

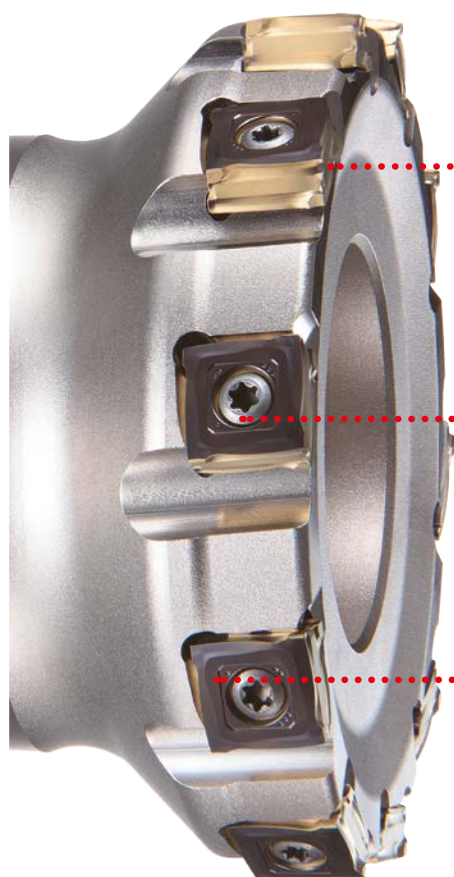
VOX400

VOX CUTTER WITH VERTICAL INSERTS
FOR ULTRA HIGH EFFICIENCY



VOX400

VERTICAL INSERTS WITH HIGH STRENGTH CUTTING EDGE – SUITABLE FOR A WIDE RANGE CAST IRON ROUGHING MILLING APPLICATIONS



CUTTER BODY FEATURES

HIGH RIGIDITY DESIGN

Arranging the inserts vertically absorbs the principal cutting force through the thickness of the insert and achieves extremely high rigidity.

EASY TO CLAMP INSERT

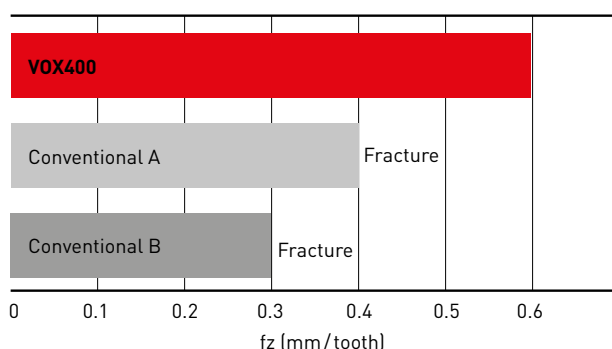
The insert profile is precisely matched to the insert seats in the tool body. This enables user friendly, accurate positioning and provides extra secure clamping.

WIDE SELECTION OF BODIES

VOX400 meets the needs for a wide range of cast iron milling applications. Available as standard are cutter bodies with normal, fine and extra fine tooth pitches for high productivity.

FRACTURE RESISTANCE

The original insert shape with a convex cutting edge and shaped relief face offers excellent sharpness and outstanding fracture resistance.



Tool	VOX400-080A08R (Ø80)
Insert	SONX1206PER (MC5020)
Workpiece	GGG70
Vc (m/min)	200
fz (mm/tooth)	0.2-0.6
ap (mm)	5
ae (mm)	40
Coolant	Dry cut

