NEW

MOLDINO
The Edge To Innovation

Radius End Mill for Hardened Steel

EPDREH-TH3

Epoch Deep Radius Evolution Hard-TH3

Lineup ranges from ϕ0.2 to ϕ1 for 2-flute version and ϕ1 to ϕ6 for 4-flute version

MOLDINO Tool Engineering, Ltd.

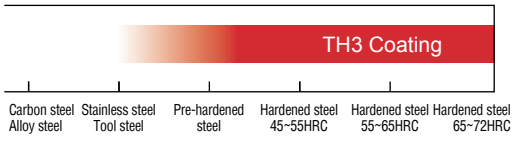
New Product News | No. H2203A-1 | 2022-01

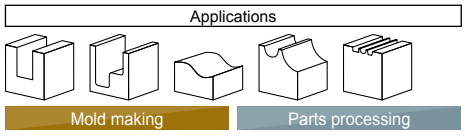
Small-radius deep-milling radius end mill for hardened steel

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

Features of EPDREH-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	φ0.2～φ1 [53 Items] (Corner Radius R0.02～R0.2)
4 Flutes	φ1～φ6 [266 Items] (Corner Radius R0.02～R1.0)

Task

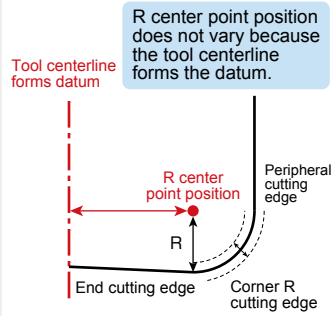
High-precision milling is required, but that requires measuring the actual tool diameter of each tool.

Point

The corner radius of the tool is ground off of the tool centerline, instead of the outside diameter of the tool.

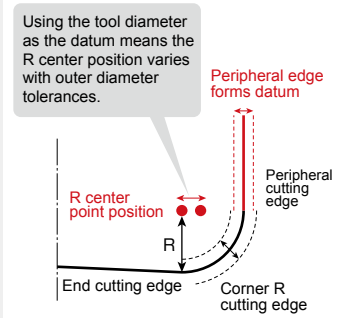
High-precision corner radius

EPDREH-TH3 (tool centerline datum)



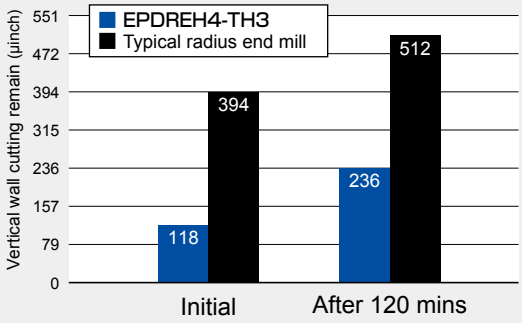
Impact on tool precision
= Radius variations

Typical radius end mill (tool diameter datum)



Impact on tool precision
= Variations in tool diameter + Radius variations

Comparison between cutting remain for vertical wall milling using nominal diameter



【Cutting conditions】

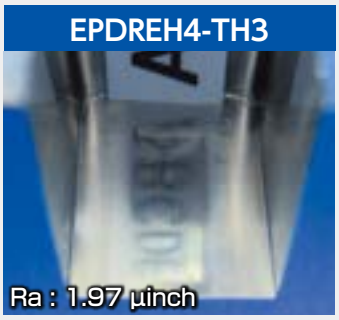
Tool dia : φ1×R0.1 (DC .039 inch x R .004 inch)
No. of flutes : 4flutes
Cutting speed : v_c = 216 SFM Feed per tooth : f_z = .0008 IPT
Depth of cut : a_p × a_e = .0008x.0008 inch
Work material : STAVAX(52HRC) Coolant : Mist blow

Task

Mill surface is uneven when milling for extended periods of time, which then requires polishing time.

Point

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



【Cutting conditions】

Bottom face finishing
Tool dia. : φ3×R0.1 (DC .118 inch × R .004 inch)
No. of flutes : 4flutes
Cutting speed : v_c = 430 SFM
Feed per tooth : f_z = .001 IPT
Depth of cut : a_p × a_e = .001x.002 inch
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 an automated operation.
With direct milling of hardened steel, the tool life is inconsistent.

Point

The tools combine a carbide based material designed fro hardened steel machining along with the TH3 Coating.
This combination improves the wear resistance and allows for longer machining times compared to conventional tools.

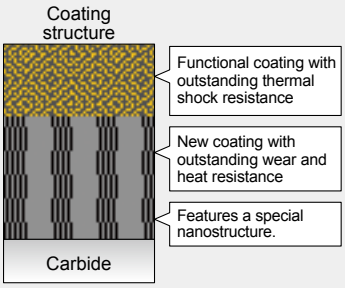
TH3 Coating

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



Less damage after 11 hours of finish processing

Tool photo after use

Flank wear : .0002 inch (0.005mm)

【Cutting conditions】

Tool dia : φ2×R0.1
(DC .079 inch × RE .004 inch)
Under neck length : .079 inch (2mm)
No. of flutes : 2 flutes
Work material : STAVAX(52HRC)
Cutting speed : v_c =410 SFM
Feed per tooth : f_z =.0002 IPT
Depth of cut : a_p×a_e=.0002x.0002 inch
Coolant : Air blow

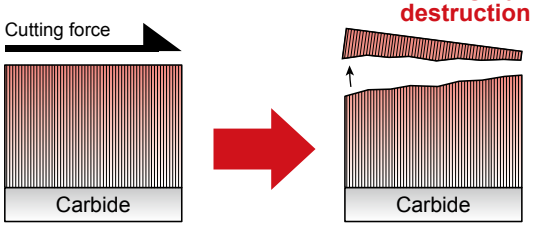
Cutting time : 11Hours

⇒Finished surface is posted on page 44

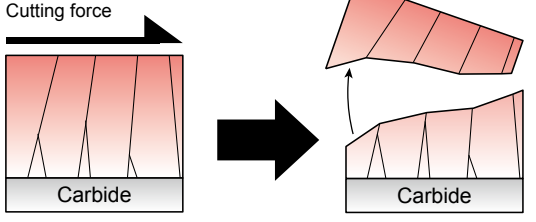
! Point

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)						
	φ0.2	φ0.3	φ0.4	φ0.5	φ0.6	φ0.8	φ1.0
0.02	●	●	●	●	●	●	●
0.05	●	●	●	●	●	●	●
0.1			●	●	●	●	●
0.2							
0.3							

■ Tool diameter/under neck length

Under neck length (mm)	Tool dia.(mm)						
	φ0.2	φ0.3	φ0.4	φ0.5	φ0.6	φ0.8	φ1.0
0.5	●						
1	●	●	●	●			
2		●	●	●	●	●	●
3				●			
4					●	●	●
6							●
8							●

4 Flutes EPDREH4

■ Tool diameter/corner radius

Corner radius (mm)	Tool dia.(mm)						
	φ1.0	φ1.5	φ2	φ3	φ4	φ5	φ6
0.02	●	●	●				
0.05	●	●	●	●			
0.1	●	●	●	●	●	●	●
0.2	●	●	●	●	●	●	●
0.3	●	●	●	●	●	●	●
0.5		●	●	●	●	●	●
1					●	●	●

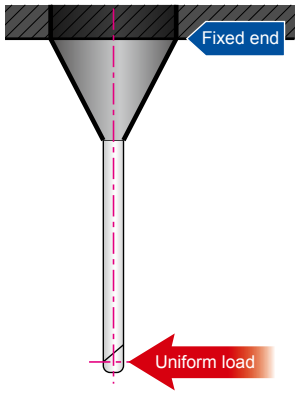
■ Tool diameter/under neck length

Under neck length (mm)	Tool dia.(mm)						
	φ1.0	φ1.5	φ2	φ3	φ4	φ5	φ6
1.5	●						
2	●	●					
2.5	●		●				
3	●	●	●				
4	●	●	●	●			
5	●	●	●				
6	●	●	●	●			
8	●	●	●	●	●		
10		●	●	●	●	●	
12		●	●	●	●		●
14				●	●		
15						●	
16				●	●		
18				●	●		●
20				●	●	●	
22					●		
24					●		●
25						●	
30							●

● : Inventory maintained in US ★ : Inventory maintained in Japan

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 .079 inch (2mm) is stiffer (1.61/0.36 = 4.47 times stiffer) than under neck .157 inch (4mm)

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			
	14				0.68			
	16				0.97			
	18				1.34			
	20				1.78			
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

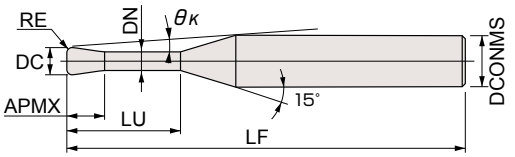
Line Up

2 Flutes

Radius

2 Flutes

Corner radius tolerance : ±0.005 (centerline datum)



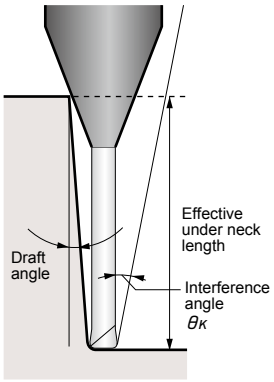
※The 2-flute tool uses a backdraft profile (with strong back taper).

