

NEW

Radius End Mill for Hardened Steel

EPDREH-TH3

EPDRH-TH3

Epoch Deep Radius (Evolution) Hard-TH3

EPDREH-TH3
(Evolution)

(DC0.2mm ~ 6mm) RE: centerline as datum

EPDRH-TH3 **NEW**

(DC8mm ~ 12mm) RE: tool diameter as datum



MOLDINO Tool Engineering, Ltd.

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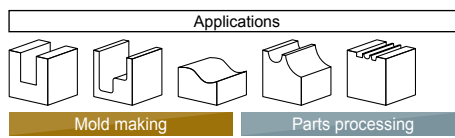
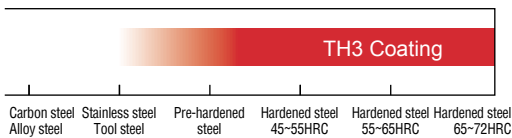
Small-radius deep-milling radius end mill for hardened steel

DC8mm to 12mm added to the 4-flute lineup!

TH3 Coating benefits and unique cutting edge profile enables long-life/high-accuracy milling of hardened steel.

Features of EPDR(E)H-TH3

- Corner radius precision guaranteed for high-accuracy milling
- Tool design optimized for high-accuracy milling
- TH3 Coating for milling hardened steel



EPDREH-TH3	
2 Flutes	$\phi 0.2 \sim \phi 1$ [53 Items] (Corner Radius R0.02~R0.2)
4 Flutes	$\phi 1 \sim \phi 6$ [266 Items] (Corner Radius R0.02~R1)
EPDRH-TH3	
4 Flutes	$\phi 8 \sim \phi 12$ [26 Items] (Corner Radius R0.2~R2)

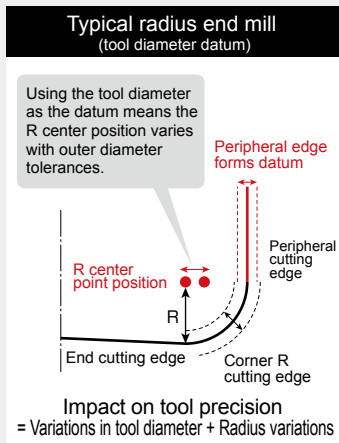
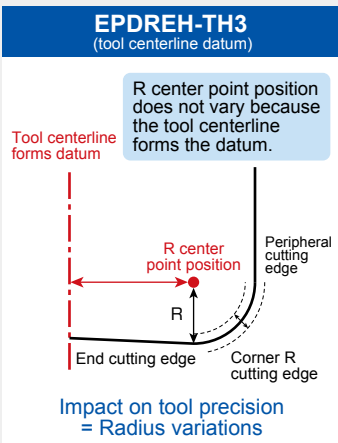


We need high-precision milling. But high-accuracy milling requires measuring the actual tool diameter. And diameter corrections take time.

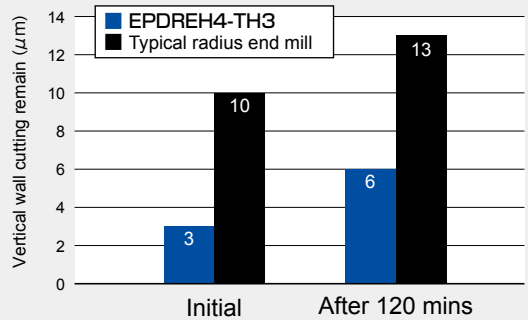


The corner radius of Evolution type uses the tool centerline as its datum independent of the tool diameter. This allows high-accuracy milling compared to conventional tools, even when using nominal diameters.
*The corner radius of EPDRH-TH3 (DC8mm ~ 12mm) uses the tool diameter as its datum.

High-precision corner radius



Comparison between cutting remain for vertical wall milling using nominal diameter



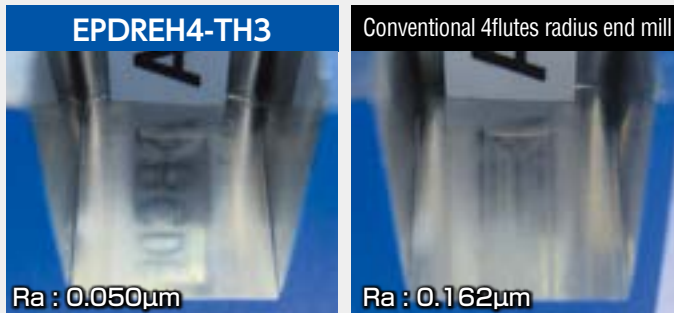
[Cutting conditions]
 Tool dia : $\phi 1$ (RE0.1) No. of flutes : 4flutes
 Cutting speed : $v_c = 66\text{m/min}$ Feed per tooth : $f_z = 0.021\text{mm/t}$
 Depth of cut : $a_p \times a_e = 0.02 \times 0.02\text{mm}$
 Work material : STAVAX(52HRC) Coolant : Mist blow

Task

Machined surface is not smooth enough for finishing of hardened steel. Machined surface is uneven after long time machining then it will take long time for polish.

Point

A positive cutting edge profile is adopted for the bottom cutting edge. Thus, improved machined surface quality for hardened steel is achieved.



【Cutting conditions】

Bottom face finishing
 Tool dia. : $\phi 3$ (RE0.1)
 No. of flutes : 4flutes
 Cutting speed : $v_c = 131\text{m/min}$
 Feed per tooth : $f_z = 0.025\text{mm/t}$
 Depth of cut : $a_p \times a_e = 0.028 \times 0.05\text{mm}$
 Work material : STAVAX(52HRC)
 Coolant : Mist blow

Good level of shine for bottom face finishing ("ABCDE" text is reflected)

Task

We want to switch to automated operation. But with direct milling of hardened steel, we never know when a tool might break.

Point

The tools combine carbide base material designed for hardened steel machining with the TH3 Coating, offering improved wear resistance and allowing longer machining usage over conventional tools!

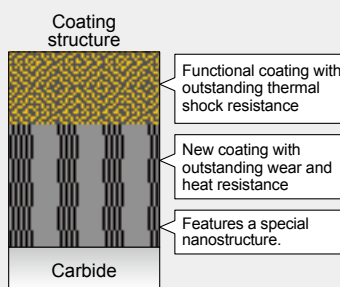
TH3 Coating

Features and performance

- Hard surface coating for outstanding wear and heat resistance
- Outstanding impact resistance to minimize risk of sudden damage
- Long tool life when machining hardened steels of 50 HRC or harder

Target steel grades

- Hardened steels (especially 50 HRC or higher); high-speed steel



Small damage after 11 hours of finish processing

Tool photo after use



Flank wear : 0.005mm

【Cutting conditions】

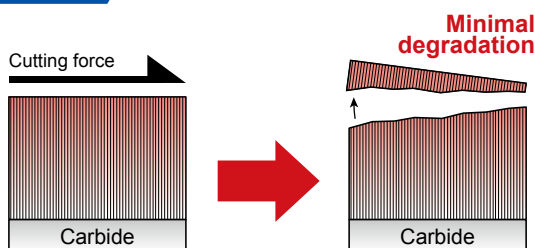
Tool dia : $\phi 1$ (RE0.2)
 Under neck length : 2mm
 No. of flutes : 2 flutes
 Work material : STAVAX(52HRC)
 Cutting speed : $v_c = 125\text{m/min}$
 Feed per tooth : $f_z = 0.005\text{mm/t}$
 Depth of cut : $a_p \times a_e = 0.005 \times 0.005\text{mm}$
 Coolant : Air blow

Cutting time : 11 Hours

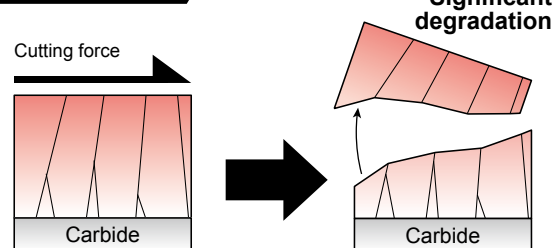
⇒Finished surface is posted on page 33

! Point TH3 features a special nanostructure to minimize degradation of the coating layer!

TH3 Coating



Conventional coating



Lineup by tool diameter/corner radius and tool diameter/under neck length

2 Flutes

EPDREH2

■ Tool diameter/corner radius

Corner radius (mm)	Tool dia.(mm)						
	0.2	0.3	0.4	0.5	0.6	0.8	1.0
0.02	●	●	●	●	●	●	●
0.05	●	●	●	●	●	●	●
0.1			●	●	●	●	●
0.2						●	●

■ Tool diameter/under neck length

Under neck length (mm)	Tool dia.(mm)						
	0.2	0.3	0.4	0.5	0.6	0.8	1.0
0.5	●						
1	●	●	●	●			
2		●	●	●	●	●	●
3				●			
4					●	●	●
6							●
8							●

4 Flutes

EPDREH4

■ Tool diameter/corner radius

Corner radius (mm)	Tool dia.(mm)						
	1.0	1.5	2	3	4	5	6
0.02	●	●	●				
0.05	●	●	●	●			
0.1	●	●	●	●	●	●	●
0.2	●	●	●	●	●	●	●
0.3	●	●	●	●	●	●	●
0.5		●	●	●	●	●	●
1					●	●	●

■ Tool diameter/under neck length

Under neck length (mm)	Tool dia.(mm)						
	1.0	1.5	2	3	4	5	6
1.5	●						
2	●	●					
2.5	●		●				
3	●	●	●				
4	●	●	●	●			
5	●	●	●				
6	●	●	●	●			
8	●	●	●	●	●		
10		●	●	●	●	●	
12		●	●	●	●		●
14				●	●		
15						●	
16				●	●		
18				●	●		●
20				●	●	●	
22					●		
24					●		●
25						●	
30							●

4 Flutes

EPDRH4 **NEW**

■ Tool diameter/corner radius

Corner radius (mm)	Tool dia.(mm)		
	8	10	12
0.2	★	★	★
0.3	★		
0.5	★	★	★
1	★	★	★
2	★	★	★

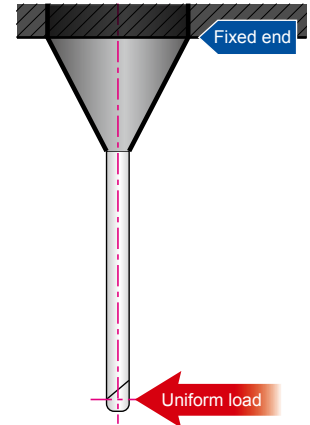
■ Tool diameter/under neck length

Under neck length (mm)	Tool dia.(mm)		
	8	10	12
24	★		
30		★	
36			★
40	★		
50		★	
60			★

★ : Stocked items of new products ● : Stocked items.

Individual tool deflection comparison

Please use this information as one criteria for selecting tool



[Note]

- The calculated deflections are based on MOLDINO equations that treat the tool as an elastic body.
 - The data here does not account for flute and does not indicate deflection accurately.
- This is not a guarantee of accuracy. Actual deflection will vary during machining.

[Method of calculation]

- Calculated as a cantilever beam
- The start of the taper is set as a fixed end
- A uniform load is applied at the outermost diameter section of the flute tip
- The deflection is calculated at the outermost diameter section of the flute tip (loading point)

Example

EPDREH2010-2-002 = 0.36, EPDREH2010-4-002 = 1.61: under neck length 2 is stiffer ($1.61/0.36 = 4.47$ times stiffer) than under neck length 4

2 Flutes

EPDREH2

Deflection characteristics (Smaller values indicate greater rigidity.)

Corner radius (mm)	Under neck length (mm)	Tool dia. (mm)						
		0.2	0.3	0.4	0.5	0.6	0.8	1
0.02	0.5	3.86						
	1	19.84	4.09	1.53	0.77			
	2		23.37	7.51	3.28	1.72	0.66	0.36
	3				9.12			
	4					9.67	3.26	1.61
	6							4.54
	8							9.86

Corner radius (mm)	Under neck length (mm)	Tool dia. (mm)						
		0.2	0.3	0.4	0.5	0.6	0.8	1
0.05	0.5	3.42						
	1	18.34	3.82	1.45	0.74			
	2		22.45	7.23	3.17	1.67	0.64	0.35
	3				8.88			
	4					9.48	3.20	1.59
	6							4.48
	8							9.76

Corner radius (mm)	Under neck length (mm)	Tool dia. (mm)					
		0.4	0.5	0.6	0.8	1	
0.1	1	1.31	0.67				
	2	6.77	2.98	1.57	0.61	0.34	
	3		8.49				
	4			9.16	3.10	1.54	
	6					4.38	
	8					9.59	
	0.2	2				0.55	0.31
		4				2.90	1.44
6						4.19	
8						9.26	

4 Flutes

EPDREH4

Corner radius (mm)	Under neck length (mm)	Tool dia. (mm)							
		1	1.5	2	3	4	5	6	
0.02	1.5	0.21							
	2	0.34	0.10						
	2.5	0.52		0.06					
	3	0.77	0.21	0.08					
	4	1.50	0.37	0.14					
	5	2.62	0.62	0.22					
	6	4.20	0.97	0.34					
	8	9.11	2.02	0.69					
	10		3.65	1.23					
	12		6.01	2.01					
	0.05	1.5	0.20						
		2	0.33	0.10					
2.5		0.51		0.06					
3		0.75	0.20	0.08					
4		1.47	0.37	0.14	0.04				
5		2.58	0.61	0.22					
6		4.15	0.96	0.34	0.09				
8		9.02	2.00	0.69	0.17				
10			3.62	1.22	0.29				
12			5.97	2.00	0.46				
0.1		1.5	0.19						
		2	0.32	0.10					
	2.5	0.49		0.06					
	3	0.73	0.20	0.08					
	4	1.43	0.36	0.13	0.04				
	5	2.51	0.60	0.22					
	6	4.05	0.94	0.33	0.09				
	8	8.86	1.96	0.68	0.17	0.06			
	10		3.57	1.21	0.29	0.09	0.03		
	12		5.90	1.97	0.46	0.15		0.02	
	14				0.68	0.22			
	15						0.10		
16				0.97	0.31				

Corner radius (mm)	Under neck length (mm)	Tool dia. (mm)							
		1	1.5	2	3	4	5	6	
0.1	18				1.33	0.43		0.06	
	20				1.77	0.57	0.22		
	22					0.74			
	24					0.94		0.14	
	25						0.40		
	30							0.28	
	0.2	1.5	0.18						
		2	0.29	0.09					
2.5		0.45		0.05					
3		0.67	0.18	0.07					
4		1.34	0.34	0.13	0.04				
5		2.38	0.57	0.21					
6		3.88	0.90	0.32	0.09				
8		8.56	1.90	0.65	0.16	0.05			
10			3.48	1.18	0.28	0.09	0.03		
12			5.76	1.93	0.45	0.15		0.02	
14					0.67	0.22			
15							0.10		
16					0.95	0.31			
18					1.31	0.42		0.06	
20					1.74	0.56	0.21		
22						0.73			
24					0.92		0.14		
25						0.40			
30							0.27		
0.3	1.5	0.16							
	2	0.26	0.08						
	2.5	0.41		0.05					
	3	0.62	0.17	0.07					
	4	1.26	0.32	0.12	0.04				
	5	2.26	0.54	0.20					
	6	3.70	0.86	0.31	0.08				
	8	8.27	1.84	0.63	0.16	0.05			
	10		3.38	1.15	0.27	0.09	0.03		
	12		5.63	1.88	0.44	0.14		0.02	
	14				0.65	0.21			
	15						0.10		

Corner radius (mm)	Under neck length (mm)	Tool dia. (mm)						
		1.5	2	3	4	5	6	
0.3	16			0.93	0.30			
	18			1.29	0.41		0.06	
	20			1.72	0.55	0.21		
	22				0.72			
	24				0.91		0.14	
	25					0.39		
	30						0.27	
	0.5	2	0.07					
		2.5		0.04				
		3	0.15	0.06				
4		0.29	0.11	0.04				
5		0.49	0.18					
6		0.79	0.28	0.08				
8		1.72	0.59	0.15	0.05			
10		3.20	1.09	0.26	0.09	0.03		
12		5.37	1.80	0.42	0.14		0.02	
14				0.63	0.20			
15							0.09	
16				0.90	0.29			
18				1.25	0.40		0.06	
20				1.67	0.54	0.20		
22				0.70				
24				0.89		0.14		
25					0.38			
30						0.27		
1	8			0.04				
	10			0.08	0.03			
	12			0.12		0.02		
	14			0.19				
	15				0.08			
	16			0.27				
	18			0.37		0.05		
	20			0.50	0.19			
	22			0.66				
	24			0.84		0.13		
	25				0.36			
30						0.25		

Line Up

2 Flutes

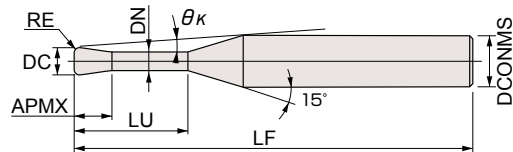
EPDREH2-TH3

Radius

2 Flutes



Tolerance on corner radius RE : $\pm 0.005\text{mm}$ (centerline datum)



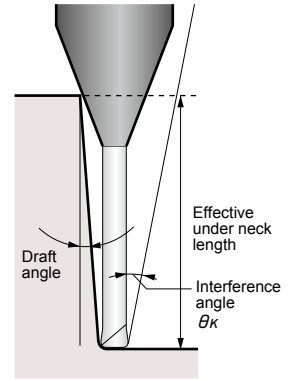
※The 2-flute tool uses a backdraft profile (with strong back taper).

EPDREH2-TH3



Item code	Stock	Size(mm)							Interference angle (°)	Effective under neck length with respect to draft angle									
		Tool dia.	Corner radius	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.		0.5°	1°	1.5°	2°	3°					
		DC	RE	LU	APMX	DN	LF	DCONMS		θ_K									
EPDREH2002-0.5-002-TH3	●	0.2	0.02	0.5	0.15	0.17	50	4	13.99	0.57	0.59	0.61	0.63	0.68					
EPDREH2002-1-002-TH3	●			1					13.16	1.09	1.12	1.16	1.21	1.30					
EPDREH2002-0.5-005-TH3	●		0.05	0.5					14.05	0.57	0.59	0.61	0.63	0.67					
EPDREH2002-1-005-TH3	●			1					13.21	1.08	1.12	1.16	1.20	1.30					
EPDREH2003-1-002-TH3	●	0.3	0.02	1	0.25	0.27	50	4	13.12	1.09	1.12	1.16	1.21	1.30					
EPDREH2003-2-002-TH3	●			2					11.70	2.12	2.19	2.27	2.36	2.55					
EPDREH2003-1-005-TH3	●		0.05	1					13.17	1.08	1.12	1.16	1.20	1.30					
EPDREH2003-2-005-TH3	●			2					11.73	2.12	2.19	2.27	2.35	2.54					
EPDREH2004-1-002-TH3	●	0.4	0.02	1	0.3	0.37	50	4	13.07	1.09	1.12	1.16	1.21	1.30					
EPDREH2004-2-002-TH3	●			2					11.62	2.12	2.19	2.27	2.36	2.55					
EPDREH2004-1-005-TH3	●		0.05	1					13.12	1.08	1.12	1.16	1.20	1.30					
EPDREH2004-2-005-TH3	●			2					11.66	2.12	2.19	2.27	2.35	2.54					
EPDREH2004-1-01-TH3	●		0.1	1					13.21	1.08	1.12	1.15	1.19	1.28					
EPDREH2004-2-01-TH3	●			2					11.73	2.12	2.19	2.26	2.34	2.53					
EPDREH2005-1-002-TH3	●	0.5	0.02	1	0.35	0.47	50	4	13.03	1.09	1.12	1.16	1.21	1.30					
EPDREH2005-2-002-TH3	●			2					11.55	2.12	2.19	2.27	2.36	2.55					
EPDREH2005-3-002-TH3	●			3					10.37	3.15	3.26	3.38	3.51	3.79					
EPDREH2005-1-005-TH3	●		0.05	1					13.08	1.08	1.12	1.16	1.20	1.30					
EPDREH2005-2-005-TH3	●			2					11.59	2.12	2.19	2.27	2.35	2.54					
EPDREH2005-3-005-TH3	●			3					10.40	3.15	3.26	3.38	3.50	3.78					
EPDREH2005-1-01-TH3	●		0.1	1					13.16	1.08	1.12	1.15	1.19	1.28					
EPDREH2005-2-01-TH3	●			2					11.66	2.12	2.19	2.26	2.34	2.53					
EPDREH2005-3-01-TH3	●			3					10.46	3.15	3.26	3.37	3.49	3.77					
EPDREH2006-2-002-TH3	●		0.6	0.02					2	0.4	0.57	50	4	11.47	2.12	2.19	2.27	2.36	2.55
EPDREH2006-4-002-TH3	●								4					9.31	4.19	4.33	4.49	4.66	5.03
EPDREH2006-2-005-TH3	●			0.05					2					11.51	2.12	2.19	2.27	2.35	2.54
EPDREH2006-4-005-TH3	●	4			9.33	4.19	4.33	4.48	4.65					5.03					
EPDREH2006-2-01-TH3	●	0.1		2	11.58	2.12	2.19	2.26	2.34					2.53					
EPDREH2006-4-01-TH3	●			4	9.38	4.18	4.33	4.48	4.64					5.01					
EPDREH2008-2-002-TH3	●	0.8	0.02	2	0.5	0.77	50	4	11.30	2.12	2.19	2.27	2.36	2.55					
EPDREH2008-4-002-TH3	●			4					9.09	4.19	4.33	4.49	4.66	5.03					
EPDREH2008-2-005-TH3	●		0.05	2					11.35	2.12	2.19	2.27	2.35	2.54					
EPDREH2008-4-005-TH3	●			4					9.12	4.19	4.33	4.48	4.65	5.03					
EPDREH2008-2-01-TH3	●		0.1	2					11.42	2.12	2.19	2.26	2.34	2.53					
EPDREH2008-4-01-TH3	●			4					9.16	4.18	4.33	4.48	4.64	5.01					
EPDREH2008-2-02-TH3	●		0.2	2					11.56	2.11	2.18	2.25	2.33	2.50					
EPDREH2008-4-02-TH3	●			4					9.25	4.18	4.32	4.47	4.63	4.99					

● : Stocked items.