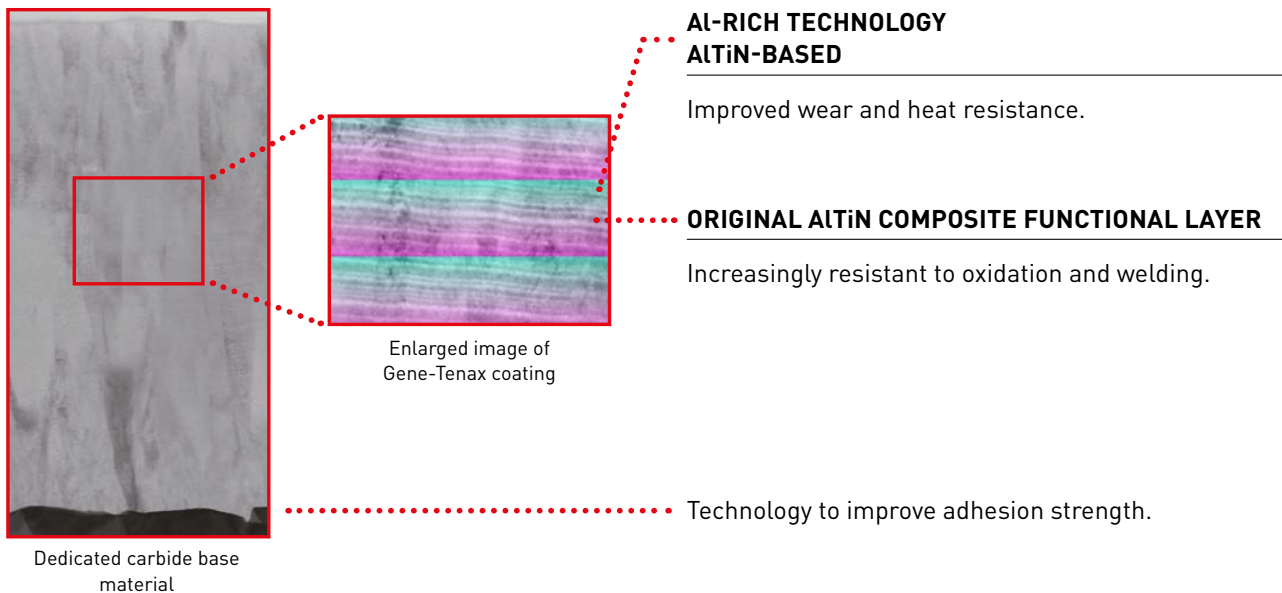
MP1220 / MP1230* / MP1240*

MULTI-LAYER PVD COATING FOR MILLING

ONE INSERT SERIES TO SOLVE ALL PROBLEMS WHEN MACHINING STEELS, STAINLESS STEELS, HEAT RESISTANT AND TITANIUM ALLOYS.

GENE-TENAX COATING

By controlling the coating structure at the nano level, damage to the coating has been vastly reduced compared to conventional lamination. By successfully laminating multiple films, simultaneous strengthening of heat, wear and welding resistance is achieved. Additionally the coating is now much less prone to cracking and with the increased adhesive strength, the most stable grade for milling has been created.



ACHIEVES TOUGHNESS FOR A WIDE RANGE OF WORK MATERIALS

DUCTILE CAST IRON MACHINING DAMAGE



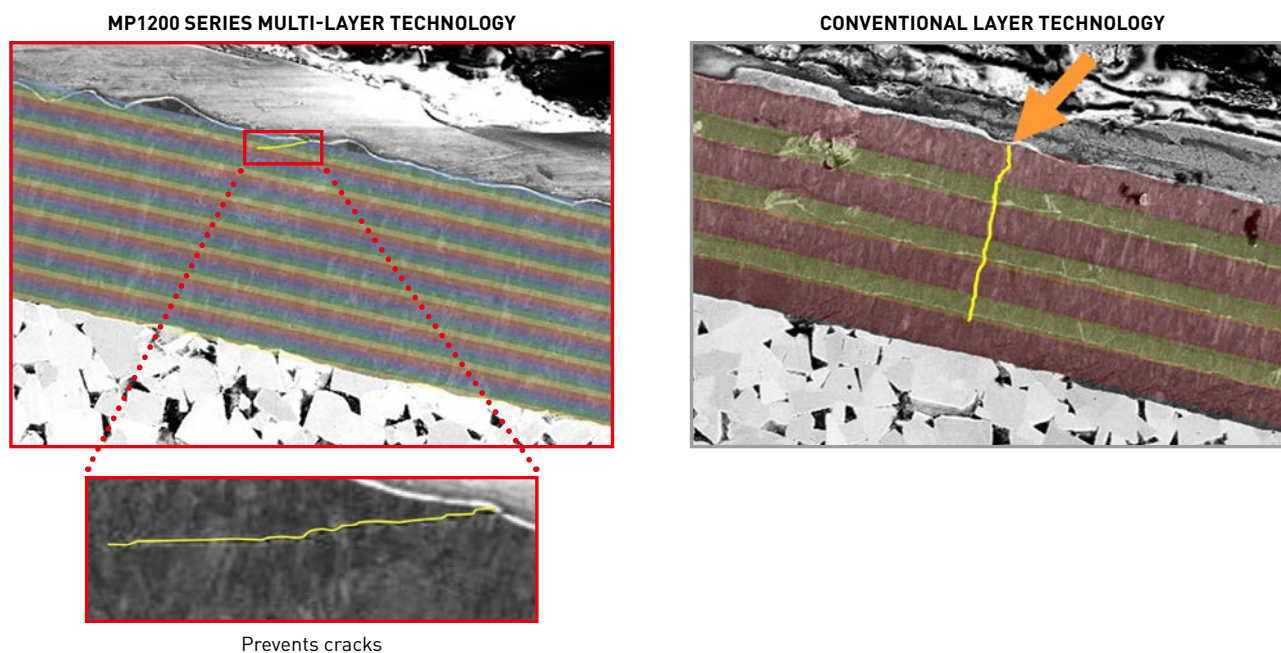
Cutting edge that is resistant to wear when machining ductile cast iron



Thermal cracking

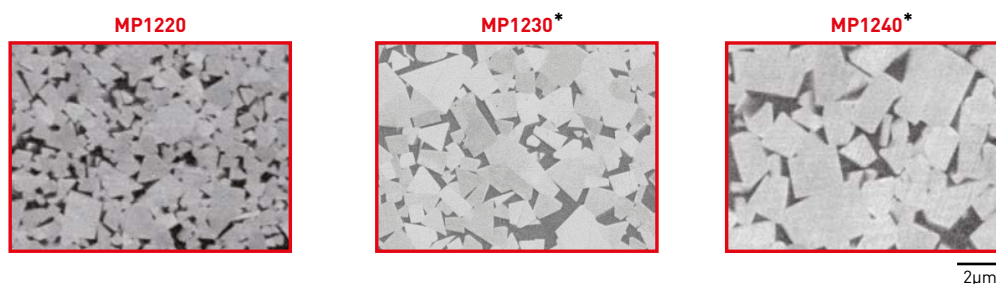
NEW MULTILAYER TECHNOLOGY

The adoption of a new multi-layer technology has succeeded in suppressing crack propagation and dramatically improved fracture resistance when compared to conventional technology.