EPDREH2○○○-○.○-○○○-TH3

Carbide TH3 72 HRC Helix 30 h4

Item code	Stock	Size(mm)							Interference angle θκ (°)	Effective under neck length with respect to draft angle				
		Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS		0.5°	1°	1.5°	2°	3°
EPDREH2002-0.5-002-TH3	●	0.2 (.008inch)	0.02 (.001inch)	0.5 (.020inch)	0.15	0.17	50	4	13.99	0.57	0.59	0.61	0.63	0.68
EPDREH2002-1-002-TH3	●			1 (.039inch)					13.16	1.09	1.12	1.16	1.21	1.30
EPDREH2002-0.5-005-TH3	●		0.05 (.002inch)	0.5 (.020inch)					14.05	0.57	0.59	0.61	0.63	0.67
EPDREH2002-1-005-TH3	●			1 (.039inch)					13.21	1.08	1.12	1.16	1.20	1.30
EPDREH2003-1-002-TH3	●	0.3 (.012inch)	0.02 (.001inch)	1 (.039inch)	0.25	0.27	50	4	13.12	1.09	1.12	1.16	1.21	1.30
EPDREH2003-2-002-TH3	●			2 (.079inch)					11.70	2.12	2.19	2.27	2.36	2.55
EPDREH2003-1-005-TH3	●		0.05 (.002inch)	1 (.039inch)					13.17	1.08	1,12	1.16	1.20	1.30
EPDREH2003-2-005-TH3	●			2 (.079inch)					11.73	2.12	2.19	2.27	2.35	2.54
EPDREH2004-1-002-TH3	●	0.4 (.016inch)	0.02 (.001inch)	1 (.039inch)	0.3	0.37	50	4	13.07	1.09	1.12	1.16	1.21	1.30
EPDREH2004-2-002-TH3	●			2 (.079inch)					11.62	2.12	2.19	2.27	2.36	2.55
EPDREH2004-1-005-TH3	●		0.05 (.002inch)	1 (.039inch)					13.12	1.08	1.12	1.16	1.20	1.30
EPDREH2004-2-005-TH3	●			2 (.079inch)					11.66	2.12	2.19	2.27	2.35	2.54
EPDREH2004-1-01-TH3	●		0.1 (.004inch)	1 (.039inch)					13.21	1.08	1.12	1.15	1.19	1.28
EPDREH2004-2-01-TH3	●			2 (.079inch)					11.73	2.12	2.19	2.26	2.34	2.53
EPDREH2005-1-002-TH3	●	0.5 (.020inch)	0.02 (.001inch)	1 (.039inch)	0.35	0.47	50	4	13.03	1.09	1.12	1.16	1.21	1.30
EPDREH2005-2-002-TH3	●			2 (.079inch)					11.55	2.12	2.19	2.27	2.36	2.55
EPDREH2005-3-002-TH3	●			3 (.118inch)					10.37	3.15	3.26	3.38	3.51	3.79
EPDREH2005-1-005-TH3	●		0.05 (.002inch)	1 (.039inch)					13.08	1.08	1.12	1.16	1.20	1.30
EPDREH2005-2-005-TH3	●			2 (.079inch)					11.59	2.12	2.19	2.27	2.35	2.54
EPDREH2005-3-005-TH3	●			3 (.118inch)					10.40	3.15	3.26	3.38	3.50	3.78
EPDREH2005-1-01-TH3	●		0.1 (.004inch)	1 (.039inch)					13.16	1.08	1.12	1.15	1.19	1.28
EPDREH2005-2-01-TH3	●			2 (.079inch)					11.66	2.12	2.19	2.26	2.34	2.53
EPDREH2005-3-01-TH3	●			3 (.118inch)					10.46	3.15	3.26	3.37	3.49	3.77
EPDREH2006-2-002-TH3	●	0.6 (.024inch)	0.02 (.001inch)	2 (.079inch)	0.4	0.57	50	4	11.47	2.12	2.19	2.27	2.36	2.55
EPDREH2006-4-002-TH3	●			4 (.157inch)					9.31	4.19	4.33	4.49	4.66	5.03
EPDREH2006-2-005-TH3	●		0.05 (.002inch)	2 (.079inch)					11.51	2.12	2.19	2.27	2.35	2.54
EPDREH2006-4-005-TH3	●			4 (.157inch)					9.33	4.19	4.33	4.48	4.65	5.03
EPDREH2006-2-01-TH3	●		0.1 (.004inch)	2 (.079inch)					11.58	2.12	2.19	2.26	2.34	2.53
EPDREH2006-4-01-TH3	●			4 (.157inch)					9.38	4.18	4.33	4.48	4.64	5.01
EPDREH2008-2-002-TH3	●	0.8 (.031inch)	0.02 (.001inch)	2 (.079inch)	0.5	0.77	50	4	11.30	2.12	2.19	2.27	2.36	2.55
EPDREH2008-4-002-TH3	●			4 (.157inch)					9.09	4.19	4.33	4.49	4.66	5.03
EPDREH2008-2-005-TH3	●		0.05 (.002inch)	2 (.079inch)					11.35	2.12	2.19	2.27	2.35	2.54
EPDREH2008-4-005-TH3	●			4 (.157inch)					9.12	4.19	4.33	4.48	4.65	5.03
EPDREH2008-2-01-TH3	●		0.1 (.004inch)	2 (.079inch)					11.42	2.12	2.19	2.26	2.34	2.53
EPDREH2008-4-01-TH3	●			4 (.157inch)					9.16	4.18	4.33	4.48	4.64	5.01
EPDREH2008-2-02-TH3	●		0.2 (.008inch)	2 (.079inch)					11.56	2.11	2.18	2.25	2.33	2.50
EPDREH2008-4-02-TH3	●			4 (.157inch)					9.25	4.18	4.32	4.47	4.63	4.99

● : Inventory maintained in US ★ : Inventory maintained in Japan



【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○○○-○.○-○○○-TH3

Item code	Stock	Size(mm)							Interference angle θK (°)	Effective under neck length with respect to draft angle				
		Tool dia.	Corner radius	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.						
		DC	RE	LU	APMX	DN	LF	DCONMS		0.5°	1°	1.5°	2°	3°
EPDREH2010-2-002-TH3	●	1 (.039inch)	0.02 (.001inch)	2 (.079inch)	0.8	0.94	50	4	11.04	2.18	2.25	2.33	2.42	2.62
EPDREH2010-4-002-TH3	●			4 (.157inch)					8.80	4.24	4.39	4.55	4.72	5.10
EPDREH2010-6-002-TH3	●			6 (.236inch)					7.32	6.31	6.53	6.77	7.02	7.59
EPDREH2010-8-002-TH3	●			8 (.315inch)					6.26	8.38	8.67	8.98	9.32	10.07
EPDREH2010-2-005-TH3	●		0.05 (.002inch)	2 (.079inch)					11.08	2.18	2.25	2.33	2.42	2.61
EPDREH2010-4-005-TH3	●			4 (.157inch)					8.83	4.24	4.39	4.55	4.72	5.09
EPDREH2010-6-005-TH3	●			6 (.236inch)					7.34	6.31	6.53	6.76	7.02	7.58
EPDREH2010-8-005-TH3	●			8 (.315inch)					6.27	8.38	8.67	8.98	9.32	10.07
EPDREH2010-2-01-TH3	●		0.1 (.004inch)	2 (.079inch)					11.16	2.17	2.25	2.33	2.41	2.60
EPDREH2010-4-01-TH3	●			4 (.157inch)					8.88	4.24	4.39	4.54	4.71	5.08
EPDREH2010-6-01-TH3	●			6 (.236inch)					7.37	6.31	6.53	6.76	7.01	7.57
EPDREH2010-8-01-TH3	●			8 (.315inch)					6.29	8.38	8.67	8.97	9.31	10.06
EPDREH2010-2-02-TH3	●		0.2 (.008inch)	2 (.079inch)					11.30	2.17	2.24	2.31	2.39	2.57
EPDREH2010-4-02-TH3	●			4 (.157inch)					8.97	4.24	4.38	4.53	4.69	5.06
EPDREH2010-6-02-TH3	●			6 (.236inch)					7.43	6.31	6.52	6.75	6.99	7.55
EPDREH2010-8-02-TH3	●			8 (.315inch)					6.34	8.37	8.66	8.96	9.29	10.03

For detailed information on the EPDREH2 cutting conditions, refer to pages 15, 16, 17, 18, 29, 30, 31 and 32.

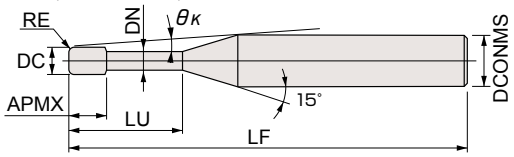
Line Up

4 Flutes

Radius

4 Flutes

Corner radius tolerance : ±0.005 (centerline datum)