[Note]
The actual effective under neck length with respect to the draft angle differs from the Epoch Deep Radius Evolution EPDRE-ATH. Please be sure to check this.

EPDREH2-0.0-0.0-TH3

Item code	Stock	Size(mm)							Interference angle (°) θ_K	Effective under neck length with respect to draft angle				
		Tool dia.	Corner radius	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.		0.5°	1°	1.5°	2°	3°
		DC	RE	LU	APMX	DN	LF	DCONMS						
EPDREH2010-2-002-TH3	●	1	0.02	2	0.8	0.94	50	4	11.04	2.18	2.25	2.33	2.42	2.62
EPDREH2010-4-002-TH3	●			4					8.80	4.24	4.39	4.55	4.72	5.10
EPDREH2010-6-002-TH3	●			6					7.32	6.31	6.53	6.77	7.02	7.59
EPDREH2010-8-002-TH3	●			8					6.26	8.38	8.67	8.98	9.32	10.07
EPDREH2010-2-005-TH3	●		0.05	2					11.08	2.18	2.25	2.33	2.42	2.61
EPDREH2010-4-005-TH3	●			4					8.83	4.24	4.39	4.55	4.72	5.09
EPDREH2010-6-005-TH3	●			6					7.34	6.31	6.53	6.76	7.02	7.58
EPDREH2010-8-005-TH3	●			8					6.27	8.38	8.67	8.98	9.32	10.07
EPDREH2010-2-01-TH3	●		0.1	2					11.16	2.17	2.25	2.33	2.41	2.60
EPDREH2010-4-01-TH3	●			4					8.88	4.24	4.39	4.54	4.71	5.08
EPDREH2010-6-01-TH3	●			6					7.37	6.31	6.53	6.76	7.01	7.57
EPDREH2010-8-01-TH3	●			8					6.29	8.38	8.67	8.97	9.31	10.06
EPDREH2010-2-02-TH3	●		0.2	2					11.30	2.17	2.24	2.31	2.39	2.57
EPDREH2010-4-02-TH3	●			4					8.97	4.24	4.38	4.53	4.69	5.06
EPDREH2010-6-02-TH3	●			6					7.43	6.31	6.52	6.75	6.99	7.55
EPDREH2010-8-02-TH3	●			8					6.34	8.37	8.66	8.96	9.29	10.03

For detailed information on the EPDREH2 cutting conditions, refer to pages 16 to 17.

Regrinding compatibility range table

Item code	Product name	Shape	Re-grinding compatibility range(mm)	
			Outer dia.	End
EPDREH2-TH3	Epoch Deep Radius Evolution Hard-TH3 (2 Flutes)		N/A	N/A

Line Up

4 Flutes

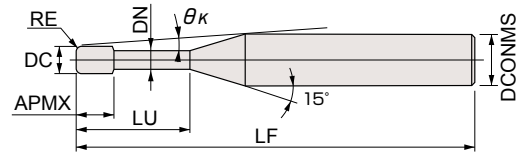
EPDREH4-TH3

Radius

4 Flutes



Tolerance on corner radius RE : ±0.005mm (centerline datum)

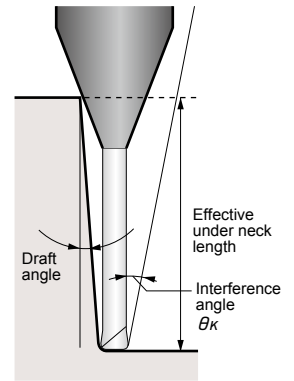


EPDREH4-0.02-0.05-0.1-0.2-0.3-TH3



Item code	Stock	Size(mm)							Interference angle (°)	Effective under neck length with respect to draft angle														
		Tool dia.	Corner radius	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.		0.5°	1°	1.5°	2°	3°										
		DC	RE	LU	APMX	DN	LF	DCONMS																
EPDREH4010-1.5-002-TH3	●	1	0.02	1.5	0.6	0.96	50	4	11.85	1.62	1.68	1.74	1.80	1.95										
EPDREH4010-2-002-TH3	●			2					11.09	2.14	2.21	2.29	2.38	2.57										
EPDREH4010-2.5-002-TH3	●			2.5					10.43	2.66	2.75	2.85	2.95	3.19										
EPDREH4010-3-002-TH3	●			3					9.84	3.17	3.28	3.40	3.53	3.81										
EPDREH4010-4-002-TH3	●			4					8.84	4.21	4.35	4.51	4.68	5.06										
EPDREH4010-5-002-TH3	●			5					8.02	5.24	5.42	5.62	5.83	6.30										
EPDREH4010-6-002-TH3	●			6					7.34	6.27	6.49	6.73	6.98	7.54										
EPDREH4010-8-002-TH3	●			8					6.27	8.34	8.63	8.94	9.28	10.03										
EPDREH4010-1.5-005-TH3	●			0.05					1.5	0.6	0.96	50	4	11.90	1.62	1.68	1.73	1.80	1.94					
EPDREH4010-2-005-TH3	●								2					11.14	2.14	2.21	2.29	2.37	2.56					
EPDREH4010-2.5-005-TH3	●								2.5					10.47	2.65	2.75	2.84	2.95	3.18					
EPDREH4010-3-005-TH3	●								3					9.87	3.17	3.28	3.40	3.52	3.81					
EPDREH4010-4-005-TH3	●								4					8.87	4.21	4.35	4.51	4.67	5.05					
EPDREH4010-5-005-TH3	●								5					8.04	5.24	5.42	5.61	5.82	6.29					
EPDREH4010-6-005-TH3	●								6					7.36	6.27	6.49	6.72	6.97	7.53					
EPDREH4010-8-005-TH3	●								8					6.29	8.34	8.63	8.94	9.27	10.02					
EPDREH4010-1.5-01-TH3	●								0.1					1.5	0.6	0.96	50	4	11.98	1.62	1.67	1.73	1.79	1.93
EPDREH4010-2-01-TH3	●													2					11.21	2.14	2.21	2.28	2.37	2.55
EPDREH4010-2.5-01-TH3	●													2.5					10.53	2.65	2.74	2.84	2.94	3.17
EPDREH4010-3-01-TH3	●													3					9.93	3.17	3.28	3.39	3.52	3.79
EPDREH4010-4-01-TH3	●													4					8.91	4.20	4.35	4.50	4.67	5.04
EPDREH4010-5-01-TH3	●													5					8.08	5.24	5.42	5.61	5.82	6.28
EPDREH4010-6-01-TH3	●													6					7.39	6.27	6.49	6.72	6.97	7.52
EPDREH4010-8-01-TH3	●													8					6.31	8.34	8.63	8.93	9.26	10.01
EPDREH4010-1.5-02-TH3	●		0.2		1.5	0.6	0.96	50						4					12.15	1.62	1.67	1.72	1.78	1.91
EPDREH4010-2-02-TH3	●				2														11.36	2.13	2.20	2.27	2.35	2.53
EPDREH4010-2.5-02-TH3	●				2.5														10.66	2.65	2.74	2.83	2.93	3.15
EPDREH4010-3-02-TH3	●				3														10.04	3.17	3.27	3.38	3.50	3.77
EPDREH4010-4-02-TH3	●				4														9.00	4.20	4.34	4.49	4.65	5.01
EPDREH4010-5-02-TH3	●				5														8.16	5.23	5.41	5.60	5.80	6.26
EPDREH4010-6-02-TH3	●				6														7.45	6.27	6.48	6.71	6.95	7.50
EPDREH4010-8-02-TH3	●				8														6.36	8.33	8.62	8.92	9.25	9.99
EPDREH4010-1.5-03-TH3	●			0.3	1.5					0.6	0.96	50	4						12.32	1.61	1.66	1.71	1.76	1.88
EPDREH4010-2-03-TH3	●				2														11.51	2.13	2.19	2.26	2.34	2.50
EPDREH4010-2.5-03-TH3	●				2.5														10.79	2.65	2.73	2.82	2.91	3.12
EPDREH4010-3-03-TH3	●				3														10.16	3.16	3.26	3.37	3.49	3.75
EPDREH4010-4-03-TH3	●				4														9.10	4.20	4.33	4.48	4.64	4.99
EPDREH4010-5-03-TH3	●				5														8.23	5.23	5.40	5.59	5.79	6.23
EPDREH4010-6-03-TH3	●				6														7.52	6.26	6.47	6.70	6.94	7.48
EPDREH4010-8-03-TH3	●				8														6.41	8.33	8.61	8.91	9.24	9.96

● : Stocked items.



[Note]
 The actual effective under neck length with respect to the draft angle differs from the Epoch Deep Radius Evolution EPDRE-ATH. Please be sure to check this.

EPDREH4 \varnothing 1- \varnothing 1.5- \varnothing 0.02-TH3

Item code	Stock	Size(mm)							Interference angle ($^{\circ}$) θ_{κ}	Effective under neck length with respect to draft angle					
		Tool dia.	Corner radius	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.		0.5 $^{\circ}$	1 $^{\circ}$	1.5 $^{\circ}$	2 $^{\circ}$	3 $^{\circ}$	
		DC	RE	LU	APMX	DN	LF	DCONMS							
EPDREH4015-2-002-TH3	●	1.5	0.02	2	0.9	1.44	50	4	10.49	2.18	2.25	2.33	2.42	2.62	
EPDREH4015-3-002-TH3	●			3					9.16	3.21	3.32	3.44	3.57	3.86	
EPDREH4015-4-002-TH3	●			4					8.13	4.24	4.39	4.55	4.72	5.10	
EPDREH4015-5-002-TH3	●			5					7.31	5.28	5.46	5.66	5.87	6.35	
EPDREH4015-6-002-TH3	●			6					6.63	6.31	6.53	6.77	7.02	7.59	
EPDREH4015-8-002-TH3	●			8					5.60	8.38	8.67	8.98	9.32	10.07	
EPDREH4015-10-002-TH3	●			10					4.85	10.45	10.81	11.20	11.62	12.56	
EPDREH4015-12-002-TH3	●			12					4.27	12.51	12.95	13.42	13.92	15.05	
EPDREH4015-2-005-TH3	●			0.05					2	10.53	2.18	2.25	2.33	2.42	2.61
EPDREH4015-3-005-TH3	●								3	9.19	3.21	3.32	3.44	3.57	3.85
EPDREH4015-4-005-TH3	●								4	8.16	4.24	4.39	4.55	4.72	5.09
EPDREH4015-5-005-TH3	●								5	7.33	5.28	5.46	5.66	5.87	6.34
EPDREH4015-6-005-TH3	●		6						6.65	6.31	6.53	6.76	7.02	7.58	
EPDREH4015-8-005-TH3	●		8						5.61	8.38	8.67	8.98	9.32	10.07	
EPDREH4015-10-005-TH3	●		10						4.86	10.45	10.81	11.20	11.61	12.55	
EPDREH4015-12-005-TH3	●		12						4.28	12.51	12.95	13.41	13.91	15.04	
EPDREH4015-2-01-TH3	●		0.1						2	10.61	2.17	2.25	2.33	2.41	2.60
EPDREH4015-3-01-TH3	●								3	9.25	3.21	3.32	3.43	3.56	3.84
EPDREH4015-4-01-TH3	●								4	8.20	4.24	4.39	4.54	4.71	5.08
EPDREH4015-5-01-TH3	●								5	7.37	5.28	5.46	5.65	5.86	6.33
EPDREH4015-6-01-TH3	●			6					6.68	6.31	6.53	6.76	7.01	7.57	
EPDREH4015-8-01-TH3	●			8					5.64	8.38	8.67	8.97	9.31	10.06	
EPDREH4015-10-01-TH3	●			10					4.87	10.44	10.80	11.19	11.61	12.54	
EPDREH4015-12-01-TH3	●			12					4.29	12.51	12.94	13.41	13.91	15.03	
EPDREH4015-2-02-TH3	●			0.2					2	10.77	2.17	2.24	2.31	2.39	2.57
EPDREH4015-3-02-TH3	●								3	9.37	3.21	3.31	3.42	3.54	3.82
EPDREH4015-4-02-TH3	●								4	8.30	4.24	4.38	4.53	4.69	5.06
EPDREH4015-5-02-TH3	●								5	7.44	5.27	5.45	5.64	5.84	6.30
EPDREH4015-6-02-TH3	●		6						6.74	6.31	6.52	6.75	6.99	7.55	
EPDREH4015-8-02-TH3	●		8						5.68	8.37	8.66	8.96	9.29	10.03	
EPDREH4015-10-02-TH3	●		10						4.91	10.44	10.80	11.18	11.59	12.52	
EPDREH4015-12-02-TH3	●		12						4.32	12.51	12.94	13.40	13.89	15.00	
EPDREH4015-2-03-TH3	●		0.3						2	10.93	2.17	2.23	2.30	2.38	2.55
EPDREH4015-3-03-TH3	●								3	9.50	3.20	3.30	3.41	3.53	3.79
EPDREH4015-4-03-TH3	●								4	8.39	4.24	4.37	4.52	4.68	5.04
EPDREH4015-5-03-TH3	●								5	7.52	5.27	5.44	5.63	5.83	6.28
EPDREH4015-6-03-TH3	●			6					6.81	6.30	6.51	6.74	6.98	7.52	
EPDREH4015-8-03-TH3	●			8					5.73	8.37	8.65	8.95	9.28	10.01	
EPDREH4015-10-03-TH3	●			10					4.94	10.44	10.79	11.17	11.58	12.49	
EPDREH4015-12-03-TH3	●			12					4.34	12.50	12.93	13.39	13.88	14.98	

Line Up

4 Flutes

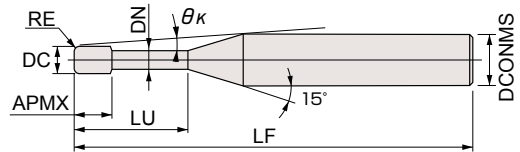
EPDREH4-TH3

Radius

4 Flutes



Tolerance on corner radius RE : ±0.005mm (centerline datum)

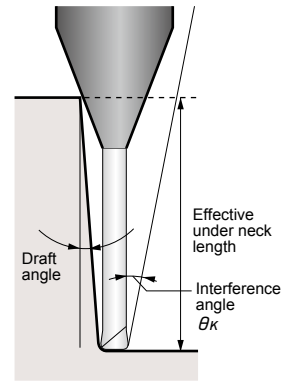


EPDREH4-0.002-0.01-0.02-TH3



Item code	Stock	Size(mm)							Interference angle (°)	Effective under neck length with respect to draft angle														
		Tool dia.	Corner radius	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.		0.5°	1°	1.5°	2°	3°										
		DC	RE	LU	APMX	DN	LF	DCONMS																
EPDREH4015-2-05-TH3	●	1.5	0.5	2	0.9	1.44	50	4	11.27	2.16	2.22	2.28	2.35	2.50										
EPDREH4015-3-05-TH3	●			3					9.75	3.19	3.29	3.39	3.50	3.75										
EPDREH4015-4-05-TH3	●			4					8.59	4.23	4.36	4.50	4.65	4.99										
EPDREH4015-5-05-TH3	●			5					7.68	5.26	5.43	5.61	5.80	6.23										
EPDREH4015-6-05-TH3	●			6					6.94	6.30	6.50	6.72	6.95	7.47										
EPDREH4015-8-05-TH3	●			8					5.82	8.36	8.64	8.93	9.25	9.96										
EPDREH4015-10-05-TH3	●			10					5.01	10.43	10.78	11.15	11.55	12.45										
EPDREH4015-12-05-TH3	●			12					4.40	12.50	12.92	13.37	13.85	14.93										
EPDREH4020-2.5-002-TH3	●	2	0.02	2.5	1.2	1.92	50	4	8.94	2.73	2.83	2.93	3.04	3.28										
EPDREH4020-3-002-TH3	●			3					8.30	3.25	3.36	3.48	3.61	3.91										
EPDREH4020-4-002-TH3	●			4					7.25	4.28	4.43	4.59	4.76	5.15										
EPDREH4020-5-002-TH3	●			5					6.44	5.32	5.50	5.70	5.91	6.39										
EPDREH4020-6-002-TH3	●			6					5.80	6.35	6.57	6.81	7.06	7.63										
EPDREH4020-8-002-TH3	●			8					4.82	8.42	8.71	9.02	9.36	10.12										
EPDREH4020-10-002-TH3	●			10					4.13	10.49	10.85	11.24	11.66	12.61										
EPDREH4020-12-002-TH3	●			12					3.61	12.55	12.99	13.46	13.96	15.09										
EPDREH4020-2.5-005-TH3	●			0.05					2.5	1.2	1.92	50	4	8.98	2.73	2.83	2.93	3.03	3.28					
EPDREH4020-3-005-TH3	●								3					8.33	3.25	3.36	3.48	3.61	3.90					
EPDREH4020-4-005-TH3	●								4					7.28	4.28	4.43	4.59	4.76	5.14					
EPDREH4020-5-005-TH3	●								5					6.47	5.32	5.50	5.70	5.91	6.38					
EPDREH4020-6-005-TH3	●								6					5.81	6.35	6.57	6.80	7.06	7.63					
EPDREH4020-8-005-TH3	●								8					4.84	8.42	8.71	9.02	9.36	10.11					
EPDREH4020-10-005-TH3	●								10					4.14	10.48	10.85	11.24	11.66	12.60					
EPDREH4020-12-005-TH3	●								12					3.62	12.55	12.99	13.45	13.96	15.09					
EPDREH4020-2.5-01-TH3	●								0.1					2.5	1.2	1.92	50	4	9.05	2.73	2.82	2.92	3.03	3.26
EPDREH4020-3-01-TH3	●													3					8.39	3.25	3.36	3.47	3.60	3.89
EPDREH4020-4-01-TH3	●													4					7.33	4.28	4.43	4.58	4.75	5.13
EPDREH4020-5-01-TH3	●													5					6.50	5.31	5.50	5.69	5.90	6.37
EPDREH4020-6-01-TH3	●			6						5.84	6.35	6.57	6.80	7.05					7.62					
EPDREH4020-8-01-TH3	●			8						4.86	8.42	8.71	9.02	9.35					10.10					
EPDREH4020-10-01-TH3	●			10						4.16	10.48	10.84	11.23	11.65					12.59					
EPDREH4020-12-01-TH3	●			12						3.63	12.55	12.98	13.45	13.95					15.07					
EPDREH4020-2.5-02-TH3	●	0.2	2.5	1.2	1.92	50	4	9.19	2.73	2.82	2.91	3.01	3.24											
EPDREH4020-3-02-TH3	●		3					8.52	3.24	3.35	3.46	3.59	3.86											
EPDREH4020-4-02-TH3	●		4					7.42	4.28	4.42	4.57	4.74	5.11											
EPDREH4020-5-02-TH3	●		5					6.58	5.31	5.49	5.68	5.89	6.35											
EPDREH4020-6-02-TH3	●		6					5.90	6.34	6.56	6.79	7.04	7.59											
EPDREH4020-8-02-TH3	●		8					4.90	8.41	8.70	9.01	9.34	10.08											
EPDREH4020-10-02-TH3	●		10					4.19	10.48	10.84	11.22	11.64	12.56											
EPDREH4020-12-02-TH3	●		12					3.65	12.55	12.98	13.44	13.94	15.05											

● : Stocked items.