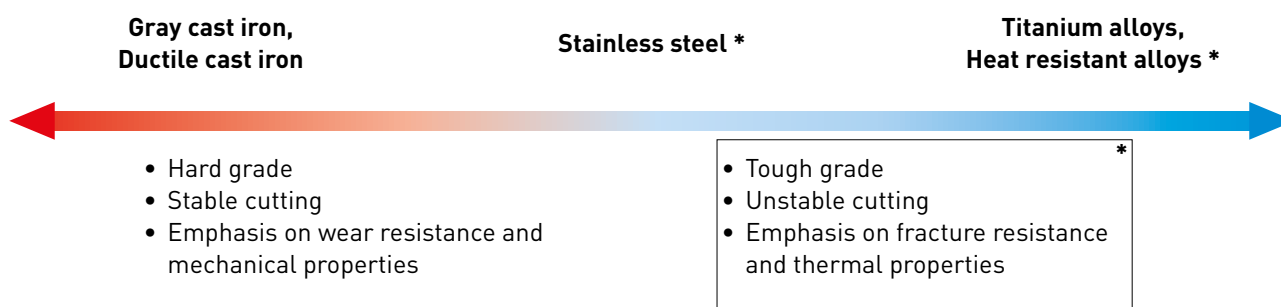


MULTI-GRADE SYSTEM

Using simulation technology, precise analysis of the cutting edge load and temperature when machining different workpiece materials was carried out. This led to the creation of different substrates for three different grades and ensures optimal performance for each type of workpiece material. Ensuring the best performance over a wide range of applications.



SELECTION GUIDELINES



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INSERT FEATURES

UNIQUE VERTICAL INSERT

- 8 usable corners with a high strength cutting edge.
- Fracture resistance is significantly improved due to a convex curve cutting edge and a specially shaped relief face.
- Maximum depth of cut is 10 mm.



MC5020

- Ideal for milling cast iron.
- The "Black Super Smooth" coating surface protects against built-up edge, thus ensuring longer tool life.
- Dry machining is recommended.



VP15TF

- A PVD coated grade for application versatility.
- Ideal for ductile cast iron, unstable cutting conditions and low rigidity workpieces.
- Wet cutting is possible.

SELECTION OF NUMBER OF TEETH

To achieve higher efficiency, the number of teeth can be increased with stable workpiece clamping and with sufficient machine power. In these cases we recommend milling cutters with fine or extra fine pitches when machining gray cast iron.

REGULAR PITCH CUTTER



Differential split milling cutters with a small number of cutting edges

- 1st choice for unstable machining due to the lowest cutting forces
- Limited machine performance
- Milling application with long overhangs

FINE PITCH CUTTER



Sufficient chip space for roughing ISO K materials

- 1st choice for roughing under stable conditions
- Excellent productivity

EXTRA FINE PITCH CUTTER



Equally spaced, fine pitch cutter with max. number of cutting edges

- 1st choice for high productivity in applications with a small side engagement
- Roughing of ISO K materials under stable cutting conditions

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FOR CAST IRONS

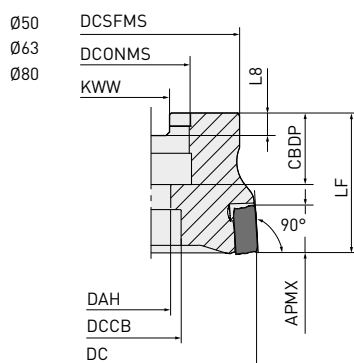


K

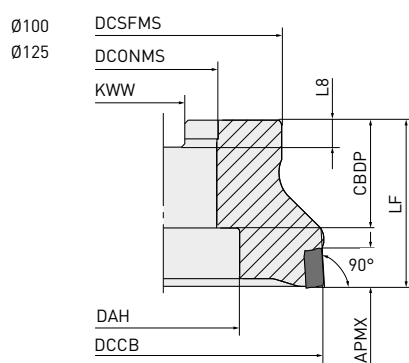


KAPR :90°

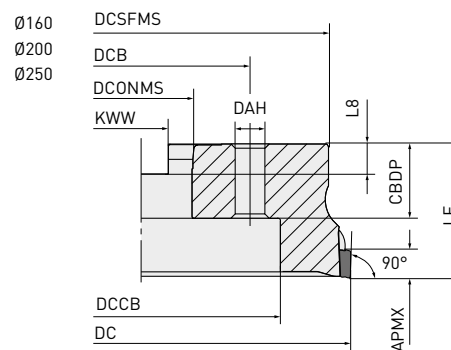
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Right hand tool holder only.

