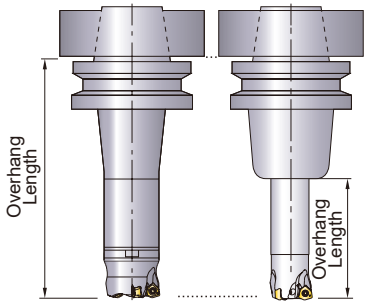
RECOMMENDED CUTTING CONDITIONS

■ Correction Value According to Overhang Length

Multiply the recommended cutting conditions by the correction factor x overhang length.

(mm)

Type	Cutting Dia. Max. **DCX**	Overhang Length	Correction Value According		
			Cutting Speed **Vc** (m/min)	Depth of Cut **ap**	Feed **fz**(mm/t.)
Shank Type Screw-in Type	25—40	< 2.5×DCON	100%	100%	100%
		3.0×DCON	90%	100%	90%
		4.0×DCON	85%	90%	85%
		5.0×DCON	80%	85%	80%
		7.5×DCON	70%	75%	75%
Arbor Type	40—66	< 2.5×DCX	100%	100%	100%
		3.0×DCX	85%	100%	90%
		4.0×DCX	80%	80%	80%
		5.0×DCX	75%	75%	60%
		6.0×DCX	70%	70%	40%



DCON=Connection Dia.

■ Cutting Speed (Dry Cutting)

(mm)

	Work Material	Properties	Cutting Speed **Vc** (m/min)				
P			**MP6130**	**MP6120**	**VP15TF**	**MC7020**	**VP30RT**
	Mild Steel	≤180HB	160 (110—200)	170 (120—220)	170 (120—220)	230 (180—280)	140 (100—180)
	Carbon Steel Alloy Steel	180—280HB	140 (90—200)	160 (100—220)	160 (100—220)	220 (170—270)	120 (80—170)
	Carbon Steel Alloy Steel	280—350HB	140 (90—200)	160 (100—220)	160 (100—220)	220 (170—270)	120 (80—170)
	Alloy Tool Steel	≤350HB (Annealing)	140 (90—200)	160 (100—220)	160 (100—220)	220 (170—270)	120 (80—170)
	Pre-hardened Steel	35—45HRC	100 (60—140)	120 (80—160)	120 (80—160)	—	90 (50—130)
M			**MP7130**	**MP7140**	**MC7020**	**VP30RT**	
	Austenitic Stainless Steel	≤200HB	160 (130—200)	150 (120—180)	220 (170—270)	150 (120—180)	
	Austenitic Stainless Steel	>200HB	140 (100—200)	130 (80—180)	190 (140—240)	130 (80—180)	
	Ferritic and Martensitic Stainless Steel	≤200HB	150 (100—200)	130 (80—180)	220 (170—270)	130 (80—180)	
	Duplex Stainless Steel	≤280HB	130 (80—180)	110 (60—160)	180 (130—230)	110 (60—160)	
	Precipitation Hardening Stainless Steel	<450HB	110 (60—160)	90 (50—130)	170 (120—220)	90 (50—130)	
K			**VP15TF**				
	Gray Cast Iron	≤350MPa	180 (140—220)				
	Ductile Cast Iron	≤450MPa	160 (120—210)				
	Ductile Cast Iron	≤800MPa	130 (90—170)				
S			**MP9130**	**MP9120**	**VP15TF**		
	Titanium Alloy	—	40 (30—60)	50 (30—65)	50 (30—65)		
	Heat Resistant Alloy	—	30 (20—40)	40 (20—50)	40 (20—50)		
H			**VP15TF**				
	Hardened Steel	40—55HRC	70 (40—100)				

Note 1) To discharge chips effectively, use an air blow when machining. When the air blow is less effective at discharging chips, we recommend wet cutting.
Note 2) When wet cutting, tool life may become shorter than dry cutting. When carrying out wet cutting for the applications recommended with dry cutting, reduce the cutting speed by 25%.
Note 3) When large vibration occurs, reduce the cutting conditions.
Note 4) For interrupted cutting, reduce the cutting speed and feed rate by 20%.

RECOMMENDED CUTTING CONDITIONS

■ Depth of Cut / Feed per Tooth

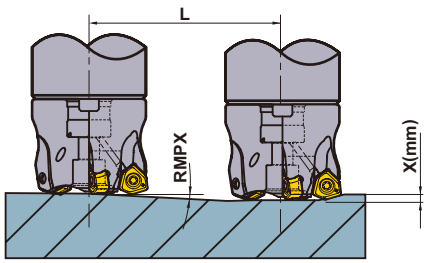
(mm)