[Note]
 The actual effective under neck length with respect to the draft angle differs from the Epoch Deep Radius Evolution EPDRE-ATH.
 Please be sure to check this.

EPDREH4-TH3

Item code	Stock	Size(mm)							Interference angle (°) θκ	Effective under neck length with respect to draft angle				
		Tool dia.	Corner radius	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.		0.5°	1°	1.5°	2°	3°
		DC	RE	LU	APMX	DN	LF	DCONMS						
EPDREH4020-2.5-03-TH3	●	2	0.3	2.5	1.2	1.92	50	4	9.34	2.72	2.81	2.90	3.00	3.22
EPDREH4020-3-03-TH3	●			3					8.64	3.24	3.34	3.45	3.57	3.84
EPDREH4020-4-03-TH3	●			4					7.52	4.27	4.41	4.56	4.72	5.08
EPDREH4020-5-03-TH3	●			5					6.65	5.31	5.48	5.67	5.87	6.33
EPDREH4020-6-03-TH3	●			6					5.96	6.34	6.55	6.78	7.02	7.57
EPDREH4020-8-03-TH3	●			8					4.94	8.41	8.69	8.99	9.32	10.05
EPDREH4020-10-03-TH3	●			10					4.22	10.48	10.83	11.21	11.62	12.54
EPDREH4020-12-03-TH3	●			12					3.68	12.54	12.97	13.43	13.92	15.03
EPDREH4020-2.5-05-TH3	●		0.5	2.5					9.65	2.72	2.79	2.88	2.97	3.17
EPDREH4020-3-05-TH3	●			3					8.91	3.23	3.33	3.43	3.54	3.79
EPDREH4020-4-05-TH3	●			4					7.72	4.27	4.40	4.54	4.69	5.03
EPDREH4020-5-05-TH3	●			5					6.81	5.30	5.47	5.65	5.84	6.28
EPDREH4020-6-05-TH3	●			6					6.09	6.33	6.54	6.76	6.99	7.52
EPDREH4020-8-05-TH3	●			8					5.03	8.40	8.68	8.97	9.29	10.01
EPDREH4020-10-05-TH3	●			10					4.28	10.47	10.82	11.19	11.59	12.49
EPDREH4020-12-05-TH3	●			12					3.72	12.54	12.96	13.41	13.89	14.98
EPDREH4030-4-005-TH3	●	3	0.05	4	1.8	2.88	50	6	8.73	4.36	4.51	4.67	4.84	5.23
EPDREH4030-6-005-TH3	●			6					7.27	6.43	6.65	6.89	7.14	7.72
EPDREH4030-8-005-TH3	●			8					6.22	8.49	8.79	9.10	9.44	10.21
EPDREH4030-10-005-TH3	●			10					5.44	10.56	10.93	11.32	11.74	12.69
EPDREH4030-12-005-TH3	●			12					4.83	12.63	13.07	13.54	14.04	15.18
EPDREH4030-14-005-TH3	●			14					4.34	14.70	15.21	15.75	16.34	17.67
EPDREH4030-16-005-TH3	●			16					3.95	16.76	17.35	17.97	18.64	20.15
EPDREH4030-18-005-TH3	●			18					3.62	18.83	19.49	20.19	20.94	22.64
EPDREH4030-20-005-TH3	●		20	3.34					20.90	21.62	22.40	23.24	25.12	
EPDREH4030-4-01-TH3	●		0.1	4					8.78	4.36	4.51	4.67	4.84	5.22
EPDREH4030-6-01-TH3	●			6					7.30	6.43	6.65	6.88	7.14	7.71
EPDREH4030-8-01-TH3	●			8					6.24	8.49	8.79	9.10	9.44	10.19
EPDREH4030-10-01-TH3	●			10					5.45	10.56	10.92	11.32	11.74	12.68
EPDREH4030-12-01-TH3	●			12					4.84	12.63	13.06	13.53	14.04	15.17
EPDREH4030-14-01-TH3	●			14					4.35	14.69	15.20	15.75	16.34	17.65
EPDREH4030-16-01-TH3	●			16					3.96	16.76	17.34	17.97	18.64	20.14
EPDREH4030-18-01-TH3	●			18					3.62	18.83	19.48	20.18	20.94	22.63
EPDREH4030-20-01-TH3	●		20	3.34					20.90	21.62	22.40	23.23	25.11	
EPDREH4030-4-02-TH3	●		0.2	4					8.87	4.35	4.50	4.66	4.82	5.20
EPDREH4030-6-02-TH3	●			6					7.36	6.42	6.64	6.87	7.12	7.68
EPDREH4030-8-02-TH3	●			8					6.29	8.49	8.78	9.09	9.42	10.17
EPDREH4030-10-02-TH3	●			10					5.49	10.56	10.92	11.30	11.72	12.66
EPDREH4030-12-02-TH3	●			12					4.87	12.62	13.06	13.52	14.02	15.14
EPDREH4030-14-02-TH3	●			14					4.38	14.69	15.20	15.74	16.32	17.63

Line Up

4 Flutes

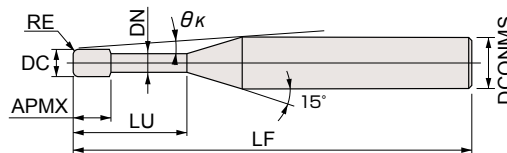
EPDREH4-TH3

Radius

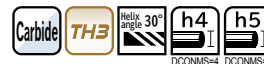
4 Flutes



Tolerance on corner radius RE : ±0.005mm (centerline datum)

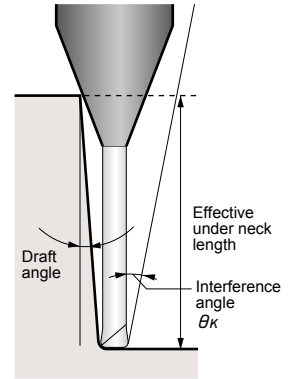


EPDREH4-0.1-0.2-0.3-0.5-TH3



Item code	Stock	Size(mm)							Interference angle (°)	Effective under neck length with respect to draft angle					
		Tool dia.	Corner radius	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.		0.5°	1°	1.5°	2°	3°	
		DC	RE	LU	APMX	DN	LF	DCONMS							
EPDREH4030-16-02-TH3	●	3	0.2	16	1.8	2.88	60	6	3.97	16.76	17.34	17.95	18.62	20.12	
EPDREH4030-18-02-TH3	●			18					3.64	18.83	19.47	20.17	20.92	22.60	
EPDREH4030-20-02-TH3	●			20					3.36	20.89	21.61	22.39	23.22	25.09	
EPDREH4030-4-03-TH3	●			0.3					4	50	8.96	4.35	4.49	4.64	4.81
EPDREH4030-6-03-TH3	●		6						7.42		6.42	6.63	6.86	7.11	7.66
EPDREH4030-8-03-TH3	●		8						6.33		8.49	8.77	9.08	9.41	10.15
EPDREH4030-10-03-TH3	●		10						5.52		10.55	10.91	11.29	11.71	12.63
EPDREH4030-12-03-TH3	●		12						4.90		12.62	13.05	13.51	14.01	15.12
EPDREH4030-14-03-TH3	●		14						4.40		14.69	15.19	15.73	16.31	17.61
EPDREH4030-16-03-TH3	●		16						3.99		16.76	17.33	17.94	18.61	20.09
EPDREH4030-18-03-TH3	●		18						3.65		18.82	19.47	20.16	20.91	22.58
EPDREH4030-20-03-TH3	●		20	3.37					20.89	21.61	22.38	23.21	25.07		
EPDREH4030-4-05-TH3	●		0.5	4					50	9.15	4.34	4.48	4.62	4.78	5.13
EPDREH4030-6-05-TH3	●			6						7.55	6.41	6.62	6.84	7.08	7.61
EPDREH4030-8-05-TH3	●			8						6.43	8.48	8.76	9.06	9.38	10.10
EPDREH4030-10-05-TH3	●			10						5.60	10.55	10.90	11.27	11.68	12.59
EPDREH4030-12-05-TH3	●			12						4.95	12.61	13.04	13.49	13.98	15.07
EPDREH4030-14-05-TH3	●			14						4.44	14.68	15.18	15.71	16.28	17.56
EPDREH4030-16-05-TH3	●			16						4.03	16.75	17.31	17.92	18.58	20.05
EPDREH4030-18-05-TH3	●			18						3.69	18.82	19.45	20.14	20.88	22.53
EPDREH4030-20-05-TH3	●	20		3.40	20.88	21.59	22.36	23.18		25.02					
EPDREH4040-8-01-TH3	●	4		0.1	8	3.5	3.85	55		6	4.80	8.55	8.84	9.16	9.50
EPDREH4040-10-01-TH3	●		10		4.12				10.62		10.98	11.38	11.80	12.75	
EPDREH4040-12-01-TH3	●		12		3.60				12.68		13.12	13.59	14.10	15.24	
EPDREH4040-14-01-TH3	●		14		3.20				14.75		15.26	15.81	16.40	17.72	
EPDREH4040-16-01-TH3	●		16		2.88				16.82		17.40	18.03	18.70	No interference	
EPDREH4040-18-01-TH3	●		18		2.62				18.89		19.54	20.24	21.00	No interference	
EPDREH4040-20-01-TH3	●		20		2.40				20.95		21.68	22.46	23.30	No interference	
EPDREH4040-22-01-TH3	●		22		2.22				23.02		23.82	24.68	25.60	No interference	
EPDREH4040-24-01-TH3	●		24	2.06	25.09				25.96		26.89	27.90	No interference		
EPDREH4040-8-02-TH3	●		0.2	8	60				4.84		8.55	8.84	9.15	9.49	10.24
EPDREH4040-10-02-TH3	●			10					4.15		10.61	10.98	11.37	11.79	12.73
EPDREH4040-12-02-TH3	●			12					3.62		12.68	13.12	13.58	14.09	15.21
EPDREH4040-14-02-TH3	●			14					3.22		14.75	15.26	15.80	16.39	17.70
EPDREH4040-16-02-TH3	●			16					2.89		16.82	17.40	18.02	18.69	No interference
EPDREH4040-18-02-TH3	●			18					2.63		18.88	19.53	20.23	20.98	No interference
EPDREH4040-20-02-TH3	●			20					2.41		20.95	21.67	22.45	23.28	No interference
EPDREH4040-22-02-TH3	●			22					2.22		23.02	23.81	24.67	25.58	No interference
EPDREH4040-24-02-TH3	●		24	2.06	25.09				25.95		26.88	27.88	No interference		

● : Stocked items.



[Note]
The actual effective under neck length with respect to the draft angle differs from the Epoch Deep Radius Evolution EPDRE-ATH. Please be sure to check this.

EPDREH4 \varnothing 3- \varnothing 5-TH3

Item code	Stock	Size(mm)							Interference angle (°) θ_{κ}	Effective under neck length with respect to draft angle					
		Tool dia.	Corner radius	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.		0.5°	1°	1.5°	2°	3°	
		DC	RE	LU	APMX	DN	LF	DCONMS							
EPDREH4040-8-03-TH3	●	4	0.3	8	3.5	3.85	6	6	4.89	8.54	8.83	9.14	9.47	10.22	
EPDREH4040-10-03-TH3	●			10					4.18	10.61	10.97	11.36	11.77	12.70	
EPDREH4040-12-03-TH3	●			12					3.65	12.68	13.11	13.57	14.07	15.19	
EPDREH4040-14-03-TH3	●			14					3.24	14.75	15.25	15.79	16.37	17.68	
EPDREH4040-16-03-TH3	●			16					2.91	16.81	17.39	18.01	18.67	No interference	
EPDREH4040-18-03-TH3	●			18					2.64	18.88	19.53	20.22	20.97	No interference	
EPDREH4040-20-03-TH3	●			20					2.42	20.95	21.67	22.44	23.27	No interference	
EPDREH4040-22-03-TH3	●			22					2.23	23.01	23.81	24.66	25.57	No interference	
EPDREH4040-24-03-TH3	●			24					2.07	25.08	25.95	26.87	27.87	No interference	
EPDREH4040-8-05-TH3	●			0.5					8	4.97	8.54	8.82	9.12	9.44	10.17
EPDREH4040-10-05-TH3	●								10	4.24	10.60	10.96	11.33	11.74	12.66
EPDREH4040-12-05-TH3	●								12	3.69	12.67	13.10	13.55	14.04	15.14
EPDREH4040-14-05-TH3	●		14						3.27	14.74	15.24	15.77	16.34	17.63	
EPDREH4040-16-05-TH3	●		16						2.94	16.81	17.37	17.98	18.64	No interference	
EPDREH4040-18-05-TH3	●		18						2.67	18.87	19.51	20.20	20.94	No interference	
EPDREH4040-20-05-TH3	●		20						2.44	20.94	21.65	22.42	23.24	No interference	
EPDREH4040-22-05-TH3	●		22						2.25	23.01	23.79	24.63	25.54	No interference	
EPDREH4040-24-05-TH3	●		24						2.09	25.08	25.93	26.85	27.84	No interference	
EPDREH4040-8-10-TH3	●		1						8	5.19	8.52	8.78	9.06	9.37	10.05
EPDREH4040-10-10-TH3	●								10	4.40	10.59	10.92	11.28	11.67	12.54
EPDREH4040-12-10-TH3	●								12	3.82	12.65	13.06	13.50	13.97	15.02
EPDREH4040-14-10-TH3	●			14					3.37	14.72	15.20	15.71	16.27	17.51	
EPDREH4040-16-10-TH3	●			16					3.02	16.79	17.34	17.93	18.57	20.00	
EPDREH4040-18-10-TH3	●			18					2.73	18.86	19.48	20.15	20.87	No interference	
EPDREH4040-20-10-TH3	●	20		2.49	20.92	21.62	22.36	23.17	No interference						
EPDREH4040-22-10-TH3	●	22		2.29	22.99	23.76	24.58	25.47	No interference						
EPDREH4040-24-10-TH3	●	24		2.13	25.06	25.90	26.80	27.77	No interference						
EPDREH4050-10-01-TH3	●	5		0.1	10	4	4.85	6	6	2.38	10.62	10.98	11.38	11.80	No interference
EPDREH4050-15-01-TH3	●				15					1.69	15.79	16.33	16.92	No interference	No interference
EPDREH4050-20-01-TH3	●				20					1.30	20.95	21.68	No interference	No interference	No interference
EPDREH4050-25-01-TH3	●		25		1.06					26.12	27.03	No interference	No interference	No interference	
EPDREH4050-10-02-TH3	●		0.2	10	2.40					10.61	10.98	11.37	11.79	No interference	
EPDREH4050-15-02-TH3	●			15	1.70					15.78	16.33	16.91	No interference	No interference	
EPDREH4050-20-02-TH3	●			20	1.31					20.95	21.67	No interference	No interference	No interference	
EPDREH4050-25-02-TH3	●			25	1.07					26.12	27.02	No interference	No interference	No interference	
EPDREH4050-10-03-TH3	●		0.3	10	2.42					10.61	10.97	11.36	11.77	No interference	
EPDREH4050-15-03-TH3	●			15	1.71					15.78	16.32	16.90	No interference	No interference	
EPDREH4050-20-03-TH3	●			20	1.32					20.95	21.67	No interference	No interference	No interference	
EPDREH4050-25-03-TH3	●			25	1.07					26.12	27.02	No interference	No interference	No interference	

Line Up

4 Flutes

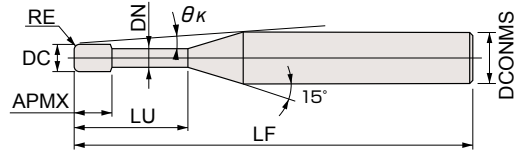
EPDREH4-TH3

Radius

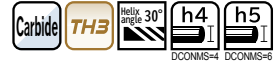
4 Flutes



Tolerance on corner radius RE : ±0.005mm (centerline datum)



EPDREH4-TH3



Item code	Stock	Size(mm)							Interference angle (°)	Effective under neck length with respect to draft angle				
		Tool dia.	Corner radius	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.		0.5°	1°	1.5°	2°	3°
		DC	RE	LU	APMX	DN	LF	DCONMS		θ_K				
EPDREH4050-10-05-TH3	●	5	0.5	10	4	4.85	60	6	2.46	10.60	10.96	11.33	11.74	No interference
EPDREH4050-15-05-TH3	●			15					1.73	15.77	16.31	16.88	No interference	No interference
EPDREH4050-20-05-TH3	●			20					1.33	20.94	21.65	No interference	No interference	No interference
EPDREH4050-25-05-TH3	●			25					1.08	26.11	27.00	No interference	No interference	No interference
EPDREH4050-10-10-TH3	●		1	10			60		2.57	10.59	10.92	11.28	11.67	No interference
EPDREH4050-15-10-TH3	●			15			1.78		15.76	16.27	16.82	No interference	No interference	
EPDREH4050-20-10-TH3	●			20			1.36		20.92	21.62	No interference	No interference	No interference	
EPDREH4050-25-10-TH3	●			25			1.10		26.09	26.97	No interference	No interference	No interference	
EPDREH4060-12-01-TH3	●	6	0.1	12	5	5.85	60	6	0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-01-TH3	●			18					0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-24-01-TH3	●			24					0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-30-01-TH3	●			30					0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-12-02-TH3	●		0.2	12			60		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-02-TH3	●			18			0.00		No interference	No interference	No interference	No interference	No interference	
EPDREH4060-24-02-TH3	●			24			0.00		No interference	No interference	No interference	No interference	No interference	
EPDREH4060-30-02-TH3	●			30			0.00		No interference	No interference	No interference	No interference	No interference	
EPDREH4060-12-03-TH3	●		0.3	12			60		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-03-TH3	●			18			0.00		No interference	No interference	No interference	No interference	No interference	
EPDREH4060-24-03-TH3	●			24			0.00		No interference	No interference	No interference	No interference	No interference	
EPDREH4060-30-03-TH3	●			30			0.00		No interference	No interference	No interference	No interference	No interference	
EPDREH4060-12-05-TH3	●		0.5	12			60		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-05-TH3	●			18			0.00		No interference	No interference	No interference	No interference	No interference	
EPDREH4060-24-05-TH3	●			24			0.00		No interference	No interference	No interference	No interference	No interference	
EPDREH4060-30-05-TH3	●			30			0.00		No interference	No interference	No interference	No interference	No interference	
EPDREH4060-12-10-TH3	●		1	12			60		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-10-TH3	●			18			0.00		No interference	No interference	No interference	No interference	No interference	
EPDREH4060-24-10-TH3	●			24			0.00		No interference	No interference	No interference	No interference	No interference	
EPDREH4060-30-10-TH3	●			30			0.00		No interference	No interference	No interference	No interference	No interference	

For detailed information on the EPDREH4 $\varnothing 5$ and $\varnothing 6$ cutting conditions, refer to pages 23, 24, 28, and 29.

● : Stocked items.

Regrinding compatibility range table

Item code	Product name	Shape	Re-grinding compatibility range(mm)	
			Outer dia.	End
EPDREH4-TH3	Epoch Deep Radius Evolution Hard-TH3 (4 Flutes)		N/A	4~6

※ The corner radius precision after regrinding uses the tool diameter as its datum.

4 Flutes

EPDRH4-TH3 **NEW**

Radius

4 Flutes



Tolerance on corner radius RE : ±0.005mm (Tool diameter datum)



EPDRH4-TH3



Item code	Stock	Size(mm)										
		Tool dia.	Corner radius	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.				
		DC	RE	LU	APMX	DN	LF	DCONMS				
EPDRH4080-24-02-TH3	★	8	0.2	24	9	7.6	63	8				
EPDRH4080-40-02-TH3	★			40			100					
EPDRH4080-24-03-TH3	★		0.3	24			63					
EPDRH4080-40-03-TH3	★			40			100					
EPDRH4080-24-05-TH3	★		0.5	24			63					
EPDRH4080-40-05-TH3	★			40			100					
EPDRH4080-24-10-TH3	★		1	24			63					
EPDRH4080-40-10-TH3	★			40			100					
EPDRH4080-24-20-TH3	★		2	24			63					
EPDRH4080-40-20-TH3	★			40			100					
EPDRH4100-30-02-TH3	★	10	0.2	30	11	9.5	74	10				
EPDRH4100-50-02-TH3	★			50			100					
EPDRH4100-30-05-TH3	★		0.5	30			74					
EPDRH4100-50-05-TH3	★			50			100					
EPDRH4100-30-10-TH3	★		1	30			74					
EPDRH4100-50-10-TH3	★			50			100					
EPDRH4100-30-20-TH3	★		2	30			74					
EPDRH4100-50-20-TH3	★			50			100					
EPDRH4120-36-02-TH3	★		12	0.2			36		13	11.5	86	12
EPDRH4120-60-02-TH3	★						60				110	
EPDRH4120-36-05-TH3	★	0.5		36	86							
EPDRH4120-60-05-TH3	★			60	110							
EPDRH4120-36-10-TH3	★	1		36	86							
EPDRH4120-60-10-TH3	★			60	110							
EPDRH4120-36-20-TH3	★	2		36	86							
EPDRH4120-60-20-TH3	★			60	110							

For detailed information on the EPDRH4 $\varnothing 5$ and $\varnothing 6$ cutting conditions, refer to pages 30, and 31.