ARBOR TYPE

Order number	Stock	APMX	DC	DCONMS	LF	WT	ZNF	Type
COARSE PITCH								
VOX400-050A03R	●	10	50	22	40	0.3	3	1
VOX400-063A04R	●	10	63	22	40	0.6	4	1
VOX400-080A04R	●	10	80	27	50	1	4	1
VOX400-100B06R	●	10	100	32	50	1.7	6	2
VOX400-125B08R	●	10	125	40	63	3	8	2
VOX400-160C10R	●	10	160	40	63	5.4	10	3
VOX400-200C12R	●	10	200	60	63	8.1	12	3
VOX400-250C16R	●	10	250	60	63	11.8	16	3
FINE PITCH								
VOX400-050A05R	●	10	50	22	40	0.3	5	1
VOX400-063A06R	●	10	63	22	40	0.6	6	1
VOX400-080A08R	●	10	80	27	50	1	8	1
VOX400-100B10R	●	10	100	32	50	1.7	10	2
VOX400-125B12R	●	10	125	40	63	3	12	2
VOX400-160C16R	●	10	160	40	63	5.4	16	3
VOX400-200C20R	●	10	200	60	63	8.1	20	3
VOX400-250C24R	●	10	250	60	63	11.8	24	3

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VOX400 - ARBOR TYPE

Order number	Stock	APMX	DC	DCONMS	LF	WT	ZNF	Type
EXTRA FINE PITCH								
VOX400-063A08R	●	10	63	22	40	0.5	8	1
VOX400-080A10R	●	10	80	27	50	1	10	1
VOX400-100B12R	●	10	100	32	50	1.6	12	2
VOX400-125B16R	●	10	125	40	63	2.8	16	2
VOX400-160C20R	●	10	160	40	63	5.2	20	3
VOX400-200C26R	★	10	200	60	63	7.9	26	3
VOX400-250C34R	★	10	250	60	63	11.5	34	3
								2/2



MOUNTING DIMENSIONS

Order number	CBDP	DAH	DCCB	DCSFMS	KWW	DBC	L8	Type
COARSE PITCH								
VOX400-050A03R	20	11	17	41	10.4	—	6.3	1
VOX400-063A04R	20	11	17	50	10.4	—	6.3	1
VOX400-080A04R	23	13	20	56	12.4	—	7	1
VOX400-100B06R	32	—	45	78	14.4	—	8	2
VOX400-125B08R	32	—	56	89	16.4	—	9	2
VOX400-160C10R	29	14	56	120	16.4	66.7	9	3
VOX400-200C12R	32	18	130	175	25.7	101.6	14.22	3
VOX400-250C16R	32	18	180	210	25.7	101.6	14.22	3
FINE PITCH								
VOX400-050A05R	20	11	17	41	10.4	—	6.3	1
VOX400-063A06R	20	11	17	50	10.4	—	6.3	1
VOX400-080A08R	23	13	20	56	12.4	—	7	1
VOX400-100B10R	32	—	45	78	14.4	—	8	2
VOX400-125B12R	32	—	56	89	16.4	—	9	2
VOX400-160C16R	29	14	56	120	16.4	66.7	9	3
VOX400-200C20R	32	18	130	175	25.7	101.6	14.22	3
VOX400-250C24R	32	18	180	210	25.7	101.6	14.22	3
EXTRA FINE PITCH								
VOX400-063A08R	20	11	17	50	10.4	—	6.3	1
VOX400-080A10R	23	13	20	56	12.4	—	7	1
VOX400-100B12R	32	—	45	78	14.4	—	8	2
VOX400-125B16R	32	—	56	89	16.4	—	9	2
VOX400-160C20R	29	14	56	120	16.4	66.7	9	3
VOX400-200C26R	32	18	130	175	25.7	101.6	14.22	3
VOX400-250C34R	32	18	180	210	25.7	101.6	14.22	3
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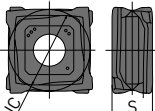
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SPARE PARTS

Tool holder type		
	Clamp screw	Wrench
Coarse Pitch	CS401160T	TKY15T
Fine Pitch		
Extra Fine Pitch		

* Clamp Torque (N • m) : CS401160T=3.5

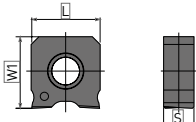
INSERTS

Order number	Class	Edge preparation	 MP1220	MC5020	VP15TF	IC	S	Geometry <i>Right hand insert shown</i>	Shape
SONX1206PER	N	E	★	●	●	12.7	6.3		
SONX1206PEL	N	E			★	12.7	6.3		

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1. Left hand inserts available for side and face cutters and special products.