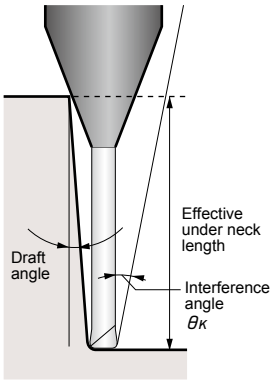


EPDREH4○○○-○.○-○○○-TH3

Carbide TH3 72 HRC Helix 30° h4 DCONMS=4 h5 DCONMS=6

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						
EPDREH4010-1.5-002-TH3	●	1 (.039inch)	0.02 (.001inch)	1.5 (.059inch)	0.6	0.96	50	4	11.85	1.62	1.68	1.74	1.80	1.95
EPDREH4010-2-002-TH3	●			2 (.079inch)					11.09	2.14	2.21	2.29	2.38	2.57
EPDREH4010-2.5-002-TH3	●			2.5 (.098inch)					10.43	2.66	2.75	2.85	2.95	3.19
EPDREH4010-3-002-TH3	●			3 (.118inch)					9.84	3.17	3.28	3.40	3.53	3.81
EPDREH4010-4-002-TH3	●			4 (.157inch)					8.84	4.21	4.35	4.51	4.68	5.06
EPDREH4010-5-002-TH3	●			5 (.197inch)					8.02	5.24	5.42	5.62	5.83	6.30
EPDREH4010-6-002-TH3	●			6 (.236inch)					7.34	6.27	6.49	6.73	6.98	7.54
EPDREH4010-8-002-TH3	●			8 (.315inch)					6.27	8.34	8.63	8.94	9.28	10.03
EPDREH4010-1.5-005-TH3	●		0.05 (.002inch)	1.5 (.059inch)					11.90	1.62	1.68	1.73	1.80	1.94
EPDREH4010-2-005-TH3	●			2 (.079inch)					11.14	2.14	2.21	2.29	2.37	2.56
EPDREH4010-2.5-005-TH3	●			2.5 (.098inch)					10.47	2.65	2.75	2.84	2.95	3.18
EPDREH4010-3-005-TH3	●			3 (.118inch)					9.87	3.17	3.28	3.40	3.52	3.81
EPDREH4010-4-005-TH3	●			4 (.157inch)					8.87	4.21	4.35	4.51	4.67	5.05
EPDREH4010-5-005-TH3	●			5 (.197inch)					8.04	5.24	5.42	5.61	5.82	6.29
EPDREH4010-6-005-TH3	●			6 (.236inch)					7.36	6.27	6.49	6.72	6.97	7.53
EPDREH4010-8-005-TH3	●			8 (.315inch)					6.29	8.34	8.63	8.94	9.27	10.02
EPDREH4010-1.5-01-TH3	●		0.1 (.004inch)	1.5 (.059inch)					11.98	1.62	1.67	1.73	1.79	1.93
EPDREH4010-2-01-TH3	●			2 (.079inch)					11.21	2.14	2.21	2.28	2.37	2.55
EPDREH4010-2.5-01-TH3	●			2.5 (.098inch)					10.53	2.65	2.74	2.84	2.94	3.17
EPDREH4010-3-01-TH3	●			3 (.118inch)					9.93	3.17	3.28	3.39	3.52	3.79
EPDREH4010-4-01-TH3	●			4 (.157inch)					8.91	4.20	4.35	4.50	4.67	5.04
EPDREH4010-5-01-TH3	●			5 (.197inch)					8.08	5.24	5.42	5.61	5.82	6.28
EPDREH4010-6-01-TH3	●			6 (.236inch)					7.39	6.27	6.49	6.72	6.97	7.52
EPDREH4010-8-01-TH3	●			8 (.315inch)					6.31	8.34	8.63	8.93	9.26	10.01
EPDREH4010-1.5-02-TH3	●		0.2 (.008inch)	1.5 (.059inch)					12.15	1.62	1.67	1.72	1.78	1.91
EPDREH4010-2-02-TH3	●			2 (.079inch)					11.36	2.13	2.20	2.27	2.35	2.53
EPDREH4010-2.5-02-TH3	●			2.5 (.098inch)					10.66	2.65	2.74	2.83	2.93	3.15
EPDREH4010-3-02-TH3	●			3 (.118inch)					10.04	3.17	3.27	3.38	3.50	3.77
EPDREH4010-4-02-TH3	●			4 (.157inch)					9.00	4.20	4.34	4.49	4.65	5.01
EPDREH4010-5-02-TH3	●			5 (.197inch)					8.16	5.23	5.41	5.60	5.80	6.26
EPDREH4010-6-02-TH3	●			6 (.236inch)					7.45	6.27	6.48	6.71	6.95	7.50
EPDREH4010-8-02-TH3	●			8 (.315inch)					6.36	8.33	8.62	8.92	9.25	9.99
EPDREH4010-1.5-03-TH3	●		0.3 (.012inch)	1.5 (.059inch)					12.32	1.61	1.66	1.71	1.76	1.88
EPDREH4010-2-03-TH3	●			2 (.079inch)					11.51	2.13	2.19	2.26	2.34	2.50
EPDREH4010-2.5-03-TH3	●			2.5 (.098inch)					10.79	2.65	2.73	2.82	2.91	3.12
EPDREH4010-3-03-TH3	●			3 (.118inch)					10.16	3.16	3.26	3.37	3.49	3.75
EPDREH4010-4-03-TH3	●			4 (.157inch)					9.10	4.20	4.33	4.48	4.64	4.99
EPDREH4010-5-03-TH3	●			5 (.197inch)					8.23	5.23	5.40	5.59	5.79	6.23
EPDREH4010-6-03-TH3	●			6 (.236inch)					7.52	6.26	6.47	6.70	6.94	7.48
EPDREH4010-8-03-TH3	●			8 (.315inch)					6.41	8.33	8.61	8.91	9.24	9.96

● : Inventory maintained in US ★ : Inventory maintained in Japan



【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						
EPDREH4015-2-002-TH3	●	1.5 (.059inch)	0.02 (.001inch)	2 (.079inch)	0.9	1.44	50	4	10.49	2.18	2.25	2.33	2.42	2.62
EPDREH4015-3-002-TH3	●			3 (.118inch)					9.16	3.21	3.32	3.44	3.57	3.86
EPDREH4015-4-002-TH3	●			4 (.157inch)					8.13	4.24	4.39	4.55	4.72	5.10
EPDREH4015-5-002-TH3	●			5 (.197inch)					7.31	5.28	5.46	5.66	5.87	6.35
EPDREH4015-6-002-TH3	●			6 (.236inch)					6.63	6.31	6.53	6.77	7.02	7.59
EPDREH4015-8-002-TH3	●			8 (.315inch)					5.60	8.38	8.67	8.98	9.32	10.07
EPDREH4015-10-002-TH3	●			10 (.394inch)					4.85	10.45	10.81	11.20	11.62	12.56
EPDREH4015-12-002-TH3	●			12 (.472inch)					4.27	12.51	12.95	13.42	13.92	15.05
EPDREH4015-2-005-TH3	●		0.05 (.002inch)	2 (.079inch)					10.53	2.18	2.25	2.33	2.42	2.61
EPDREH4015-3-005-TH3	●			3 (.118inch)					9.19	3.21	3.32	3.44	3.57	3.85
EPDREH4015-4-005-TH3	●			4 (.157inch)					8.16	4.24	4.39	4.55	4.72	5.09
EPDREH4015-5-005-TH3	●			5 (.197inch)					7.33	5.28	5.46	5.66	5.87	6.34
EPDREH4015-6-005-TH3	●			6 (.236inch)					6.65	6.31	6.53	6.76	7.02	7.58
EPDREH4015-8-005-TH3	●			8 (.315inch)					5.61	8.38	8.67	8.98	9.32	10.07
EPDREH4015-10-005-TH3	●			10 (.394inch)					4.86	10.45	10.81	11.20	11.61	12.55
EPDREH4015-12-005-TH3	●			12 (.472inch)					4.28	12.51	12.95	13.41	13.91	15.04
EPDREH4015-2-01-TH3	●		0.1 (.004inch)	2 (.079inch)					10.61	2.17	2.25	2.33	2.41	2.60
EPDREH4015-3-01-TH3	●			3 (.118inch)					9.25	3.21	3.32	3.43	3.56	3.84
EPDREH4015-4-01-TH3	●			4 (.157inch)					8.20	4.24	4.39	4.54	4.71	5.08
EPDREH4015-5-01-TH3	●			5 (.197inch)					7.37	5.28	5.46	5.65	5.86	6.33
EPDREH4015-6-01-TH3	●			6 (.236inch)					6.68	6.31	6.53	6.76	7.01	7.57
EPDREH4015-8-01-TH3	●			8 (.315inch)					5.64	8.38	8.67	8.97	9.31	10.06
EPDREH4015-10-01-TH3	●			10 (.394inch)					4.87	10.44	10.80	11.19	11.61	12.54
EPDREH4015-12-01-TH3	●			12 (.472inch)					4.29	12.51	12.94	13.41	13.91	15.03
EPDREH4015-2-02-TH3	●		0.2 (.008inch)	2 (.079inch)					10.77	2.17	2.24	2.31	2.39	2.57
EPDREH4015-3-02-TH3	●			3 (.118inch)					9.37	3.21	3.31	3.42	3.54	3.82
EPDREH4015-4-02-TH3	●			4 (.157inch)					8.30	4.24	4.38	4.53	4.69	5.06
EPDREH4015-5-02-TH3	●			5 (.197inch)					7.44	5.27	5.45	5.64	5.84	6.30
EPDREH4015-6-02-TH3	●			6 (.236inch)					6.74	6.31	6.52	6.75	6.99	7.55
EPDREH4015-8-02-TH3	●			8 (.315inch)					5.68	8.37	8.66	8.96	9.29	10.03
EPDREH4015-10-02-TH3	●			10 (.394inch)					4.91	10.44	10.80	11.18	11.59	12.52
EPDREH4015-12-02-TH3	●			12 (.472inch)					4.32	12.51	12.94	13.40	13.89	15.00
EPDREH4015-2-03-TH3	●		0.3 (.012inch)	2 (.079inch)					10.93	2.17	2.23	2.30	2.38	2.55
EPDREH4015-3-03-TH3	●			3 (.118inch)					9.50	3.20	3.30	3.41	3.53	3.79
EPDREH4015-4-03-TH3	●			4 (.157inch)					8.39	4.24	4.37	4.52	4.68	5.04
EPDREH4015-5-03-TH3	●			5 (.197inch)					7.52	5.27	5.44	5.63	5.83	6.28
EPDREH4015-6-03-TH3	●			6 (.236inch)					6.81	6.30	6.51	6.74	6.98	7.52
EPDREH4015-8-03-TH3	●			8 (.315inch)					5.73	8.37	8.65	8.95	9.28	10.01
EPDREH4015-10-03-TH3	●			10 (.394inch)					4.94	10.44	10.79	11.17	11.58	12.49
EPDREH4015-12-03-TH3	●			12 (.472inch)					4.34	12.50	12.93	13.39	13.88	14.98

For detailed information on the EPDREH4 ⌀1 to ⌀1.5 cutting conditions, refer to pages 19, 20, 24, 25, 33, 34, 38 and 39.

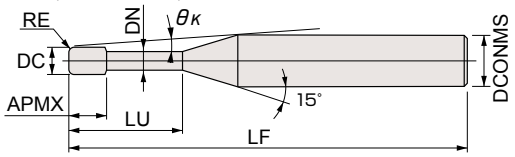
Line Up

4 Flutes

Radius

4 Flutes

Corner radius tolerance : ±0.005 (centerline datum)