★ : Stocked items of new products.

Regrinding compatibility range table

Item code	Product name	Shape	Re-grinding compatibility range(mm)	
			Outer dia.	End
EPDRH4-TH3	Epoch Deep Radius Hard-TH3 (4 Flutes)		× (N/A)	8~12

Recommended Cutting Conditions

2 Flutes

High efficiency
cutting condition

High accuracy
cutting condition

For detailed information on high-accuracy cutting conditions, refer to page 18.

Work material				1		2		3		4		5	
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)		Hardened steels (65~68HRC)		Hardened steels (68~72HRC)	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min
0.2	0.02	0.5	0.016	42,500	710	37,500	550	35,000	450	31,500	410	31,880	320
		1	0.011	42,500	710	37,500	550	35,000	450	31,500	410	31,880	320
	0.05	0.5	0.020	42,500	710	37,500	550	35,000	450	31,500	410	31,880	320
		1	0.014	42,500	710	37,500	550	35,000	450	31,500	410	31,880	320
0.3	0.02	1	0.016	40,800	730	36,000	550	33,600	440	30,240	400	30,600	310
		2	0.011	33,050	590	29,160	440	27,220	360	24,490	320	24,790	250
	0.05	1	0.021	40,800	730	36,000	550	33,600	440	30,240	400	30,600	310
		2	0.012	33,050	590	29,160	440	27,220	360	24,490	320	24,790	250
0.4	0.02	1	0.016	32,260	790	28,800	620	26,730	510	24,050	460	24,480	360
		2	0.013	32,260	710	28,800	560	26,730	460	24,050	410	24,480	320
	0.05	1	0.025	32,260	790	28,800	620	26,730	510	24,050	460	24,480	360
		2	0.016	32,260	710	28,800	560	26,730	460	24,050	410	24,480	320
	0.1	1	0.033	32,260	790	28,800	620	26,730	510	24,050	460	24,480	360
		2	0.028	32,260	710	28,800	560	26,730	460	24,050	410	24,480	320
0.5	0.02	1	0.016	32,260	790	28,800	620	26,730	510	24,050	460	24,480	360
		2	0.013	32,260	790	28,800	620	26,730	510	24,050	460	24,480	360
		3	0.010	26,440	630	23,330	470	21,770	380	19,600	340	19,830	270
	0.05	1	0.030	32,260	790	28,800	620	26,730	510	24,050	460	24,480	360
		2	0.023	32,260	790	28,800	620	26,730	510	24,050	460	24,480	360
		3	0.017	26,440	630	23,330	470	21,770	380	19,600	340	19,830	270
	0.1	1	0.035	32,260	790	28,800	620	26,730	510	24,050	460	24,480	360
		2	0.030	32,260	790	28,800	620	26,730	510	24,050	460	24,480	360
		3	0.020	26,440	630	23,330	470	21,770	380	19,600	340	19,830	270
0.6	0.02	2	0.016	32,260	990	28,800	770	26,730	640	24,050	570	24,480	440
		4	0.013	26,440	790	23,330	590	21,770	480	19,600	430	19,830	330
	0.05	2	0.028	32,260	990	28,800	770	26,730	640	24,050	570	24,480	440
		4	0.019	26,440	790	23,330	590	21,770	480	19,600	430	19,830	330
	0.1	2	0.035	32,260	990	28,800	770	26,730	640	24,050	570	24,480	440
		4	0.024	26,440	790	23,330	590	21,770	480	19,600	430	19,830	330
0.8	0.02	2	0.023	34,000	1,410	30,000	1,110	28,000	900	25,200	810	25,500	630
		4	0.016	34,000	1,130	30,000	890	28,000	720	25,200	650	25,500	510
	0.05	2	0.038	34,000	1,410	30,000	1,110	28,000	900	25,200	810	25,500	630
		4	0.026	34,000	1,130	30,000	890	28,000	720	25,200	650	25,500	510
	0.1	2	0.047	34,000	1,410	30,000	1,110	28,000	900	25,200	810	25,500	630
		4	0.032	34,000	1,130	30,000	890	28,000	720	25,200	650	25,500	510
	0.2	2	0.081	34,000	1,410	30,000	1,110	28,000	900	25,200	810	25,500	630
		4	0.056	34,000	1,130	30,000	890	28,000	720	25,200	650	25,500	510

Work material				1		2		3		4		5	
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)		Hardened steels (65~68HRC)		Hardened steels (68~72HRC)	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)
1	0.02	2	0.016	33,440	1,810	29,620	1,420	27,710	1,160	24,940	1,050	25,170	810
		4	0.013	30,600	1,650	27,000	1,290	25,200	1,060	22,680	950	22,950	740
		6	0.010	24,790	1,340	21,870	1,050	20,410	860	18,370	770	18,590	600
		8	0.008	22,030	1,190	19,440	930	18,140	760	16,330	680	16,520	530
	0.05	2	0.046	33,440	1,810	29,620	1,420	27,710	1,160	24,940	1,050	25,170	810
		4	0.027	30,600	1,650	27,000	1,290	25,200	1,060	22,680	950	22,950	740
		6	0.017	24,790	1,340	21,870	1,050	20,410	860	18,370	770	18,590	600
		8	0.016	22,030	1,190	19,440	930	18,140	760	16,330	680	16,520	530
	0.1	2	0.065	33,440	1,810	29,620	1,420	27,710	1,160	24,940	1,050	25,170	810
		4	0.038	30,600	1,650	27,000	1,290	25,200	1,060	22,680	950	22,950	740
		6	0.024	24,790	1,340	21,870	1,050	20,410	860	18,370	770	18,590	600
		8	0.024	22,030	1,190	19,440	930	18,140	760	16,330	680	16,520	530
	0.2	2	0.110	33,440	1,810	29,620	1,420	27,710	1,160	24,940	1,050	25,170	810
		4	0.070	30,600	1,650	27,000	1,290	25,200	1,060	22,680	950	22,950	740
		6	0.040	24,790	1,340	21,870	1,050	20,410	860	18,370	770	18,590	600
		8	0.040	22,030	1,190	19,440	930	18,140	760	16,330	680	16,520	530

- (1) a_p is shown as the criteria for pre-hardened steel. For other materials, adjust the cutting depth according to the cutting depth factors in the above table.
- (2) When performing cutting where cutting chips may cause clogging, such as for rib cutting, blind grooves, etc., the cutting depth setting should be set by multiplying a_p by a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
- (3) Adjust by setting a_e to (5 or less) \times (a_p) \times (cutting depth ratio). When performing finishing cutting, calculate the theoretical cusp height and set accordingly.
- (4) The recommended slope entrance angle when engraving is 1° or less. In addition, feed rate should be adjusted to 70% or less of the values in the cutting condition table.
- (5) When slotting such engraving letters, adjust feed rate to 50% or less and a_p to 30% or less of the values shown. In addition, cutting by reciprocal cutting is recommended.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDREH2010-2-02-TH3 tool:
Cutting depth = 0.11 (a_p) \times 0.85 (cutting depth factor for hardened steel [45~55HRC]) \times 0.8 (for closed-area cutting) = 0.075mm

[Note]

- ① Use the appropriate coolant for the work material and machining shape.
- ② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
- ③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Recommended Cutting Conditions

2 Flutes

High efficiency
cutting condition

High accuracy
cutting condition

For detailed information on high-efficiency cutting conditions, refer to page 16.

Work material				1		2		3		4		5	
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)		Hardened steels (65~68HRC)		Hardened steels (68~72HRC)	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	Revolution n min ⁻¹	Feed rate V _f mm/min	Revolution n min ⁻¹	Feed rate V _f mm/min	Revolution n min ⁻¹	Feed rate V _f mm/min	Revolution n min ⁻¹	Feed rate V _f mm/min	Revolution n min ⁻¹	Feed rate V _f mm/min
0.2	0.02	0.5	0.016	50,000	210	50,000	180	50,000	160	45,000	140	42,500	110
		1	0.011	50,000	210	50,000	180	50,000	160	45,000	140	42,500	110
	0.05	0.5	0.020	50,000	210	50,000	180	50,000	160	45,000	140	42,500	110
		1	0.014	50,000	210	50,000	180	50,000	160	45,000	140	42,500	110
0.3	0.02	1	0.016	50,000	460	50,000	340	50,000	320	45,000	290	42,500	220
		2	0.011	45,000	420	45,000	300	45,000	290	40,500	260	38,250	200
	0.05	1	0.021	50,000	460	50,000	340	50,000	320	45,000	290	42,500	220
		2	0.012	45,000	420	45,000	300	45,000	290	40,500	260	38,250	200
0.4	0.02	1	0.016	50,000	460	40,000	320	36,000	270	32,400	240	30,600	190
		2	0.013	45,000	410	36,000	290	34,000	240	30,600	220	28,900	170
	0.05	1	0.025	50,000	460	40,000	320	36,000	270	32,400	240	30,600	190
		2	0.016	45,000	410	36,000	290	34,000	240	30,600	220	28,900	170
	0.1	1	0.033	50,000	460	40,000	320	36,000	270	32,400	240	30,600	190
		2	0.028	45,000	410	36,000	290	34,000	240	30,600	220	28,900	170
0.5	0.02	1	0.016	40,000	460	30,000	380	28,000	320	25,200	280	23,800	220
		2	0.013	40,000	460	30,000	380	28,000	320	25,200	280	23,800	220
		3	0.010	36,000	410	27,000	320	24,500	260	22,050	230	20,830	180
	0.05	1	0.030	40,000	460	30,000	380	28,000	320	25,200	280	23,800	220
		2	0.023	40,000	460	30,000	380	28,000	320	25,200	280	23,800	220
		3	0.017	36,000	410	27,000	320	24,500	260	22,050	230	20,830	180
	0.1	1	0.035	40,000	460	30,000	380	28,000	320	25,200	280	23,800	220
		2	0.030	40,000	460	30,000	380	28,000	320	25,200	280	23,800	220
		3	0.020	36,000	410	27,000	320	24,500	260	22,050	230	20,830	180
0.6	0.02	2	0.016	37,830	600	28,200	390	23,000	320	20,700	290	19,550	220
		4	0.013	27,800	440	23,600	280	21,000	230	18,900	210	17,850	160
	0.05	2	0.028	37,830	600	28,200	390	23,000	320	20,700	290	19,550	220
		4	0.019	27,800	440	23,600	280	21,000	230	18,900	210	17,850	160
	0.1	2	0.035	37,830	600	28,200	390	23,000	320	20,700	290	19,550	220
		4	0.024	27,800	440	23,600	280	21,000	230	18,900	210	17,850	160
0.8	0.02	2	0.023	28,000	650	20,000	400	20,000	360	18,000	320	17,000	250
		4	0.016	28,000	520	20,000	320	20,000	290	18,000	260	17,000	200
	0.05	2	0.038	28,000	650	20,000	400	20,000	360	18,000	320	17,000	250
		4	0.026	28,000	520	20,000	320	20,000	290	18,000	260	17,000	200
	0.1	2	0.047	28,000	650	20,000	400	20,000	360	18,000	320	17,000	250
		4	0.032	28,000	520	20,000	320	20,000	290	18,000	260	17,000	200
	0.2	2	0.081	28,000	650	20,000	400	20,000	360	18,000	320	17,000	250
		4	0.056	28,000	520	20,000	320	20,000	290	18,000	260	17,000	200

Work material				1		2		3		4		5	
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)		Hardened steels (65~68HRC)		Hardened steels (68~72HRC)	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min
1	0.02	2	0.016	30,290	1,210	26,730	960	24,950	800	22,450	720	21,210	560
		4	0.013	27,540	1,040	24,300	820	22,680	670	20,410	600	19,280	470
		6	0.010	22,310	840	19,680	660	18,370	540	16,530	490	15,620	380
		8	0.008	19,830	750	17,500	590	16,330	480	14,700	430	13,880	340
	0.05	2	0.046	30,250	1,210	26,730	960	24,950	800	22,450	720	21,210	560
		4	0.027	28,920	1,130	24,300	820	22,680	670	20,410	600	19,280	470
		6	0.017	24,540	930	19,680	660	18,370	540	16,530	490	15,620	380
		8	0.016	19,830	750	17,500	590	16,330	480	14,700	430	13,880	340
	0.1	2	0.065	30,290	1,210	26,730	960	24,950	800	22,450	720	21,210	560
		4	0.038	27,540	1,040	24,300	820	22,680	670	20,410	600	19,280	470
		6	0.024	22,310	840	19,680	660	18,370	540	16,530	490	15,620	380
		8	0.024	19,830	750	17,500	590	16,330	480	14,700	430	13,880	340
	0.2	2	0.110	30,290	1,210	26,730	960	24,950	800	22,450	720	21,210	560
		4	0.070	27,540	1,040	24,300	820	22,680	670	20,410	600	19,280	470
		6	0.040	22,310	840	19,680	660	18,370	540	16,530	490	15,620	380
		8	0.040	19,830	750	17,500	590	16,330	480	14,700	430	13,880	340

- (1) a_p is shown as the criteria for pre-hardened steel. For other materials, adjust the cutting depth according to the cutting depth factors in the above table.
- (2) When performing cutting where cutting chips may cause clogging, such as for rib cutting, blind grooves, etc., the cutting depth setting should be set by multiplying a_p by a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
- (3) Adjust by setting a_e to (5 or less) \times (a_p) \times (cutting depth ratio). When performing finishing cutting, calculate the theoretical cusp height and set accordingly.
- (4) The recommended slope entrance angle when engraving is 1° or less. In addition, feed rate should be adjusted to 70% or less of the values in the cutting condition table.
- (5) When slotting such engraving letters, adjust feed rate to 50% or less and a_p to 30% or less of the values shown. In addition, cutting by reciprocal cutting is recommended.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDREH2010-2-02-TH3 tool:
Cutting depth = 0.11 (a_p) \times 0.85 (cutting depth factor for hardened steel [45~55HRC]) \times 0.8 (for closed-area cutting) = 0.075mm

[Note]

- ① Use the appropriate coolant for the work material and machining shape.
- ② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
- ③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Recommended Cutting Conditions

4 Flutes

High efficiency cutting condition

High accuracy cutting condition

For detailed information on high-accuracy cutting conditions, refer to page 25.

Work material				1		2		3		4		5		
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~60HRC)		Hardened steels (60~65HRC)		Hardened steels (65~72HRC)		
Cutting depth ratio				120%		100%		70%		50%		25%		
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	
1	0.02	1.5	0.019	38,900	3,420	38,900	3,110	28,300	2,040	23,000	1,840	21,200	1,440	
		2	0.016	35,000	3,080	35,000	2,800	25,500	1,840	20,700	1,660	19,100	1,300	
		2.5	0.015	31,800	2,800	31,800	2,540	23,100	1,660	18,800	1,500	17,400	1,180	
		3	0.014	29,200	2,570	29,200	2,340	21,200	1,530	17,200	1,380	15,900	1,080	
		4	0.013	25,000	2,200	25,000	2,000	18,200	1,310	14,800	1,180	13,600	920	
		5	0.013	21,900	1,930	21,900	1,750	15,900	1,140	12,900	1,030	11,900	810	
		6	0.007	19,500	1,720	19,500	1,560	14,100	1,020	11,500	920	10,600	720	
		8	0.004	15,900	1,400	15,900	1,270	11,600	840	9,400	750	8,700	590	
	0.05	1.5	0.046	38,900	3,420	38,900	3,110	28,300	2,040	23,000	1,840	21,200	1,440	
		2	0.034	35,000	3,080	35,000	2,800	25,500	1,840	20,700	1,660	19,100	1,300	
		2.5	0.033	31,800	2,800	31,800	2,540	23,100	1,660	18,800	1,500	17,400	1,180	
		3	0.030	29,200	2,570	29,200	2,340	21,200	1,530	17,200	1,380	15,900	1,080	
		4	0.028	25,000	2,200	25,000	2,000	18,200	1,310	14,800	1,180	13,600	920	
		5	0.027	21,900	1,930	21,900	1,750	15,900	1,140	12,900	1,030	11,900	810	
		6	0.015	19,500	1,720	19,500	1,560	14,100	1,020	11,500	920	10,600	720	
		8	0.009	15,900	1,400	15,900	1,270	11,600	840	9,400	750	8,700	590	
	0.1	1.5	0.056	38,900	3,420	38,900	3,110	28,300	2,040	23,000	1,840	21,200	1,440	
		2	0.042	35,000	3,080	35,000	2,800	25,500	1,840	20,700	1,660	19,100	1,300	
		2.5	0.040	31,800	2,800	31,800	2,540	23,100	1,660	18,800	1,500	17,400	1,180	
		3	0.037	29,200	2,570	29,200	2,340	21,200	1,530	17,200	1,380	15,900	1,080	
		4	0.035	25,000	2,200	25,000	2,000	18,200	1,310	14,800	1,180	13,600	920	
		5	0.034	21,900	1,930	21,900	1,750	15,900	1,140	12,900	1,030	11,900	810	
		6	0.019	19,500	1,720	19,500	1,560	14,100	1,020	11,500	920	10,600	720	
		8	0.011	15,900	1,400	15,900	1,270	11,600	840	9,400	750	8,700	590	
	0.2	1.5	0.063	38,900	3,420	38,900	3,110	28,300	2,040	23,000	1,840	21,200	1,440	
		2	0.047	35,000	3,080	35,000	2,800	25,500	1,840	20,700	1,660	19,100	1,300	
		2.5	0.045	31,800	2,800	31,800	2,540	23,100	1,660	18,800	1,500	17,400	1,180	
		3	0.042	29,200	2,570	29,200	2,340	21,200	1,530	17,200	1,380	15,900	1,080	
		4	0.039	25,000	2,200	25,000	2,000	18,200	1,310	14,800	1,180	13,600	920	
		5	0.038	21,900	1,930	21,900	1,750	15,900	1,140	12,900	1,030	11,900	810	
		6	0.021	19,500	1,720	19,500	1,560	14,100	1,020	11,500	920	10,600	720	
		8	0.012	15,900	1,400	15,900	1,270	11,600	840	9,400	750	8,700	590	
	0.3	1.5	0.070	38,900	3,420	38,900	3,110	28,300	2,040	23,000	1,840	21,200	1,440	
		2	0.053	35,000	3,080	35,000	2,800	25,500	1,840	20,700	1,660	19,100	1,300	
		2.5	0.050	31,800	2,800	31,800	2,540	23,100	1,660	18,800	1,500	17,400	1,180	
		3	0.047	29,200	2,570	29,200	2,340	21,200	1,530	17,200	1,380	15,900	1,080	
		4	0.044	25,000	2,200	25,000	2,000	18,200	1,310	14,800	1,180	13,600	920	
		5	0.042	21,900	1,930	21,900	1,750	15,900	1,140	12,900	1,030	11,900	810	
		6	0.023	19,500	1,720	19,500	1,560	14,100	1,020	11,500	920	10,600	720	
		8	0.013	15,900	1,400	15,900	1,270	11,600	840	9,400	750	8,700	590	
	1.5	0.02	2	0.017	26,900	3,310	26,900	3,010	19,600	1,980	15,900	1,780	14,700	1,400
			3	0.016	23,300	2,870	23,300	2,610	17,000	1,710	13,800	1,550	12,700	1,210
			4	0.014	20,600	2,540	20,600	2,310	15,000	1,510	12,200	1,370	11,200	1,070
			5	0.013	18,400	2,270	18,400	2,060	13,400	1,350	10,900	1,220	10,100	960
			6	0.012	16,700	2,060	16,700	1,870	12,100	1,220	9,900	1,110	9,100	870
			8	0.011	15,200	1,870	15,200	1,700	11,100	1,120	9,000	1,010	8,300	790
			10	0.010	14,000	1,720	14,000	1,570	10,200	1,030	8,300	930	7,600	720
			12	0.008	12,100	1,490	12,100	1,360	8,800	890	7,100	800	6,600	630
0.05		2	0.048	26,900	3,310	26,900	3,010	19,600	1,980	15,900	1,780	14,700	1,400	
		3	0.043	23,300	2,870	23,300	2,610	17,000	1,710	13,800	1,550	12,700	1,210	
		4	0.039	20,600	2,540	20,600	2,310	15,000	1,510	12,200	1,370	11,200	1,070	
		5	0.035	18,400	2,270	18,400	2,060	13,400	1,350	10,900	1,220	10,100	960	
		6	0.032	16,700	2,060	16,700	1,870	12,100	1,220	9,900	1,110	9,100	870	
		8	0.030	15,200	1,870	15,200	1,700	11,100	1,120	9,000	1,010	8,300	790	
		10	0.027	14,000	1,720	14,000	1,570	10,200	1,030	8,300	930	7,600	720	
		12	0.022	12,100	1,490	12,100	1,360	8,800	890	7,100	800	6,600	630	
0.1		2	0.078	26,900	3,310	26,900	3,010	19,600	1,980	15,900	1,780	14,700	1,400	
		3	0.071	23,300	2,870	23,300	2,610	17,000	1,710	13,800	1,550	12,700	1,210	
		4	0.064	20,600	2,540	20,600	2,310	15,000	1,510	12,200	1,370	11,200	1,070	
		5	0.057	18,400	2,270	18,400	2,060	13,400	1,350	10,900	1,220	10,100	960	

