH 10 A						
1.2888		X 20 CoCrWMo 10 9							
1.2889		X 45 CoCrMoV 5 5 3							
1.3202	T 15	S 1-2-1-4-5	BT 15		T12015	(HS12-1-5-5)	HS 12-1-5-5	HS 12-1-5-5	
1.3207	M-44	S 1-0-4-3-1-0	BT 42	SKH 57	T11334	HS10-4-3-10	Z130WKCDV 10-10-04-04	HS 10-4-3-10	
1.3241		S 6-7-6-10							2727
1.3243	M 35	S 6-5-2-5	BM 35	SKH 55	T11336	(HS6-5-2-5)	KCV 06-05-05-04-02	HS 6-5-2-5	2723
1.3244		ASP 2030				HS6-5-3-8			
1.3246	M 41	S 7-4-2-5	(HS 7-4-2-5)		T11341	HS1-8-1	Z110 WKCDV 07-05-04	HS 7-4-2-5	
1.3247	M 42	S 2-1-0-1-8	BM 42		T11342	HS2-9-1-8	Z110 DKCWV 09-08-04	HS 2-9-1-8	2716
1.3249	M-34	S 2-9-2-8	BM 34		T11334	HS 2-9-2-8			
1.3255	T 4	S 1-8-1-2-5	BT 4	SKH 3	T12004	(HS18-1-1-5)	Z80 WKCV 18-05-04-01	HS18-1-1-5	
1.3257	T 6	S 1-8-1-2-1-5			T12006	HS 18-1-2-15			
1.3265	T 5	S 1-8-1-2-1-0	BT 5	SKH 4A	T12005	(HS 1-8-0-1-10)		HS18-0-1-10	
1.3302	A -7	S 1-2-1-4			T30107	HS 12-1-4		(X 150 WV 1305 KU)	
1.3318		S 1-2-1-2				HS 02.01.12			
1.3325		HS 0-4-1				HS 0-4-1			
1.3326		ASP 2015				HS 1-4-2			
1.3327		HS 1-8-1				HS 1-8-1			
1.3333		S 3-3-2						HS 3-3-2	
1.3335		S 3-3-2 Si							
1.3339		BGH 3339				HS 6-5-2			
1.3342	M 3	SC 6-5-2			T11313	(HS 6-5-2)	Z90WDCV06-05-04-02	HSC 6-5-3	
1.3343	M 2	S 6-5-2	BM 2	SKH 51	T11302	HS 6-5-3	Z85WDCV06-05-04-02	HS 6-5-2	2722
1.3344	M 3 Cl.2	S 6-3-2	BM 4	SKH 52	T11323	HS 6-4-1	Z120WDCV 06-05-04-03	HS 6-3-1	2725
1.3345		GarantDOMO1				HS 6-5-3C			
1.3346	M 1	S 2-9-1	BM 1		T20842	HS 1-8-1	Z85DCWV 08-04-02-01	HS 1-8-1	
1.3348	M 7	S 2-9-2			T11307	HS 2-9-2	Z100DCWV 09-04-02-02	HS 2-9-2	2782
1.3350		HS 6-6-2				HS 6-6-2			
1.3351		HS 6-4-1				HS 6-4-1			
1.3355	T 1	S 1-8-0-1	BT 1	SKH 2	T12001	HS 1-8-0-1	Z80WCV 18-04-01	HS 18-0-1	
1.3395		ASP 2004							
1.3401	A 128	X 120 Mn 12	BW 10	SCMnH 1	J91109		Z 120 M 12	X G 120 Mn 12	2183
1.3533		18 NiCrMo 14 6 14				18 NiCrMo	16 NCD 13		
1.3541		X 45 Cr 13				X 45 Cr 13	X44Cr14	X 41 Cr 13	
1.3543		X 102 CrMo 17			J91639	X 102 Crmo 17	X100CrMo17	X 105 CrMo 17	
1.3549		X 89 CrMoV 18 1							
1.3551	M 50	80 MoCrV 42 16					80 DCV 40	X 80 MoCrV 4 4	
1.3553		X 82 WMoCrV 6 5 4	BM 2	SKH 51		X 80 WMoCrV 654	RAPIDEM	X 82 WMoV 65	
1.3558		X 75 WCrV 18 4 1	BT 1	SKH 2		X 75 WCrV 18 4 1	X75WCrV 18-4-1	X 75 WCrV 18	
1.3802		X 120 Mn 13							
1.3805		X 35 Mn 18							
1.3813		X 40 MnCrN 19							
1.3815		X 40 MnCr 182							
1.3816		X 8 CrMnN 18 18							
1.3817		X 40 MnCr 18							
1.3819		X 50 MnCrV 20 14							
1.3820		X 8 CrMnN 20 10							
1.3917		Ni 42					Fe-Ni 42		
1.3919		X 3 Ni 44							
1.3922		Ni 48					Fe-Ni 48		
1.3923		Ni 51					Fe-Ni 50 Cr 1		
1.3940		GX 2 CrNiN 18 13	VGs 5.100						
1.3941		X 4 CrNi 18 13							
1.3942		X 15 NiCr 22 3							
1.3943		X 20 NiCr 36 10							
1.3945		X 2 CrNiN 18 11	S.160						
1.3946		NiCr 42 6 (Dilaton 42 Cr 6)					Fe-Ni 42 Cr 6		
1.3949		X 5 MnCr 18 13							
1.3952		X 4 CrNiMoN 18 14	316 S 63						
1.3953		X 2 CrNiMo 18 15							
1.3958		X 5 CrNi 18 11							

Workpiece Material Conversion Table • P6

P6 High-Strength Ferritic, Martensitic, and PH Stainless Steels Content: C = .1-.6% Tensile Strength RM (MPa)*: 900-1350 Hardness (HB): 350-450

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.3960		X 45 MnNiCrV 13 76							
1.3962		X 15 CrNiMn 12 10							
1.3964		X 4 CrNiMnMoN 19 1 6 5							
1.3965		X 8 CrMnNi 18 8							
1.3967		X 50 CrMnNiN 22 9							
1.3968		X 12 MnCr 18 12							
1.3974		X 3 CrNiMoNbN 23 17							
1.3987		X 8 CoNiCr 26 20							
1.4526		X 6 CrMoNb 17 1				X 6 CrMoNb 17-1	X6CrMoNb 17-1	F 17 MNb	
1.4527		GX 4 NiCrCuMo 30 20 4				GX 4 NiCrCuMo 30-20-4	GX 4 NiCrCuMo 30-20-4		
1.4559		GX 7 NiCrMoCuNb 42 20				GX 7 NiCrMoCuNb 4220			
1.4572		GX 5 CrNiMoNb 23 9							
1.4704	HNV 2	X 45 SiCr 4			S64006				
1.4710		GX 30 CrSi 6							
1.4712		X 10 CrSi 6							
1.4713		X 10 CrAl 7				X 10 CrAl 7			
1.4716		X 8 Cr 9							
1.4718	HNV 3	X 45 CrSi 93	401 S 45	SUH 1	S65007	X 45 CrSi 8	Z 45 CS 9	X 45 CrSi 8	
1.4721		215 Cr 12							
1.4722		X 10 CrSi 13							
1.4725		Cr Al 14 4			K91670				
1.4731		X 40 CrSiMo 10 2		SUH 3		X 40 CrSiMo 10-2	Z 40 CSD 10		
1.4732		X 80 CrSiMoW 15 2							
1.4741		X 10 CrSi 18							
1.4743		GX 160 CrSi 18							
1.4748		X 85 CrMoV 18 2				X 85 CrMoV 18 2	Z 85 CDMV 18.02	X 85 CrMoV 19 3	
1.4765		CrAl 25 5							
1.4767		CrAl 20 5							
1.4773		X 8 Cr 30							
1.4777		GX 130 CrSi 29							
1.4785		X 60 CrMnMoVNbN 21 10					Z 60 CMDVNb 21-10 Az		
1.4820		X 12 CrNi 25 4							
1.4822		GX 40 CrNi 24 5							
1.4829		X 12 CrNi 22 12	311 S 94	SUS Y 309	S30980	X 15 CrNi 23 13		X 16 CrNi 23 14	

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.4842		X 12 CrNi 25 20	310 S 94		S31080	X 12 CrNi 26 21 KE	Z 12 CN 26-21		
1.4843		CrNi 25 20		SCS 18	J94202				
1.4846		X 40 CrNi 25 21	310 S 98	SCH 13					
1.4860		NiCr 30 20							
1.4861		X 20 NiCr 32 10							
1.4873		X 45 CrNiW 18 9	331 S 40	SUH 31		X 45 CrNiW 18 9	Z 35 CNWS 14.14	X 45 CrNiW 18 9	
1.4875	EV 12	X 55 CrMnNiN 20 8			S63012	X 55 CrMnNiN 20-8	Z 55 CMN 2 0.08 Az		
1.4903		X 10 CrMoV 9 -1 9 -1			S59180	X 10 CrMoV			
1.4911		X 8 CrCoNiMo 10 6	Z 9 CKD 11						
1.4912		X 7 CrNiNb 18 10				X7CrNiNb 18-10	X7CrNiNb 18-10		
1.4913		X 19 CrMoVNbN 11 1					Z 21 CDNbV 11		
1.4920		X 15 CrMoV 1 2 1							
1.4921		X 19 CrMoV 12 1							
1.4922		X 20 CrMoV 12 1				X 20 CrMoV 11-1		X 20 CrMoV 12 01 KW	2317
1.4925		X 20 CrMoNV 15 1							
1.4926		X 21 CrMoV 12 1						X21CrMoV 121	
1.4935	422	X 20 CrMoWV 12 1		SUH 616	S42200			X 22 CrMoWV 121	
1.4936		X 24 CrMoV 12 1							
1.4945		X 6 CrNiWNb 16 16							
1.4960		X 40 CrNiCoNb 13 13							
1.4962		X 12 CrNiWTi 16 13							
1.4971	661	X 12 CrCoNi 21 20		SUH 661	R30155	X 12 CrCoNi MoWNb 21 20 20	Z 12 CKNDWNb 21-20-20		
1.4978		X 50 CoCrNi 20 20							
1.4986		X 8 CrNiMoBNb 16 16				X 7 C rNiMoBNb 16-16			
1.5662	A 353	X 8 Ni 9	509	SL 9 N 53	K81340	FeE 490 Ni 36	9 Ni	X 10 Ni 9	
1.5663		X 7 Ni 9	X 7 Ni 9	SL9 N590		X 7 Ni 9	X 7 Ni 9	X 7 Ni 9	
1.5680	E 2515	19 Ni 6	19 Ni 6	SL5N60	K41583	X 12 Ni 5	Z 18 N 5	112 Ni 19	
1.5708		12 NiCr 3					12 NC 2	12 NiCr 3	
1.5810	3115	18 NiCr 6 4	18NiCr5-4			18 NiCr 6 -4	20 NC 6		
1.6340		12 NiMnMo 5 5							

Workpiece Material Conversion Table • P6

P6 High-Strength Ferritic, Martensitic, and PH Stainless Steels Content: C = .1-.6% Tensile Strength RM (MPa): 900-1350 Hardness (HB): 350-450*