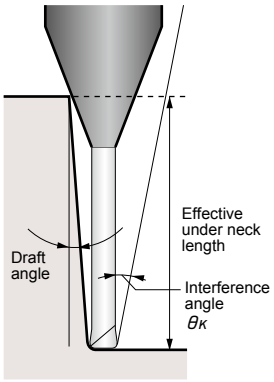


EPDREH4○○○-○.○-○○○-TH3

Carbide TH3 72 HRC Helix 30° h4 DCONMS=4 h5 DCONMS=6

Item code	Stock	Size(mm)							Interference angle θκ (°)	Effective under neck length with respect to draft angle				
		Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS		0.5°	1°	1.5°	2°	3°
EPDREH4015-2-05-TH3	●	1.5 (.059inch)	0.5 (.020inch)	2 (.079inch)	0.9	1.44	50	4	11.27	2.16	2.22	2.28	2.35	2.50
EPDREH4015-3-05-TH3	●			3 (.118inch)					9.75	3.19	3.29	3.39	3.50	3.75
EPDREH4015-4-05-TH3	●			4 (.157inch)					8.59	4.23	4.36	4.50	4.65	4.99
EPDREH4015-5-05-TH3	●			5 (.197inch)					7.68	5.26	5.43	5.61	5.80	6.23
EPDREH4015-6-05-TH3	●			6 (.236inch)					6.94	6.30	6.50	6.72	6.95	7.47
EPDREH4015-8-05-TH3	●			8 (.315inch)					5.82	8.36	8.64	8.93	9.25	9.96
EPDREH4015-10-05-TH3	●			10 (.394inch)					5.01	10.43	10.78	11.15	11.55	12.45
EPDREH4015-12-05-TH3	●			12 (.472inch)					4.40	12.50	12.92	13.37	13.85	14.93
EPDREH4020-2.5-002-TH3	●	2 (.079inch)	0.02 (.001inch)	2.5 (.098inch)	1.2	1.92	50	4	8.94	2.73	2.83	2.93	3.04	3.28
EPDREH4020-3-002-TH3	●			3 (.118inch)					8.30	3.25	3.36	3.48	3.61	3.91
EPDREH4020-4-002-TH3	●			4 (.157inch)					7.25	4.28	4.43	4.59	4.76	5.15
EPDREH4020-5-002-TH3	●			5 (.197inch)					6.44	5.32	5.50	5.70	5.91	6.39
EPDREH4020-6-002-TH3	●			6 (.236inch)					5.80	6.35	6.57	6.81	7.06	7.63
EPDREH4020-8-002-TH3	●			8 (.315inch)					4.82	8.42	8.71	9.02	9.36	10.12
EPDREH4020-10-002-TH3	●			10 (.394inch)					4.13	10.49	10.85	11.24	11.66	12.61
EPDREH4020-12-002-TH3	●			12 (.472inch)					3.61	12.55	12.99	13.46	13.96	15.09
EPDREH4020-2.5-005-TH3	●		0.05 (.002inch)	2.5 (.098inch)					8.98	2.73	2.83	2.93	3.03	3.28
EPDREH4020-3-005-TH3	●			3 (.118inch)					8.33	3.25	3.36	3.48	3.61	3.90
EPDREH4020-4-005-TH3	●			4 (.157inch)					7.28	4.28	4.43	4.59	4.76	5.14
EPDREH4020-5-005-TH3	●			5 (.197inch)					6.47	5.32	5.50	5.70	5.91	6.38
EPDREH4020-6-005-TH3	●			6 (.236inch)					5.81	6.35	6.57	6.80	7.06	7.63
EPDREH4020-8-005-TH3	●			8 (.315inch)					4.84	8.42	8.71	9.02	9.36	10.11
EPDREH4020-10-005-TH3	●			10 (.394inch)					4.14	10.48	10.85	11.24	11.66	12.60
EPDREH4020-12-005-TH3	●			12 (.472inch)					3.62	12.55	12.99	13.45	13.96	15.09
EPDREH4020-2.5-01-TH3	●		0.1 (.004inch)	2.5 (.098inch)					9.05	2.73	2.82	2.92	3.03	3.26
EPDREH4020-3-01-TH3	●			3 (.118inch)					8.39	3.25	3.36	3.47	3.60	3.89
EPDREH4020-4-01-TH3	●			4 (.157inch)					7.33	4.28	4.43	4.58	4.75	5.13
EPDREH4020-5-01-TH3	●			5 (.197inch)					6.50	5.31	5.50	5.69	5.90	6.37
EPDREH4020-6-01-TH3	●			6 (.236inch)					5.84	6.35	6.57	6.80	7.05	7.62
EPDREH4020-8-01-TH3	●			8 (.315inch)					4.86	8.42	8.71	9.02	9.35	10.10
EPDREH4020-10-01-TH3	●			10 (.394inch)					4.16	10.48	10.84	11.23	11.65	12.59
EPDREH4020-12-01-TH3	●			12 (.472inch)					3.63	12.55	12.98	13.45	13.95	15.07
EPDREH4020-2.5-02-TH3	●		0.2 (.008inch)	2.5 (.098inch)					9.19	2.73	2.82	2.91	3.01	3.24
EPDREH4020-3-02-TH3	●			3 (.118inch)					8.52	3.24	3.35	3.46	3.59	3.86
EPDREH4020-4-02-TH3	●			4 (.157inch)					7.42	4.28	4.42	4.57	4.74	5.11
EPDREH4020-5-02-TH3	●			5 (.197inch)					6.58	5.31	5.49	5.68	5.89	6.35
EPDREH4020-6-02-TH3	●			6 (.236inch)					5.90	6.34	6.56	6.79	7.04	7.59
EPDREH4020-8-02-TH3	●			8 (.315inch)					4.90	8.41	8.70	9.01	9.34	10.08
EPDREH4020-10-02-TH3	●			10 (.394inch)					4.19	10.48	10.84	11.22	11.64	12.56
EPDREH4020-12-02-TH3	●			12 (.472inch)					3.65	12.55	12.98	13.44	13.94	15.05

● : Inventory maintained in US ★ : Inventory maintained in Japan



【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 (.079inch)	0.3 (.012inch)	2.5 (.098inch)	1.2	1.92	50	4	9.34	2.72	2.81	2.90	3.00	3.22
EPDREH4020-3-03-TH3	●			3 (.118inch)					8.64	3.24	3.34	3.45	3.57	3.84
EPDREH4020-4-03-TH3	●			4 (.157inch)					7.52	4.27	4.41	4.56	4.72	5.08
EPDREH4020-5-03-TH3	●			5 (.197inch)					6.65	5.31	5.48	5.67	5.87	6.33
EPDREH4020-6-03-TH3	●			6 (.236inch)					5.96	6.34	6.55	6.78	7.02	7.57
EPDREH4020-8-03-TH3	●			8 (.315inch)					4.94	8.41	8.69	8.99	9.32	10.05
EPDREH4020-10-03-TH3	●			10 (.394inch)					4.22	10.48	10.83	11.21	11.62	12.54
EPDREH4020-12-03-TH3	●			12 (.472inch)					3.68	12.54	12.97	13.43	13.92	15.03
EPDREH4020-2.5-05-TH3	●		0.5 (.020inch)	2.5 (.098inch)					9.65	2.72	2.79	2.88	2.97	3.17
EPDREH4020-3-05-TH3	●			3 (.118inch)					8.91	3.23	3.33	3.43	3.54	3.79
EPDREH4020-4-05-TH3	●			4 (.157inch)					7.72	4.27	4.40	4.54	4.69	5.03
EPDREH4020-5-05-TH3	●			5 (.197inch)					6.81	5.30	5.47	5.65	5.84	6.28
EPDREH4020-6-05-TH3	●			6 (.236inch)					6.09	6.33	6.54	6.76	6.99	7.52
EPDREH4020-8-05-TH3	●			8 (.315inch)					5.03	8.40	8.68	8.97	9.29	10.01
EPDREH4020-10-05-TH3	●			10 (.394inch)					4.28	10.47	10.82	11.19	11.59	12.49
EPDREH4020-12-05-TH3	●			12 (.472inch)					3.72	12.54	12.96	13.41	13.89	14.98
EPDREH4030-4-005-TH3	●	3 (.118inch)	0.05 (.002inch)	4 (.157inch)	1.8	2.88	50	6	8.73	4.36	4.51	4.67	4.84	5.23
EPDREH4030-6-005-TH3	●			6 (.236inch)					7.27	6.43	6.65	6.89	7.14	7.72
EPDREH4030-8-005-TH3	●			8 (.315inch)			55		6.22	8.49	8.79	9.10	9.44	10.21
EPDREH4030-10-005-TH3	●			10 (.394inch)					5.44	10.56	10.93	11.32	11.74	12.69
EPDREH4030-12-005-TH3	●			12 (.472inch)			60		4.83	12.63	13.07	13.54	14.04	15.18
EPDREH4030-14-005-TH3	●			14 (.551inch)					4.34	14.70	15.21	15.75	16.34	17.67
EPDREH4030-16-005-TH3	●			16 (.630inch)					3.95	16.76	17.35	17.97	18.64	20.15
EPDREH4030-18-005-TH3	●			18 (.709inch)			65		3.62	18.83	19.49	20.19	20.94	22.64
EPDREH4030-20-005-TH3	●			20 (.787inch)					3.34	20.90	21.62	22.40	23.24	25.12
EPDREH4030-4-01-TH3	●		0.1 (.004inch)	4 (.157inch)			50		8.78	4.36	4.51	4.67	4.84	5.22
EPDREH4030-6-01-TH3	●			6 (.236inch)					7.30	6.43	6.65	6.88	7.14	7.71
EPDREH4030-8-01-TH3	●			8 (.315inch)			55		6.24	8.49	8.79	9.10	9.44	10.19
EPDREH4030-10-01-TH3	●			10 (.394inch)					5.45	10.56	10.92	11.32	11.74	12.68
EPDREH4030-12-01-TH3	●			12 (.472inch)			60		4.84	12.63	13.06	13.53	14.04	15.17
EPDREH4030-14-01-TH3	●			14 (.551inch)					4.35	14.69	15.20	15.75	16.34	17.65
EPDREH4030-16-01-TH3	●			16 (.630inch)					3.96	16.76	17.34	17.97	18.64	20.14
EPDREH4030-18-01-TH3	●			18 (.709inch)			65		3.62	18.83	19.48	20.18	20.94	22.63
EPDREH4030-20-01-TH3	●			20 (.787inch)					3.34	20.90	21.62	22.40	23.23	25.11
EPDREH4030-4-02-TH3	●		0.2 (.008inch)	4 (.157inch)			50		8.87	4.35	4.50	4.66	4.82	5.20
EPDREH4030-6-02-TH3	●			6 (.236inch)					7.36	6.42	6.64	6.87	7.12	7.68
EPDREH4030-8-02-TH3	●			8 (.315inch)			55		6.29	8.49	8.78	9.09	9.42	10.17
EPDREH4030-10-02-TH3	●			10 (.394inch)					5.49	10.56	10.92	11.30	11.72	12.66
EPDREH4030-12-02-TH3	●			12 (.472inch)			60		4.87	12.62	13.06	13.52	14.02	15.14
EPDREH4030-14-02-TH3	●			14 (.551inch)					4.38	14.69	15.20	15.74	16.32	17.63

For detailed information on the EPDREH4 ⌀1 to ⌀1.5 cutting conditions, refer to pages 20, 21, 25, 26, 34, 35, 39 and 40.