Work material				1		2		3		4		5		
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~60HRC)		Hardened steels (60~65HRC)		Hardened steels (65~72HRC)		
Cutting depth ratio				120%		100%		70%		50%		25%		
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	
1.5	0.1	6	0.052	16,700	2,060	16,700	1,870	12,100	1,220	9,900	1,110	9,100	870	
		8	0.049	15,200	1,870	15,200	1,700	11,100	1,120	9,000	1,010	8,300	790	
		10	0.044	14,000	1,720	14,000	1,570	10,200	1,030	8,300	930	7,600	720	
		12	0.035	12,100	1,490	12,100	1,360	8,800	890	7,100	800	6,600	630	
	0.2	2	0.082	26,900	3,310	26,900	3,010	19,600	1,980	15,900	1,780	14,700	1,400	
		3	0.075	23,300	2,870	23,300	2,610	17,000	1,710	13,800	1,550	12,700	1,210	
		4	0.067	20,600	2,540	20,600	2,310	15,000	1,510	12,200	1,370	11,200	1,070	
		5	0.060	18,400	2,270	18,400	2,060	13,400	1,350	10,900	1,220	10,100	960	
	0.3	6	0.055	16,700	2,060	16,700	1,870	12,100	1,220	9,900	1,110	9,100	870	
		8	0.051	15,200	1,870	15,200	1,700	11,100	1,120	9,000	1,010	8,300	790	
		10	0.047	14,000	1,720	14,000	1,570	10,200	1,030	8,300	930	7,600	720	
		12	0.037	12,100	1,490	12,100	1,360	8,800	890	7,100	800	6,600	630	
	0.5	2	0.085	26,900	3,310	26,900	3,010	19,600	1,980	15,900	1,780	14,700	1,400	
		3	0.077	23,300	2,870	23,300	2,610	17,000	1,710	13,800	1,550	12,700	1,210	
		4	0.069	20,600	2,540	20,600	2,310	15,000	1,510	12,200	1,370	11,200	1,070	
		5	0.062	18,400	2,270	18,400	2,060	13,400	1,350	10,900	1,220	10,100	960	
	0.5	6	0.057	16,700	2,060	16,700	1,870	12,100	1,220	9,900	1,110	9,100	870	
		8	0.053	15,200	1,870	15,200	1,700	11,100	1,120	9,000	1,010	8,300	790	
		10	0.048	14,000	1,720	14,000	1,570	10,200	1,030	8,300	930	7,600	720	
		12	0.039	12,100	1,490	12,100	1,360	8,800	890	7,100	800	6,600	630	
	2	0.02	2.5	0.018	20,600	3,630	20,600	3,300	15,000	2,160	12,200	1,950	11,200	1,520
			3	0.016	19,500	3,430	19,500	3,120	14,100	2,030	11,500	1,840	10,600	1,440
			4	0.014	17,500	3,080	17,500	2,800	12,700	1,830	10,300	1,650	9,500	1,290
			5	0.014	15,900	2,800	15,900	2,540	11,600	1,670	9,400	1,500	8,700	1,180
0.05		6	0.013	14,600	2,570	14,600	2,340	10,600	1,530	8,600	1,380	8,000	1,090	
		8	0.013	12,500	2,200	12,500	2,000	9,100	1,310	7,400	1,180	6,800	920	
		10	0.012	10,900	1,920	10,900	1,740	8,000	1,150	6,500	1,040	6,000	820	
		12	0.009	9,700	1,710	9,700	1,550	7,100	1,020	5,700	910	5,300	720	
0.1		2.5	0.048	20,600	3,630	20,600	3,300	15,000	2,160	12,200	1,950	11,200	1,520	
		3	0.043	19,500	3,430	19,500	3,120	14,100	2,030	11,500	1,840	10,600	1,440	
		4	0.037	17,500	3,080	17,500	2,800	12,700	1,830	10,300	1,650	9,500	1,290	
		5	0.036	15,900	2,800	15,900	2,540	11,600	1,670	9,400	1,500	8,700	1,180	
0.1		6	0.035	14,600	2,570	14,600	2,340	10,600	1,530	8,600	1,380	8,000	1,090	
		8	0.034	12,500	2,200	12,500	2,000	9,100	1,310	7,400	1,180	6,800	920	
		10	0.032	10,900	1,920	10,900	1,740	8,000	1,150	6,500	1,040	6,000	820	
		12	0.024	9,700	1,710	9,700	1,550	7,100	1,020	5,700	910	5,300	720	
0.2		2.5	0.082	20,600	3,630	20,600	3,300	15,000	2,160	12,200	1,950	11,200	1,520	
		3	0.073	19,500	3,430	19,500	3,120	14,100	2,030	11,500	1,840	10,600	1,440	
		4	0.063	17,500	3,080	17,500	2,800	12,700	1,830	10,300	1,650	9,500	1,290	
		5	0.061	15,900	2,800	15,900	2,540	11,600	1,670	9,400	1,500	8,700	1,180	
0.2		6	0.059	14,600	2,570	14,600	2,340	10,600	1,530	8,600	1,380	8,000	1,090	
		8	0.058	12,500	2,200	12,500	2,000	9,100	1,310	7,400	1,180	6,800	920	
		10	0.054	10,900	1,920	10,900	1,740	8,000	1,150	6,500	1,040	6,000	820	
		12	0.041	9,700	1,710	9,700	1,550	7,100	1,020	5,700	910	5,300	720	
0.2	2.5	0.092	20,600	3,630	20,600	3,300	15,000	2,160	12,200	1,950	11,200	1,520		
	3	0.082	19,500	3,430	19,500	3,120	14,100	2,030	11,500	1,840	10,600	1,440		
	4	0.071	17,500	3,080	17,500	2,800	12,700	1,830	10,300	1,650	9,500	1,290		
	5	0.069	15,900	2,800	15,900	2,540	11,600	1,670	9,400	1,500	8,700	1,180		
0.2	6	0.066	14,600	2,570	14,600	2,340	10,600	1,530	8,600	1,380	8,000	1,090		
	8	0.066	12,500	2,200	12,500	2,000	9,100	1,310	7,400	1,180	6,800	920		
	10	0.061	10,900	1,920	10,900	1,740	8,000	1,150	6,500	1,040	6,000	820		
	12	0.046	9,700	1,710	9,700	1,550	7,100	1,020	5,700	910	5,300	720		

[Note] Refer to the comments and notes below the table on page 24 regarding usage.

Recommended Cutting Conditions

4 Flutes

High efficiency cutting condition

High accuracy cutting condition

For detailed information on high-accuracy cutting conditions, refer to page 25.

Work material				1		2		3		4		5	
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~60HRC)		Hardened steels (60~65HRC)		Hardened steels (65~72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min
2	0.3	2.5	0.097	20,600	3,630	20,600	3,300	15,000	2,160	12,200	1,950	11,200	1,520
		3	0.087	19,500	3,430	19,500	3,120	14,100	2,030	11,500	1,840	10,600	1,440
		4	0.074	17,500	3,080	17,500	2,800	12,700	1,830	10,300	1,650	9,500	1,290
		5	0.073	15,900	2,800	15,900	2,540	11,600	1,670	9,400	1,500	8,700	1,180
		6	0.070	14,600	2,570	14,600	2,340	10,600	1,530	8,600	1,380	8,000	1,090
		8	0.069	12,500	2,200	12,500	2,000	9,100	1,310	7,400	1,180	6,800	920
	10	0.064	10,900	1,920	10,900	1,740	8,000	1,150	6,500	1,040	6,000	820	
	12	0.049	9,700	1,710	9,700	1,550	7,100	1,020	5,700	910	5,300	720	
	0.5	2.5	0.102	20,600	3,630	20,600	3,300	15,000	2,160	12,200	1,950	11,200	1,520
		3	0.091	19,500	3,430	19,500	3,120	14,100	2,030	11,500	1,840	10,600	1,440
		4	0.078	17,500	3,080	17,500	2,800	12,700	1,830	10,300	1,650	9,500	1,290
		5	0.076	15,900	2,800	15,900	2,540	11,600	1,670	9,400	1,500	8,700	1,180
		6	0.074	14,600	2,570	14,600	2,340	10,600	1,530	8,600	1,380	8,000	1,090
		8	0.073	12,500	2,200	12,500	2,000	9,100	1,310	7,400	1,180	6,800	920
3	0.05	4	0.045	18,600	2,950	18,600	2,680	13,500	1,750	11,000	1,580	10,200	1,250
		6	0.043	15,400	2,440	15,400	2,220	11,200	1,450	9,100	1,310	8,400	1,030
		8	0.042	13,100	2,080	13,100	1,890	9,500	1,230	7,700	1,110	7,100	870
		10	0.041	11,400	1,810	11,400	1,640	8,300	1,080	6,700	960	6,200	760
		12	0.038	10,100	1,600	10,100	1,450	7,300	950	5,900	850	5,500	670
		14	0.035	9,000	1,430	9,000	1,300	6,600	860	5,300	760	4,900	600
		16	0.034	8,200	1,300	8,200	1,180	5,900	760	4,800	690	4,500	550
		18	0.030	7,500	1,190	7,500	1,080	5,400	700	4,400	630	4,100	500
	20	0.022	6,900	1,090	6,900	990	5,000	650	4,100	590	3,800	470	
	0.1	4	0.090	18,600	2,950	18,600	2,680	13,500	1,750	11,000	1,580	10,200	1,250
		6	0.087	15,400	2,440	15,400	2,220	11,200	1,450	9,100	1,310	8,400	1,030
		8	0.085	13,100	2,080	13,100	1,890	9,500	1,230	7,700	1,110	7,100	870
		10	0.081	11,400	1,810	11,400	1,640	8,300	1,080	6,700	960	6,200	760
		12	0.075	10,100	1,600	10,100	1,450	7,300	950	5,900	850	5,500	670
14		0.069	9,000	1,430	9,000	1,300	6,600	860	5,300	760	4,900	600	
16		0.067	8,200	1,300	8,200	1,180	5,900	760	4,800	690	4,500	550	
18		0.061	7,500	1,190	7,500	1,080	5,400	700	4,400	630	4,100	500	
20	0.044	6,900	1,090	6,900	990	5,000	650	4,100	590	3,800	470		
0.2	4	0.102	18,600	2,950	18,600	2,680	13,500	1,750	11,000	1,580	10,200	1,250	
	6	0.098	15,400	2,440	15,400	2,220	11,200	1,450	9,100	1,310	8,400	1,030	
	8	0.095	13,100	2,080	13,100	1,890	9,500	1,230	7,700	1,110	7,100	870	
	10	0.092	11,400	1,810	11,400	1,640	8,300	1,080	6,700	960	6,200	760	
	12	0.085	10,100	1,600	10,100	1,450	7,300	950	5,900	850	5,500	670	
	14	0.078	9,000	1,430	9,000	1,300	6,600	860	5,300	760	4,900	600	
	16	0.076	8,200	1,300	8,200	1,180	5,900	760	4,800	690	4,500	550	
	18	0.068	7,500	1,190	7,500	1,080	5,400	700	4,400	630	4,100	500	
20	0.050	6,900	1,090	6,900	990	5,000	650	4,100	590	3,800	470		
0.3	4	0.107	18,600	2,950	18,600	2,680	13,500	1,750	11,000	1,580	10,200	1,250	
	6	0.103	15,400	2,440	15,400	2,220	11,200	1,450	9,100	1,310	8,400	1,030	
	8	0.101	13,100	2,080	13,100	1,890	9,500	1,230	7,700	1,110	7,100	870	
	10	0.097	11,400	1,810	11,400	1,640	8,300	1,080	6,700	960	6,200	760	
	12	0.090	10,100	1,600	10,100	1,450	7,300	950	5,900	850	5,500	670	
	14	0.082	9,000	1,430	9,000	1,300	6,600	860	5,300	760	4,900	600	
	16	0.080	8,200	1,300	8,200	1,180	5,900	760	4,800	690	4,500	550	
	18	0.072	7,500	1,190	7,500	1,080	5,400	700	4,400	630	4,100	500	
20	0.053	6,900	1,090	6,900	990	5,000	650	4,100	590	3,800	470		
0.5	4	0.113	18,600	2,950	18,600	2,680	13,500	1,750	11,000	1,580	10,200	1,250	
	6	0.109	15,400	2,440	15,400	2,220	11,200	1,450	9,100	1,310	8,400	1,030	
	8	0.106	13,100	2,080	13,100	1,890	9,500	1,230	7,700	1,110	7,100	870	
	10	0.102	11,400	1,810	11,400	1,640	8,300	1,080	6,700	960	6,200	760	
	12	0.094	10,100	1,600	10,100	1,450	7,300	950	5,900	850	5,500	670	
	14	0.087	9,000	1,430	9,000	1,300	6,600	860	5,300	760	4,900	600	
	16	0.084	8,200	1,300	8,200	1,180	5,900	760	4,800	690	4,500	550	
	18	0.076	7,500	1,190	7,500	1,080	5,400	700	4,400	630	4,100	500	
20	0.056	6,900	1,090	6,900	990	5,000	650	4,100	590	3,800	470		

Work material				1		2		3		4		5		
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~60HRC)		Hardened steels (60~65HRC)		Hardened steels (65~72HRC)		
Cutting depth ratio				120%		100%		70%		50%		25%		
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	
4	0.1	8	0.091	10,400	2,750	10,400	2,500	7,600	1,640	6,200	1,490	5,700	1,160	
		10	0.089	9,300	2,460	9,300	2,230	6,800	1,470	5,500	1,320	5,100	1,040	
		12	0.084	8,400	2,220	8,400	2,020	6,100	1,320	5,000	1,200	4,600	940	
		14	0.079	7,700	2,030	7,700	1,850	5,600	1,210	4,500	1,080	4,200	860	
		16	0.076	7,100	1,870	7,100	1,700	5,100	1,100	4,200	1,010	3,900	800	
		18	0.074	6,500	1,720	6,500	1,560	4,800	1,040	3,900	940	3,600	730	
		20	0.070	6,100	1,610	6,100	1,460	4,400	950	3,600	860	3,300	670	
		22	0.059	5,700	1,500	5,700	1,370	4,100	890	3,400	820	3,100	630	
	0.2	24	0.055	5,300	1,400	5,300	1,270	3,900	840	3,200	770	2,900	590	
		8	0.126	10,400	2,750	10,400	2,500	7,600	1,640	6,200	1,490	5,700	1,160	
		10	0.123	9,300	2,460	9,300	2,230	6,800	1,470	5,500	1,320	5,100	1,040	
		12	0.117	8,400	2,220	8,400	2,020	6,100	1,320	5,000	1,200	4,600	940	
		14	0.109	7,700	2,030	7,700	1,850	5,600	1,210	4,500	1,080	4,200	860	
		16	0.105	7,100	1,870	7,100	1,700	5,100	1,100	4,200	1,010	3,900	800	
		18	0.102	6,500	1,720	6,500	1,560	4,800	1,040	3,900	940	3,600	730	
		20	0.097	6,100	1,610	6,100	1,460	4,400	950	3,600	860	3,300	670	
	0.3	22	0.081	5,700	1,500	5,700	1,370	4,100	890	3,400	820	3,100	630	
		24	0.077	5,300	1,400	5,300	1,270	3,900	840	3,200	770	2,900	590	
		8	0.133	10,400	2,750	10,400	2,500	7,600	1,640	6,200	1,490	5,700	1,160	
		10	0.129	9,300	2,460	9,300	2,230	6,800	1,470	5,500	1,320	5,100	1,040	
		12	0.123	8,400	2,220	8,400	2,020	6,100	1,320	5,000	1,200	4,600	940	
		14	0.115	7,700	2,030	7,700	1,850	5,600	1,210	4,500	1,080	4,200	860	
		16	0.111	7,100	1,870	7,100	1,700	5,100	1,100	4,200	1,010	3,900	800	
		18	0.108	6,500	1,720	6,500	1,560	4,800	1,040	3,900	940	3,600	730	
	0.5	20	0.102	6,100	1,610	6,100	1,460	4,400	950	3,600	860	3,300	670	
		22	0.086	5,700	1,500	5,700	1,370	4,100	890	3,400	820	3,100	630	
		24	0.081	5,300	1,400	5,300	1,270	3,900	840	3,200	770	2,900	590	
		8	0.137	10,400	2,750	10,400	2,500	7,600	1,640	6,200	1,490	5,700	1,160	
		10	0.133	9,300	2,460	9,300	2,230	6,800	1,470	5,500	1,320	5,100	1,040	
		12	0.127	8,400	2,220	8,400	2,020	6,100	1,320	5,000	1,200	4,600	940	
		14	0.118	7,700	2,030	7,700	1,850	5,600	1,210	4,500	1,080	4,200	860	
		16	0.114	7,100	1,870	7,100	1,700	5,100	1,100	4,200	1,010	3,900	800	
	1	18	0.111	6,500	1,720	6,500	1,560	4,800	1,040	3,900	940	3,600	730	
		20	0.106	6,100	1,610	6,100	1,460	4,400	950	3,600	860	3,300	670	
		22	0.088	5,700	1,500	5,700	1,370	4,100	890	3,400	820	3,100	630	
		24	0.084	5,300	1,400	5,300	1,270	3,900	840	3,200	770	2,900	590	
		8	0.140	10,400	2,750	10,400	2,500	7,600	1,640	6,200	1,490	5,700	1,160	
		10	0.136	9,300	2,460	9,300	2,230	6,800	1,470	5,500	1,320	5,100	1,040	
		12	0.130	8,400	2,220	8,400	2,020	6,100	1,320	5,000	1,200	4,600	940	
		14	0.121	7,700	2,030	7,700	1,850	5,600	1,210	4,500	1,080	4,200	860	
	5	0.1	16	0.117	7,100	1,870	7,100	1,700	5,100	1,100	4,200	1,010	3,900	800
			18	0.114	6,500	1,720	6,500	1,560	4,800	1,040	3,900	940	3,600	730
			20	0.108	6,100	1,610	6,100	1,460	4,400	950	3,600	860	3,300	670
			22	0.090	5,700	1,500	5,700	1,370	4,100	890	3,400	820	3,100	630
		0.2	24	0.085	5,300	1,400	5,300	1,270	3,900	840	3,200	770	2,900	590
			10	0.096	9,300	3,270	9,300	2,980	6,800	1,960	5,500	1,760	5,100	1,390
			15	0.081	7,400	2,600	7,400	2,370	5,400	1,560	4,400	1,410	4,000	1,090
			20	0.077	6,100	2,150	6,100	1,950	4,400	1,270	3,600	1,150	3,300	900
0.3		25	0.075	5,200	1,830	5,200	1,660	3,800	1,090	3,100	990	2,800	760	
		10	0.123	9,300	3,270	9,300	2,980	6,800	1,960	5,500	1,760	5,100	1,390	
		15	0.103	7,400	2,600	7,400	2,370	5,400	1,560	4,400	1,410	4,000	1,090	
		20	0.098	6,100	2,150	6,100	1,950	4,400	1,270	3,600	1,150	3,300	900	
0.5	25	0.095	5,200	1,830	5,200	1,660	3,800	1,090	3,100	990	2,800	760		
	10	0.166	9,300	3,270	9,300	2,980	6,800	1,960	5,500	1,760	5,100	1,390		
	15	0.140	7,400	2,600	7,400	2,370	5,400	1,560	4,400	1,410	4,000	1,090		
	20	0.133	6,100	2,150	6,100	1,950	4,400	1,270	3,600	1,150	3,300	900		
0.5	25	0.129	5,200	1,830	5,200	1,660	3,800	1,090	3,100	990	2,800	760		
	10	0.172	9,300	3,270	9,300	2,980	6,800	1,960	5,500	1,760	5,100	1,390		
	15	0.144	7,400	2,600	7,400	2,370	5,400	1,560	4,400	1,410	4,000	1,090		
	20	0.137	6,100	2,150	6,100	1,950	4,400	1,270	3,600	1,150	3,300	900		
		25	0.133	5,200	1,830	5,200	1,660	3,800	1,090	3,100	990	2,800	760	

[Note] Refer to the comments and notes below the table on page 24 regarding usage.