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.6566		17 NiCrMo 6 4	17NiCrMo 6-4			17 NiCrMo 6-4	17 NiCrMo 6-4		
1.6569		17 NiCrMoS 6 4	17NiCrMo 6-4			17 NiCrMoS 6-4	17 NiCrMoS 6-4		
1.6657	E 9310 H	14 NiCrMo 13 4	832 M 13		G93106	14 NiCrMo 13-4	14 NiCrMo 13-4	15 NiCrMo 13	
1.6773		36 NiCrMo 16				36 NiCrMo 1 6	35 NCD 16	34 NiCrMo 16	
1.6784		12 NiMoCr 17 4							
1.6903		X 10 CrNiTi 18 10							
1.6905		GX 5 CrNiNb 18 10							
1.6906		X 5 CrNi 18 10							
1.7141									
1.7366		X 16 CrMo 5 1				X 16 CrMo 5-1			
1.7716		UP S2 MoV							
1.8949		S 695 MC							
1.8997		S 720 MC							
1.8998		S 680 MC							
2.4651		S-NiCr 20 Mo 9							
2.4802		S-NiMo 28							
2.4803		S-NiCr 15 FeTi							

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

AISI — American Iron and Steel Institute
AFNOR — French National Organization for Standardization
AMS — Aerospace Material Specifications
ASTM — American Society of Mechanical Engineers
BS — British Standards
DIN — German Institute for Standardization
EN — European Standards
JIS — Japanese Industrial Standards
SAE — Society of Automotive Engineers
SIS — Swedish Standards Institute
UNI — Italian Organization for Standardization
UNS — Unified Numbering System

Workpiece Material Conversion Table • M1

M1 Austenitic Stainless Steels | **Content: C = .05-.15%** | **Tensile Strength RM (MPa)*: <650** | **Hardness (HB): 130-200**

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.2765		GX 19 NiCrMo 4							
1.2780	442	X 15 CrNiSi 20 12	En61	SUS 309 S	S44200	X 16 CrNiSi 20 12	Z 15 CN 24.13		
1.2782		X 15 CrNiSi 25 20		SUS 309 S		X 16 CrNiSi 25 20	Z 15 CN 24.13	X 16 CrNiSi 25 20	
1.3956		X 8 CrNi 18 12							
1.4003		X 2 CrNi 1 2				Hyfab3/12	CLC4003	F12N (Mn<1,50)	
1.4009		X 8 Cr 14		SUS Y 410	S41080	X 8 Cr 13 KE			
1.4015		X 8 Cr 18		SUS Y 430	S43080				
1.4017		X 6 CrNi 17 1				X6CrNi17-1	F17N	X6CrNi17-1	
1.4108		X 100 CrMo 13							
1.4123		X 15 TN							
1.4300		X 12 CrNi 18 8	302						
1.4301	304 H	X 5 CrNi 18 10	304 S 15	SUS 304	S30400	X 6 CrNi 18 10 KD	Z 6 CN 18.09	X 5 CrNi 18 10	2332
1.4303	305	X 5 CrNi 18 12	305 S 19	SUS 305	S30500	X 8 CrNi18 12 KD	Z 8 CN 18.12	X 8 CrNi 19 10	
1.4307	304L	X 2 CrNi 18 9	304 S 11	SUS 304L		X 2 CrNi 18 9	CLC18.9.L	X 2 CrNi 18-9	
1.4308	CF-8	GX 6 CrNi 18 9	304 C 15	SCS 13		X 2 CrNiN 18 7	Z 6 CN 18.10 M	G X 5 CrNi 19-10	2333
1.4310	301	X 12 CrNi 17 7	301 S 21	SUS 301	S30100	X 12 CrNi 17	Z 12 CN 17.07	X 12 CrNi 17	2331
1.4311	304	X 2 CrNiN 18 10	304 S 62	SUS 304 LN	S30453	X 2 CrNiN 18 10	Z 8 CN 18.12	X 8 CrNi 19 10	2371
1.4312		GX 10 CrNi 18 8	302 C 25	SCS 12			Z 10 CN 18.9 M		
1.4317		GX 4 CrNi 13 4				GX 4 CrNi 13-4	GX 4 CrNi 13-4	GX 4 CrNi 13-4	
1.4318		X 2 CrNiN 18 7				X 2 CrNiN 18-7	18-7L	18-7L	
1.4350	304	X5CrNi189	304S31		304	1	Z6CN18.09	X5CrNi1810	1
1.4362	S3 2304	X 2 CrNiN 23 4				SAF 2304	35 N	X 2 CrNiN 23-4	2327
1.4401	316	X 5 CrNiMo 17 12 2	316 S 16	SUS 316	S31600	X6 CrNiMo 17 X 12 2 KD	Z 6 CND 17.11	X 5 CrNiMo 17 12	2347
1.4404	316 L	X 2 CrNiMo 17 13 2	316 S 12	SUS 316 L	S31603	GX 3 CrNiMo 17 12 2 KD	Z 3 CND 19.10 M	GX 2CrNiMo 19 11	2348
1.4406	316	X 2 CrNiMoN 17	316 S 61 LN	SUS 316 LN 12 2	S31653	X 3 CrNiMoN 17 12 2	Z 2 CND 17.12 Az	X 2CrNiMoN 17 12	2353
1.4408	CF-8M	GX 6 CrNiMo 18 10	316 C 16	SCS 14	J92900	GX 5 CrNiMo 19-11-2	GX5CrNiMo 19-11-2	G X 5CrNiMo 19-11-2	2343
1.4410	S3 2750	GX 10 CrNiMo 18 9		SCS 14 A		X 2 CrNiMoN 25-7-4	Z 5 CND 20.10 M	X 2 CrNiMoN 25-7-4	
1.4411		ERO 4411 A				GX 4 CrNiMo 16-5-2	GX 4 CrNiMo 16-5-2		
1.4412		ERO 4412 AHMo				GX 5 CrNiMo 19-11-3	GX 5 CrNiMo 19-11-3		
1.4429	316 LN	X 2 CrNiMoN 17 13 3	316 S 62	SUS 316 LN	S31653	X 3 CrNiMoN 17 13 3	Z 2 CND 17.13 Az	X 2 CrNiMoN 17 13	2375
1.4434		X 2 CrNiMoN 18 12 4				317 LN	CLC 18.12.4.LN	X2CrNiMoN1 812-4	
1.4435	316 L	X 2 CrNiMo 18 14 3	316 S 11	SCS 16	S31603	X 2 CrNiMo 18 16	Z 2 CND 17.13	X 2 CrNiMo 17 13	2353
1.4436	316	X 5 CrNiMo 17 1 3 3	316 S 16	SUS 316	S31600	X6 CrNiMo 18 13 3 KD	Z 6 CND 17.12	X 5 CrNiMo 17 13	2343

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.4438	317 L	X 2 CrNiMo 18 16 4	317 S 12	SUS 317 L	S31703	X 3 CrNiMo 18 16 4	Z 2 CND 19.15	X 2 CrNiMo 18 15	2367
1.4439		X 2 CrNiMoN 17 13 5				X 3 CrNiMo 17 13 5	Z 3 CND 1 8.14-05 AZ		
1.4442		X 2 CrNiMo 18 15 4					X 3 CrNiMoN 19-14		
1.4465		X 1 CrNiMoN 25 2 5 2			S31050				
1.4503		X 3 NiCrCuMoTi 27 2 3							
1.4506		X 5 NiCrMoCuTi 20 18							
1.4516		X 6 CrNiTi 12				X 6 CrNiTi 12	X 6 CrNiTi 12	X 6 CrNiTi 12	
1.4525		GX 5 CrNiCu 16 4				GX 5 CrNiCu 16-4	GX 5 CrNiCu 16-4		
1.4529		X 1 NiCrMoCuN 25206							
1.4532	15-7 PH	X 8 CrNiMoAl 15 7 2				X 8 CrNiMoAl 15-7-2	X15D2	X 8 CrNiMoAl 15-7-2	
1.4539 52662		X 1 NiCrMoCuN	904 S 13 25 20		N 08904	X 1 NiCrMoCu	Z 1 NCDU 25-20-5	25.20	
1.4541	321	X 6 CrNiTi 18 10	321 S 12	SUS 321	S32100 10	X 6 CrNiTi 18	Z 6 CNT 18.10	X 6 CrNiTi 18 11	2337
1.4542	630	X 5 CrNiCuNb 16 4		SUS 630		X 5 CrNiCuNb 16-4	Z6CNU17.04		
1.4550	347	X 6 CrNiNb 18 10	347 S 17	SUS 347	S34700	X 6 CrNiNb 18 10	Z 6 CNNb 18.10	X 6 CrNiNb 18 11	2338
1.4552		GX 5 CrNiNb 18 9	347 C 17	SCS 21	J92710	GX 5 CrNiNb 19-11	Z 4 CNNb 19.10 M	G-X 5 Cr NiNb 19-11	
1.4571	316 Ti	X 6 CrNiMoTi 17 12 2	320 S 31	SUS 316 Ti		X 6 CrNiMoTi 17 12 2	Z 6 CNDT 17.12	X 6 CrNiMo Ti 17 12	2350
1.4573	316 Ti	X 10 CrNiMoTi 18 12	320 S 33	SUS 316 Ti	S31635			X 6 CrNiMo Ti 17 13	
1.4575		X 1 CrNiMoNb 28 42							
1.4577		X 3 CrNiMoTi 25 25							
1.4580	316 Cb	X 6 CrNiMoNb 17 12 2	318 S 17			X 6 CrNiMoNb 17.12	Z 6 CNDNb Nb 17.12	X 6 CrNiMo 17 12 2	
1.4581		GX 5 CrNiMoNb 18 10	318 C 17	SCS 22		GX 5 CrNiMo Nb 19-11-2	Z 4 CNDNb 18.12 M	GX 6 20 11 CRNOMONB	
1.4582		X 4 CrNiMoNb 25 7		SCS 22					
1.4583	318	X 10 CrNiMoNb 18 12						X 6 CrNiMo 13 Nb 17	
1.4585		GX 7 CrNiMo CuNb 18 18			J94651				
1.4586		X 5 CrNiMoCuNb 22 18							
1.4818		153 MA				X 6 CrNiSiN Ce 19-10			
1.4825		GX 25 CrNiSi 18 9	302 C 35		J92602			G X 16 CrNi 20 10	
1.4826		GX 40 CrNiSi 22 9		SCH 12	J92603				
1.4828	309	X 15 CrNiSi 20 12	309 S 24	SUH 309	S30900	X 15 CrNiSi 20 12	Z 15 CNS 20.12	X 16 CrNiSi 25, 20	

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Workpiece Material Conversion Table • M1

M1 Austenitic Stainless Steels | **Content: C = .05-.15%** | **Tensile Strength RM (MPa)*: <650** | **Hardness (HB): 130-200**