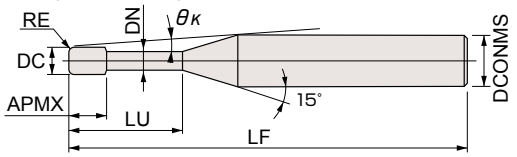
Line Up

4 Flutes

Radius

4 Flutes

Corner radius tolerance : ±0.005 (centerline datum)

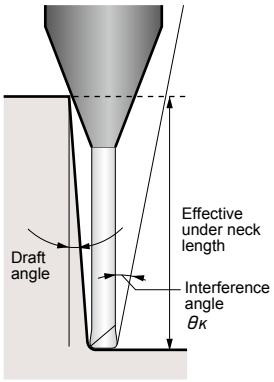


EPDREH4○○○-○.○-○○○-TH3

Carbide TH3 72 HRC Helix 30° h4 DCONMS=4 h5 DCONMS=6

Item code	Stock	Size(mm)							Interference angle θκ (°)	Effective under neck length with respect to draft angle				
		Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS		0.5°	1°	1.5°	2°	3°
EPDREH4030-16-02-TH3	●	3 (.118inch)	0.2 (.008inch)	16 (.630inch)	1.8	2.88	60	6	3.97	16.76	17.34	17.95	18.62	20.12
EPDREH4030-18-02-TH3	●			18 (.709inch)			65		3.64	18.83	19.47	20.17	20.92	22.60
EPDREH4030-20-02-TH3	●			20 (.787inch)					3.36	20.89	21.61	22.39	23.22	25.09
EPDREH4030-4-03-TH3	●		0.3 (.012inch)	4 (.157inch)			50		8.96	4.35	4.49	4.64	4.81	5.17
EPDREH4030-6-03-TH3	●			6 (.236inch)					7.42	6.42	6.63	6.86	7.11	7.66
EPDREH4030-8-03-TH3	●			8 (.315inch)			55		6.33	8.49	8.77	9.08	9.41	10.15
EPDREH4030-10-03-TH3	●			10 (.394inch)					5.52	10.55	10.91	11.29	11.71	12.63
EPDREH4030-12-03-TH3	●			12 (.472inch)			60		4.90	12.62	13.05	13.51	14.01	15.12
EPDREH4030-14-03-TH3	●			14 (.551inch)					4.40	14.69	15.19	15.73	16.31	17.61
EPDREH4030-16-03-TH3	●			16 (.630inch)					3.99	16.76	17.33	17.94	18.61	20.09
EPDREH4030-18-03-TH3	●			18 (.709inch)			65		3.65	18.82	19.47	20.16	20.91	22.58
EPDREH4030-20-03-TH3	●			20 (.787inch)					3.37	20.89	21.61	22.38	23.21	25.07
EPDREH4030-4-05-TH3	●		0.5 (.020inch)	4 (.157inch)			50		9.15	4.34	4.48	4.62	4.78	5.13
EPDREH4030-6-05-TH3	●			6 (.236inch)					7.55	6.41	6.62	6.84	7.08	7.61
EPDREH4030-8-05-TH3	●			8 (.315inch)			55		6.43	8.48	8.76	9.06	9.38	10.10
EPDREH4030-10-05-TH3	●			10 (.394inch)					5.60	10.55	10.90	11.27	11.68	12.59
EPDREH4030-12-05-TH3	●			12 (.472inch)			60		4.95	12.61	13.04	13.49	13.98	15.07
EPDREH4030-14-05-TH3	●			14 (.551inch)					4.44	14.68	15.18	15.71	16.28	17.56
EPDREH4030-16-05-TH3	●			16 (.630inch)					4.03	16.75	17.31	17.92	18.58	20.05
EPDREH4030-18-05-TH3	●			18 (.709inch)			65		3.69	18.82	19.45	20.14	20.88	22.53
EPDREH4030-20-05-TH3	●			20 (.787inch)					3.40	20.88	21.59	22.36	23.18	25.02
EPDREH4040-8-01-TH3	●	4 (.157inch)	0.1 (.004inch)	8 (.315inch)	3.5	3.85	55	6	4.80	8.55	8.84	9.16	9.50	10.26
EPDREH4040-10-01-TH3	●			10 (.394inch)			60		4.12	10.62	10.98	11.38	11.80	12.75
EPDREH4040-12-01-TH3	●			12 (.472inch)					3.60	12.68	13.12	13.59	14.10	15.24
EPDREH4040-14-01-TH3	●			14 (.551inch)					3.20	14.75	15.26	15.81	16.40	17.72
EPDREH4040-16-01-TH3	●			16 (.630inch)					2.88	16.82	17.40	18.03	18.70	No interference
EPDREH4040-18-01-TH3	●			18 (.709inch)					2.62	18.89	19.54	20.24	21.00	No interference
EPDREH4040-20-01-TH3	●			20 (.787inch)			65		2.40	20.95	21.68	22.46	23.30	No interference
EPDREH4040-22-01-TH3	●			22 (.866inch)					2.22	23.02	23.82	24.68	25.60	No interference
EPDREH4040-24-01-TH3	●			24 (.945inch)			70		2.06	25.09	25.96	26.89	27.90	No interference
EPDREH4040-8-02-TH3	●		0.2 (.008inch)	8 (.315inch)			55		4.84	8.55	8.84	9.15	9.49	10.24
EPDREH4040-10-02-TH3	●			10 (.394inch)			60		4.15	10.61	10.98	11.37	11.79	12.73
EPDREH4040-12-02-TH3	●			12 (.472inch)					3.62	12.68	13.12	13.58	14.09	15.21
EPDREH4040-14-02-TH3	●			14 (.551inch)					3.22	14.75	15.26	15.80	16.39	17.70
EPDREH4040-16-02-TH3	●			16 (.630inch)					2.89	16.82	17.40	18.02	18.69	No interference
EPDREH4040-18-02-TH3	●			18 (.709inch)					2.63	18.88	19.53	20.23	20.98	No interference
EPDREH4040-20-02-TH3	●			20 (.787inch)			65		2.41	20.95	21.67	22.45	23.28	No interference
EPDREH4040-22-02-TH3	●			22 (.866inch)					2.22	23.02	23.81	24.67	25.58	No interference
EPDREH4040-24-02-TH3	●			24 (.945inch)			70		2.06	25.09	25.95	26.88	27.88	No interference

● : Inventory maintained in US ★ : Inventory maintained in Japan



【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. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS		0.5°	1°	1.5°	2°	3°
EPDREH4040-8-03-TH3	●	4 (.157inch)	0.3 (.012inch)	8 (.315inch)	3.5	3.85	55	6	4.89	8.54	8.83	9.14	9.47	10.22
EPDREH4040-10-03-TH3	●			10 (.394inch)			60		4.18	10.61	10.97	11.36	11.77	12.70
EPDREH4040-12-03-TH3	●			12 (.472inch)					3.65	12.68	13.11	13.57	14.07	15.19
EPDREH4040-14-03-TH3	●			14 (.551inch)					3.24	14.75	15.25	15.79	16.37	17.68
EPDREH4040-16-03-TH3	●			16 (.630inch)					2.91	16.81	17.39	18.01	18.67	No interference
EPDREH4040-18-03-TH3	●			18 (.709inch)					2.64	18.88	19.53	20.22	20.97	No interference
EPDREH4040-20-03-TH3	●			20 (.787inch)			65		2.42	20.95	21.67	22.44	23.27	No interference
EPDREH4040-22-03-TH3	●			22 (.866inch)					2.23	23.01	23.81	24.66	25.57	No interference
EPDREH4040-24-03-TH3	●			24 (.945inch)			70		2.07	25.08	25.95	26.87	27.87	No interference
EPDREH4040-8-05-TH3	●		0.5 (.020inch)	8 (.315inch)			55		4.97	8.54	8.82	9.12	9.44	10.17
EPDREH4040-10-05-TH3	●			10 (.394inch)			60		4.24	10.60	10.96	11.33	11.74	12.66
EPDREH4040-12-05-TH3	●			12 (.472inch)					3.69	12.67	13.10	13.55	14.04	15.14
EPDREH4040-14-05-TH3	●			14 (.551inch)					3.27	14.74	15.24	15.77	16.34	17.63
EPDREH4040-16-05-TH3	●			16 (.630inch)					2.94	16.81	17.37	17.98	18.64	No interference
EPDREH4040-18-05-TH3	●			18 (.709inch)					2.67	18.87	19.51	20.20	20.94	No interference
EPDREH4040-20-05-TH3	●			20 (.787inch)			65		2.44	20.94	21.65	22.42	23.24	No interference
EPDREH4040-22-05-TH3	●			22 (.866inch)					2.25	23.01	23.79	24.63	25.54	No interference
EPDREH4040-24-05-TH3	●			24 (.945inch)			70		2.09	25.08	25.93	26.85	27.84	No interference
EPDREH4040-8-10-TH3	●		1 (.039inch)	8 (.315inch)			55		5.19	8.52	8.78	9.06	9.37	10.05
EPDREH4040-10-10-TH3	●			10 (.394inch)			60		4.40	10.59	10.92	11.28	11.67	12.54
EPDREH4040-12-10-TH3	●			12 (.472inch)					3.82	12.65	13.06	13.50	13.97	15.02
EPDREH4040-14-10-TH3	●			14 (.551inch)					3.37	14.72	15.20	15.71	16.27	17.51
EPDREH4040-16-10-TH3	●			16 (.630inch)					3.02	16.79	17.34	17.93	18.57	20.00
EPDREH4040-18-10-TH3	●			18 (.709inch)					2.73	18.86	19.48	20.15	20.87	No interference
EPDREH4040-20-10-TH3	●			20 (.787inch)			65		2.49	20.92	21.62	22.36	23.17	No interference
EPDREH4040-22-10-TH3	●			22 (.866inch)					2.29	22.99	23.76	24.58	25.47	No interference
EPDREH4040-24-10-TH3	●			24 (.945inch)			70		2.13	25.06	25.90	26.80	27.77	No interference
EPDREH4050-10-01-TH3	●	5 (.197inch)	0.1 (.004inch)	10 (.394inch)	4	4.85	60	6	2.38	10.62	10.98	11.38	11.80	No interference
EPDREH4050-15-01-TH3	●			15 (.591inch)					1.69	15.79	16.33	16.92	No interference	No interference
EPDREH4050-20-01-TH3	●			20 (.787inch)			65		1.30	20.95	21.68	No interference	No interference	No interference
EPDREH4050-25-01-TH3	●			25 (.984inch)			70		1.06	26.12	27.03	No interference	No interference	No interference
EPDREH4050-10-02-TH3	●		0.2 (.008inch)	10 (.394inch)			60		2.40	10.61	10.98	11.37	11.79	No interference
EPDREH4050-15-02-TH3	●			15 (.591inch)					1.70	15.78	16.33	16.91	No interference	No interference
EPDREH4050-20-02-TH3	●			20 (.787inch)			65		1.31	20.95	21.67	No interference	No interference	No interference
EPDREH4050-25-02-TH3	●			25 (.984inch)			70		1.07	26.12	27.02	No interference	No interference	No interference
EPDREH4050-10-03-TH3	●		0.3 (.012inch)	10 (.394inch)			60		2.42	10.61	10.97	11.36	11.77	No interference
EPDREH4050-15-03-TH3	●			15 (.591inch)					1.71	15.78	16.32	16.90	No interference	No interference
EPDREH4050-20-03-TH3	●			20 (.787inch)			65		1.32	20.95	21.67	No interference	No interference	No interference
EPDREH4050-25-03-TH3	●			25 (.984inch)			70		1.07	26.12	27.02	No interference	No interference	No interference

For detailed information on the EPDREH4 ⌀1.5 to ⌀3 cutting conditions, refer to pages 21, 22, 26, 27, 35, 36, 40 and 41.