Recommended Cutting Conditions

4 Flutes

High efficiency cutting condition

High accuracy cutting condition

For detailed information on high-accuracy cutting conditions, refer to page 25.

Work material				1		2		3		4		5	
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~60HRC)		Hardened steels (60~65HRC)		Hardened steels (65~72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)
5	1	10	0.175	9,300	3,270	9,300	2,980	6,800	1,960	5,500	1,760	5,100	1,390
		15	0.147	7,400	2,600	7,400	2,370	5,400	1,560	4,400	1,410	4,000	1,090
		20	0.140	6,100	2,150	6,100	1,950	4,400	1,270	3,600	1,150	3,300	900
		25	0.135	5,200	1,830	5,200	1,660	3,800	1,090	3,100	990	2,800	760
6	0.1	12	0.098	8,300	3,290	8,300	2,990	6,100	1,980	4,900	1,760	4,500	1,380
		18	0.088	6,500	2,570	6,500	2,340	4,700	1,520	3,800	1,370	3,500	1,070
		24	0.082	5,300	2,100	5,300	1,910	3,900	1,260	3,100	1,120	2,900	890
		30	0.079	4,500	1,780	4,500	1,620	3,300	1,070	2,700	970	2,400	730
	0.2	12	0.177	8,300	3,290	8,300	2,990	6,100	1,980	4,900	1,760	4,500	1,380
		18	0.158	6,500	2,570	6,500	2,340	4,700	1,520	3,800	1,370	3,500	1,070
		24	0.148	5,300	2,100	5,300	1,910	3,900	1,260	3,100	1,120	2,900	890
	0.3	12	0.142	4,500	1,780	4,500	1,620	3,300	1,070	2,700	970	2,400	730
		18	0.187	8,300	3,290	8,300	2,990	6,100	1,980	4,900	1,760	4,500	1,380
		18	0.166	6,500	2,570	6,500	2,340	4,700	1,520	3,800	1,370	3,500	1,070
	0.5	24	0.156	5,300	2,100	5,300	1,910	3,900	1,260	3,100	1,120	2,900	890
		30	0.150	4,500	1,780	4,500	1,620	3,300	1,070	2,700	970	2,400	730
		12	0.193	8,300	3,290	8,300	2,990	6,100	1,980	4,900	1,760	4,500	1,380
	1	18	0.172	6,500	2,570	6,500	2,340	4,700	1,520	3,800	1,370	3,500	1,070
		24	0.161	5,300	2,100	5,300	1,910	3,900	1,260	3,100	1,120	2,900	890
		30	0.154	4,500	1,780	4,500	1,620	3,300	1,070	2,700	970	2,400	730
		12	0.197	8,300	3,290	8,300	2,990	6,100	1,980	4,900	1,760	4,500	1,380
	1	18	0.175	6,500	2,570	6,500	2,340	4,700	1,520	3,800	1,370	3,500	1,070
		24	0.164	5,300	2,100	5,300	1,910	3,900	1,260	3,100	1,120	2,900	890
		30	0.158	4,500	1,780	4,500	1,620	3,300	1,070	2,700	970	2,400	730

- a_p is shown as the criteria for hardened steel (45-55HRC). For other materials than hardened steel (45-55HRC), adjust the cutting depth according to the cutting depth factors in the above table.
- When performing cutting where cutting chips may cause clogging, such as for rib cutting, blind grooves, etc., the cutting depth setting should be set by multiplying a_p by a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
- Adjust by setting a_e to (5 or less) \times (a_p) \times (cutting depth ratio). For finishing cutting, calculate the theoretical cusp height and set accordingly.
- The recommended slope entrance angle when engraving is 1° or less. Adjust the feed rate to 70% or less of values presented in the cutting condition table.
- When slotting such engraving letters, adjust the feed rate to 50% or less and a_p to 30% or less of the values shown. We recommend reciprocal cutting.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDREH4010-2-02-TH3 tool:
 Cutting depth = $0.047 (a_p) \times 1$ (cutting depth factor for hardened steel [45-55HRC]) $\times 0.8$ (for closed-area cutting) = 0.0376 mm

[Note]

- Use the appropriate coolant for the work material and machining shape.
- These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
- If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

4 Flutes

High efficiency cutting condition

High accuracy cutting condition

For detailed information on high-efficiency cutting conditions, refer to page 20.

Work material				1		2		3		4		5		
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~60HRC)		Hardened steels (60~65HRC)		Hardened steels (65~72HRC)		
Cutting depth ratio				120%		100%		70%		50%		25%		
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	
1	0.02	1.5	0.016	32,300	2,840	32,300	2,580	23,500	1,690	19,100	1,530	17,600	1,200	
		2	0.013	29,100	2,560	29,100	2,320	21,200	1,530	17,200	1,380	15,900	1,080	
		2.5	0.013	26,400	2,320	26,400	2,110	19,200	1,380	15,600	1,250	14,400	980	
		3	0.012	24,200	2,130	24,200	1,940	17,600	1,270	14,300	1,150	13,200	900	
		4	0.011	20,800	1,830	20,800	1,660	15,100	1,090	12,300	980	11,300	760	
		5	0.010	18,200	1,600	18,200	1,450	13,200	950	10,700	850	9,900	670	
		6	0.006	16,200	1,430	16,200	1,290	11,700	850	9,500	760	8,800	600	
		8	0.003	13,200	1,160	13,200	1,060	9,600	700	7,800	620	7,200	490	
	0.05	1.5	0.038	32,300	2,840	32,300	2,580	23,500	1,690	19,100	1,530	17,600	1,200	
		2	0.028	29,100	2,560	29,100	2,320	21,200	1,530	17,200	1,380	15,900	1,080	
		2.5	0.027	26,400	2,320	26,400	2,110	19,200	1,380	15,600	1,250	14,400	980	
		3	0.025	24,200	2,130	24,200	1,940	17,600	1,270	14,300	1,150	13,200	900	
		4	0.024	20,800	1,830	20,800	1,660	15,100	1,090	12,300	980	11,300	760	
		5	0.023	18,200	1,600	18,200	1,450	13,200	950	10,700	850	9,900	670	
		6	0.013	16,200	1,430	16,200	1,290	11,700	850	9,500	760	8,800	600	
		8	0.007	13,200	1,160	13,200	1,060	9,600	700	7,800	620	7,200	490	
	0.1	1.5	0.046	32,300	2,840	32,300	2,580	23,500	1,690	19,100	1,530	17,600	1,200	
		2	0.035	29,100	2,560	29,100	2,320	21,200	1,530	17,200	1,380	15,900	1,080	
		2.5	0.033	26,400	2,320	26,400	2,110	19,200	1,380	15,600	1,250	14,400	980	
		3	0.031	24,200	2,130	24,200	1,940	17,600	1,270	14,300	1,150	13,200	900	
		4	0.029	20,800	1,830	20,800	1,660	15,100	1,090	12,300	980	11,300	760	
		5	0.028	18,200	1,600	18,200	1,450	13,200	950	10,700	850	9,900	670	
		6	0.015	16,200	1,430	16,200	1,290	11,700	850	9,500	760	8,800	600	
		8	0.009	13,200	1,160	13,200	1,060	9,600	700	7,800	620	7,200	490	
	0.2	1.5	0.052	32,300	2,840	32,300	2,580	23,500	1,690	19,100	1,530	17,600	1,200	
		2	0.039	29,100	2,560	29,100	2,320	21,200	1,530	17,200	1,380	15,900	1,080	
		2.5	0.038	26,400	2,320	26,400	2,110	19,200	1,380	15,600	1,250	14,400	980	
		3	0.035	24,200	2,130	24,200	1,940	17,600	1,270	14,300	1,150	13,200	900	
		4	0.033	20,800	1,830	20,800	1,660	15,100	1,090	12,300	980	11,300	760	
		5	0.031	18,200	1,600	18,200	1,450	13,200	950	10,700	850	9,900	670	
		6	0.017	16,200	1,430	16,200	1,290	11,700	850	9,500	760	8,800	600	
		8	0.010	13,200	1,160	13,200	1,060	9,600	700	7,800	620	7,200	490	
	0.3	1.5	0.058	32,300	2,840	32,300	2,580	23,500	1,690	19,100	1,530	17,600	1,200	
		2	0.044	29,100	2,560	29,100	2,320	21,200	1,530	17,200	1,380	15,900	1,080	
		2.5	0.042	26,400	2,320	26,400	2,110	19,200	1,380	15,600	1,250	14,400	980	
		3	0.039	24,200	2,130	24,200	1,940	17,600	1,270	14,300	1,150	13,200	900	
		4	0.036	20,800	1,830	20,800	1,660	15,100	1,090	12,300	980	11,300	760	
		5	0.035	18,200	1,600	18,200	1,450	13,200	950	10,700	850	9,900	670	
		6	0.019	16,200	1,430	16,200	1,290	11,700	850	9,500	760	8,800	600	
		8	0.011	13,200	1,160	13,200	1,060	9,600	700	7,800	620	7,200	490	
	1.5	0.02	2	0.014	22,300	2,750	22,300	2,500	16,300	1,640	13,200	1,480	12,200	1,160
			3	0.013	19,300	2,380	19,300	2,170	14,100	1,420	11,500	1,290	10,500	1,000
			4	0.012	17,100	2,110	17,100	1,920	12,500	1,250	10,100	1,140	9,300	890
			5	0.010	15,300	1,880	15,300	1,710	11,100	1,120	9,000	1,010	8,400	800
			6	0.010	13,900	1,710	13,900	1,550	10,000	1,010	8,200	920	7,600	720
			8	0.008	12,600	1,550	12,600	1,410	9,200	930	7,500	840	6,900	660
			10	0.007	11,600	1,430	11,600	1,300	8,500	850	6,900	770	6,300	600
			12	0.004	10,000	1,240	10,000	1,130	7,300	740	5,900	660	5,500	520
0.05		2	0.040	22,300	2,750	22,300	2,500	16,300	1,640	13,200	1,480	12,200	1,160	
		3	0.036	19,300	2,380	19,300	2,170	14,100	1,420	11,500	1,290	10,500	1,000	
		4	0.032	17,100	2,110	17,100	1,920	12,500	1,250	10,100	1,140	9,300	890	
		5	0.029	15,300	1,880	15,300	1,710	11,100	1,120	9,000	1,010	8,400	800	
		6	0.026	13,900	1,710	13,900	1,550	10,000	1,010	8,200	920	7,600	720	
		8	0.022	12,600	1,550	12,600	1,410	9,200	930	7,500	840	6,900	660	
		10	0.018	11,600	1,430	11,600	1,300	8,500	850	6,900	770	6,300	600	
		12	0.012	10,000	1,240	10,000	1,130	7,300	740	5,900	660	5,500	520	
0.1		2	0.065	22,300	2,750	22,300	2,500	16,300	1,640	13,200	1,480	12,200	1,160	
		3	0.059	19,300	2,380	19,300	2,170	14,100	1,420	11,500	1,290	10,500	1,000	
		4	0.053	17,100	2,110	17,100	1,920	12,500	1,250	10,100	1,140	9,300	890	
		5	0.047	15,300	1,880	15,300	1,710	11,100	1,120	9,000	1,010	8,400	800	

[Note] Refer to the comments and notes below the table on page 29 regarding usage.

Recommended Cutting Conditions

4 Flutes

High efficiency cutting condition

High accuracy cutting condition

For detailed information on high-efficiency cutting conditions, refer to page 20.

Work material				1		2		3		4		5	
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~60HRC)		Hardened steels (60~65HRC)		Hardened steels (65~72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min
1.5	0.1	6	0.043	13,900	1,710	13,900	1,550	10,000	1,010	8,200	920	7,600	720
		8	0.037	12,600	1,550	12,600	1,410	9,200	930	7,500	840	6,900	660
		10	0.029	11,600	1,430	11,600	1,300	8,500	850	6,900	770	6,300	600
		12	0.020	10,000	1,240	10,000	1,130	7,300	740	5,900	660	5,500	520
	0.2	2	0.068	22,300	2,750	22,300	2,500	16,300	1,640	13,200	1,480	12,200	1,160
		3	0.062	19,300	2,380	19,300	2,170	14,100	1,420	11,500	1,290	10,500	1,000
		4	0.056	17,100	2,110	17,100	1,920	12,500	1,250	10,100	1,140	9,300	890
		5	0.050	15,300	1,880	15,300	1,710	11,100	1,120	9,000	1,010	8,400	800
	0.3	6	0.046	13,900	1,710	13,900	1,550	10,000	1,010	8,200	920	7,600	720
		8	0.039	12,600	1,550	12,600	1,410	9,200	930	7,500	840	6,900	660
		10	0.031	11,600	1,430	11,600	1,300	8,500	850	6,900	770	6,300	600
		12	0.021	10,000	1,240	10,000	1,130	7,300	740	5,900	660	5,500	520
	0.5	2	0.070	22,300	2,750	22,300	2,500	16,300	1,640	13,200	1,480	12,200	1,160
		3	0.064	19,300	2,380	19,300	2,170	14,100	1,420	11,500	1,290	10,500	1,000
		4	0.058	17,100	2,110	17,100	1,920	12,500	1,250	10,100	1,140	9,300	890
		5	0.051	15,300	1,880	15,300	1,710	11,100	1,120	9,000	1,010	8,400	800
	0.5	6	0.047	13,900	1,710	13,900	1,550	10,000	1,010	8,200	920	7,600	720
		8	0.040	12,600	1,550	12,600	1,410	9,200	930	7,500	840	6,900	660
		10	0.032	11,600	1,430	11,600	1,300	8,500	850	6,900	770	6,300	600
		12	0.021	10,000	1,240	10,000	1,130	7,300	740	5,900	660	5,500	520
	0.5	2	0.072	22,300	2,750	22,300	2,500	16,300	1,640	13,200	1,480	12,200	1,160
		3	0.065	19,300	2,380	19,300	2,170	14,100	1,420	11,500	1,290	10,500	1,000
		4	0.059	17,100	2,110	17,100	1,920	12,500	1,250	10,100	1,140	9,300	890
		5	0.052	15,300	1,880	15,300	1,710	11,100	1,120	9,000	1,010	8,400	800
0.5	6	0.048	13,900	1,710	13,900	1,550	10,000	1,010	8,200	920	7,600	720	
	8	0.041	12,600	1,550	12,600	1,410	9,200	930	7,500	840	6,900	660	
	10	0.033	11,600	1,430	11,600	1,300	8,500	850	6,900	770	6,300	600	
	12	0.022	10,000	1,240	10,000	1,130	7,300	740	5,900	660	5,500	520	
2	0.02	2.5	0.015	17,100	3,010	17,100	2,740	12,500	1,790	10,100	1,620	9,300	1,260
		3	0.014	16,200	2,850	16,200	2,590	11,700	1,680	9,500	1,530	8,800	1,200
		4	0.012	14,500	2,560	14,500	2,320	10,500	1,520	8,500	1,370	7,900	1,070
		5	0.011	13,200	2,320	13,200	2,110	9,600	1,390	7,800	1,250	7,200	980
		6	0.011	12,100	2,130	12,100	1,940	8,800	1,270	7,100	1,150	6,600	900
		8	0.011	10,400	1,830	10,400	1,660	7,600	1,090	6,100	980	5,600	760
		10	0.010	9,000	1,590	9,000	1,440	6,600	950	5,400	860	5,000	680
		12	0.008	8,100	1,420	8,100	1,290	5,900	850	4,700	760	4,400	600
	0.05	2.5	0.040	17,100	3,010	17,100	2,740	12,500	1,790	10,100	1,620	9,300	1,260
		3	0.036	16,200	2,850	16,200	2,590	11,700	1,680	9,500	1,530	8,800	1,200
		4	0.031	14,500	2,560	14,500	2,320	10,500	1,520	8,500	1,370	7,900	1,070
		5	0.030	13,200	2,320	13,200	2,110	9,600	1,390	7,800	1,250	7,200	980
		6	0.029	12,100	2,130	12,100	1,940	8,800	1,270	7,100	1,150	6,600	900
		8	0.028	10,400	1,830	10,400	1,660	7,600	1,090	6,100	980	5,600	760
		10	0.026	9,000	1,590	9,000	1,440	6,600	950	5,400	860	5,000	680
		12	0.020	8,100	1,420	8,100	1,290	5,900	850	4,700	760	4,400	600
	0.1	2.5	0.068	17,100	3,010	17,100	2,740	12,500	1,790	10,100	1,620	9,300	1,260
		3	0.061	16,200	2,850	16,200	2,590	11,700	1,680	9,500	1,530	8,800	1,200
		4	0.052	14,500	2,560	14,500	2,320	10,500	1,520	8,500	1,370	7,900	1,070
		5	0.051	13,200	2,320	13,200	2,110	9,600	1,390	7,800	1,250	7,200	980
		6	0.049	12,100	2,130	12,100	1,940	8,800	1,270	7,100	1,150	6,600	900
		8	0.048	10,400	1,830	10,400	1,660	7,600	1,090	6,100	980	5,600	760
		10	0.045	9,000	1,590	9,000	1,440	6,600	950	5,400	860	5,000	680
		12	0.034	8,100	1,420	8,100	1,290	5,900	850	4,700	760	4,400	600
0.2	2.5	0.077	17,100	3,010	17,100	2,740	12,500	1,790	10,100	1,620	9,300	1,260	
	3	0.068	16,200	2,850	16,200	2,590	11,700	1,680	9,500	1,530	8,800	1,200	
	4	0.059	14,500	2,560	14,500	2,320	10,500	1,520	8,500	1,370	7,900	1,070	
	5	0.057	13,200	2,320	13,200	2,110	9,600	1,390	7,800	1,250	7,200	980	
	6	0.055	12,100	2,130	12,100	1,940	8,800	1,270	7,100	1,150	6,600	900	
	8	0.054	10,400	1,830	10,400	1,660	7,600	1,090	6,100	980	5,600	760	
	10	0.050	9,000	1,590	9,000	1,440	6,600	950	5,400	860	5,000	680	
	12	0.038	8,100	1,420	8,100	1,290	5,900	850	4,700	760	4,400	600	