Material Number	AISI	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.4833	309 S	X 7 CrNi 23 14	309 S 24	SUS 309 S	J93400	X 12 CrNi 23 13	Z 15 CN 24.13	X 6 CrNi 23 14	
1.4835		X 9 CrNiSiNCe 21 11 2				X 9 CrNiSiN Ce 21-11-2			
1.4837		GX 40 CrNiSi 25 12	309 C 30	SCS 17	J93503			GX 35 CrNi 25 12	
1.4841	310	X 15 CrNiSi 25 20	314 S 25	SUH 310	S31000	X 15 CrNiSi 25 20	Z 15 CNS 25.20	X 16 CrNiSi 25.20	
1.4845	310 S	X 12 CrNi 25 21	310 S 24	SUS 310 S	S31008	X 8 CrNi 25 21	Z 12 CN 25.20	X 6 CrNi 25 20	2361
1.4848	HK	GX 40 CrNiSi 25 20	310 C 40	SCH 21	J94204			GX 40 CrNi 26 20	
1.4854		353 MA				X 6 NiCrSiN Ce 35-25			
1.4877		X 6 NiCrNbCe 32 27				X 6 NiCrNb Ce 32-27			
1.4878	321	X 12 CrNiTi 18 9	321 S 20	SUS 321	S32100	X 10 CrNiTi 18 10	Z 6 CNT 18.12	X 6 CrNiTi 18.11	2337
1.4881	EV 11	X 70 CrMnNiN 21 6			S63011			X 70 CrMnNiN 21 6	
1.4910		X 3 CrNiMoN 17 13				X 3 CrNiMoN 17-13-3		X 2 CrNiMoN 17 12	
1.4919	316 H	X 6 CrNiMo 17 13	316 S 51		S31609	X 6 CrNiMo 17 12 2	Z 6 CND 17-13 B		
1.4941		X 8 CrNiTi 18 10			X 6 CrNiTiB 18-10	Z 6 CNT 18-10 B	X 6 CrNiTiB 11		
1.4948		X 6 CrNi 18 11	304 S 51		S30480	X 6 CrNi 18 10	Z 6 CN 18-09	X 5 CrNi 18 10 KW	2333
1.4949		X 3 CrNi 18 11						X 2 CrNiN 18 11	
1.4950		X 6 CrNi 23 13				309 H			
1.4951		X 6 CrNi 25 20				310 H			
1.4961		X 8 CrNiNb 16 13	347 S 51						
1.4981		X 8 CrNiMoNb 16 16							
1.4988		X 8 CrNiMoVNb 16 13							
1.6907			304 S 71					AR 304 N	
1.6909							CLC 004 BC		
1.6982		GX 3 CrNi 13 4				GX 3 CrNi 13-4	GX3CrNi13-4	GX 3 CrNi 13-4	

Material Number	AISI	DIN	BS	JIS	UNS	AFNOR	UNI	SIS	AMS
AMS Materials – M1									
1.4319	302	X3CrNi-N17-8	301 S 26; 302 S 26	SUS 302 S 26, 302 S 26					5629
1.4305	303	X8CrNiS18-9 (X 10 Cr-NiS 18 9)	303 S 22, 303 S 31	SUS 303 S22, 303 S 31				2346	5640E
1.4828	309	X15Cr-NiSi20-12	309 S 24	SUH 309					5650
1.4401	316	X 5CrNiMo 17 12 2 (X4 CrNiMo 17-12-2)	316 S 13, 17, 19, 31, 33"	SUS 316				2347	5362
1.4000; 1.4001	403, 410S	X6Cr13, X7Cr14	403 S 17	SUS 403, 410 S, 429			2301	5504C	
1.4005	416	X12CrS13	416 S 21	SUS 416				2380	5610D
1.4021	420	X20Cr13	420 S 37	SUS 420 J1				2303	5621
1.4016	430	X6Cr17	430 S 17; 430 S 18	SUS 430				2320	5627
1.4057	431	X17CrNi16-2	431 S 29, 6 S. 80	SUS 431				2321	5623
1.4303	305, 30	X4Cr-Ni18-12 (X 5 Cr-Ni 18 12)	305 S 17; 305 S 19	SUS 305 J 1; SUS 305				5514A	
1.4301	304, 304 H	X5CrNi18 10 (X 4 Cr-Ni18-10)	304 S 11, 304 S 15; 304 S 16; 304 S 17; LW21; LWCF 21; 304 S 31	SUS 304				2332; 2333	5513
1.4842	310 S	X12Cr-Ni25-20		SUS 310 S				2361	5521B
1.4841	314, 310	X15Cr-NiSi25-20; X15Cr-NiSi25-21	314 S 25	SUH 310					5652
1.455	347, 348	X6CrNi-Nb 18-10	347 S 20, 31, 51; ANC 3 B	SUS 347				2338	5512B
1.4125	440 C	X105CrMo17		SUS 440 C					5352
1.4876	B163	X10NiCr-AlTi32-20; X10NiCr-AlTi32-21	NA 15 (H)	NCF 800 (TP)					

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

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Workpiece Material Conversion Table • M2

M2 High-Strength Austenitic Stainless and Cast Stainless Steels Content: C=.05-.15% Tensile Strength RM (MPa): 500-700 Hardness (HB): 150-230*

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.3912		Ni 36			K93601		Fe-Ni 36		
1.3984		X 3 CrNiMnMoN	24 21 7 4						
1.3986		X 1 CrNiMnMoN	22-17-7						
1.4320		X 2 CrNiMo 13 4							
1.4324		X 10 CrNi18 9	302 S 26		J92501	X 10 CrNi 18 9			
1.4333		X 5 NiCr 32 21			S33200				
1.4372		X 12 CrMnNiN 17 7 5	284 S 16	SUS 201		X 12 CrMnNiN 17-7-5	X 12 CrMnNiN 17-7-5	X 12 CrMnNiN 17-7-5	
1.4375		X 2 CrMnNiN 20 9 7					DMV500		
1.4413		X 3 CrNiMo 13 4			S42400		X3CrNiMo 13-4		
1.4432	316L	X 2 CrNiMo 17 12 3	316 S 13	SUS 316L		X 2 CrNiMo 17 12 2	Z 3 CND 17-13-30	X 2 CrNiMo 17-12-3	
1.4441		X 2 CrNiMo 18 15 3					DMV 4441		
1.4454									
1.4466		X 1 CrNiMoN 25 22 2				725 LN	DMV 25.22.2	X 1 CrNiMoN 25-22-2	
1.4501		X 2 CrNiMoCuWN 25-7-4				X 2 CrNiMoCuWN 25 7 4	X 2 CrNiMoCuWN 25 7 4	X 2 CrNiMoCuWN 25 7 4	
1.4504					S17780				
1.4507		X 2 CrNiMoCuN 25 6 3				X 2 CrNiMo CuN 25-6-3	DMV25.7Cu	329SK	
1.4508		GX 2 CrNiMo CuWN 25 8 4				X 6 CrNiCu 18 10 4 KD	Z 4 CNUD 17-11-03 FF		
1.4530		X 3 CrNiMoNbVN	25 6 4						
1.4534	13-8 PH	X 3 CrNiMoAl 13 8 2			S13800		Z4 CNDAT 13-09		
1.4537						X 1 CrNiMoCuN 25-25-5	X 1 CrNiMoCuN 25-25-5	X 1 CrNiMoCuN 25-25-5	
1.4540	15-5 PH	X 4 CrNiCuNb 16 4			J92200		Z 4 CNUNb 16.4 M		
1.4544		A 700	304 S 31		J92630			X 6 CrNiTi 18 11	
1.4545		X 15 U 5 W							
1.4546	348	X 5 CrNiNb 18 10	S 527		J92640			X 6 CrNiNb 18 11	
1.4547		X 1 CrNiMoCuN 20-18-7	X 1 CrNiMoCuN 20-18-7			X 1 CrNiMoCuN 20-18-7	X 1 CrNiMoCuN 20-18-7	X 1 CrNiMoCuN 20-18-7	
1.4548	17-4 PH	X 5 CrNiCuNb 17 4 4		SUS 630	S17400	X 5 CrNiCuNb 16-4	X5CrNiCuNb 16-4		
1.4561		X 1 CrNiMoTi 18-13-2							
1.4564		17-7 PH							
1.4568		X 7 CrNiAl 17 7	301 S 81	SUS 631	S17700	X 7 CrNiAl 17-7	X7CrNiAl17-7; Z9CNA17-07	X 7 CrNiAl 17-7	2388
1.4574		N 752							
1.4578		X 3 CrNiCuMo 17 11 3 2				X 3 CrNiCuMo 17 11 3 2	X3CrNiCuMo 17-11-3-2	X 3 CrNiCuMo 17-11-3-2	
1.4593		BGH 4593							
1.4594		X 5 CrNiMoCuNb 14 5				X 5 CrNiMoCuNb 14-5	X 5 CrNiMoCuNb 14-5	X 5 CrNiMoCu Nb 14-5	
1.4605		X 2 CrAlTi 18 2				X 2 CrAlTi 18-2	DMV 59	X 2 CrAlTi 18-2	
1.4652		654 SMO							
1.4840		G-X 15 CrNi 25-20							
1.4847		X 8 CrNiAlTi 20 20			S33400				
1.4866		X 33 CrNiMnN 23 8				X 33 CrNiMnN 23-8	X 33 CrNiMnN 23-8		
1.4892		BGH 4892							
1.4938		X 12 CrNiMoV 12 3				X 12 CrNiMoV 12-3	X 12 CrNiMoV 12-3		
1.4982		Esshete12 50				X 10 CrNiMoMnN bVB 15-10-1	X 10 CrNiMoMnN bVB 15-10-1		
1.6960		X 1 CrNiCoMo 13-8-5							

Workpiece Material Conversion Table • M3

M3 Duplex Steels Content: C=.05-.2% Tensile Strength RM (MPa): <900 Hardness (HB): 135-275*

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.3985		X 2 CrNiMoN 23 15							
1.4460	329	X 4 CrNiMo 27 5 2		SUS 329 J1	S32900	X 3 CrNiMo 27 5 2	X 2 CrNiMo 25-7-3	X 3 CrNiMo 27-5-2	2324
1.4462	S318 03	X 2 CrNiMoN 22 5 3	318 S 13	SUS 329J 3L		X 2 CrNiMoN 22 5 3	Z 3 CND 22.05 AZ	X 2 CrNiMoN 22-5-3	2377
1.4821		X 20 CrNiSi 25 4			S44635	X 15 CrNiSi 25 4	Z 20 CNS 25.04	X 20 CrNiSi 254	
1.4823		GX 40 CrNiSi 27 4				J92605			

Workpiece Material Conversion Table • K1

K1 Gray Cast Irons and Low-Strength Ductile Irons — Tensile Strength RM (MPa): 150–400 — Hardness (HB): 120–290*

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
0.6010	A48-20 B	GG-10	Grade 100	FC 100		GJL-100	FGL 100	G 10	0110-00
0.6012		GG-150HB				GJL-HB 170			
0.6015	A48-25 B	GG-15	Grade 150	FC 150		GJL-150	FGL 150	G 15	0115-00
0.6017		GG-170HB			N06985	GJL-HB 205			
0.6020	A48-30 B	GG- 20	Grade 220	FC 200	W06020	GJL-200	FGL 200	G 20	0120-00
0.6022		GG-190HB			N06022	GJL-HB 230			
0.6025	A48-35 B	GG -25	Grade 260	FC 250		GJL-250	FGL 250	G 25	0125-00
0.6026		GG- 26		FC260				G 26	0126-00
0.6027		GG -220HB			W06027	GJL-HB 250	FGL 250		
0.6030	A48-45 B	GG- 30	Grade 300	FC 300		GJL-300	FGL 300	G 30	0130-00
0.6032		GG -240HB				GJL-HB 275			
0.6035	A48-50 B	GG- 35	Grade 350	FC 350		GJL-350	FGL 350	G 35	0135-00
0.6037		GG- 260HB				GJL-HB 275			
0.6040	A48-55 B	GG- 40	Grade 400			GJL-400	FGL 400		0140-00
0.9990		GGV-40				GJV-400			

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

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Workpiece Material Conversion Table • K2

K2 Low- and Medium-Strength CGI and Ductile Irons — Tensile Strength RM (MPa): 400–600 — Hardness (HB): 130–260*