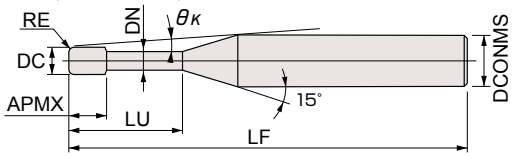
Line Up

4 Flutes

Radius

4 Flutes

Corner radius tolerance : ±0.005 (centerline datum)



EPDREH4○○○-○.○-○○○-TH3

Carbide TH3 72 HRC Helix 30° h4 DCONMS=4 h5 DCONMS=6

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.						
		DC	RE	LU	APMX	DN	LF	DCONMS		0.5°	1°	1.5°	2°	3°
EPDREH4050-10-05-TH3	●	5 (.197inch)	0.5 (.020inch)	10 (.394inch)	4	4.85	60	6	2.46	10.60	10.96	11.33	11.74	No interference
EPDREH4050-15-05-TH3	●			15 (.591inch)					1.73	15.77	16.31	16.88	No interference	No interference
EPDREH4050-20-05-TH3	●			20 (.787inch)			65		1.33	20.94	21.65	No interference	No interference	No interference
EPDREH4050-25-05-TH3	●			25 (.984inch)			70		1.08	26.11	27.00	No interference	No interference	No interference
EPDREH4050-10-10-TH3	●		1 (.039inch)	10 (.394inch)			60		2.57	10.59	10.92	11.28	11.67	No interference
EPDREH4050-15-10-TH3	●			15 (.591inch)					1.78	15.76	16.27	16.82	No interference	No interference
EPDREH4050-20-10-TH3	●			20 (.787inch)			65		1.36	20.92	21.62	No interference	No interference	No interference
EPDREH4050-25-10-TH3	●			25 (.984inch)			70		1.10	26.09	26.97	No interference	No interference	No interference
EPDREH4060-12-01-TH3	●	6 (.236inch)	0.1 (.004inch)	12 (.472inch)	5	5.85	60	6	0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-01-TH3	●			18 (.709inch)					0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-24-01-TH3	●			24 (.945inch)			70		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-30-01-TH3	●			30 (1.181inch)			80		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-12-02-TH3	●		0.2 (.008inch)	12 (.472inch)			60		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-02-TH3	●			18 (.709inch)					0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-24-02-TH3	●			24 (.945inch)			70		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-30-02-TH3	●			30 (1.181inch)			80		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-12-03-TH3	●		0.3 (.012inch)	12 (.472inch)			60		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-03-TH3	●			18 (.709inch)					0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-24-03-TH3	●			24 (.945inch)			70		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-30-03-TH3	●			30 (1.181inch)			80		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-12-05-TH3	●		0.5 (.020inch)	12 (.472inch)			60		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-05-TH3	●			18 (.709inch)					0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-24-05-TH3	●			24 (.945inch)			70		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-30-05-TH3	●			30 (1.181inch)			80		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-12-10-TH3	●		1 (.039inch)	12 (.472inch)			60		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-10-TH3	●			18 (.709inch)					0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-24-10-TH3	●			24 (.945inch)			70		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-30-10-TH3	●			30 (1.181inch)			80		0.00	No interference	No interference	No interference	No interference	No interference

For detailed information on the EPDREH4 ⌀5 and ⌀6 cutting conditions, refer to pages 22, 23, 27, 28, 36, 37, 41 and 42.

● : Inventory maintained in US ★ : Inventory maintained in Japan

Recommended Cutting Conditions (Inch)

2 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page 17.

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～65HRC)**		**Hardened Steel (65～68HRC)**		**Hardened Steel (68～72HRC)**	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.008	.001	.02	.0006	42,500	28.0	37,500	21.7	35,000	17.7	31,500	16.1	31,880	12.6
		.039	.0004	42,500	28.0	37,500	21.7	35,000	17.7	31,500	16.1	31,880	12.6
	.002	.02	.0008	42,500	28.0	37,500	21.7	35,000	17.7	31,500	16.1	31,880	12.6
		.039	.0006	42,500	28.0	37,500	21.7	35,000	17.7	31,500	16.1	31,880	12.6
.012	.001	.039	.0006	40,800	28.7	36,000	21.7	33,600	17.3	30,240	15.7	30,600	12.2
		.079	.0004	33,050	23.2	29,160	17.3	27,220	14.2	24,490	12.6	24,790	9.8
	.002	.039	.0008	40,800	28.7	36,000	21.7	33,600	17.3	30,240	15.7	30,600	12.2
		.079	.0005	33,050	23.2	29,160	17.3	27,220	14.2	24,490	12.6	24,790	9.8
.016	.001	.039	.0006	32,260	31.1	28,800	24.4	26,730	20.1	24,050	18.1	24,480	14.2
		.079	.0005	32,260	28.0	28,800	22.0	26,730	18.1	24,050	16.1	24,480	12.6
	.002	.039	.001	32,260	31.1	28,800	24.4	26,730	20.1	24,050	18.1	24,480	14.2
		.079	.0006	32,260	28.0	28,800	22.0	26,730	18.1	24,050	16.1	24,480	12.6
	.004	.039	.0013	32,260	31.1	28,800	24.4	26,730	20.1	24,050	18.1	24,480	14.2
		.079	.0011	32,260	28.0	28,800	22.0	26,730	18.1	24,050	16.1	24,480	12.6
.020	.001	.039	.0006	32,260	31.1	28,800	24.4	26,730	20.1	24,050	18.1	24,480	14.2
		.079	.0005	32,260	31.1	28,800	24.4	26,730	20.1	24,050	18.1	24,480	14.2
		.118	.0004	26,440	24.8	23,330	18.5	21,770	15.0	19,600	13.4	19,830	10.6
	.002	.039	.0012	32,260	31.1	28,800	24.4	26,730	20.1	24,050	18.1	24,480	14.2
		.079	.0009	32,260	31.1	28,800	24.4	26,730	20.1	24,050	18.1	24,480	14.2
		.118	.0007	26,440	24.8	23,330	18.5	21,770	15.0	19,600	13.4	19,830	10.6
	.004	.039	.0014	32,260	31.1	28,800	24.4	26,730	20.1	24,050	18.1	24,480	14.2
		.079	.0012	32,260	31.1	28,800	24.4	26,730	20.1	24,050	18.1	24,480	14.2
		.118	.0008	26,440	24.8	23,330	18.5	21,770	15.0	19,600	13.4	19,830	10.6
.024	.001	.079	.0006	32,260	39.0	28,800	30.3	26,730	25.2	24,050	22.4	24,480	17.3
		.157	.0005	26,440	31.1	23,330	23.2	21,770	18.9	19,600	16.9	19,830	13.0
	.002	.079	.0011	32,260	39.0	28,800	30.3	26,730	25.2	24,050	22.4	24,480	17.3
		.157	.0007	26,440	31.1	23,330	23.2	21,770	18.9	19,600	16.9	19,830	13.0
	.004	.079	.0014	32,260	39.0	28,800	30.3	26,730	25.2	24,050	22.4	24,480	17.3
		.157	.0009	26,440	31.1	23,330	23.2	21,770	18.9	19,600	16.9	19,830	13.0
.031	.001	.079	.0009	34,000	55.5	30,000	43.7	28,000	35.4	25,200	31.9	25,500	24.8
		.157	.0006	34,000	44.5	30,000	35.0	28,000	28.3	25,200	25.6	25,500	20.1
	.002	.079	.0015	34,000	55.5	30,000	43.7	28,000	35.4	25,200	31.9	25,500	24.8
		.157	.001	34,000	44.5	30,000	35.0	28,000	28.3	25,200	25.6	25,500	20.1
	.004	.079	.0019	34,000	55.5	30,000	43.7	28,000	35.4	25,200	31.9	25,500	24.8
		.157	.0013	34,000	44.5	30,000	35.0	28,000	28.3	25,200	25.6	25,500	20.1
	.008	.079	.0032	34,000	55.5	30,000	43.7	28,000	35.4	25,200	31.9	25,500	24.8
		.157	.0022	34,000	44.5	30,000	35.0	28,000	28.3	25,200	25.6	25,500	20.1

【Note】 Refer to the comments and notes below the table on page 16 regarding usage.

Recommended Cutting Conditions (Inch)

2 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page 17.

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～65HRC)**		**Hardened Steel (65～68HRC)**		**Hardened Steel (68～72HRC)**	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.039	.001	.079	.0006	33,440	71.3	29,620	55.9	27,710	45.7	24,940	41.3	25,170	31.9
		.157	.0005	30,600	65.0	27,000	50.8	25,200	41.7	22,680	37.4	22,950	29.1
		.236	.0004	24,790	52.8	21,870	41.3	20,410	33.9	18,370	30.3	18,590	23.6
		.315	.0003	22,030	46.9	19,440	36.6	18,140	29.9	16,330	26.8	16,520	20.9
	.002	.079	.0018	33,440	71.3	29,620	55.9	27,710	45.7	24,940	41.3	25,170	31.9
		.157	.0011	30,600	65.0	27,000	50.8	25,200	41.7	22,680	37.4	22,950	29.1
		.236	.0007	24,790	52.8	21,870	41.3	20,410	33.9	18,370	30.3	18,590	23.6
		.315	.0006	22,030	46.9	19,440	36.6	18,140	29.9	16,330	26.8	16,520	20.9
	.004	.079	.0026	33,440	71.3	29,620	55.9	27,710	45.7	24,940	41.3	25,170	31.9
		.157	.0015	30,600	65.0	27,000	50.8	25,200	41.7	22,680	37.4	22,950	29.1
		.236	.0009	24,790	52.8	21,870	41.3	20,410	33.9	18,370	30.3	18,590	23.6
		.315	.0009	22,030	46.9	19,440	36.6	18,140	29.9	16,330	26.8	16,520	20.9
	.008	.079	.0043	33,440	71.3	29,620	55.9	27,710	45.7	24,940	41.3	25,170	31.9
		.157	.0028	30,600	65.0	27,000	50.8	25,200	41.7	22,680	37.4	22,950	29.1
		.236	.0016	24,790	52.8	21,870	41.3	20,410	33.9	18,370	30.3	18,590	23.6
		.315	.0016	22,030	46.9	19,440	36.6	18,140	29.9	16,330	26.8	16,520	20.9

(1) a_p indicates guidelines for Group 1 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (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 EPDREH2010-2-02-TH3 tool:
Cutting depth = .004 inch (0.11mm) (a_p) × 0.85 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = .003 inch (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.