WIPER INSERTS

Order number	Class	Honing	 MP1220	VP15TF	W1	L	S	Geometry	Shape
WOEX1206PER5C	E	E	★	●	13.025	12.5	5.5		

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RECOMMENDED CUTTING CONDITIONS

STANDARD PITCH

Material	Properties	Grade	Vc	Ø50 — Ø250		
				ae	ap	fz
K	Gray cast iron	MC5020	300 (250 – 350)	≤DC	≤10	0.4 (0.3 – 0.5)
		MP1220	250 (200 – 300)	≤DC	≤10	0.4 (0.3 – 0.5)
		VP15TF	250 (200 – 300)	≤DC	≤10	0.4 (0.3 – 0.5)
	≤350MPa	MC5020	220 (150 – 300)	≤DC	≤10	0.3 (0.2 – 0.4)
		MP1220	200 (150 – 300)	≤DC	≤10	0.3 (0.2 – 0.4)
		VP15TF	200 (150 – 300)	≤DC	≤10	0.3 (0.2 – 0.4)
Ductile cast iron	≤450MPa	MC5020	200 (150 – 250)	≤DC	≤10	0.3 (0.2 – 0.4)
		MP1220	170 (150 – 200)	≤DC	≤10	0.3 (0.2 – 0.4)
		VP15TF	170 (150 – 200)	≤DC	≤10	0.3 (0.2 – 0.4)
	≤800MPa	MC5020	170 (150 – 200)	≤DC	≤10	0.2 (0.1 – 0.3)
		MP1220	150 (100 – 200)	≤DC	≤10	0.2 (0.1 – 0.3)
		VP15TF	150 (100 – 200)	≤DC	≤10	0.2 (0.1 – 0.3)

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FINE PITCH

Material	Properties	Grade	Vc	Ø50. Ø63			Ø80		
				ae	ap	fz	ae	ap	fz
K	Gray cast iron	MC5020	300 (250 – 350)	≤DC	≤10	0.4 (0.3 – 0.5)	≤DC	≤10	0.4 (0.3 – 0.5)
		MP1220	250 (200 – 300)	≤DC	≤10	0.4 (0.3 – 0.5)	≤DC	≤10	0.4 (0.3 – 0.5)
		VP15TF	250 (200 – 300)	≤DC	≤10	0.4 (0.3 – 0.5)	≤DC	≤10	0.4 (0.3 – 0.5)
	≤350MPa	MC5020	220 (150 – 300)	≤DC	≤10	0.3 (0.2 – 0.4)	≤DC	≤10	0.3 (0.2 – 0.4)
		MP1220	200 (150 – 300)	≤DC	≤10	0.3 (0.2 – 0.4)	≤DC	≤10	0.3 (0.2 – 0.4)
		VP15TF	200 (150 – 300)	≤DC	≤10	0.3 (0.2 – 0.4)	≤DC	≤10	0.3 (0.2 – 0.4)
Ductile cast iron	≤450MPa	MC5020	200 (150 – 250)	≤0.8 DC	≤10	0.3 (0.2 – 0.4)	≤0.6 DC	≤10	0.3 (0.2 – 0.4)
		MP1220	170 (150 – 200)	≤0.8 DC	≤10	0.3 (0.2 – 0.4)	≤0.6 DC	≤10	0.3 (0.2 – 0.4)
		VP15TF	170 (150 – 200)	≤0.8 DC	≤10	0.3 (0.2 – 0.4)	≤0.6 DC	≤10	0.3 (0.2 – 0.4)
	≤800MPa	MC5020	170 (150 – 200)	≤0.8 DC	≤10	0.2 (0.1 – 0.3)	≤0.6 DC	≤10	0.2 (0.1 – 0.3)
		MP1220	150 (100 – 200)	≤0.8 DC	≤10	0.2 (0.1 – 0.3)	≤0.6 DC	≤10	0.2 (0.1 – 0.3)
		VP15TF	150 (100 – 200)	≤0.8 DC	≤10	0.2 (0.1 – 0.3)	≤0.6 DC	≤10	0.2 (0.1 – 0.3)

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FINE PITCH

Material		Properties	Grade	Vc	Ø100			Ø125		
					ae	ap	fz	ae	ap	fz
K	Gray cast iron	≤200MPa	MC5020	300 (250 – 350)	≤DC	≤10	0.4 (0.3 – 0.5)	≤DC	≤10	0.4 (0.3 – 0.5)
			MP1220	250 (200 – 300)	≤DC	≤10	0.4 (0.3 – 0.5)	≤DC	≤10	0.4 (0.3 – 0.5)
			VP15TF	250 (200 – 300)	≤DC	≤10	0.4 (0.3 – 0.5)	≤DC	≤10	0.4 (0.3 – 0.5)
		≤350MPa	MC5020	220 (150 – 300)	≤DC	≤10	0.3 (0.2 – 0.4)	≤DC	≤10	0.3 (0.2 – 0.4)
			MP1220	200 (150 – 300)	≤DC	≤10	0.3 (0.2 – 0.4)	≤DC	≤10	0.3 (0.2 – 0.4)
			VP15TF	200 (150 – 300)	≤DC	≤10	0.3 (0.2 – 0.4)	≤DC	≤10	0.3 (0.2 – 0.4)
	Ductile cast iron	≤450MPa	MC5020	200 (150 – 250)	≤0.5 DC	≤10	0.3 (0.2 – 0.4)	≤0.4 DC	≤10	0.3 (0.2 – 0.4)
			MP1220	170 (150 – 200)	≤0.5 DC	≤10	0.3 (0.2 – 0.4)	≤0.4 DC	≤10	0.3 (0.2 – 0.4)
			VP15TF	170 (150 – 200)	≤0.5 DC	≤10	0.3 (0.2 – 0.4)	≤0.4 DC	≤10	0.3 (0.2 – 0.4)
		≤800MPa	MC5020	170 (150 – 200)	≤0.5 DC	≤10	0.2 (0.1 – 0.3)	≤0.4 DC	≤10	0.2 (0.1 – 0.3)
			MP1220	150 (100 – 200)	≤0.5 DC	≤10	0.2 (0.1 – 0.3)	≤0.4 DC	≤10	0.2 (0.1 – 0.3)
			VP15TF	150 (100 – 200)	≤0.5 DC	≤10	0.2 (0.1 – 0.3)	≤0.4 DC	≤10	0.2 (0.1 – 0.3)