	Work Material	Properties	Depth of Cut **ap**	Breaker	Cutting Dia. Max. DCX=25,28(Z=2) Feed **fz**(mm/t.)	Cutting Dia. Max. DCX=25,28(Z=3) Feed **fz**(mm/t.)	Cutting Dia. Max. DCX=32– Feed **fz**(mm/t.)	Cutting Mode
P	Mild Steel	Hardness ≤180HB	≤0.5	M,R	1.3(0.4–2.0)	1.3(0.4–2.0)	1.5(0.5–2.0)	Dry
				L	1.2(0.4–1.6)	1.2(0.4–1.6)	1.2(0.4–1.6)	
			≤1.0	M,R	1.0(0.3–1.3)	0.8(0.3–1.0)	1.2(0.4–1.5)	
				L	0.8(0.3–1.2)	0.8(0.3–1.0)	0.8(0.3–1.2)	
			≤1.5	M,R	0.6(0.3–1.0)	–	0.8(0.4–1.2)	
	Carbon Steel Alloy Steel	Hardness 180–280HB	≤0.5	M,R	1.3(0.4–1.7)	1.3(0.4–1.7)	1.5(0.4–2.0)	Dry
				L	1.2(0.3–1.5)	1.2(0.3–1.5)	1.2(0.3–1.5)	
			≤1.0	M,R	0.8(0.3–1.0)	0.7(0.3–0.9)	1.0(0.3–1.3)	
				L	0.7(0.2–1.0)	0.7(0.2–0.9)	0.7(0.2–1.0)	
			≤1.5	M,R	0.5(0.3–0.7)	–	0.7(0.3–1.0)	
	Carbon Steel Alloy Steel Alloy Tool Steel	Hardness 280–350HB ≤350HB (Annealing)	≤0.5	M,R	1.3(0.4–1.7)	1.3(0.4–1.7)	1.5(0.4–2.0)	Dry
				L	1.2(0.3–1.5)	1.2(0.3–1.5)	1.2(0.3–1.5)	
			≤1.0	M,R	0.8(0.3–1.0)	0.7(0.3–0.9)	1.0(0.3–1.3)	
				L	0.7(0.2–1.0)	0.7(0.2–0.9)	0.7(0.2–1.0)	
			≤1.5	M,R	0.5(0.3–0.7)	–	0.7(0.3–1.0)	
	Pre-hardened Steel	Hardness 35–45HRC	≤0.5	M,R	1.0(0.3–1.3)	1.0(0.3–1.3)	1.2(0.3–1.5)	Dry
				L	0.8(0.3–1.2)	0.8(0.3–1.2)	0.8(0.3–1.2)	
			≤1.0	M,R	0.6(0.2–0.8)	0.6(0.2–0.8)	0.8(0.2–1.0)	
				L	0.5(0.2–0.8)	0.5(0.2–0.8)	0.5(0.2–0.8)	
M	Austenitic Stainless Steel	–	≤0.5	L	0.8(0.3–1.0)	0.8(0.3–1.0)	0.8(0.3–1.0)	Dry
				M	1.0(0.4–1.2)	1.0(0.4–1.2)	1.0(0.4–1.2)	
			≤1.0	L	0.6(0.2–0.8)	0.6(0.2–0.8)	0.6(0.2–0.8)	
				M	0.8(0.3–1.0)	0.8(0.3–1.0)	0.8(0.3–1.0)	
	Ferritic and Martensitic Stainless Steel	Hardness ≤200HB	≤0.5	L	0.8(0.3–1.0)	0.8(0.3–1.0)	0.8(0.3–1.0)	Dry
				M	1.0(0.4–1.2)	1.0(0.4–1.2)	1.0(0.4–1.2)	
			≤1.0	L	0.6(0.2–0.8)	0.6(0.2–0.8)	0.6(0.2–0.8)	
				M	0.8(0.3–1.0)	0.8(0.3–1.0)	0.8(0.3–1.0)	
	Duplex Stainless Steel	Hardness ≤280HB	≤0.5	L	0.6(0.3–0.8)	0.6(0.3–0.8)	0.6(0.3–0.8)	Dry
				M	0.7(0.3–1.0)	0.7(0.3–1.0)	0.7(0.3–1.0)	
			≤1.0	L	0.5(0.2–0.7)	0.5(0.2–0.7)	0.5(0.2–0.7)	
				M	0.6(0.3–0.7)	0.6(0.3–0.7)	0.6(0.3–0.7)	
	Precipitation Hardening Stainless Steel	Hardness <450HB	≤0.5	L	0.6(0.3–0.8)	0.6(0.3–0.8)	0.6(0.3–0.8)	Dry
				M	0.7(0.3–1.0)	0.7(0.3–1.0)	0.7(0.3–1.0)	
			≤1.0	L	0.5(0.2–0.7)	0.5(0.2–0.7)	0.5(0.2–0.7)	
				M	0.6(0.3–0.7)	0.6(0.3–0.7)	0.6(0.3–0.7)	
K	Gray Cast Iron	Tensile Strength ≤350MPa	≤0.5	M,R	1.3(0.4–2.0)	1.3(0.4–2.0)	1.5(0.5–2.0)	Dry
				L	1.2(0.4–1.6)	1.2(0.4–1.6)	1.2(0.4–1.6)	
			≤1.0	M,R	1.0(0.3–1.3)	0.8(0.3–1.0)	1.2(0.4–1.5)	
				L	1.0(0.3–1.3)	0.8(0.3–1.0)	1.0(0.3–1.3)	
			≤1.5	M,R	0.6(0.3–1.0)	–	0.8(0.4–1.2)	
	Ductile Cast Iron	Tensile Strength ≤450MPa	≤0.5	M,R	1.3(0.4–1.7)	1.3(0.4–1.7)	1.5(0.4–2.0)	Dry
				L	1.0(0.3–1.3)	1.0(0.3–1.3)	1.0(0.3–1.3)	
			≤1.0	M,R	0.8(0.3–1.0)	0.7(0.3–0.9)	1.0(0.3–1.3)	
				L	0.8(0.2–1.0)	0.7(0.2–0.9)	0.8(0.2–1.2)	
			≤1.5	M,R	0.5(0.3–0.7)	–	0.7(0.3–1.0)	
	Ductile Cast Iron	Tensile Strength ≤800MPa	≤0.5	M,R	1.0(0.2–1.5)	1.0(0.2–1.5)	1.3(0.3–1.7)	Dry
				L	0.8(0.3–1.2)	0.8(0.3–1.2)	0.8(0.3–1.2)	
			≤1.0	M,R	0.8(0.2–1.0)	0.6(0.2–0.8)	1.0(0.3–1.2)	
				L	0.5(0.2–0.8)	0.5(0.2–0.8)	0.5(0.2–0.8)	
S	Titanium Alloy	–	≤0.5	L	0.3(0.2–0.6)	0.3(0.2–0.6)	0.3(0.2–0.6)	Wet
			≤1.0	L	0.3(0.2–0.4)	0.3(0.2–0.4)	0.3(0.2–0.4)	
	Heat Resistant Alloy	–	≤0.5	L,M,R	0.8(0.3–1.2)	0.8(0.3–1.2)	0.8(0.3–1.2)	Wet
			≤1.0	L,M,R	0.7(0.3–1.0)	0.7(0.3–1.0)	0.7(0.3–1.0)	
H	Hardened Steel	Hardness 40–55HRC	≤0.5	R,M	0.6(0.3–1.0)	0.6(0.3–1.0)	0.6(0.3–1.0)	Dry
			≤ 1.0	R,M	0.5(0.3–0.8)	0.4(0.3–0.6)	0.5(0.3–0.8)	