2 Flutes

High efficiency cutting condition

High accuracy cuttiing condition

For detailed information on high-efficiency cutting conditions, refer to page 15.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～65HRC)		4 Hardened Steel (65～68HRC)		5 Hardened Steel (68～72HRC)	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.008	.001	.02	.0006	50,000	8.3	50,000	7.1	50,000	6.3	45,000	5.5	42,500	4.3
		.039	.0004	50,000	8.3	50,000	7.1	50,000	6.3	45,000	5.5	42,500	4.3
	.002	.02	.0008	50,000	8.3	50,000	7.1	50,000	6.3	45,000	5.5	42,500	4.3
		.039	.0006	50,000	8.3	50,000	7.1	50,000	6.3	45,000	5.5	42,500	4.3
.012	.001	.039	.0006	50,000	18.1	50,000	13.4	50,000	12.6	45,000	11.4	42,500	8.7
		.079	.0004	45,000	16.5	45,000	11.8	45,000	11.4	40,500	10.2	38,250	7.9
	.002	.039	.0008	50,000	18.1	50,000	13.4	50,000	12.6	45,000	11.4	42,500	8.7
		.079	.0005	45,000	16.5	45,000	11.8	45,000	11.4	40,500	10.2	38,250	7.9
.016	.001	.039	.0006	50,000	18.1	40,000	12.6	36,000	10.6	32,400	9.4	30,600	7.5
		.079	.0005	45,000	16.1	36,000	11.4	34,000	9.4	30,600	8.7	28,900	6.7
	.002	.039	.001	50,000	18.1	40,000	12.6	36,000	10.6	32,400	9.4	30,600	7.5
		.079	.0006	45,000	16.1	36,000	11.4	34,000	9.4	30,600	8.7	28,900	6.7
	.004	.039	.0013	50,000	18.1	40,000	12.6	36,000	10.6	32,400	9.4	30,600	7.5
		.079	.0011	45,000	16.1	36,000	11.4	34,000	9.4	30,600	8.7	28,900	6.7
.020	.001	.039	.0006	40,000	18.1	30,000	15.0	28,000	12.6	25,200	11.0	23,800	8.7
		.079	.0005	40,000	18.1	30,000	15.0	28,000	12.6	25,200	11.0	23,800	8.7
		.118	.0004	36,000	16.1	27,000	12.6	24,500	10.2	22,050	9.1	20,830	7.1
	.002	.039	.0012	40,000	18.1	30,000	15.0	28,000	12.6	25,200	11.0	23,800	8.7
		.079	.0009	40,000	18.1	30,000	15.0	28,000	12.6	25,200	11.0	23,800	8.7
		.118	.0007	36,000	16.1	27,000	12.6	24,500	10.2	22,050	9.1	20,830	7.1
	.004	.039	.0014	40,000	18.1	30,000	15.0	28,000	12.6	25,200	11.0	23,800	8.7
		.079	.0012	40,000	18.1	30,000	15.0	28,000	12.6	25,200	11.0	23,800	8.7
		.118	.0008	36,000	16.1	27,000	12.6	24,500	10.2	22,050	9.1	20,830	7.1
.024	.001	.079	.0006	37,830	23.6	28,200	15.4	23,000	12.6	20,700	11.4	19,550	8.7
		.157	.0005	27,800	17.3	23,600	11.0	21,000	9.1	18,900	8.3	17,850	6.3
	.002	.079	.0011	37,830	23.6	28,200	15.4	23,000	12.6	20,700	11.4	19,550	8.7
		.157	.0007	27,800	17.3	23,600	11.0	21,000	9.1	18,900	8.3	17,850	6.3
	.004	.079	.0014	37,830	23.6	28,200	15.4	23,000	12.6	20,700	11.4	19,550	8.7
		.157	.0009	27,800	17.3	23,600	11.0	21,000	9.1	18,900	8.3	17,850	6.3
.031	.001	.079	.0009	28,000	25.6	20,000	15.7	20,000	14.2	18,000	12.6	17,000	9.8
		.157	.0006	28,000	20.5	20,000	12.6	20,000	11.4	18,000	10.2	17,000	7.9
	.002	.079	.0015	28,000	25.6	20,000	15.7	20,000	14.2	18,000	12.6	17,000	9.8
		.157	.001	28,000	20.5	20,000	12.6	20,000	11.4	18,000	10.2	17,000	7.9
	.004	.079	.0019	28,000	25.6	20,000	15.7	20,000	14.2	18,000	12.6	17,000	9.8
		.157	.0013	28,000	20.5	20,000	12.6	20,000	11.4	18,000	10.2	17,000	7.9
	.008	.079	.0032	28,000	25.6	20,000	15.7	20,000	14.2	18,000	12.6	17,000	9.8
		.157	.0022	28,000	20.5	20,000	12.6	20,000	11.4	18,000	10.2	17,000	7.9

【Note】 Refer to the comments and notes below the table on page 18 regarding usage.

Recommended Cutting Conditions (Inch)

2 Flutes | High efficiency cutting condition | **High accuracy cutting condition**

For detailed information on high-efficiency cutting conditions, refer to page 15.

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～65HRC)**		**Hardened Steel (65～68HRC)**		**Hardened Steel (68～72HRC)**	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.039	.001	.079	.0006	30,290	47.6	**26,730**	**37.8**	**24,950**	**31.5**	**22,450**	**28.3**	**21,210**	**22.0**
		.157	.0005	27,540	40.9	**24,300**	**32.3**	**22,680**	**26.4**	**20,410**	**23.6**	**19,280**	**18.5**
		.236	.0004	22,310	33.1	**19,680**	**26.0**	**18,370**	**21.3**	**16,530**	**19.3**	**15,620**	**15.0**
		.315	.0003	19,830	29.5	**17,500**	**23.2**	**16,330**	**18.9**	**14,700**	**16.9**	**13,880**	**13.4**
	.002	.079	.0018	30,250	47.6	**26,730**	**37.8**	**24,950**	**31.5**	**22,450**	**28.3**	**21,210**	**22.0**
		.157	.0011	28,920	44.5	**24,300**	**32.3**	**22,680**	**26.4**	**20,410**	**23.6**	**19,280**	**18.5**
		.236	.0007	24,540	36.6	**19,680**	**26.0**	**18,370**	**21.3**	**16,530**	**19.3**	**15,620**	**15.0**
		.315	.0006	19,830	29.5	**17,500**	**23.2**	**16,330**	**18.9**	**14,700**	**16.9**	**13,880**	**13.4**
	.004	.079	.0026	30,290	47.6	**26,730**	**37.8**	**24,950**	**31.5**	**22,450**	**28.3**	**21,210**	**22.0**
		.157	.0015	27,540	40.9	**24,300**	**32.3**	**22,680**	**26.4**	**20,410**	**23.6**	**19,280**	**18.5**
		.236	.0009	22,310	33.1	**19,680**	**26.0**	**18,370**	**21.3**	**16,530**	**19.3**	**15,620**	**15.0**
		.315	.0009	19,830	29.5	**17,500**	**23.2**	**16,330**	**18.9**	**14,700**	**16.9**	**13,880**	**13.4**
	.008	.079	.0043	30,290	47.6	**26,730**	**37.8**	**24,950**	**31.5**	**22,450**	**28.3**	**21,210**	**22.0**
		.157	.0028	27,540	40.9	**24,300**	**32.3**	**22,680**	**26.4**	**20,410**	**23.6**	**19,280**	**18.5**
		.236	.0016	22,310	33.1	**19,680**	**26.0**	**18,370**	**21.3**	**16,530**	**19.3**	**15,620**	**15.0**
		.315	.0016	19,830	29.5	**17,500**	**23.2**	**16,330**	**18.9**	**14,700**	**16.9**	**13,880**	**13.4**

(1) a_p indicates guidelines for Group 1 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (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 EPDREH2010-2-02-TH3 tool:
Cutting depth = .004 inch (0.11mm) (a_p) × 0.85 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = .003 inch (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.