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Material		Properties	Grade	Vc	Ø160			Ø200 — Ø250		
					ae	ap	fz	ae	ap	fz
K	Gray cast iron	≤200MPa	MC5020	300 (250 – 350)	≤DC	≤10	0.4 (0.3 – 0.5)	≤DC	≤10	0.4 (0.3 – 0.5)
			MP1220	250 (200 – 300)	≤DC	≤10	0.4 (0.3 – 0.5)	≤DC	≤10	0.4 (0.3 – 0.5)
			VP15TF	250 (200 – 300)	≤DC	≤10	0.4 (0.3 – 0.5)	≤DC	≤10	0.4 (0.3 – 0.5)
		≤350MPa	MC5020	220 (150 – 300)	≤DC	≤10	0.3 (0.2 – 0.4)	≤DC	≤10	0.3 (0.2 – 0.4)
			MP1220	200 (150 – 300)	≤DC	≤10	0.3 (0.2 – 0.4)	≤DC	≤10	0.3 (0.2 – 0.4)
			VP15TF	200 (150 – 300)	≤DC	≤10	0.3 (0.2 – 0.4)	≤DC	≤10	0.3 (0.2 – 0.4)
	Ductile cast iron	≤450MPa	MC5020	200 (150 – 250)	≤0.3 DC	≤10	0.3 (0.2 – 0.4)	≤0.2 DC	≤10	0.3 (0.2 – 0.4)
			MP1220	170 (150 – 200)	≤0.3 DC	≤10	0.3 (0.2 – 0.4)	≤0.2 DC	≤10	0.3 (0.2 – 0.4)
			VP15TF	170 (150 – 200)	≤0.3 DC	≤10	0.3 (0.2 – 0.4)	≤0.2 DC	≤10	0.3 (0.2 – 0.4)
		≤800MPa	MC5020	170 (150 – 200)	≤0.3 DC	≤10	0.2 (0.1 – 0.3)	≤0.2 DC	≤10	0.2 (0.1 – 0.3)
			MP1220	150 (100 – 200)	≤0.3 DC	≤10	0.2 (0.1 – 0.3)	≤0.2 DC	≤10	0.2 (0.1 – 0.3)
			VP15TF	150 (100 – 200)	≤0.3 DC	≤10	0.2 (0.1 – 0.3)	≤0.2 DC	≤10	0.2 (0.1 – 0.3)

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EXTRA FINE PITCH

Material	Properties	Grade	Vc	Ø63			Ø80		
				ae	ap	fz	ae	ap	fz
K	Gray cast iron	≤200MPa	MC5020	300 (250 – 350)	≤DC	≤10 0.4 (0.3 – 0.5)	≤DC	≤10 0.4 (0.3 – 0.5)	
			MP1220	250 (200 – 300)	≤DC	≤10 0.4 (0.3 – 0.5)	≤DC	≤10 0.4 (0.3 – 0.5)	
			VP15TF	250 (200 – 300)	≤DC	≤10 0.4 (0.3 – 0.5)	≤DC	≤10 0.4 (0.3 – 0.5)	
	≤350MPa		MC5020	220 (150 – 300)	≤DC	≤10 0.3 (0.2 – 0.4)	≤DC	≤10 0.3 (0.2 – 0.4)	
			MP1220	200 (150 – 300)	≤DC	≤10 0.3 (0.2 – 0.4)	≤DC	≤10 0.3 (0.2 – 0.4)	
			VP15TF	200 (150 – 300)	≤DC	≤10 0.3 (0.2 – 0.4)	≤DC	≤10 0.3 (0.2 – 0.4)	
K	Ductile cast iron	≤450MPa	MC5020	200 (150 – 250)	≤0.6 DC	≤10 0.3 (0.2 – 0.4)	≤0.5 DC	≤10 0.3 (0.2 – 0.4)	
			MP1220	170 (150 – 200)	≤0.6 DC	≤10 0.3 (0.2 – 0.4)	≤0.5 DC	≤10 0.3 (0.2 – 0.4)	
			VP15TF	170 (150 – 200)	≤0.6 DC	≤10 0.3 (0.2 – 0.4)	≤0.5 DC	≤10 0.3 (0.2 – 0.4)	
	≤800MPa		MC5020	170 (150 – 200)	≤0.6 DC	≤10 0.2 (0.1 – 0.3)	≤0.5 DC	≤10 0.2 (0.1 – 0.3)	
			MP1220	150 (100 – 200)	≤0.6 DC	≤10 0.2 (0.1 – 0.3)	≤0.5 DC	≤10 0.2 (0.1 – 0.3)	
			VP15TF	150 (100 – 200)	≤0.6 DC	≤10 0.2 (0.1 – 0.3)	≤0.5 DC	≤10 0.2 (0.1 – 0.3)	