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
0.6652		GGL-NiMn137	L-NiMn 13 7	FCA NiMn 13 7	F43000	GJLA-XNiMn 13-7	L-NM 13 7		
0.6655	A 436 Type 1	GGL-NiCuCr1562	L-NiCuCr 15 6 2	FCA - NiCuCr 15 6 2	F41000	GJLA-XNiCuCr 15-6-2	L-NUC 15 6 2		
0.6656	A 436 Type 1b	GGL-NiCuCr1563	L-NiCuCr 15 6 3	FCA-NiCuCr 15 6 3	F41001	GJLA-XNiCuCr 15-6-3	L-NUC 15 6 3		
0.6660	A 436 Type 2	GGL-NiCr202	L-NiCr 20 2	FCA-NiCr 20 2	F41002	GJLA-XNiCr 20-2	L-NC 20 2		0523-00
0.6661	A 436 Type 2b	GGL-NiCr203	L-NiCr 20 3	FCA-NiCr 20 3	F41003	GJLA-XNiCr 20-3	L -NC 20 3		
0.6667		GGL-NiSiCr2053	L-NiSiCr 20 5 3	FCA-NiSiCr 20 5 3		GJLA-XNiSiCr 20-5-3	L-NSC 20 5 3		
0.7033		GGG-35.3				GJS-350-22			0717-15
0.7040	60-40-18	GGG-40	SNG 420/12	FCD 400	F32800 class 1	GJS-400-15	FGS400-12	GS400-12	0717-02
0.7043		GGG- 40.3	SNG 370/17	FCD 370		GJS-400-18	FGS 370-17	GSO 42/15	0717-15
0.7045		GGG-45		FCD 450					
0.7049							FGS450.10		
0.7050	65-45-12	GGG-50	SNG 500/7	FCD 500	F33100	GJS-500-7	FGS 500-7	GS 500/7	0727-02
0.7060	80-55-06	GGG -60	SNG 600/3	FCD 600	F33800	GJS-600-3	FGS 600-3	GS 600/3	0732-03
0.7065		GGG-65							
0.7070	100-70-03	GGG-70	SNG 700/2	FCD 700	F34800	GJS-700-2	FGS 700-2	GS 700-2	0737-01
0.7652		GGG-NiMn137	S-NiMn 13 7	FCDA-137		GJSA-XNiMn 13-7	S-Mn 13 7		0772-00
0.7659		GGG-NiCrNb202 S2W	FCDA-NiCrNb 20 2			GJSA-XNiCrNb 20-2			
0.7660	A 439 Type D-2	GGG-NiCr202	L-NiCuCr 20 2	FCDA-NiCr 20 2		GJSA-20 2; A32-301	S-L-NC XNiCr 20-2		0523-00
0.7665		GGG-NiSiCr2052	S-NiSiCr 20 5 2	FCDA-NiSiCr 20 5 2		GJSA-XNiSiCr 20-5-2	S-NSC 20 5 2		
0.7670	A 439 Type D-2C	GGG-Ni22	S-Ni 22	FCDA-Ni 22	F43002	GJSA-XNi 22	S-N 22		
0.7673	A 571 Type D-2M	GGG-NiMn234	S-NiMn 23 4	FCDA-NiMn 23 4		GJSA-XNiMn 23-4	S-NM 23 4		
0.9991		GGV-30				GJV-300			

Workpiece Material Conversion Table • K3

K3 High-Strength Ductile and Austempered Ductile Irons Tensile Strength RM (MPa)*: 600–900 Hardness (HB): 180–350

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
0.7080	120-90-02	GGG-80	SNG 800/2	FCD 800	F36200	GJS-800-2	FGS 800-2	GS 800-2	
0.7661	A 439 Type D-2B	GGG-NiCr203	S-NiCr 20 3	FCDA-NiCr 20 3	F43001	GJSA-XNiCr 20-3			
0.8035		GTW-35-04	W 35-04	FCMW 330 class 1		GJMW-35-0-4	MB 35-7	W 35-04	
0.8038		GTW-S-38-1 2	W 38-12			GJMW-360-12	MB 300-12	5922 W38-12	
0.8040		GTW-40-05	W 40-05	FCMW 370		GJMW-400-5	MB 400-5	GMB 40	
0.8045		GTW-45-07	W 45-07	FCMWP 440 class 3		GJMW-450-7	MB 450-7	GMB 45	
0.8055		GTW-55						GMB 55	

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
0.8065		GTW-65						GMB 65	
0.8070									
0.8135	32510	GTS-35-10	B 340/12	FCMP 330		GJMB-350-10	MN 350-10	5922 B35-10	0815
0.8145	40010	GTS-45-06	P 440/7	FCMP 440	GJMB-450-6	MN 450 - 6	P 45-06		0852
0.8155	50005	GTS-55-04	P 510/4	FCMP 490	GJMB-550-4	MN 550-4	P 55-04		0854
0.8165	70003	GTS-65-02	P 570/3	FCMP 540	GJMB-650-2	MN 650-3	P 65-02		0858-00, 0856-00
0.8170	90001	GTS-70-02	P 690/2	FCMP 690	GJMB-700-2	MN 700-2	P 70-02		0862-03; 0864-03

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

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Workpiece Material Conversion Table • N1

N1 Wrought Aluminium Alloys — **Tensile Strength RM (MPa)*: <520** — **Hardness (HB): 60-90**

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
—	—	AlMg3Mn	—	—	—	1	1	1	1
1.0226		Algafort/ DX51D (St 02 Z)		—		DX51D	GC	FeP 02 G	1151-10
1.0250		St E 320-3Z				S 320 GD + ZA			
1.0309		St 35.4				DX 55 D + AS			
1.0350		Alugal AL3							
1.0531		AluzincAC550 (S550 GD + Z)				S 550 GD + Z			
1.0579		Aldur 50							
1.3711		AlNiCo 3/5p							
1.3713		AlNiCo 5/6p							
1.3715		AlNiCo 7/8p							
1.3728		AlNiCo 9/5							
1.3743		AlNiCo 12/6							
1.3756		AlNiCo 18/9							
1.3757		AlNiCo 44/5							
1.3758		AlNiCo 30/10							
1.3759		AlNiCo 52/6							
1.3760		AlNiCo 26/6							
1.3761		AlNiCo 35/5							
1.3763		AlNiCo 60/11							
1.3765		AlNiCo 30/14							
1.6528		AISI 8660			G 86600, H 86600				
1.8909		S 500 QL				S500QL	S 500 QL	S 500 QL	2615
1.8926		S 550 QL (TStE 500 V)				S 550 QL	S 550 QL	S 550 QL	
1.8927		S 620 QL (TStE 620 V)				S 620 QL	S 620 QL	S 620 QL	
3.0250	1000	Al99.5H	L31				A59050C		
3.0255	1000	Al99.5	L 31				A 59050 C		
3.0259		SG-Al 99,5							
3.0280		Al99.8							
3.0286		SG-Al99, 8							
3.0305		Al 99.9							
3.0515		G-Al99,5							
3.0615		AlMgSiPb							
3.0805		SG-Al 99, 5Ti							
3.1325	2017	AlCuMg 1				AW-2017 A			
3.1355	2024	AlCuMg 2				AW-2024			
3.1371		G-AlCu 4 TiMg							
3.1645		AlCuMgPb							
3.1655	2011	AlCuBiPb							
3.1754		G-AlCu 5 Ni 1, 5							
3.2245		SG-AlSi 5							
3.2315	6351	AlMgSi 1				AW-6005 A			
3.3206	6063	AlMgSi0.5							
3.3292		G-D AlMg 9							
3.3315	5005	AlMg 1				AW-6082			
3.3316	5050	—	—	—	—	1	1	1	1
3.3455		AlZnMg 3							
3.3523	5052	—	—	—	—	1	1	1	1
3.3525		AlMg 2							
3.3535	5754	AlMg 3							
3.3536		SG-AlMg 3							
3.3541		G-AlMg 3							
3.3545	5086	—	—	—	—	1	1	1	1
3.3547	5083	AlMg4,5Mn							
3.3548		SG-AlMg 4, 5 Mn							
3.3549	5056	—	—	—	—	1	1	1	1
3.3555		AlMg 5							
3.3556		SG-AlMg 5							
3.4345	7050	AlZnMgCu0, 5; AlZnMgCu1	L 86				AZ 4 GU/9051	811-04	
3.4365	—	AlZn5, 5MgCu	—	—	—	1	1	1	1

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

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Workpiece Material Conversion Table • N2

N2 Cast Aluminiums — Content: Si<12.2% — Tensile Strength RM (MPa)*: <350 — Hardness (HB): 70–100

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
2.1871		G-AlCu 4 TiMg							
3.0805		SG-Al 99,5 Ti							
3.0928		G-AlCu 5 Si 3							
3.1263		GK-AlCu 5 Si 3							
3.1841		G-AlCu 4 Ti							
3.2131		G-AlSi 5 Cu 1							
3.2151		G-AlSi 6 Cu 4							
3.2153		G-AlSi 7 Cu 3							
3.2161		G-AlSi 8 Cu 3							
3.2163		G-AlSi 9 Cu 3							
3.2211		G-AlSi 1 1							
3.2245		SG-AlSi 5							
3.2341		G-AlSi 5 Mg							
3.2341		G-AlSi 5 Mg							
3.2371	4218 B	G-AlSi 7 Mg							
3.2373		G-AlSi 9 Mg							
3.2381		G-AlSi 10 Mg							
3.2382		G-D AlSi 10 Mg							
3.2383	A 360.2	G-AlSi 10 Mg (Cu)	LM 9						4253
3.2515		AlMgSi 1							
3.2573		G-AlSi 9 (Cu)							
3.2581	A	G-AlSi 12	LM 6						4261
3.2582	A 413.0	G-D AlSi 12							4247
3.2583	A 413.1	G-AlSi 12 (Cu)	LM 20						4260
3.2585		SG-AlSi 12							
3.2982		G-D AlSi 12 (Cu)							
3.3241		G-AlMg 3 Si							
3.3245		AlMg 3 Si							

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
3.3261		G-AlMg 5 Si							
3.3308		Al 99.9 Mg 5							
3.3458		G-AlMg5Si (Cu, Mn)							
3.3546		SG-Al Mg 4,5 Mn Zr							
3.3561		G-AlMg 5							
3.3591		G-AlMg 10							
3.5100									
3.5101	ZE 41	G-MgZn 4 SE 1 Zr 1	MAG 5			MCMgZn 4 RE 1 Zr	G-Z 4 TR		
3.5102		G-MgZn 5 Th 2 Zr 1							
3.5103	EZ 33	MgSE 3 Zn 2 Zr 1	MAG 6			MCMgRE 3 Zn 2 Zr	G-TR 3 Z 2		
3.5104		MgAl 9 Zn 1							
3.5105		G-MgTh 3 Zn 2 Zr 1							
3.5106	QE 22	G-MgAg 3 SE 2 Zr 1	MAG 12			MCMgRE 2 Ag 2 Zr	G-Ag 22, 5		
3.5200		G-MgAl 8 Zn 1							
3.5312		MgAl 3 Zn							
3.5470	AS 41	G-D MgAl 4 Si 1				MCMgAl4Si	G-A4S 1		
3.5612		G-D MgAl 6 Zn 1							
3.5632		G-MgAl 6 Zn 3							
3.5662		G-D MgAl 6							
3.5812	AZ 81	G-MgAl 8 Zn 1	MAG 1			MCMgAl 8 Zn 1	G-A 9		
3.5912	AZ 91	G-MgAl 9 Zn 1	MAG 7			MCMgAl 9 Zn 1	G-A 9 Z 1		
3.5922		GD-MgAl 9 Zn 2							
		G-AlZn10Si8Mg							