Work material				1		2		3		4		5		
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~60HRC)		Hardened steels (60~65HRC)		Hardened steels (65~72HRC)		
Cutting depth ratio				120%		100%		70%		50%		25%		
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	Revolution n min ⁻¹	Feed rate Vf mm/min	
2	0.3	2.5	0.081	17,100	3,010	17,100	2,740	12,500	1,790	10,100	1,620	9,300	1,260	
		3	0.072	16,200	2,850	16,200	2,590	11,700	1,680	9,500	1,530	8,800	1,200	
		4	0.062	14,500	2,560	14,500	2,320	10,500	1,520	8,500	1,370	7,900	1,070	
		5	0.060	13,200	2,320	13,200	2,110	9,600	1,390	7,800	1,250	7,200	980	
		6	0.058	12,100	2,130	12,100	1,940	8,800	1,270	7,100	1,150	6,600	900	
		8	0.057	10,400	1,830	10,400	1,660	7,600	1,090	6,100	980	5,600	760	
	0.5	10	0.053	9,000	1,590	9,000	1,440	6,600	950	5,400	860	5,000	680	
		12	0.041	8,100	1,420	8,100	1,290	5,900	850	4,700	760	4,400	600	
		2.5	0.085	17,100	3,010	17,100	2,740	12,500	1,790	10,100	1,620	9,300	1,260	
		3	0.076	16,200	2,850	16,200	2,590	11,700	1,680	9,500	1,530	8,800	1,200	
		4	0.065	14,500	2,560	14,500	2,320	10,500	1,520	8,500	1,370	7,900	1,070	
		5	0.063	13,200	2,320	13,200	2,110	9,600	1,390	7,800	1,250	7,200	980	
	3	0.05	6	0.061	12,100	2,130	12,100	1,940	8,800	1,270	7,100	1,150	6,600	900
			8	0.061	10,400	1,830	10,400	1,660	7,600	1,090	6,100	980	5,600	760
10			0.056	9,000	1,590	9,000	1,440	6,600	950	5,400	860	5,000	680	
12			0.043	8,100	1,420	8,100	1,290	5,900	850	4,700	760	4,400	600	
4			0.037	15,400	2,450	15,400	2,220	11,200	1,450	9,100	1,310	8,500	1,040	
6			0.036	12,800	2,030	12,800	1,840	9,300	1,200	7,600	1,090	7,000	850	
0.1		8	0.035	10,900	1,730	10,900	1,570	7,900	1,020	6,400	920	5,900	720	
		10	0.034	9,500	1,500	9,500	1,360	6,900	900	5,600	800	5,100	630	
		12	0.031	8,400	1,330	8,400	1,200	6,100	790	4,900	710	4,600	560	
		14	0.029	7,500	1,190	7,500	1,080	5,500	710	4,400	630	4,100	500	
		16	0.028	6,800	1,080	6,800	980	4,900	630	4,000	570	3,700	460	
		18	0.025	6,200	990	6,200	900	4,500	580	3,700	520	3,400	420	
0.2		20	0.018	5,700	900	5,700	820	4,200	540	3,400	490	3,200	390	
		4	0.075	15,400	2,450	15,400	2,220	11,200	1,450	9,100	1,310	8,500	1,040	
	6	0.072	12,800	2,030	12,800	1,840	9,300	1,200	7,600	1,090	7,000	850		
	8	0.070	10,900	1,730	10,900	1,570	7,900	1,020	6,400	920	5,900	720		
	10	0.068	9,500	1,500	9,500	1,360	6,900	900	5,600	800	5,100	630		
	12	0.063	8,400	1,330	8,400	1,200	6,100	790	4,900	710	4,600	560		
0.3	14	0.058	7,500	1,190	7,500	1,080	5,500	710	4,400	630	4,100	500		
	16	0.056	6,800	1,080	6,800	980	4,900	630	4,000	570	3,700	460		
	18	0.051	6,200	990	6,200	900	4,500	580	3,700	520	3,400	420		
	20	0.037	5,700	900	5,700	820	4,200	540	3,400	490	3,200	390		
	4	0.084	15,400	2,450	15,400	2,220	11,200	1,450	9,100	1,310	8,500	1,040		
	6	0.081	12,800	2,030	12,800	1,840	9,300	1,200	7,600	1,090	7,000	850		
0.5	8	0.079	10,900	1,730	10,900	1,570	7,900	1,020	6,400	920	5,900	720		
	10	0.076	9,500	1,500	9,500	1,360	6,900	900	5,600	800	5,100	630		
	12	0.070	8,400	1,330	8,400	1,200	6,100	790	4,900	710	4,600	560		
	14	0.065	7,500	1,190	7,500	1,080	5,500	710	4,400	630	4,100	500		
	16	0.063	6,800	1,080	6,800	980	4,900	630	4,000	570	3,700	460		
	18	0.057	6,200	990	6,200	900	4,500	580	3,700	520	3,400	420		
3	0.2	20	0.041	5,700	900	5,700	820	4,200	540	3,400	490	3,200	390	
		4	0.089	15,400	2,450	15,400	2,220	11,200	1,450	9,100	1,310	8,500	1,040	
		6	0.086	12,800	2,030	12,800	1,840	9,300	1,200	7,600	1,090	7,000	850	
		8	0.084	10,900	1,730	10,900	1,570	7,900	1,020	6,400	920	5,900	720	
		10	0.080	9,500	1,500	9,500	1,360	6,900	900	5,600	800	5,100	630	
		12	0.074	8,400	1,330	8,400	1,200	6,100	790	4,900	710	4,600	560	
	0.3	14	0.068	7,500	1,190	7,500	1,080	5,500	710	4,400	630	4,100	500	
		16	0.066	6,800	1,080	6,800	980	4,900	630	4,000	570	3,700	460	
		18	0.060	6,200	990	6,200	900	4,500	580	3,700	520	3,400	420	
		20	0.044	5,700	900	5,700	820	4,200	540	3,400	490	3,200	390	
		4	0.094	15,400	2,450	15,400	2,220	11,200	1,450	9,100	1,310	8,500	1,040	
		6	0.090	12,800	2,030	12,800	1,840	9,300	1,200	7,600	1,090	7,000	850	
	0.5	8	0.088	10,900	1,730	10,900	1,570	7,900	1,020	6,400	920	5,900	720	
		10	0.084	9,500	1,500	9,500	1,360	6,900	900	5,600	800	5,100	630	
12		0.078	8,400	1,330	8,400	1,200	6,100	790	4,900	710	4,600	560		
14		0.072	7,500	1,190	7,500	1,080	5,500	710	4,400	630	4,100	500		
16		0.070	6,800	1,080	6,800	980	4,900	630	4,000	570	3,700	460		
18		0.063	6,200	990	6,200	900	4,500	580	3,700	520	3,400	420		
20	0.046	5,700	900	5,700	820	4,200	540	3,400	490	3,200	390			

[Note] Refer to the comments and notes below the table on page 29 regarding usage.

Recommended Cutting Conditions

4 Flutes

High efficiency cutting condition

High accuracy cutting condition

For detailed information on high-efficiency cutting conditions, refer to page 20.

Work material				1		2		3		4		5		
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~60HRC)		Hardened steels (60~65HRC)		Hardened steels (65~72HRC)		
Cutting depth ratio				120%		100%		70%		50%		25%		
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ϕ_p (mm)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	
4	0.1	8	0.076	8,600	2,280	8,600	2,080	6,300	1,360	5,100	1,240	4,700	960	
		10	0.073	7,700	2,040	7,700	1,850	5,600	1,220	4,600	1,100	4,200	860	
		12	0.070	7,000	1,840	7,000	1,680	5,100	1,100	4,200	1,000	3,800	780	
		14	0.065	6,400	1,680	6,400	1,540	4,600	1,000	3,700	900	3,500	710	
		16	0.063	5,900	1,550	5,900	1,410	4,200	910	3,500	840	3,200	660	
		18	0.061	5,400	1,430	5,400	1,290	4,000	860	3,200	780	3,000	610	
		20	0.058	5,100	1,340	5,100	1,210	3,700	790	3,000	710	2,700	560	
		22	0.049	4,700	1,250	4,700	1,140	3,400	740	2,800	680	2,600	520	
	24	0.046	4,400	1,160	4,400	1,050	3,200	700	2,700	640	2,400	490		
	0.2	8	0.105	8,600	2,280	8,600	2,080	6,300	1,360	5,100	1,240	4,700	960	
		10	0.102	7,700	2,040	7,700	1,850	5,600	1,220	4,600	1,100	4,200	860	
		12	0.097	7,000	1,840	7,000	1,680	5,100	1,100	4,200	1,000	3,800	780	
		14	0.090	6,400	1,680	6,400	1,540	4,600	1,000	3,700	900	3,500	710	
		16	0.087	5,900	1,550	5,900	1,410	4,200	910	3,500	840	3,200	660	
		18	0.085	5,400	1,430	5,400	1,290	4,000	860	3,200	780	3,000	610	
		20	0.080	5,100	1,340	5,100	1,210	3,700	790	3,000	710	2,700	560	
		22	0.067	4,700	1,250	4,700	1,140	3,400	740	2,800	680	2,600	520	
	24	0.064	4,400	1,160	4,400	1,050	3,200	700	2,700	640	2,400	490		
	0.3	8	0.110	8,600	2,280	8,600	2,080	6,300	1,360	5,100	1,240	4,700	960	
		10	0.107	7,700	2,040	7,700	1,850	5,600	1,220	4,600	1,100	4,200	860	
		12	0.102	7,000	1,840	7,000	1,680	5,100	1,100	4,200	1,000	3,800	780	
		14	0.095	6,400	1,680	6,400	1,540	4,600	1,000	3,700	900	3,500	710	
		16	0.092	5,900	1,550	5,900	1,410	4,200	910	3,500	840	3,200	660	
		18	0.090	5,400	1,430	5,400	1,290	4,000	860	3,200	780	3,000	610	
		20	0.085	5,100	1,340	5,100	1,210	3,700	790	3,000	710	2,700	560	
		22	0.071	4,700	1,250	4,700	1,140	3,400	740	2,800	680	2,600	520	
	24	0.067	4,400	1,160	4,400	1,050	3,200	700	2,700	640	2,400	490		
	0.5	8	0.114	8,600	2,280	8,600	2,080	6,300	1,360	5,100	1,240	4,700	960	
		10	0.111	7,700	2,040	7,700	1,850	5,600	1,220	4,600	1,100	4,200	860	
		12	0.105	7,000	1,840	7,000	1,680	5,100	1,100	4,200	1,000	3,800	780	
		14	0.098	6,400	1,680	6,400	1,540	4,600	1,000	3,700	900	3,500	710	
		16	0.095	5,900	1,550	5,900	1,410	4,200	910	3,500	840	3,200	660	
		18	0.092	5,400	1,430	5,400	1,290	4,000	860	3,200	780	3,000	610	
		20	0.088	5,100	1,340	5,100	1,210	3,700	790	3,000	710	2,700	560	
		22	0.073	4,700	1,250	4,700	1,140	3,400	740	2,800	680	2,600	520	
	24	0.069	4,400	1,160	4,400	1,050	3,200	700	2,700	640	2,400	490		
	1	8	0.116	8,600	2,280	8,600	2,080	6,300	1,360	5,100	1,240	4,700	960	
		10	0.113	7,700	2,040	7,700	1,850	5,600	1,220	4,600	1,100	4,200	860	
		12	0.108	7,000	1,840	7,000	1,680	5,100	1,100	4,200	1,000	3,800	780	
		14	0.100	6,400	1,680	6,400	1,540	4,600	1,000	3,700	900	3,500	710	
		16	0.097	5,900	1,550	5,900	1,410	4,200	910	3,500	840	3,200	660	
		18	0.094	5,400	1,430	5,400	1,290	4,000	860	3,200	780	3,000	610	
		20	0.089	5,100	1,340	5,100	1,210	3,700	790	3,000	710	2,700	560	
		22	0.075	4,700	1,250	4,700	1,140	3,400	740	2,800	680	2,600	520	
	24	0.071	4,400	1,160	4,400	1,050	3,200	700	2,700	640	2,400	490		
	5	0.1	10	0.080	7,700	2,710	7,700	2,470	5,600	1,630	4,600	1,460	4,200	1,150
			15	0.067	6,100	2,160	6,100	1,970	4,500	1,290	3,700	1,170	3,300	900
			20	0.064	5,100	1,780	5,100	1,620	3,700	1,050	3,000	950	2,700	750
25			0.062	4,300	1,520	4,300	1,380	3,200	900	2,600	820	2,300	630	
0.2		10	0.102	7,700	2,710	7,700	2,470	5,600	1,630	4,600	1,460	4,200	1,150	
		15	0.086	6,100	2,160	6,100	1,970	4,500	1,290	3,700	1,170	3,300	900	
		20	0.081	5,100	1,780	5,100	1,620	3,700	1,050	3,000	950	2,700	750	
		25	0.079	4,300	1,520	4,300	1,380	3,200	900	2,600	820	2,300	630	
0.3		10	0.138	7,700	2,710	7,700	2,470	5,600	1,630	4,600	1,460	4,200	1,150	
		15	0.116	6,100	2,160	6,100	1,970	4,500	1,290	3,700	1,170	3,300	900	
		20	0.110	5,100	1,780	5,100	1,620	3,700	1,050	3,000	950	2,700	750	
		25	0.107	4,300	1,520	4,300	1,380	3,200	900	2,600	820	2,300	630	
0.5		10	0.142	7,700	2,710	7,700	2,470	5,600	1,630	4,600	1,460	4,200	1,150	
		15	0.120	6,100	2,160	6,100	1,970	4,500	1,290	3,700	1,170	3,300	900	
		20	0.114	5,100	1,780	5,100	1,620	3,700	1,050	3,000	950	2,700	750	
		25	0.110	4,300	1,520	4,300	1,380	3,200	900	2,600	820	2,300	630	

Work material				1		2		3		4		5	
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~60HRC)		Hardened steels (60~65HRC)		Hardened steels (65~72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min
5	1	10	0.145	7,700	2,710	7,700	2,470	5,600	1,630	4,600	1,460	4,200	1,150
		15	0.122	6,100	2,160	6,100	1,970	4,500	1,290	3,700	1,170	3,300	900
		20	0.116	5,100	1,780	5,100	1,620	3,700	1,050	3,000	950	2,700	750
		25	0.112	4,300	1,520	4,300	1,380	3,200	900	2,600	820	2,300	630
6	0.1	12	0.082	6,900	2,730	6,900	2,480	5,100	1,640	4,100	1,460	3,700	1,150
		18	0.073	5,400	2,130	5,400	1,940	3,900	1,260	3,200	1,140	2,900	890
		24	0.068	4,400	1,740	4,400	1,590	3,200	1,050	2,600	930	2,400	740
		30	0.065	3,700	1,480	3,700	1,340	2,700	890	2,200	810	2,000	610
	0.2	12	0.147	6,900	2,730	6,900	2,480	5,100	1,640	4,100	1,460	3,700	1,150
		18	0.131	5,400	2,130	5,400	1,940	3,900	1,260	3,200	1,140	2,900	890
		24	0.123	4,400	1,740	4,400	1,590	3,200	1,050	2,600	930	2,400	740
		30	0.118	3,700	1,480	3,700	1,340	2,700	890	2,200	810	2,000	610
	0.3	12	0.155	6,900	2,730	6,900	2,480	5,100	1,640	4,100	1,460	3,700	1,150
		18	0.138	5,400	2,130	5,400	1,940	3,900	1,260	3,200	1,140	2,900	890
		24	0.129	4,400	1,740	4,400	1,590	3,200	1,050	2,600	930	2,400	740
		30	0.124	3,700	1,480	3,700	1,340	2,700	890	2,200	810	2,000	610
	0.5	12	0.160	6,900	2,730	6,900	2,480	5,100	1,640	4,100	1,460	3,700	1,150
		18	0.142	5,400	2,130	5,400	1,940	3,900	1,260	3,200	1,140	2,900	890
		24	0.133	4,400	1,740	4,400	1,590	3,200	1,050	2,600	930	2,400	740
		30	0.128	3,700	1,480	3,700	1,340	2,700	890	2,200	810	2,000	610
	1	12	0.163	6,900	2,730	6,900	2,480	5,100	1,640	4,100	1,460	3,700	1,150
		18	0.145	5,400	2,130	5,400	1,940	3,900	1,260	3,200	1,140	2,900	890
		24	0.136	4,400	1,740	4,400	1,590	3,200	1,050	2,600	930	2,400	740
		30	0.131	3,700	1,480	3,700	1,340	2,700	890	2,200	810	2,000	610

- a_p is shown as the criteria for hardened steel (45-55HRC). For other materials than hardened steel (45-55HRC), adjust the cutting depth according to the cutting depth factors in the above table.
- When performing cutting where cutting chips may cause clogging, such as for rib cutting, blind grooves, etc., the cutting depth setting should be set by multiplying a_p by a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
- Adjust by setting a_e to (5 or less) \times (a_p) \times (cutting depth ratio). For finishing cutting, calculate the theoretical cusp height and set accordingly.
- The recommended slope entrance angle when engraving is 1° or less. Adjust the feed rate to 70% or less of values presented in the cutting condition table.
- When slotting such engraving letters, adjust the feed rate to 50% or less and a_p to 30% or less of the values shown. We recommend reciprocal cutting.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDREH4010-2-02-TH3 tool:
Cutting depth = 0.039 (a_p) \times 1 (cutting depth factor for hardened steel [45-55HRC]) \times 0.8 (for closed-area cutting) = 0.0312mm

[Note]

- Use the appropriate coolant for the work material and machining shape.
- These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
- If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Recommended Cutting Conditions

4 Flutes

High efficiency cutting condition

High accuracy cutting condition

For detailed information on high-accuracy cutting conditions, refer to page 31.

Work material				1		2		3		4		5		
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~60HRC)		Hardened steels (60~65HRC)		Hardened steels (65~72HRC)		
Cutting depth ratio				120%		100%		70%		50%		25%		
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	
	0.2	24	0.180	4,800	2,550	4,800	2,300	3,500	1,510	2,900	1,220	2,600	1,060	
		40	0.162	3,300	1,400	3,300	1,270	2,500	860	2,000	670	1,800	590	
	0.3	24	0.192	4,800	2,550	4,800	2,300	3,500	1,510	2,900	1,220	2,600	1,060	
		40	0.173	3,300	1,400	3,300	1,270	2,500	860	2,000	670	1,800	590	
	0.5	24	0.204	4,800	2,550	4,800	2,300	3,500	1,510	2,900	1,220	2,600	1,060	
		40	0.184	3,300	1,400	3,300	1,270	2,500	860	2,000	670	1,800	590	
	1	24	0.209	4,800	2,550	4,800	2,300	3,500	1,510	2,900	1,220	2,600	1,060	
		40	0.188	3,300	1,400	3,300	1,270	2,500	860	2,000	670	1,800	590	
	2	24	0.215	4,800	2,550	4,800	2,300	3,500	1,510	2,900	1,220	2,600	1,060	
		40	0.194	3,300	1,400	3,300	1,270	2,500	860	2,000	670	1,800	590	
		0.2	30	0.197	3,800	2,530	3,800	2,280	2,800	1,510	2,300	1,210	2,100	1,070
			50	0.178	2,700	1,440	2,700	1,300	2,000	860	1,600	670	1,500	610
0.5		30	0.245	3,800	2,530	3,800	2,280	2,800	1,510	2,300	1,210	2,100	1,070	
		50	0.220	2,700	1,440	2,700	1,300	2,000	860	1,600	670	1,500	610	
1		30	0.251	3,800	2,530	3,800	2,280	2,800	1,510	2,300	1,210	2,100	1,070	
		50	0.226	2,700	1,440	2,700	1,300	2,000	860	1,600	670	1,500	610	
2		30	0.258	3,800	2,530	3,800	2,280	2,800	1,510	2,300	1,210	2,100	1,070	
		50	0.233	2,700	1,440	2,700	1,300	2,000	860	1,600	670	1,500	610	
		0.2	36	0.197	3,200	2,550	3,200	2,300	2,300	1,490	1,900	1,200	1,800	1,100
			60	0.178	2,200	1,400	2,200	1,270	1,600	830	1,300	660	1,200	590
		0.5	36	0.294	3,200	2,550	3,200	2,300	2,300	1,490	1,900	1,200	1,800	1,100
			60	0.264	2,200	1,400	2,200	1,270	1,600	830	1,300	660	1,200	590
	1	36	0.301	3,200	2,550	3,200	2,300	2,300	1,490	1,900	1,200	1,800	1,100	
		60	0.271	2,200	1,400	2,200	1,270	1,600	830	1,300	660	1,200	590	
	2	36	0.309	3,200	2,550	3,200	2,300	2,300	1,490	1,900	1,200	1,800	1,100	
		60	0.280	2,200	1,400	2,200	1,270	1,600	830	1,300	660	1,200	590	

- (1) a_p is shown as the criteria for hardened steel (45-55HRC). For other materials than hardened steel (45-55HRC), adjust the cutting depth according to the cutting depth factors in the above table.
- (2) When performing cutting where cutting chips may cause clogging, such as for rib cutting, blind grooves, etc., the cutting depth setting should be set by multiplying a_p by a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
- (3) Adjust by setting a_e to (5 or less) \times (a_p) \times (cutting depth ratio). For finishing cutting, calculate the theoretical cusp height and set accordingly.
- (4) The recommended slope entrance angle when engraving is 1° or less. Adjust the feed rate to 70% or less of values presented in the cutting condition table.
- (5) When slotting such engraving letters, adjust the feed rate to 50% or less and a_p to 30% or less of the values shown. We recommend reciprocal cutting.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDRH4080-24-02-TH3 tool:
 Cutting depth = 0.180 (a_p) \times 1 (cutting depth factor for hardened steel [45~55HRC]) \times 0.8 (for closed-area cutting) = 0.144mm

[Note]

- ① Use the appropriate coolant for the work material and machining shape.
- ② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
- ③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

4 Flutes

High efficiency cutting condition

High accuracy cutting condition

For detailed information on high-efficiency cutting conditions, refer to page 30.