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Material	Properties	Grade	Vc	Ø100			Ø125		
				ae	ap	fz	ae	ap	fz
K	Gray cast iron	≤200MPa	MC5020	300 (250 – 350)	≤DC	≤10 0.4 (0.3 – 0.5)	≤DC	≤10 0.4 (0.3 – 0.5)	
			MP1220	250 (200 – 300)	≤DC	≤10 0.4 (0.3 – 0.5)	≤DC	≤10 0.4 (0.3 – 0.5)	
			VP15TF	250 (200 – 300)	≤DC	≤10 0.4 (0.3 – 0.5)	≤DC	≤10 0.4 (0.3 – 0.5)	
	≤350MPa		MC5020	220 (150 – 300)	≤DC	≤10 0.3 (0.2 – 0.4)	≤DC	≤10 0.3 (0.2 – 0.4)	
			MP1220	200 (150 – 300)	≤DC	≤10 0.3 (0.2 – 0.4)	≤DC	≤10 0.3 (0.2 – 0.4)	
			VP15TF	200 (150 – 300)	≤DC	≤10 0.3 (0.2 – 0.4)	≤DC	≤10 0.3 (0.2 – 0.4)	
K	Ductile cast iron	≤450MPa	MC5020	200 (150 – 250)	≤0.4 DC	≤10 0.3 (0.2 – 0.4)	≤0.3 DC	≤10 0.3 (0.2 – 0.4)	
			MP1220	170 (150 – 200)	≤0.4 DC	≤10 0.3 (0.2 – 0.4)	≤0.3 DC	≤10 0.3 (0.2 – 0.4)	
			VP15TF	170 (150 – 200)	≤0.4 DC	≤10 0.3 (0.2 – 0.4)	≤0.3 DC	≤10 0.3 (0.2 – 0.4)	
	≤800MPa		MC5020	170 (150 – 200)	≤0.4 DC	≤10 0.2 (0.1 – 0.3)	≤0.3 DC	≤10 0.2 (0.1 – 0.3)	
			MP1220	150 (100 – 200)	≤0.4 DC	≤10 0.2 (0.1 – 0.3)	≤0.3 DC	≤10 0.2 (0.1 – 0.3)	
			VP15TF	150 (100 – 200)	≤0.4 DC	≤10 0.2 (0.1 – 0.3)	≤0.3 DC	≤10 0.2 (0.1 – 0.3)	

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Material	Properties	Grade	Vc	Ø160			Ø200 — Ø250		
				ae	ap	fz	ae	ap	fz
K	Gray cast iron	≤200MPa	MC5020	300 (250 – 350)	≤DC	≤10 0.4 (0.3 – 0.5)	≤DC	≤10 0.4 (0.3 – 0.5)	
			MP1220	250 (200 – 300)	≤DC	≤10 0.4 (0.3 – 0.5)	≤DC	≤10 0.4 (0.3 – 0.5)	
			VP15TF	250 (200 – 300)	≤DC	≤10 0.4 (0.3 – 0.5)	≤DC	≤10 0.4 (0.3 – 0.5)	
	≤350MPa		MC5020	220 (150 – 300)	≤DC	≤10 0.3 (0.2 – 0.4)	≤DC	≤10 0.3 (0.2 – 0.4)	
			MP1220	200 (150 – 300)	≤DC	≤10 0.3 (0.2 – 0.4)	≤DC	≤10 0.3 (0.2 – 0.4)	
			VP15TF	200 (150 – 300)	≤DC	≤10 0.3 (0.2 – 0.4)	≤DC	≤10 0.3 (0.2 – 0.4)	
K	Ductile cast iron	≤450MPa	MC5020	200 (150 – 250)	≤0.25 DC	≤10 0.3 (0.2 – 0.4)	≤0.15 DC	≤10 0.3 (0.2 – 0.4)	
			MP1220	170 (150 – 200)	≤0.25 DC	≤10 0.3 (0.2 – 0.4)	≤0.15 DC	≤10 0.3 (0.2 – 0.4)	
			VP15TF	170 (150 – 200)	≤0.25 DC	≤10 0.3 (0.2 – 0.4)	≤0.15 DC	≤10 0.3 (0.2 – 0.4)	
	≤800MPa		MC5020	170 (150 – 200)	≤0.25 DC	≤10 0.2 (0.1 – 0.3)	≤0.15 DC	≤10 0.2 (0.1 – 0.3)	
			MP1220	150 (100 – 200)	≤0.25 DC	≤10 0.2 (0.1 – 0.3)	≤0.15 DC	≤10 0.2 (0.1 – 0.3)	
			VP15TF	150 (100 – 200)	≤0.25 DC	≤10 0.2 (0.1 – 0.3)	≤0.15 DC	≤10 0.2 (0.1 – 0.3)	