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WIDIA HANITA

Technical Information

Workpiece Material Conversion Table • N2

N2 Cast Aluminiums | **Content: Si<12.2%** | **Tensile Strength RM (MPa)*: <350** | **Hardness (HB): 70-100**

Material Number	AISI**	DIN	BS	JIS	UNS	AFNOR	UNI	SIS	AMS
						AMS Materials – N1			
3.1255	2014	AlCuSiMn	2014A, H15, L102, L103, L105, L158, L159, L168, 6L37, 3L62, 2L77, 2L87, 2L93, 5010A				A2014, A3x1	14 4338	4028, 4029, 4133, 4134, 4135, 4314, 4153
3.1355	2024	AlCuMg2	2L97, 2L98				A2024, A3x4		4007, 4035, 4037, 4086, 4119, 4120, 4193, 4112, 4152, 4164, 4165, 4087, 4088, 7223, 4031, 4066, 4068, 4143, 4144, 4162, 4163, 4313
	2618								4132

Material Number	AISI**	DIN	BS	JIS	UNS	AFNOR	UNI	SIS	AMS
						AMS Materials – N1			
3.321	6061	AlMgSiCu	606, H20, L117, L118				A6061, A2x4		4025, 4026, 4027, 4079, 4080, 4081, 4083, 4113, 4115, 4116, 4117, 4127, 4128, 4146, 4150, 4160, 4161, 4172, 4173, 4312
3.4365	7075	AlZnMg-Cu1.5	7075, 2L95, L160, L161, L162				A7075, A3x6		4044, 4078, 4122, 4123, 4126, 4141, 4147, 4154, 4166, 4167, 4168, 4169, 4186, 4187, 4310, 4311, 4124

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

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Workpiece Material Conversion Table • N3

N3 Cast Aluminiums	Content: Si>12.2%	Tensile Strength RM (MPa)*: 200-320	Hardness (HB): 60-120

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
		G-AlSi17 Cu4Mg							
		GK-AlSi18 CuNiMg							
		GK-AlSi21 CuNiMg							
		GK-AlSi12 CuNiMg							
		GK-AlSi25 CuNiMg							

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

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Workpiece Material Conversion Table • N4

N4 MMCs (Aluminium-Based Metal Matrix Composites)	Tensile Strength RM (MPa)*: <700	Hardness (HB): 210

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
2.0966	C 63000	CuAl 10 Ni 5 Fe 4	Ca 104				U-A 10 N		
3.5104		MgAl 9 Zn 1							
		GFK							
		CFK							

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

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Workpiece Material Conversion Table • N5

N5 Copper and Copper Alloys — **Tensile Strength RM (MPa)*: 200–650** — **Hardness (HB): 60–200**

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.6261		17 CuNi 4							
1.8980		5 CuNi 123 (S 500 A)				S 500 A	S 500 A	S 500 A	
2.0040		OF-Cu							
2.0060	B-120	E-Cu 57							
2.0065	C 11000	E-Cu 58	C 101				Cn-a2		
2.0070	C 10300	SE-Cu	C 101				Cu-c1		
2.0082	C 81100	G-CuL 45	HCC 1						
2.0085	C 81100	G-Cu L 50	HCC 1						
2.0220		CuZn 5							
2.0240	C 23000	CuZn 15	CZ 102	C 2300			CuZn 15		
2.0241		CuZn 40 MnPb							
2.0250		CuZn 20							
2.0265	C 26000	CuZn 30	CZ 102	C 2600			CuZn 30		
2.0280		CuZn 33							
2.0290		G-CuZn 33 Pb							
2.0321	C 27200	CuZn 37	CZ 108				CuZn 37	C 2720	
2.0330		CuZn 36 Pb 1.5							
2.0331		CuZn 36 Pb 1,5							
2.0332		CuZn 37 Pb 0,5							
2.0340		G-CuZn 37 Pb							
2.0366		L-CuZn40Si							
2.0380		CuZn 39 Pb 2							
2.0401		CuZn 39 Pb 3 + D567							
2.0402		CuZn 40 Pb 2							
2.0460		CuZn 20 Al 2							
2.0490		CuSn 2							
2.0492	B-198	G-CuZn 15Si 4							
2.0510		CuZn 37Al 1							
2.0550		CuZn 40 Al 2							
2.0561		CuZn 40Al 1							
2.0590		G-CuZn 40 Fe							
2.0591		G-KCuZn 38 Al							
2.0592	C 86500	G-CuZn 35 Al 1	HTB 1				U-Z 36 N 3		
2.0595		G-KCuZn 37 Al 1							
2.0596	C 86200	G-CuZn 34 Al 2	HTB 1				U-Z 36 N 3		
2.0598		G-CuZn 25 Al 5							
2.0790		CuNi 18 Zn 19 Pb							
2.0837		S - CuNi 30 Fe							
2.0855		CuNi 2 Si							
2.0857		CuNi 3 Si							

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
2.0872		CuNi 10 Fe 1 Mn							
2.0873		S - CuNi 10 Fe							
2.0882		CuNi 30 Mn 1 Fe							
2.0916		CuAl 5							
2.0920		CuAl 8							
2.0921		SG-Cu Al 8							
2.0922		SG-CuAl 8 Ni 2							
2.0923		SG - CuAl 8 Ni 6							
2.0927		SG-CuAl 9 Ni5 Fe							
2.0928		G-CuAl 9							
2.0932		CuAl 8 Fe							
2.0936		CuAl 10 Fe 3 Mn 2	CA 103				U-A 10 Fe		
2.0937		SG-Cu Al 10 Fe							
2.0940		G-CuAl 10 Fe							
2.0960		CuAl 9 Mn							
2.0966	C 63000	CuAl 10 Ni 5 Fe 4	Ca 104				U-A 10 N		
2.0970		G-CuAl 9 Ni							
2.0975	B-148-52	G-CuAl 10 Ni							
2.0980		CuAl 11 Ni							
2.1006		SG-Cu Sn							
2.1016		CuSn 12							
2.1022		SG-Cu Sn 6							
2.1025		EL - CuSn 7							
2.1050	C 90700	G-CuSn 10	CT 1						
2.1052	C 90800	G-CuSn 12	Pb 2				UE 12 P		
2.1060	C 91700	G-CuSn 12 Ni							
2.1061		G-CuSn 12 Pb							
2.1086		G-CuSn 10 Zn							
2.1090	C 93200	G-CuSn 7 ZnPb					U-E 7 Z 5 Pb 4		
2.1093		G-CuSn 6 ZnNi	LG 4						
2.1096	C 83600	G-CuSn 5 ZnPb	LG 2				U-E 5 Pb 5 Z 5		
2.1096		G-CuSn 5 PbZn							
2.1098		G-CuSn 2 ZnPb							
2.1170		CuPb 5 Sn 5							
2.1176	C 93700	G-CuPb 10 Sn	LB 2				U-E 10 Pb 10		
2.1182	C 93800	G-CuPb 15 Sn	LB 1				U-Pb 15 E 8		
2.1188	C 94100	G-CuPb 20 Sn	LB 5				U-Pb 20		
2.1202		CuAg							
2.1211		SG - CuAg							
2.1243		CuBe 1,2							
2.1245		CuBe 1,7							

Workpiece Material Conversion Table • N5

N5 Copper and Copper Alloys										Tensile Strength RM (MPa)*: 200-650									Hardness (HB): 60-200
Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS	Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
2.1247		CuBe 2								2.1322		CuMg 0,4							
2.1265		CuCd 0,7								2.1323		CuMg 0,7							
2.1266		CuCd 1								2.1355		CuMn 2							
2.1270		CuCdSn								2.1363		CuMn 2							
2.1285		CuCoBe								2.1366		CuMn 5							
2.1291		CuCr								2.1367		SG-Cu Mn 13 Al 7							
2.1292	C 81500	G-CuCrF 35	CC1-FF							2.1461		SG-Cu Si 3							
2.1293	C 81500	CuCrZr	CC 102				U-Cr 0,8 Zr			2.1522		CuSi 2 Mn							
										2.1525		CuSi 3 Mn							

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

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Carbon and Graphite Composites • N6

N6 Carbon and Graphite Composites	Tensile Strength RM (MPa)*: 600-1500

All materials contained in N6 are non-metallic. Therefore, there is no data to populate the chart because the materials do not exist in metal classification systems.

It is important to note that N6 contains the following materials:

- Graphite
- CFRP (Carbon-Fiber Reinforced Polymer)
- CRP (Carbon-Reinforced Polymer)
- GRP (Graphite-Reinforced Polymer)
- GFRP (Graphite-Fiber Reinforced Polymer)
- Graphite Fiber
- Fiberglass-Reinforced Composites

Carbon-fiber Reinforced Polymer (CFRP), or Carbon-Reinforced Polymer (CRP), is a very strong, light, and expensive composite material or fiber-reinforced polymer. Similar to fiberglass (glass-reinforced polymer), the composite material is commonly referred to by the name of its reinforcing fibers — carbon fiber.

The polymer is most often epoxy, but other polymers, such as polyester, vinyl ester, or nylon, are also sometimes used. Some composites contain both carbon fiber and other fibers such as kevlar, aluminium, and fiberglass reinforcement. The terms Graphite-Reinforced Polymer or Graphite-Fiber Reinforced Polymer (GFRP) are used less commonly, since glass-/glass-fiber reinforced polymer can also be called GFRP. In product advertisements, it is sometimes referred to simply as graphite fiber.

Workpiece Material Conversion Table • S1

S1 Iron-Based, Heat-Resistant Alloys — **Tensile Strength RM (MPa)*: 500–1200** — **Hardness (HB): 160–260**