Work material				1		2		3		4		5		
				Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~60HRC)		Hardened steels (60~65HRC)		Hardened steels (65~72HRC)		
Cutting depth ratio				120%		100%		70%		50%		25%		
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	Revolution n (min ⁻¹)	Feed rate V_f (mm/min)	
	0.2	24	0.150	4,000	2,130	4,000	1,920	2,900	1,250	2,400	1,010	2,200	900	
		40	0.135	2,800	1,190	2,800	1,080	2,000	690	1,700	570	1,500	490	
	0.3	24	0.160	4,000	2,130	4,000	1,920	2,900	1,250	2,400	1,010	2,200	900	
		40	0.144	2,800	1,190	2,800	1,080	2,000	690	1,700	570	1,500	490	
	0.5	24	0.170	4,000	2,130	4,000	1,920	2,900	1,250	2,400	1,010	2,200	900	
		40	0.153	2,800	1,190	2,800	1,080	2,000	690	1,700	570	1,500	490	
	1	24	0.174	4,000	2,130	4,000	1,920	2,900	1,250	2,400	1,010	2,200	900	
		40	0.157	2,800	1,190	2,800	1,080	2,000	690	1,700	570	1,500	490	
	2	24	0.179	4,000	2,130	4,000	1,920	2,900	1,250	2,400	1,010	2,200	900	
		40	0.162	2,800	1,190	2,800	1,080	2,000	690	1,700	570	1,500	490	
		0.2	30	0.165	3,200	2,130	3,200	1,920	2,300	1,240	1,900	1,000	1,800	920
			50	0.148	2,200	1,170	2,200	1,060	1,600	690	1,300	550	1,200	490
		0.5	30	0.204	3,200	2,130	3,200	1,920	2,300	1,240	1,900	1,000	1,800	920
			50	0.184	2,200	1,170	2,200	1,060	1,600	690	1,300	550	1,200	490
		1	30	0.209	3,200	2,130	3,200	1,920	2,300	1,240	1,900	1,000	1,800	920
			50	0.188	2,200	1,170	2,200	1,060	1,600	690	1,300	550	1,200	490
2		30	0.215	3,200	2,130	3,200	1,920	2,300	1,240	1,900	1,000	1,800	920	
		50	0.194	2,200	1,170	2,200	1,060	1,600	690	1,300	550	1,200	490	
		0.2	36	0.165	2,700	2,150	2,700	1,940	1,900	1,230	1,600	1,010	1,500	920
			60	0.148	1,900	1,210	1,900	1,090	1,400	730	1,100	550	1,000	490
		0.5	36	0.245	2,700	2,150	2,700	1,940	1,900	1,230	1,600	1,010	1,500	920
			60	0.220	1,900	1,210	1,900	1,090	1,400	730	1,100	550	1,000	490
	1	36	0.251	2,700	2,150	2,700	1,940	1,900	1,230	1,600	1,010	1,500	920	
		60	0.226	1,900	1,210	1,900	1,090	1,400	730	1,100	550	1,000	490	
	2	36	0.258	2,700	2,150	2,700	1,940	1,900	1,230	1,600	1,010	1,500	920	
		60	0.233	1,900	1,210	1,900	1,090	1,400	730	1,100	550	1,000	490	

- a_p is shown as the criteria for hardened steel (45-55HRC). For other materials than hardened steel (45-55HRC), adjust the cutting depth according to the cutting depth factors in the above table.
- When performing cutting where cutting chips may cause clogging, such as for rib cutting, blind grooves, etc., the cutting depth setting should be set by multiplying a_p by a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
- Adjust by setting a_e to (5 or less) \times (a_p) \times (cutting depth ratio). For finishing cutting, calculate the theoretical cusp height and set accordingly.
- The recommended slope entrance angle when engraving is 1° or less. Adjust the feed rate to 70% or less of values presented in the cutting condition table.
- When slotting such engraving letters, adjust the feed rate to 50% or less and a_p to 30% or less of the values shown. We recommend reciprocal cutting.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDRH4080-24-02-TH tool:
 Cutting depth = 0.150 (a_p) \times 1 (cutting depth factor for hardened steel [45-55HRC]) \times 0.8 (for closed-area cutting) = 0.120mm

[Note]

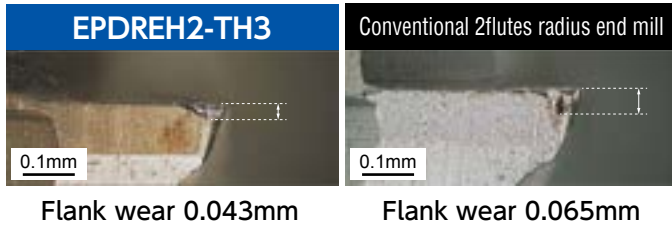
- Use the appropriate coolant for the work material and machining shape.
- These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
- If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Field data



Tool wear after 66 minutes of machining PD613 (58 HRC)

2 Flutes

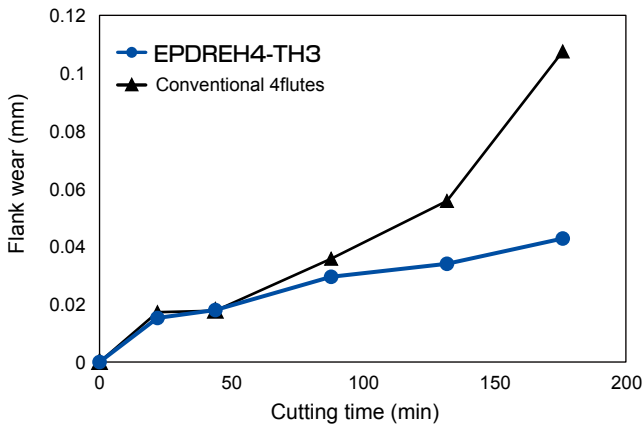


Tool size : $\phi 0.8$ (RE0.05) Under neck length 2mm
 Work material : PD613(58HRC)
 Machine : Vertical MC (HSK-F63)
 Cutting method : Contour pocketing (Pocket size : $10 \times 10 \times 0.5$ mm)
 Cutting conditions : $n=23,000\text{min}^{-1}$ ($v_c=58\text{m/min}$)
 $v_f=700\text{mm/min}$ ($f_z=0.015\text{mm/t}$)
 $a_p 0.02\text{mm}$ $a_e 0.16\text{mm}$ Mist blow



Tool wear after 176 minutes of machining STAVAX (51 HRC)

4 Flutes

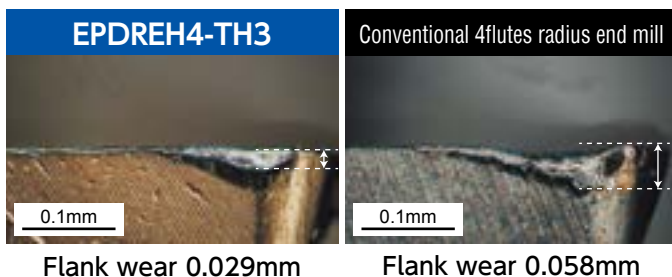


Tool size : $\phi 3$ (RE0.1) Under neck length 12mm
 Work material : STAVAX(51HRC)
 Machine : Vertical MC (HSK-A63)
 Cutting method : Bottom face cutting
 Cutting conditions : $n=11,000\text{min}^{-1}$ ($v_c=104\text{m/min}$)
 $v_f=1,600\text{mm/min}$ ($f_z=0.036\text{mm/t}$)
 $a_p 0.08\text{mm}$ $a_e 0.8\text{mm}$ Mist blow



Tool wear after 60 minutes of machining VANADIS23 (62 HRC)

4 Flutes



Tool size : $\phi 1$ (RE0.1) Under neck length 8mm
 Work material : VANADIS23(62HRC)
 Machine : Vertical MC (HSK-E32)
 Cutting method : Bottom face cutting
 Cutting conditions : $n=10,000\text{min}^{-1}$ ($v_c=31\text{m/min}$)
 $v_f=650\text{mm/min}$ ($f_z=0.016\text{mm/t}$)
 $a_p 0.005\text{mm}$ $a_e 0.2\text{mm}$ Mist blow

Offers wear resistance superior to conventional tools when machining high hardened steel



Comparison of vertical wall machining accuracy: PD613 (58 HRC)

2 Flutes

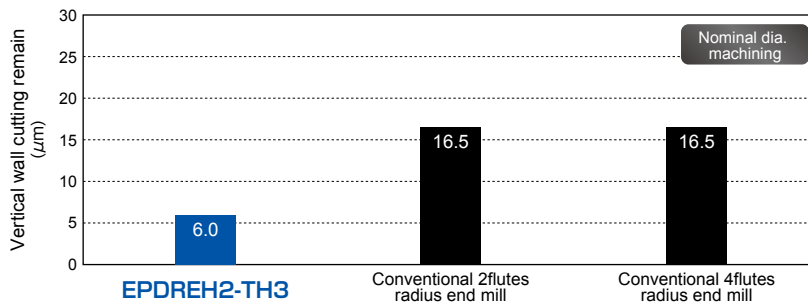
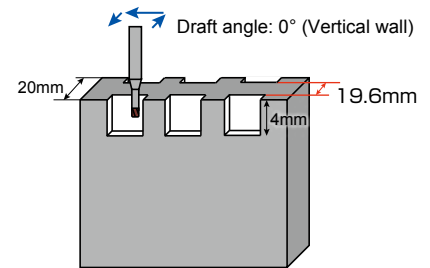


Figure Machining shape



Finishing time: 10 mins

Tool size : $\phi 0.8$ (RE0.2) Under neck length 4mm
 Work material : PD613(58HRC) Machine : Vertical MC (HSK-E25)
 Cutting conditions : $n=23,000\text{min}^{-1}$ ($v_c=57.8\text{m/min}$)
 $v_f=600\text{mm/min}$ (2flutes $f_z=0.013\text{mm/t}$, 4flutes $f_z=0.0065\text{mm/t}$)
 $a_p 0.015\text{mm}$ $a_e 0.05\text{mm}$ Mist blow

Reduces cutting remain by approx. 60% compared to conventional tools



Bottom face finishing example

2 Flutes



Tool size : $\phi 1$ (RE0.2) Under neck length 2mm
 Work material : STAVAX(52HRC)
 Machine : Vertical MC (HSK-E32)
 Cutting conditions :
 $n=40,000\text{min}^{-1}$ ($v_c=125\text{m/min}$)
 $v_f=400\text{mm/min}$ ($f_z=0.005\text{mm/t}$)
 $a_p 0.005\text{mm}$ $a_e 0.005\text{mm}$
 Water base Wet

Maintains a smooth high-quality surface even after 11 hours of continuous milling

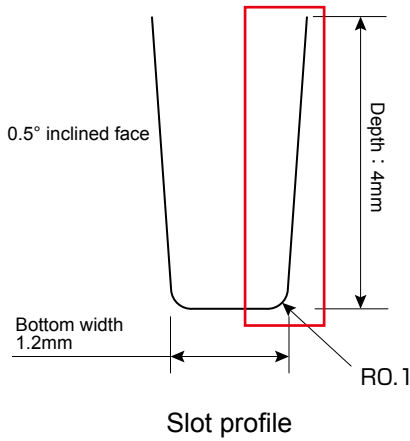
The machining conditions can be adjusted to achieve an even higher quality machined face

Field data

Deep slot machining example

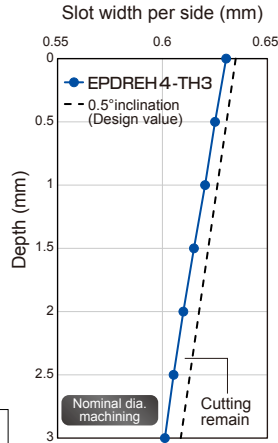
4 Flutes

Contour finishing, deep slot profile, work material: SKD11 (60 HRC), machining time: 30 mins



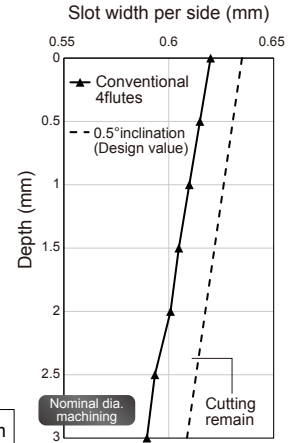
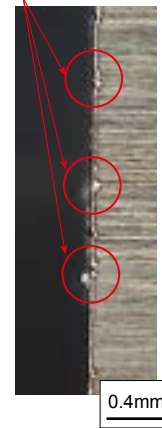
EPDREH4-TH3

No burrs



Conventional 4flutes radius end mill

Burrs



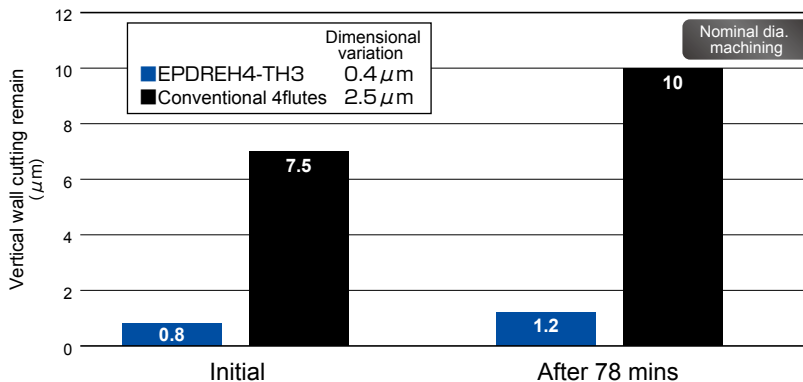
Tool size : $\phi 1$ (RE0.1) Under neck length 4mm Work material : SKD11(60HRC) Machine : Vertical MC (HSK-E25)
Cutting conditions : $n=18,200\text{min}^{-1}$ ($v_c=57\text{m/min}$) $v_f=1,310\text{mm/min}$ ($f_z=0.018\text{mm/t}$) $a_p 0.04\text{mm}$ $a_e 0.2\text{mm}$ Air blow

Deep slots can be machined with precision and without burrs

Vertical wall finishing example

4 Flutes

Vertical wall finishing, contour milling, work material: STAVAX, total finishing time: 78 mins



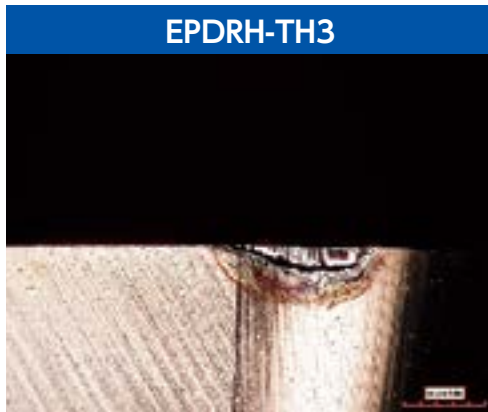
Process	Tools	Tool dia.	Corner radius RE	Revolution n (min^{-1})	Cutting speed v_c (m/min)	Feed rate v_f (mm/min)	Feed per tooth f_z (mm/t)	a_p (mm)	Finishing allowance (mm)	Coolant
Semi-finishing	EPDREH4010-3-01-TH3	1	0.1	25,000	79	600	0.006	0.04	0.01	Mist blow
Finishing	EPDREH4010-3-01-TH3	1	0.1	25,000	79	300	0.003	0.03	0	Mist blow

Offers high-accuracy machining with dimensional variation of just 0.4 μm after 1 hour of finishing machining



Tool wear after 100 minutes of machining SLD (60 HRC)

4 Flutes



Flank wear 0.154mm



Broken

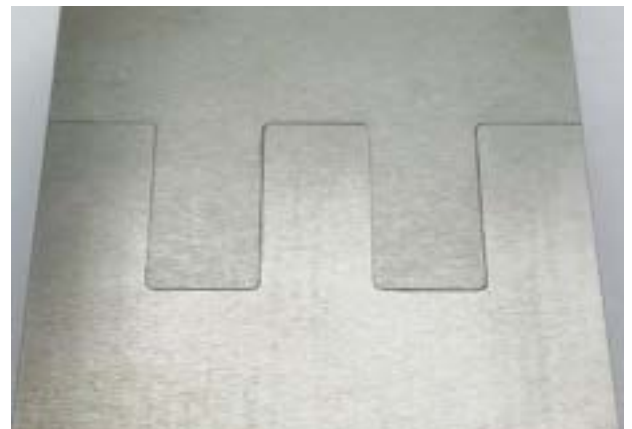
Tool size : $\phi 12$ (RE2) Under neck length 36mm Work material : SLD(60HRC) Machine : Vertical MC (HSK-F63)
 Cutting method : Bottom face cutting Coolant : Air-blow
 Cutting conditions : $n=3,050\text{min}^{-1}$ ($v_c=115\text{m/min}$) $v_f=1,950\text{mm/min}$ ($f_z=0.16\text{mm/t}$) $a_p 0.175\text{mm}$ $a_e 3\text{mm}$

Offers wear resistance superior to conventional tools when machining high hardened steel



High-precision finishing example of vertical walls and bottom surfaces

4 Flutes



Good fit with vertical wall tilt of 5 μm or less

Tool size : $\phi 8$ (RE0.5) Under neck length 24mm Work material : HPM38(52HRC) Machine : MC Vertical MC (HSK-F63)
 Cutting conditions : $n=6,000\text{min}^{-1}$ ($v_c=151\text{m/min}$) $v_f=2,000\text{mm/min}$ ($f_z=0.083\text{mm/t}$)
 XY pick feed : 0.05mm Z pick feed : 0.045mm Finishing allowance : 0.05mm Water-soluble

Ideal for machining sliding parts that require high-precision vertical walls, such as inserts and pin holes!



The diagrams and table data are examples of test results, and are not guaranteed values.

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Attentions on Safety

1. Cautions regarding handling

- (1) When removing the tool from its case (packaging), be careful that the tool does not pop out or is dropped. Be particularly careful regarding contact with the tool flutes.
- (2) When handling tools with sharp cutting flutes, be careful not to touch the cutting flutes directly with your bare hands.

2. Cautions regarding mounting

- (1) Before use, check the outside appearance of the tool for scratches, cracks, etc. and that it is firmly mounted in the collet chuck, etc.
- (2) If abnormal chattering, etc. occurs during use, stop the machine immediately and remove the cause of the chattering.

3. Cautions during use

- (1) Before use, confirm the dimensions and direction of rotation of the tool and milling work material.
- (2) The numerical values in the standard cutting conditions table should be used as criteria when starting new work. The cutting conditions should be adjusted as appropriate when the cutting depth is large, the rigidity of the machine being used is low, or according to the conditions of the work material.
- (3) Cutting tools are made of a hard material. During use, they may break and fly off. In addition, cutting chips may also fly off. Since there is a danger of injury to workers, fire, or eye damage from such flying pieces, a safety cover should be attached when work is performed and safety equipment such as safety goggles should be worn to create a safe environment for work.
- (4) There is a risk of fire or inflammation due to sparks, heat due to breakage, and cutting chips. Do not use where there is a risk of fire or explosion. **Please caution of fire while using oil base coolant, fire prevention is necessary.**
- (5) Do not use the tool for any purpose other than that for which it is intended.

4. Cautions regarding regrinding

- (1) If regrinding is not performed at the proper time, there is a risk of the tool breaking. Replace the tool with one in good condition, or perform regrinding.
- (2) Grinding dust will be created when regrinding a tool. When regrinding, be sure to attach a safety cover over the work area and wear safety clothes such as safety goggles, etc.
- (3) This product contains the specified chemical substance cobalt and its inorganic compounds. When performing regrinding or similar processing, be sure to handle the processing in accordance with the local laws and regulations regarding prevention of hazards due to specified chemical substances.

MOLDINO Tool Engineering, Ltd.


Head Office
Hulic Ryogoku Bldg. 8F, 4-31-11, Ryogoku, Sumida-ku, Tokyo, Japan 130-0026
International Sales Dept. : TEL +81-3-6890-5103 FAX +81-3-6890-5128

Official Web Site

<https://www.moldino.com/en/>

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Search Web 

Europe **MOLDINO Tool Engineering Europe GmbH**
Itterpark 12, 40724 Hilden, Germany.
Tel +49-(0)2103-24820 Fax +49-(0)2103-248230

America **MITSUBISHI MATERIALS U.S.A. CORPORATION**
Detroit office c/o RFM Inc. Customer service
2001 Orndorf Drive, Brighton, MI 48116 U.S.A.
Tel +1(248) 308-2620 Fax +1(248) 308-2627

Mexico **MITSUBISHI MATERIALS MÉXICO S.A. DE C.V.**
Av. La Cañada No.16, Parque Industrial Bernardo Quintana, El Marques, Querétaro, CP 76246, México
Tel +52-442-1926800

Brazil **MITSUBISHI MATERIALS BRASIL LTDA.**
Rua Cincinato Braga, 340 13º andar, Bela Vista – CEP 01333-010 São Paulo – SP., Brasil
Tel +55(11)3506-5600 Fax +55(11)3506-5677

Thailand **MITSUBISHI MATERIALS (THAILAND) CO., LTD.**
139/3 Moo 2, Tambon Khlong Chik, Amphoe Bang Pa-in,
Phra Nakhon Si Ayutthaya 13160, Thailand
Tel +66-3525-8024

India **Mitsubishi Materials India Private Limited**
H.O.: Prasad Enclave, #118/119, 1st Floor, 2nd Stage, 5th main, BBMP Ward #11, (New #38),
Industrial Suburb, Yeshwanthpura, Bengaluru, 560 022, Karnataka, India.
Tel +91-80-2204-3600

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