1/1

1. DC is cutter diameter.

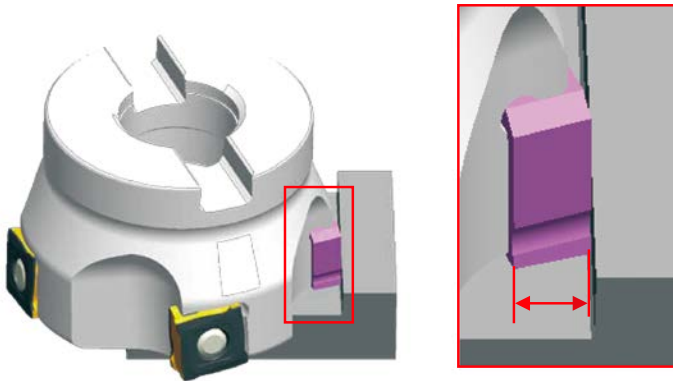
2. When using wiper insert, please reduce the feed per tooth to half the normal rate.

VOX400**USABLE CUTTING EDGE WIDTH OF WIPER INSERTS**

The width of the wiper insert itself is 5.5 mm, however the actual functioning cutting edge width after installation to the body is 4.5 mm, as shown in the diagram.

With one wiper insert, it is possible to machine up to $f_n=4$ mm feed per revolution. When exceeding $f_n=4$ mm, use two or more wiper inserts.

Note that there is a possibility to exceed $f_n=4$ mm when using a holder with more than 24 inserts.



SYMBOLS

 Recommended cutting conditions	MACHINING TYPE
NEW Completely new products or expansions released in the current Spring or Autumn product launch and are not included in the latest version of the General Catalogue.	 Roughing
NEW Products or expansions that have already been introduced in one of the previous Spring or Autumn product launches but are not included in the latest General Catalogue.	 Medium cutting
APPLICATION	 Light cutting
 Face milling	 Pre-finishing
 Chamfer milling	 Finishing
 Shoulder milling with R	 Fine-finishing
 Face milling close to a wall	TOOL MATERIAL
 Shoulder milling	 Ultra micro grain carbide Ultra micro grain carbide substrate material.
 Side milling	 Cubic boron nitride Mitsubishi Materials' original CBN material.
 Slot milling	 Ceramic For high speed efficient machining of super alloys due to the excellent high temperature strength property.
 Ramping	 High hardness powder metallurgy HSS High hardness powder metallurgy HSS substrate material.
 Pocket milling	 High grade high alloy HSS High grade high alloy HSS substrate material.
 Slot milling with R	 Cobalt high speed steel Cobalt high speed steel substrate material.
 Copy milling	 High speed steel High speed steel substrate material.
 T-Slot milling	

SYMBOLS

COATING



SMART MIRACLE coating

New smooth and dense coating technology for high efficiency milling of difficult to cut materials.



CRN coating

Newly developed CrN coating for Copper Electrodes machining.



Violet coating

Increased tool life of 2-3 times more than TiN coated products.



DP coating

New generation coating suitable for a wide range of materials.



MIRACLE coating

The original Miracle (Al,Ti)N coating. Also suitable for dry cutting.



[Al, Ti]N coating

[Al,Ti]N highly versatile application range.



[Al,Ti,Cr]N multi-layer coating

For carbon, alloy and hardened steels.



IMPACT MIRACLE coating

Single phase nano crystal coating technology has higher film hardness and heat resistance.



MIRACLE coating

The original MIRACLE (Al,Ti)N coating. Also suitable for dry cutting.



VFR coating

The [AlCrSi]N/[AlTiSi]N PVD multilayer coating is ideal for machining of extremely hard materials up to 70 HRC.



DLC coating

Hardness similar to CVD diamond coating achieved with high adhesion strength.



Diamond coating

Suitable for CFRP and CFRP-aluminium materials.



Diamond coating

Suitable for graphite machining.



Diamond coating

The original CVD diamond coating.



CVD Diamond coating

Unique multi-layer micro-grain diamond crystal control technology drastically improves wear resistance and smoothness.

CUTTING EDGE PROPERTIES



Sharp corner edge

Indicates the end mill has a sharp corner edge.



Gash land

Indicates the end mill cutting edge has a protective chamfer.



Rake angle



Helix angle

Indicates the helix angle of the end mill.



Point angle

Indicates the drill point angle.



Roughing flute geometry



Variable helix



Rounded gash



Corner angle

WEB THINNING



X type point geometry

X web thinning used at the drill point.



XR type point geometry

XR web thinning used at the drill point.



S type point geometry

Easy cutting geometry.



N type point geometry

Effective when the point web is thick.



Chipbreaker

SYMBOLS

TOLERANCES



Tolerance of taper angle
Indicates the tolerance of the taper angle.



R tolerance
Indicates the radial tolerance of a ball nose end mill.



R tolerance
Indicates the radial tolerance of the corner radius.



R tolerance
Indicates the radial tolerance of a cutter with a corner radius.



Outside diameter tolerance
Indicates the diameter tolerance of the end mill.



Peak tolerance
Indicates the tolerance for the end diameter.



Shank diameter tolerance



Shank diameter tolerance



Drill tolerance / diameter

COOLANT HOLES



External coolant



Internal coolant



Internal coolant



Centered, internal coolant hole



Radial, internal coolant holes



Internal coolant holes



Internal coolant holes

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