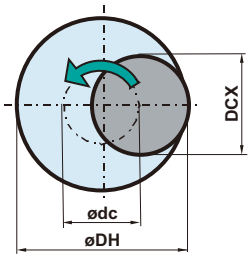
Note 1) To discharge chips effectively, use an air blow when machining. When the air blow is less effective at discharging chips, we recommend wet cutting.
Note 2) When large vibration occurs, reduce the cutting conditions.
Note 3) For interrupted cutting, reduce the cutting speed and feed rate by 20%.
Note 4) If ap is set at 2mm or more, avoid machining on the walls or ramping.

MAXIMUM CAPACITIES BY MODE

■ Ramping



■ Helical Milling



● How to derive a locus of the centre of the tool.

ødc = øDH - DCX

ødc: Locus of the Centre of the Tool
øDH: Desired Hole Diameter
DCX: Cutting Diameter Maximum

Tool Holder Type	DCX (mm)	DC (mm)	APMX (mm)	Ramping		Helical Milling (Blind Hole, Flat Bottom)		Helical Milling (Through Hole)		AZ (mm)
				RMPX	L (mm) Required Distance for X mm Depth	DH (mm)		DH (mm)	P max. (mm)	
					x = 1 (mm)	Min.	Max.	Min.		
WJX09R25	25	14.0	1.2	4.7°	12.2	38	47	34	1.2	0.8
WJX09R28	28	16.9	1.2	5.6°	10.2	44	53	38	1.2	1.2
WJX09R32	32	20.9	1.2	4.2°	13.7	52	61	46	1.2	1.2
WJX09R35	35	23.8	1.2	3.6°	15.9	58	67	52	1.2	1.2
WJX09R40	40	28.8	1.2	2.9°	19.8	68	77	61	1.2	1.2
WJX09-040	40	28.8	1.2	2.9°	19.8	68	77	61	1.2	1.2
WJX09-050	50	38.8	1.2	2.0°	28.7	88	97	81	1.2	1.2
WJX09-052	52	40.8	1.2	1.9°	30.2	92	101	85	1.2	1.2
WJX09-063	63	51.8	1.2	1.4°	41.0	114	123	107	1.2	1.2
WJX09-066	66	54.8	1.2	1.4°	41.0	120	129	113	1.2	1.2

DCX = Cutting Dia. Max. **DC** = Cutting Dia. **DH** = Desired Hole Dia.
APMX = Depth of Cut Max. **RMPX** = Ramping Angle Max. **AZ** = Plunge Depth Max.

Note 1) When ramping and helical milling, it is recommended to reduce the feed per tooth.
Note 2) When ramping, helical milling and drilling, long continuous chips may be dispersed.

<Helical Milling>
To obtain a flat bottom surface when helical milling, it requires to remove “the uncut part” in the centre of the work material at a final pass.
When helical milling, make sure that the depth of cut per helical pass doesn’t exceed the maximum depth of cut (APMX).
<Drilling>
When drilling, set the axial feed per revolution at 0.2mm/rev or less.