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
0.6676	A 436 Type 3	GGL- NiCr303	L-NiCr 30 3	FCA-NiCr 30 3	F41004	GJLA-XNiCr 30-3	L-NC 30 3		
0.6680	A 436 Type 4	GGL-NiSiCr3055	L-NiSiCr 30 5 5	FCA-NiSiCr 30 5 5	F41005	GJLA-XNiSiCr 30-5-5	L-NSC 30 5 5		
0.7676	A 439 Type D-3	GGG-NiCr303	S-NiCr 30 3	FCDA-NiCr 30 3	F43003	GJSA-XNiCr 30-3	S-NC 30 3		
0.7677	A 439 Type D-3A	GGG-NiCr301	S-NiCr 30 1	FCDA-NiCr 30 1	F43004	GJSA-XNiCr 30-1	S-NC 30 1		
0.7679		GGG-NiSiCr3055		FCDA-NiSiCr 30 5 5		GJSA-XNiSiCr 30-5-5			
0.7680	A 439 Type D-4	GGG-NiSiCr3053	FCDA-S-NiSiCr 30 5 5	F43005 NiSiCr 30 5 4	GJSA-XNiSiCr 30-5-3	S-NSC 30 5 5			
0.7683	A 439	Type D-5	GGG-Ni35	S-Ni 35	FCDA-Ni 35	F43006	GJSA-XNi 35	S-N 35	
0.7685	A 439 Type D-5A	GGG-NiCr353	S-NiCr 35 3	FCDA-NiCr 35 3	F43007	GJSA-XNiCr 35-3	S-NC 35 3		
0.7688		GGG-NiSiCr3552	FCDA-NiSiCr 35 5 2		GJSA-XNiSiCr 35-5-2	FGS Ni35 Si 5 Cr2			
1.2789		X 7 NiCrCoMo 54 20							
1.3910		D 1							
1.3915		D 1 a							
1.3916		D 3	BD 3			X 210 Cr 1 2	Z 200 C 12	X 205 Cr 12 KU	
1.3920		Ni 46							
1.3926		RNi 12							
1.3927		Ni 48							
1.3938		X 8 NiCr 17 10							
1.4335		X 1 CrNi 25 21				X 1 CrNi 25 21	X1CrNi25-21	X 1 CrNi 25-21	
1.4361		X 1 CrNiSi 18 15			X 1 CrNiSi 18-15-4	Z 1 CNS 18.15	X 1 CrNiSi 18-15-4		
1.4500		GX 7 NiCrMoCuNb 25 20		SCS 23	J95150	10.204.3.1B	Z 3 NCDU 25.20 M	GX 5 NiCrCuMo 29 21	
1.4558		X 2 NiCrAlTi 32 20		NCF 800 TB					
1.4562		X 1 NiCrMoCu 32 28 7							
1.4563		X 1 NiCrMoCuN 31 27 4				X 1 NiCrMoCu 31 27 4	X 1 NiCrMoCuN 31 -27-4	X 1 -27-4 NiCrMoCuN 31	2584
1.4836		GX 50 CrNiNb 25 22							
1.4849		GX 40 NiCrSiNb 38 18			N08004				
1.4850		X 15 NiCrNb 32 21							
1.4852		GX 40 NiCrSiNb 35 25							
1.4853		X 40 NiCrNb 35 25							
1.4857		GX 40 NiCrSi 35 25			J95705			GX 50 NiCr 35 25	
1.4859		GX 10 NiCrNb 32 20			J95151				
1.4862		X 8 NiCrSi 38 18	NA 17				Z 12 NCS 37.18		
1.4863		X 12 NiCr 36 18							
1.4864	330	X 12 NiCrSi 35 16	NA 17	SUH 330	N08330	X 12 NiCrSi 35 1 6	Z 12 NCS 37.18		
1.4865		GX 40 NiCrSi 38 18	330 C 40	SCH 15	J94605			GX 50 NiCr 39 19	
1.4876	B163	X 10 NiCrAlTi 32 20	NA 15	NCF 800		X 10 NiCrAlTi 32 20	Z 8 NC 32.21		
1.4886		X 10 NiCrSi 35 19				X10NiCrSi 35-19			
1.4887		X 10 NiCrSiNb 35 22				X10NiCrSiNb 35-22			
1.4958		X 5 NiCrAlTi 31 20							
1.4977		X 40 CoCrNi 20 20					Z 42 CNKDWNb		
	R 30188							Haynes 188	
	S 66286							A-286	
	S 41800							Greek Ascology	
	R 30556							Haynes 556	HS556
	R 30155							N155	

Material Number	AISI**	DIN	BS	JIS	UNS	AFNOR	UNI	SIS	AMS
AMS Materials – S1									
	A-286								5525, 5731, 5732, 5737, 5805, 5895, 7235, 7477, 7478
	Haynes 188								5608, 5772, 5801
	In-100								5397

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

Workpiece Material Conversion Table • S2

S2 Nickel-Based or Cobalt-Based, Heat-Resistant Alloys — Tensile Strength RM (MPa)*: 1000–1450 — Hardness (HB): 250–450

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.0513		GL-A 32 (S 315 G 1 S)			K11846	S 315 G 1 S			
1.0583		GL-A36 (S 355 G 1 S)			K11852	S 355 G1 S			
1.0874		A0							
1.0875		A 2				X 100 CrMoV 5 1			
1.0876		A 3							
1.3901		Ni 25							
1.3913		Ni 38							
1.3918		Ni 43							
1.3921		Ni 46							
1.3924		Ni 54							
1.3928		Ni 52							
1.3935		X 12 CrNiMn 18 88							
1.4939		X 12 CrNiMo 12	S.151			Z 12 CNDV 12-03			
1.4943		X 4 NiCrTi 25 15	HR251	SUH 660	S66286		Z 6 NCTDV 25.15 B		
1.4944		A 286		SUH 660					
1.4959		X 5 NiCrAlTi 32 21							
1.4980	660	X 5 CrNiTi 26 15	286 S 31		S66286	X 6 NiCrTiMoVB 21-15-2	Z 6 NCTDV 25.15 B		
2.4053		Alloy 222 (Ni99, 7Mg0, 07)							
2.4060		Ni 99,6	NA 46						
2.4061		LC-Ni 99, 6							
2.4066	N 02200	Ni 99, 2	NA 11						
2.4068		LC-Ni 99	NA 12						
2.4106		NiMn 1							
2.4108		NiMn 1 C							
2.4109		NiMn 1, 5							
2.4110		NiMn 2							
2.4122		NiMn 3 Al							
2.4126		NiMn 3 SiMg							
2.4145		NiCr 2 Mn							
2.4146		NiCr 2 MnSi							
2.4151		NiCr 5 MnSi							
2.4155		SG-NiTi 4	NA32			NA 32			
2.4170	SZ-100	G-Ni 95							
2.4175	CZ-100	G-Ni 93 C							
2.4180		G-Ni 93 Si							
2.4199		NiCr 4 Mn							
2.4360	N 04400	NiCu 30 Fe	NA 13				NU 30	Monel 400	
2.4365	M 35 -1/2	G-NiCu 30 Nb			N24030				
2.4366		EL-NiCu 30 Mn			N04402				
2.4367	M 30-H	G-NiCu 30 Si 3							
2.4368	M-255	G-NiCu 30 Si 4							

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
2.4370		NiCu 30 Ti							
2.4374		NiCu 30 Al							
2.4375	N 05500	NiCu 30 Al	NA 18				NU 30 AT	Monel K-500	
2.4377		SG-NiCu 30 MnTi	NA 33						
2.4420		NiFe 44							
2.4500		NiFe16 CuCr							
2.4520		NiFe16 CuMo							
2.4560		NiFeK 6040							
2.4602		NiCr 21 Mo 14 W			N26022			Inconel 622	
2.4603		NiCr 30 FeMo							
2.4604		NiMo 23 Cr 8 Fe							
2.4605		NiCr 23 Mo 16 Al							
2.4607		SG/UP-NiCr 23 Mo 16							
2.4608		NiCr 26 MoW							
2.4610	N 06455	NiMo 16 Cr 16 Ti	NA 45	N26455			Hastelloy C-4		
2.4615		SG(UP)-NiMo 27							
2.4617	N 10665	NiMo 28					NiMo 28		
2.4618		NiCr 22 Mo 6 Cu							
2.4619	N 06985	NiCr 22 Mo 7 Cu							
2.4626		SG-NiCr 23 Al	NA 49						
2.4627		SG-NiCr 22 Co 12 Mo	NA 50						
2.4630	N 06075	NiCr 20 Ti	HR5				NC 20 T	Nimonic 75	
2.4632		NiCr 20 Co 18 Ti	NA 36		N07090			Nimonic 90	
2.4634		NiCo 20 Cr 15 MoAlTi			N13021			Nimonic 105	
2.4636		NiCr 15 Cr 15 MoAlTi (Alloy115)	HR4					Nimonic 115	
2.4637		NiCr 22 Mo 8 AlCuTi							
2.4639		SG-NiCr 20	NA 34						
2.4641		NiCr 21 Mo 6 Cu		NCF 600 TP					
2.4642	N 06690	NiCr 29 Fe		NCF 690			NC 30 Fe	Inconel 690	
2.4647		NiCr 25 FeAlYC							
2.4650	N 07263	NiCo 20 Cr 20 MoTi	NA 38				NCK 20 D	Nimonic C-263	
2.4652		EL-NiCr 26 Mo							
2.4654		NiCr 19 Co 14 Mo 4 Ti						Waspaloy	
2.4656		SG-NiCr 29 Mo							
2.4658		NiCr 70 30			N06008				
2.4659		SG-NiCr 30 Mo 5 W							
2.4660	N 08020	NiCr 20 CuMo							
2.4661		EL-NiCr 29 Mo 5 W							

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Workpiece Material Conversion Table • S2

S2 Nickel-Based or Cobalt-Based, Heat-Resistant Alloys — Tensile Strength RM (MPa)*: 1000–1450 — Hardness (HB): 250–450

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
2.4662		NiCr 13 Mo 6 Ti 3						Nimonic 901	
2.4663	N 06617	NiCr 23 Co 12 Mo						Inconel 617	
2.4665		NiCr 22 Fe 18 Mo	NA 40					Hastelloy X	
2.4666		NiCr 18 CoMo							
2.4667		SG-NiCr 19 NbMoTi	NA 51						
2.4668	N 07718	NiCr 19 FeNbMo	INCONEL 718				NC 19 Fe Nb	Inconel 718	
2.4669	N 07750	NiCr 15 Fe 7 TiAl		N07750			NC 15 Fe 7 TA	Inconel X-750	
2.4670		G-NiCr 13 Al 6 Mo Nb							
2.4671		G-NiCr 12 Al 6 MoNb							
2.4672		G-NiCr 20 Co 20 MoTi							
2.4674		G-NiCo 15 Cr 10 AlTiMo							
2.4676		G-NiCo 10 W 10 CrAlNb							
2.4678		G-NiCr 50							
2.4679		G-NiCr 35							
2.4680		G-NiCr 50 Nb							
2.4681		CoCr 26 Ni 9 Mo							
2.4682		G-CoCr 25 NiW							
2.4683		CoCr 22 NiW							
2.4685	N-7 M	G-NiMo 28						Hastelloy B	
2.4686	CW-12 MW	G-NiMo 17 CrW							
2.4691		G-CoCr 28 Mo							
2.4693		NiCr 25 Mo 7 Ti							
2.4710		NiMo 23 Cr 8 Fe							
2.4711		CoCr 20 Ni15Mo							
2.4723		G-CoCr 29 Mo							
2.4733		NiCr 22 W 14 Mo							
2.4764		NiCr 20 AlY							
2.4765		NiCr 17 AlWY							
2.4772		G-NiCr 20 Co 20 MoTi							
2.4775		CoCr33W							
2.4778		G-CoCr 28							
2.4779		G-CoCr 28 Nb							
2.4806		SG-NiCr 20 Nb	NA 35						
2.4810	N-12 MV	NiMo 30	ANC 15				Ni-Mo 28	Hastelloy C	
2.4813		G-NiCr 50 Nb							
2.4816	N 06600	NiCr 15 Fe	NA 14	NCF 600	N06040		NC 15 Fe	Inconel 600	
2.4819	N 10276	NiMo 16 Cr 15 W					NC 17 D	Nimonic C-276	
2.4831		SG-NiCr 21 Mo 9 Nb							
2.4836		NiCr 20 Mo 15							
2.4839		SG-NiCr 20 Mo 15							
2.4851	N 06601	NiCr 23 Fe		NCF 601			NC 23 Fe A	Inconel 601	
2.4854		NiFe 33 Cr 25 Co							
2.4855		NiCr 19 Mo9Si							
2.4856	N 06625	NiCr 22 Mo 9 Nb	NA 21	NCF 625	N26625		NC 22 Fe DNb	Inconel 625	
2.4858	N 08825	NiCr 21 Mo	NA 16	NCF 825 TB			NC 21 Fe DU	Incoloy 825	
2.4867		NiCr 60 15							
2.4869		NiCr 80 20							
2.4872		NiCr 20 AlSi							
2.4879		G-NiCr 28 W							
2.4883		G-NiMo 16 Cr							
2.4886		Sg-NiMo 16 cr 16 W	NA 48						
2.4888		G-NiCr 13 MoAl							
2.4890		NiCr 45 23							
2.4916		G-NiCr 19 Co							
2.4951	N 06075	NiCr 20 Ti	HR 5		N06621		NC 20 T		
2.4952	N 07080	NiCr 20 TiAl	NA 20	NCF 80 A		NiCr 20 TiAl	NC 20 TA		
2.4955		NiFe 25 Cr 20 NbTi				NiFe 25 Cr 20 NbTi		NiFe 25 Cr 20 NbTi	
2.4956									
2.4964	R 30605	CoCr 20 W 15 Ni	HR 240				KC 22 WN	L605 Haynes 25	
2.4969		NiCr 20 Co 18 Ti	NA 19		N07090				
2.4971									
2.4972		NiCr 22 W 12 Fe							
2.4973	AMS 5399	NiCr 19 Co 11 MoTi					NC 19 KDT		
2.4974									
2.4975		NiFeCr 12 Mo							
2.4976		NiCr 20 Mo							
2.4979		CoCr 28 MoNi							
2.4982		NiCr 20 CoMo							
2.4983		NiCr 18 Co			N07500				
2.4987		NiCo 20 Cr 15 MoAlTi							
2.4989		CoCr20NiW							
—		NiCr17Mo 17FeW					NC17DWY	Hastelloy C	

Workpiece Material Conversion Table • S2

S2 Nickel-Based or Cobalt-Based, Heat-Resistant Alloys — **Tensile Strength RM (MPa)*: 1000–1450** — **Hardness (HB): 250–450**

Material Number	AISI**	DIN	JIS	BS	UNS	AFNOR	UNI	SIS	AMS
	AMS Materials – S2								
	Hastelloy C								5530
	Hastelloy N								5607
	Hastelloy S								5711
	Hastelloy W								5587, 5755
	Hastelloy X								5390, 5536, 5587, 5588, 5798, 7237
	Haynes 188								5608, 5772 5801
	In-100								5397
	Incoloy 901								5660 5661
	Inconel 600								7232
	Inconel 625								5401
	Inconel 625								5666
	Inconel 713 C								5391
	Inconel 713 LC								5377
	Inconel 718								5383, 5589, 5596, 5662, 5663, 5832
	Inconel X-750								5542, 5582, 5598, 5667, 5668, 5670, 5671, 5698, 5699
	Stellite 31								5382, 5789
	Waspaloy								5704, 5706, 5707, 5708, 5709, 7253

Workpiece Material Conversion Table • S3

S3 Titanium — **Tensile Strength RM (MPa)*: 900–1600** — **Hardness (HB): 300–400**

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
1.3993		NiCr 16 11							
2.4694	N 07751	NiCr 16 Fe 7 TiAl					Inconel 751		
3.7025	R 50250	Ti 1	2 TA 1						
3.7035	R 50400	Ti 2	2 TA 2-5						
3.7036		SG-Ti 2							
3.7055	R 50550	Ti 3	TA 3						
3.7065	R 50700	Ti 4	2 TA 6-9						
3.7124		TiCu 2	2 TA 21-24						
3.7195		TiAl 3 V2.5							
3.7225	R 52250	Ti 1 Pd	TP 1						
3.7235	R 52400	Ti 2 Pd							
3.7255		Ti 3 Pd							

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

AISI — American Iron and Steel Institute
AFNOR — French National Organization for Standardization
AMS — Aerospace Material Specifications
ASTM — American Society of Mechanical Engineers
BS — British Standards
DIN — German Institute for Standardization
EN — European Standards
JIS — Japanese Industrial Standards
SAE — Society of Automotive Engineers
SIS — Swedish Standards Institute
UNI — Italian Organization for Standardization
UNS — Unified Numbering System

Workpiece Material Conversion Table • S4

S4 Titanium Alloys — **Tensile Strength RM (MPa)*: 900–1600** — **Hardness (HB): 300–400**

Material Number	AISI**	DIN	BS	JIS	UNS	EN	AFNOR	UNI	SIS
3.7105		TiNi 0,8 Mo 0,3							
3.7110		TiAl 5 Fe 2,5							
3.7115		TiAl 5 Sn 2							
3.7145	R 54620	TiAl 6 Sn 2 Zr 4	Mo 2 Si						
3.7155		TiAl 6 ZrMo 0,5	TA 43						
3.7165	R 56400	TiAl 6 V 4	TA 10-13				T-A 6 V		
3.7175	R 56620	TiAl 6 V 6 Sn 2							
3.7185		TiAl 4 Mo 4 Sn 2	TA 45-51						
6Al-	Ti- 4V								4911, 4928, 4930, 4935, 4954, 4956, 7460

Material Number	AISI**	DIN	JIS	BS	UNS	AFNOR	UNI	SIS	AMS
AMS Materials - M1									
	Ti-6Al-4V								4911, 4928, 4930, 4935, 4954, 4956, 7460

* 1 MPa = 145 psi. ** Includes ASTM and SAE material specifications.

AISI — American Iron and Steel Institute
AFNOR — French National Organization for Standardization
AMS — Aerospace Material Specifications
ASTM — American Society of Mechanical Engineers
BS — British Standards
DIN — German Institute for Standardization
EN — European Standards
JIS — Japanese Industrial Standards
SAE — Society of Automotive Engineers
SIS — Swedish Standards Institute
UNI — Italian Organization for Standardization
UNS — Unified Numbering System

Workpiece Material Conversion Table • H1

H1 Hardened Steels and Irons — **Hardness (HB): <460 / HRC: <48**

Material Number	AISI**	DIN	BTS	JIS	UNS	EN	AFNOR	UNI	SIS
0.96		GX 200 CrNiMo 14 1							
0.961		G-X 300 NiMo 3 Mg				GJH-X300NiMo 3 Mg			
0.962	A 532 I B NiCr-LC	GX 260 NiCr 42	Grade 2 A	0512-00	F45001	GJH-X260NiCr 4-2			0512-00
0.9625	A 532 I A NiCr-HC	G-X 330 NiCr 42	Grade 2 B	0513-00	F45000	GJH-X330NiCr 4-2	FB Ni 4 Cr2 HC		0513-00
0.963	A 532 I D Ni-HiCr	G-X 300 CrNiSi 95 2	Grade 2 C	0457-00	F45003	GJH-X300CrNiSi 9-5-2			
0.9635	A 532 IIC15% CrMo-HC	G-X 300CrMo 15 3	Grade 3 A			GJH-X300CrMo 15-3			

Material Number	AISI**	DIN	BTS	JIS	UNS	EN	AFNOR	UNI	SIS
0.964		G-X 300 CrMoNi 15 2 1	Grade 3 B		F45005	GJH-X300CrMoNi 15-2-1			
0.9645	A 532 IID20% CrMo-LC	GX 260 CrMoNi 20 2 1	Grade 3 C		F45007	GJH-X260CrMoNi 20-2-1			
0.965	A 532 III A 25% Cr	GX 260 Cr 27	Grade 3 D	0466-00		GJH-X 260Cr 27			
0.9655	A 532 III A 25% Cr	G-X 300 CrMo 27 1	Grade 3 E			GJH-X300CrMo 27-1			

Workpiece Material Conversion Table • H2

H2 Hardened Steels and Irons — *Hardness (HB): 460-560 / HRC: 48-55*

Material Number	AISI**	DIN	BTS	JIS	UNS	EN	AFNOR	UNI	SIS
0.96		GX 200 CrNiMo 14 1							
0.961		G-X 300 NiMo				GJH-X300NiMo 3 Mg			
0.962	A 532 I B NiCr-LC	GX 260 NiCr 42	Grade 2 A	0512-00	F45001	GJH-X260NiCr 4-2			0512-00
0.9625	A 532 I A NiCr-HC	G-X 330 NiCr 42	Grade 2 B	0513-00	F45000	GJH-X330NiCr 4-2	FB Ni 4 Cr2 HC		0513-00
0.963	A 532 I D Ni-HiCr	G-X 300 CrNiSi 95 2	Grade 2 C	0457-00	F45003	GJH-X300CrNiSi 9-5-2			
0.9635	A 532 IIC15% CrMo-H	G-X 300CrMo 15 3	Grade 3 A			GJH-X300CrMo 15-3			

Material Number	AISI**	DIN	BTS	JIS	UNS	EN	AFNOR	UNI	SIS
0.964		G-X 300 CrMoNi 15 2 1	Grade 3 B		F45005	GJH-X300CrMoNi1 5-2-1			
0.9645	A 532 IID20% CrMo-LC	GX 260 CrMoNi 20 2 1	Grade 3 C		F45007	GJH-X260CrMoNi20-2-1			
0.965	A 532 III A25% Cr	GX 260 Cr 27	Grade 3 D	0466-00		GJH-X260Cr 27			
0.9655	A 532 III A 25%	Cr G-X 300 27 1 CrMo	Grade 3 E			GJH-X300CrMo 27-1			

Workpiece Material Conversion Table • H3

H3 Hardened Steels and Irons — *Hardness (HB): 560-650 / HRC: 56-60*

Material Number	AISI**	DIN	BTS	JIS	UNS	EN	AFNOR	UNI	SIS
0.96		GX 200 CrNiMo 14 1							
0.961		G-X 300 NiMo 3 Mg				GJH-X300NiMo 3 Mg			
0.962	A 532 I B NiCr-LC	GX 260 NiCr 42	Grade 2 A	0512-00	F45001	GJH-X260NiCr 4-2			0512-00
0.9625	A 532 I A NiCr-HC	G-X 330 NiCr 42	Grade 2 B	0513-00	GJH-F45000	FB Ni 4 X330NiCr 4-2	Cr2 HC		0513-00
0.963	A 532 I D Ni-HiCr	G-X 300 CrNiSi 95 2	Grade 2 C	0457-00	F45003	GJH-X300CrNiSi 9-5-2			
0.9635	A 532 IIC15% CrMo-HC	G-X 300CrMo 15 3	Grade 3 A			GJH-X300CrMo 15-3			

Material Number	AISI**	DIN	BTS	JIS	UNS	EN	AFNOR	UNI	SIS
0.964		G-X 300 CrMoNi 15 2 1	Grade 3 B		F45005	GJH-X300CrMoNi 15-2-1			
0.9645	A 532 IID20% CrMo-LC	GX 260 CrMoNi 20 2 1	Grade 3 C		F45007	GJH-X260CrMoNi20-2-1			
0.965	A 532 III A25% Cr	GX 260 Cr 27	Grade 3 D	0466-00		ZGJH-X260Cr 27			
0.9655	A 532 III A 25% Cr	G-X 300 CrMo 27 1	Grade 3 E			GJH-X300CrMo 27-1			

Workpiece Material Conversion Table • H4

H4 Hardened Steels and Irons — *Hardness (HB): >650 / HRC:> 60*

Material Number	AISI**	DIN	BTS	JIS	UNS	EN	AFNOR	UNI	SIS
0.96		GX 200 CrNiMo 14 1							
0.961		G-X 300 NiMo 3 Mg				GJH-X300NiMo 3 Mg			
0.962	A 532 I B NiCr-LC	GX 260 NiCr 42	Grade 2 A	0512-00	GJH-F45001	X260NiCr 4-2			0512-00
0.9625	A 532 I A NiCr-HC	G-X 330 NiCr 42	Grade 2 B	0513-00	F45000	GJH-X330NiCr 4-2	FB Ni 4 Cr2 HC		0513-00
0.963	A 532 I D Ni-HiCr	G-X 300 CrNiSi 95 2	Grade 2 C	0457-00	F45003	GJH-X300CrNiSi 9-5-2			
0.9635	A 532 IIC15% CrMo-HC	G-X 300CrMo 15 3	Grade 3 A			GJH-X300CrMo 15-3			

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0.9645	A 532 IID20% CrMo-LC	GX 260 CrMoNi 20 2 1	Grade 3 C		F45007	GJH-X260CrMoNi 20-2-1			
0.965	A 532 III A 25% Cr	GX 260 Cr 27	Grade 3 D	0466-00		GJH-X260Cr 27			
0.9655	A 532 III A 25% Cr	G-X 300 CrMo 27 1	Grade 3 E			GJH-X300CrMo 27-1			

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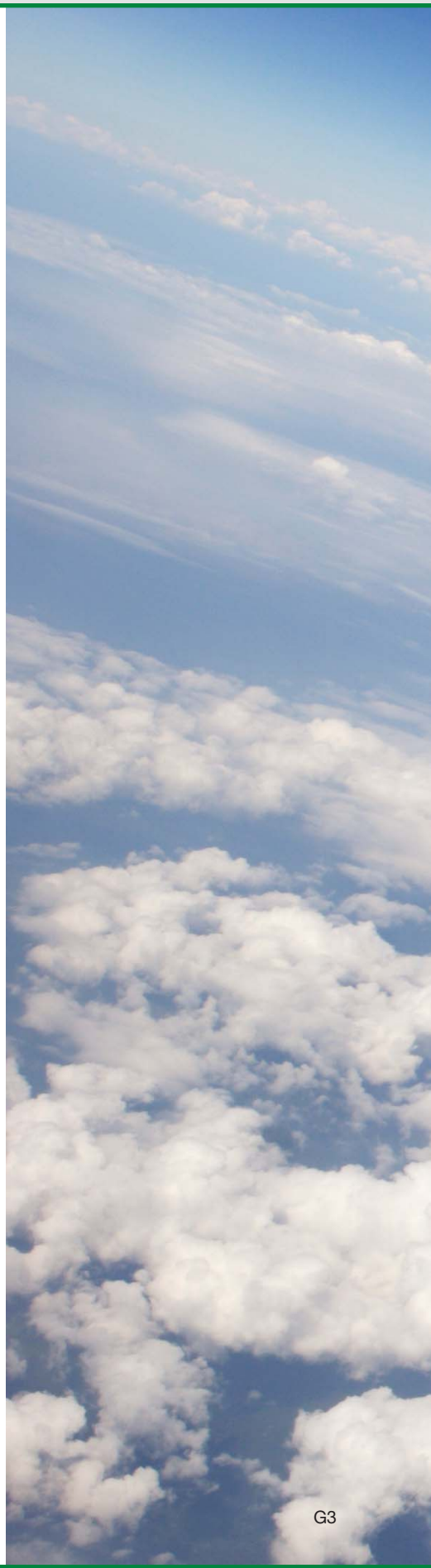

Metalcutting Safety

IMPORTANT SAFETY INSTRUCTIONS

Read before using the tools in this catalog!

Projectile and Fragmentation Hazards

Modern metalcutting operations involve high spindle and cutter speeds and high temperatures and cutting forces. Hot metal chips may fly off the workpiece during metalcutting. Although cutting tools are designed and manufactured to withstand high cutting forces and temperatures, they can sometimes fragment, particularly if they are subjected to over-stress, severe impact, or other abuse.

To avoid injury:

- Always wear appropriate personal protective equipment, including safety goggles, when operating metalcutting machines or working nearby.
- Always make sure all machine guards are in place.

Breathing and Skin Contact Hazards:

Grinding carbide or other advanced cutting tool materials produce dust or mist containing metallic particles. Breathing this dust or mist — especially over an extended period — can cause temporary or permanent lung disease or make existing medical conditions worse. Contact with this dust or mist can irritate eyes, skin, and mucous membranes and may make existing skin conditions worse.

To avoid injury:

- Always wear breathing protection and safety goggles when grinding.
- Provide ventilation control and collect and properly dispose of dust, mist, or sludge from grinding.
- Avoid skin contact with dust or mist.

For more information, read the applicable Material Safety Data Sheet provided by Kennametal and consult General Industry Safety and Health Regulations, Part 1910, Title 29 of the Code of Federal Regulations.

These safety instructions are general guidelines. Many variables affect machining operations. It is impossible to cover every specific situation. The technical information included in this catalog and recommendations on machining practices may not apply to your particular operation. For more information, consult Kennametal's Metalcutting Safety booklet, available free from Kennametal at 724.539.5747 or fax 724.539.5439. For specific product safety and environmental questions, contact our Corporate Environmental Health and Safety Office at 724.539.5066 or fax 724.539.5372.

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Application Icons

Drilling	Slotting: Ball Nose	Side/Shoulder Milling: Eased Chamfer	Reaming: Through and Cross Holes	PCD Tool
Drilling: Flat Bottom	Slotting: Square End	3D Profiling	Reaming: Blind and Cross	HSS-PM
Drilling: Stacked Plates	Side/Shoulder Milling: Ball Nose	Reaming: Through Hole	Reaming: Interrupted Cut	HSS-M42
Ramping	Side/Shoulder Milling: Square End	Reaming: Blind Hole		HSS-M7

Geometry Icons

Corner Style: Ball Nose	Corner Style: Square End	Shank: Plain	Shank: Weldon	Shank: SK Shank (Rübig)
Corner Style: Corner Chamfer	Corner Style: Torus	Shank: Plain: H6	Shank: Whistle Notch: 2°	Helix Angle: 0°–60°
Corner Style: Corner Radius	Profile: WaveCut			

Feature Icons

DIN Number: 212	DIN Number: 6537	Flood Coolant: Reaming	Flute Configuration: 2	Tool Dimensions: 2flute/2margin: coolant
DIN Number: 327	Dry: Drilling	MQL (Minimum Quantity Lubricant): Drilling	Flute Configuration: 3	2flute/2margin: no coolant
DIN Number: 844	Through Coolant: Radial: Drilling	Through Coolant: Axial: Reaming	Flute Configuration: 4	2flute/4margin: coolant
DIN Number: 6527	Through Coolant: Radial: Reaming	Flute Configuration: Variable	Flute Configuration: 5	Manufacturer's Specs: JIS
DIN Number: 6528	Flood Coolant: Drilling	Flute Configuration: 1	Flute Configuration: 6	H Limit: H6

DIN — German Institute for Standardization

JIS — Japanese Industrial Standards

Material Group	Description	Content	Tensile Strength RM (MPa)*	Hardness (HB)	Hardness (HRC)	DIN Standards
P1	Low-Carbon Steels, Long Chipping	C <.25%	<530	<125	—	P St 37-3, C 15, GS-38 Cq10
P2	Low-Carbon Steels, Free Machining, Short Chipping	C <.25%	<650	<220	<25	33 Mn 6, 9 SMn 28, 20 Mn 5, 17 Cr 3
P3	Medium-, High-Plain Carbon Steels, Low-Alloyed	C >.25%	600–850	<330	<35	C 75, Ck 45, C 70 W1, 90 MnCrV 8, 42 CrMo 4 16MnCr5, ST52
P4	Alloyed, Tempered Carbon Steels, Tool	C >.25 %	800–1100	350–450	35–48	100 Cr 6, 105 MnCr4, 51 CrMnV 4, 105 WCr 6, 100 Cr 2
P5	Ferritic, Martensitic, PH Stainless Steels	C = 0–.4%	600–850	<330	<35	X 6 Cr 13, X 10 Cr 13, X 20 Cr 13, X 12 CrMoS 17, X 20 CrMo 13
P6	High-Strength Ferritic, Martensitic, PH Stainless Steels	C = .1–.6%	900–1350	350–450	35–48	X 40 CrMoV 5 1, H1, X 155 CrVMo 12 1, S 6-5-2-5, X 45 Cr 13, X 120 Mn12
M1	Austenitic Stainless Steel	C = .05–.15%	<650	130–200	—	X 5 CrNi 18 10, GX 6 CrNiMo 18 10, X 6 CrNiMoTi 17 12 2, X 8 CrNiMoAl 15 7 2
M2	High-Strength Austenitic Stainless, Cast Stainless Steels	C = .05–.15%	500–700	150–230	<25	X 2 CrNiMo 13 4, X 10 CrNi18 9, X 5 CrNiCuNb 17 4 4
M3	Duplex Steel	C = .05–.2%	<900	135–275	<30	X 2 CrNiMoN 23 15, X 20 CrNiSi 25 4, GX 40 CrNiSi 27 4, X 2 CrNiMoN 22 5 3
K1	Gray Cast, Low-Strength Ductile Irons	—	150–400	120–290	<32	GG-10, GG-15, GG-20, GG -25, GG- 40
K2	Low-, Medium-Strength CGI, Ductile Irons	—	400–600	130–260	<28	GGG-35.3, GGG- 40.3, GGG-70
K3	High-Strength Ductile, Austempered Ductile Iron	—	600–900	180–350	<38	GTW-35-04, GTW-65, GTS-35-10, GTS-45-06
N1	Wrought Aluminium Alloys	—	<520	60–90	—	Al99.5, AlCuMgPb, AlMg 1, SG-AlMg 5
N2	Cast Aluminium	Si <12.2%	<350	70–100	—	G-AlSi 9 Mg, G-AlSi 10 Mg, G-AlSi 10 Mg(Cu), SG-AlSi 12, G-AlSi 7 Mg
N3	Cast Aluminiums	Si >12.2%	200–320	60–120	—	G-AlSi17Cu4Mg, GK-AlSi18CuNiMg, GK-AlSi21CuNiMg
N4	MMCs (Aluminium-Based Metal Matrix)	—	<700	210	—	GFK, CFK
N5	Copper, Copper Alloys	—	200–650	60–200	—	CuZn 20, CuSn 2, CuNi 18 Zn 19 Pb
N6	Carbon, Graphite Composites	—	600–1500	—	—	Graphite, CFK, CFRP
S1	Iron-Based, Heat-Resistant Alloys	—	500–1200	160–260	—	X 2 NiCrAlTi 32 20, X 1 NiCrMoCu 32 28 7, X 12 NiCr 36 18, x 12 NiCrSi 35 16
S2	Nickel-Based or Cobalt-Based, Heat-Resistant Alloys	—	1000–1450	250–450	25–48	X 12 CrNiMn 18 88, Alloy 222 (Ni99,7Mg0,07), NiCr 20 Mo, NiCr 19 FeNbMo
S3	Titanium	—	900–1600	300–400	33–43	Ti 3, Ti 4, TiAl 3 V2.5
S4	Titanium Alloys	—	900–1600	300–400	33–43	TiAl 5 Fe 2,5, TiAl 6 V 4, TiAl 4 Mo 4 Sn 2
H1	Hardened Steels, Irons	—	—	<460	<48	—
H2	Hardened Steels, Irons	—	—	460–560	48–55	—
H3	Hardened Steels, Irons	—	—	560–650	56–60	—
H4	Hardened Steels, Irons	—	—	>650	>60	—

* 1 MPa = 145 psi