4 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page 24.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (65～72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.039	.001	.059	.0007	38,900	134.6	38,900	122.0	28,300	80.3	23,000	72.4	21,200	56.7
		.079	.0006	35,000	121.3	35,000	110.2	25,500	72.4	20,700	65.4	19,100	51.2
		.098	.0006	31,800	110.2	31,800	100.0	23,100	65.4	18,800	59.1	17,400	46.5
		.118	.0006	29,200	101.2	29,200	92.1	21,200	60.2	17,200	54.3	15,900	42.5
		.157	.0005	25,000	86.6	25,000	78.7	18,200	51.6	14,800	46.5	13,600	36.2
		.197	.0005	21,900	76.0	21,900	68.9	15,900	44.9	12,900	40.6	11,900	31.9
		.236	.0003	19,500	67.7	19,500	61.4	14,100	40.2	11,500	36.2	10,600	28.3
		.315	.0002	15,900	55.1	15,900	50.0	11,600	33.1	9,400	29.5	8,700	23.2
	.002	.059	.0018	38,900	134.6	38,900	122.4	28,300	80.3	23,000	72.4	21,200	56.7
		.079	.0013	35,000	121.3	35,000	110.2	25,500	72.4	20,700	65.4	19,100	51.2
		.098	.0013	31,800	110.2	31,800	100.0	23,100	65.4	18,800	59.1	17,400	46.5
		.118	.0012	29,200	101.2	29,200	92.1	21,200	60.2	17,200	54.3	15,900	42.5
		.157	.0011	25,000	86.6	25,000	78.7	18,200	51.6	14,800	46.5	13,600	36.2
		.197	.0011	21,900	76.0	21,900	68.9	15,900	44.9	12,900	40.6	11,900	31.9
		.236	.0006	19,500	67.7	19,500	61.4	14,100	40.2	11,500	36.2	10,600	28.3
		.315	.0004	15,900	55.1	15,900	50.0	11,600	33.1	9,400	29.5	8,700	23.2
	.004	.059	.0022	38,900	134.6	38,900	122.4	28,300	80.3	23,000	72.4	21,200	56.7
		.079	.0017	35,000	121.3	35,000	110.2	25,500	72.4	20,700	65.4	19,100	51.2
		.098	.0016	31,800	110.2	31,800	100.0	23,100	65.4	18,800	59.1	17,400	46.5
		.118	.0015	29,200	101.2	29,200	92.1	21,200	60.2	17,200	54.3	15,900	42.5
		.157	.0014	25,000	86.6	25,000	78.7	18,200	51.6	14,800	46.5	13,600	36.2
		.197	.0013	21,900	76.0	21,900	68.9	15,900	44.9	12,900	40.6	11,900	31.9
		.236	.0007	19,500	67.7	19,500	61.4	14,100	40.2	11,500	36.2	10,600	28.3
		.315	.0004	15,900	55.1	15,900	50.0	11,600	33.1	9,400	29.5	8,700	23.2
	.008	.059	.0025	38,900	134.6	38,900	122.4	28,300	80.3	23,000	72.4	21,200	56.7
		.079	.0019	35,000	121.3	35,000	110.2	25,500	72.4	20,700	65.4	19,100	51.2
		.098	.0018	31,800	110.2	31,800	100.0	23,100	65.4	18,800	59.1	17,400	46.5
		.118	.0017	29,200	101.2	29,200	92.1	21,200	60.2	17,200	54.3	15,900	42.5
		.157	.0015	25,000	86.6	25,000	78.7	18,200	51.6	14,800	46.5	13,600	36.2
		.197	.0015	21,900	76.0	21,900	68.9	15,900	44.9	12,900	40.6	11,900	31.9
		.236	.0008	19,500	67.7	19,500	61.4	14,100	40.2	11,500	36.2	10,600	28.3
		.315	.0005	15,900	55.1	15,900	50.0	11,600	33.1	9,400	29.5	8,700	23.2
	.012	.059	.0028	38,900	134.6	38,900	122.4	28,300	80.3	23,000	72.4	21,200	56.7
		.079	.0021	35,000	121.3	35,000	110.2	25,500	72.4	20,700	65.4	19,100	51.2
		.098	.0020	31,800	110.2	31,800	100.0	23,100	65.4	18,800	59.1	17,400	46.5
		.118	.0019	29,200	101.2	29,200	92.1	21,200	60.2	17,200	54.3	15,900	42.5
		.157	.0017	25,000	86.6	25,000	78.7	18,200	51.6	14,800	46.5	13,600	36.2
		.197	.0017	21,900	76.0	21,900	68.9	15,900	44.9	12,900	40.6	11,900	31.9
		.236	.0009	19,500	67.7	19,500	61.4	14,100	40.2	11,500	36.2	10,600	28.3
		.315	.0005	15,900	55.1	15,900	50.0	11,600	33.1	9,400	29.5	8,700	23.2
.059	.001	.079	.0007	26,900	130.3	26,900	118.5	19,600	78.0	15,900	70.1	14,700	55.1
		.118	.0006	23,300	113.0	23,300	102.8	17,000	67.3	13,800	61.0	12,700	47.6
		.157	.0006	20,600	100.0	20,600	90.9	15,000	59.4	12,200	53.9	11,200	42.1
		.197	.0005	18,400	89.4	18,400	81.1	13,400	53.1	10,900	48.0	10,100	37.8
		.236	.0005	16,700	81.1	16,700	73.6	12,100	48.0	9,900	43.7	9,100	34.3
		.315	.0004	15,200	73.6	15,200	66.9	11,100	44.1	9,000	39.8	8,300	31.1
		.394	.0004	14,000	67.7	14,000	61.8	10,200	40.6	8,300	36.6	7,600	28.3
		.472	.0003	12,100	58.7	12,100	53.5	8,800	35.0	7,100	31.5	6,600	24.8
	.002	.079	.0019	26,900	130.3	26,900	118.5	19,600	78.0	15,900	70.1	14,700	55.1
		.118	.0017	23,300	113.0	23,300	102.8	17,000	67.3	13,800	61.0	12,700	47.6
		.157	.0015	20,600	100.0	20,600	90.9	15,000	59.4	12,200	53.9	11,200	42.1
		.197	.0014	18,400	89.4	18,400	81.1	13,400	53.1	10,900	48.0	10,100	37.8
		.236	.0013	16,700	81.1	16,700	73.6	12,100	48.0	9,900	43.7	9,100	34.3
		.315	.0012	15,200	73.6	15,200	66.9	11,100	44.1	9,000	39.8	8,300	31.1
		.394	.0011	14,000	67.7	14,000	61.8	10,200	40.6	8,300	36.6	7,600	28.3
		.472	.0009	12,100	58.7	12,100	53.5	8,800	35.0	7,100	31.5	6,600	24.8
	.004	.079	.0031	26,900	130.3	26,900	118.5	19,600	78.0	15,900	70.1	14,700	55.1
		.118	.0028	23,300	113.0	23,300	102.8	17,000	67.3	13,800	61.0	12,700	47.6
		.157	.0025	20,600	100.0	20,600	90.9	15,000	59.4	12,200	53.9	11,200	42.1
		.197	.0022	18,400	89.4	18,400	81.1	13,400	53.1	10,900	48.0	10,100	37.8

【Note】 Refer to the comments and notes below the table on page 23 regarding usage.

Recommended Cutting Conditions (Inch)

4 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page 24.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (65～72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.059	.004	.236	.0020	16,700	81.1	16,700	73.6	12,100	48.0	9,900	43.7	9,100	34.3
		.315	.0019	15,200	73.6	15,200	66.9	11,100	44.1	9,000	39.8	8,300	31.1
		.394	.0017	14,000	67.7	14,000	61.8	10,200	40.6	8,300	36.6	7,600	28.3
		.472	.0014	12,100	58.7	12,100	53.5	8,800	35.0	7,100	31.5	6,600	24.8
	.008	.079	.0032	26,900	130.3	26,900	118.5	19,600	78.0	15,900	70.1	14,700	55.1
		.118	.0030	23,300	113.0	23,300	102.8	17,000	67.3	13,800	61.0	12,700	47.6
		.157	.0026	20,600	100.0	20,600	90.9	15,000	59.4	12,200	53.9	11,200	42.1
		.197	.0024	18,400	89.4	18,400	81.1	13,400	53.1	10,900	48.0	10,100	37.8
		.236	.0022	16,700	81.1	16,700	73.6	12,100	48.0	9,900	43.7	9,100	34.3
		.315	.0020	15,200	73.6	15,200	66.9	11,100	44.1	9,000	39.8	8,300	31.1
		.394	.0019	14,000	67.7	14,000	61.8	10,200	40.6	8,300	36.6	7,600	28.3
		.472	.0015	12,100	58.7	12,100	53.5	8,800	35.0	7,100	31.5	6,600	24.8
	.012	.079	.0033	26,900	130.3	26,900	118.5	19,600	78.0	15,900	70.1	14,700	55.1
		.118	.0030	23,300	113.0	23,300	102.8	17,000	67.3	13,800	61.0	12,700	47.6
		.157	.0027	20,600	100.0	20,600	90.9	15,000	59.4	12,200	53.9	11,200	42.1
		.197	.0024	18,400	89.4	18,400	81.1	13,400	53.1	10,900	48.0	10,100	37.8
		.236	.0022	16,700	81.1	16,700	73.6	12,100	48.0	9,900	43.7	9,100	34.3
		.315	.0021	15,200	73.6	15,200	66.9	11,100	44.1	9,000	39.8	8,300	31.1
		.394	.0019	14,000	67.7	14,000	61.8	10,200	40.6	8,300	36.6	7,600	28.3
		.472	.0015	12,100	58.7	12,100	53.5	8,800	35.0	7,100	31.5	6,600	24.8
	.020	.079	.0034	26,900	130.3	26,900	118.5	19,600	78.0	15,900	70.1	14,700	55.1
		.118	.0031	23,300	113.0	23,300	102.8	17,000	67.3	13,800	61.0	12,700	47.6
		.157	.0028	20,600	100.0	20,600	90.9	15,000	59.4	12,200	53.9	11,200	42.1
		.197	.0025	18,400	89.4	18,400	81.1	13,400	53.1	10,900	48.0	10,100	37.8
		.236	.0023	16,700	81.1	16,700	73.6	12,100	48.0	9,900	43.7	9,100	34.3
		.315	.0021	15,200	73.6	15,200	66.9	11,100	44.1	9,000	39.8	8,300	31.1
		.394	.0019	14,000	67.7	14,000	61.8	10,200	40.6	8,300	36.6	7,600	28.3
		.472	.0015	12,100	58.7	12,100	53.5	8,800	35.0	7,100	31.5	6,600	24.8
.079	.001	.098	.0007	20,600	142.9	20,600	129.9	15,000	85.0	12,200	76.8	11,200	59.8
		.118	.0006	19,500	135.0	19,500	122.8	14,100	79.9	11,500	72.4	10,600	56.7
		.157	.0006	17,500	121.3	17,500	110.2	12,700	72.0	10,300	65.0	9,500	50.8
		.197	.0006	15,900	110.2	15,900	100.0	11,600	65.7	9,400	59.1	8,700	46.5
		.236	.0005	14,600	101.2	14,600	92.1	10,600	60.2	8,600	54.3	8,000	42.9
		.315	.0005	12,500	86.6	12,500	78.7	9,100	51.6	7,400	46.5	6,800	36.2
		.394	.0005	10,900	75.6	10,900	68.5	8,000	45.3	6,500	40.9	6,000	32.3
		.472	.0004	9,700	67.3	9,700	61.0	7,100	40.2	5,700	35.8	5,300	28.3
	.002	.098	.0019	20,600	142.9	20,600	129.9	15,000	85.0	12,200	76.8	11,200	59.8
		.118	.0017	19,500	135.0	19,500	122.8	14,100	79.9	11,500	72.4	10,600	56.7
		.157	.0015	17,500	121.3	17,500	110.2	12,700	72.0	10,300	65.0	9,500	50.8
		.197	.0014	15,900	110.2	15,900	100.0	11,600	65.7	9,400	59.1	8,700	46.5
		.236	.0014	14,600	101.2	14,600	92.1	10,600	60.2	8,600	54.3	8,000	42.9
		.315	.0013	12,500	86.6	12,500	78.7	9,100	51.6	7,400	46.5	6,800	36.2
		.394	.0013	10,900	75.6	10,900	68.5	8,000	45.3	6,500	40.9	6,000	32.3
		.472	.0009	9,700	67.3	9,700	61.0	7,100	40.2	5,700	35.8	5,300	28.3
	.004	.098	.0032	20,600	142.9	20,600	129.9	15,000	85.0	12,200	76.8	11,200	59.8
		.118	.0029	19,500	135.0	19,500	122.8	14,100	79.9	11,500	72.4	10,600	56.7
		.157	.0025	17,500	121.3	17,500	110.2	12,700	72.0	10,300	65.0	9,500	50.8
		.197	.0024	15,900	110.2	15,900	100.0	11,600	65.7	9,400	59.1	8,700	46.5
		.236	.0023	14,600	101.2	14,600	92.1	10,600	60.2	8,600	54.3	8,000	42.9
		.315	.0023	12,500	86.6	12,500	78.7	9,100	51.6	7,400	46.5	6,800	36.2
		.394	.0021	10,900	75.6	10,900	68.5	8,000	45.3	6,500	40.9	6,000	32.3
		.472	.0016	9,700	67.3	9,700	61.0	7,100	40.2	5,700	35.8	5,300	28.3
	.008	.098	.0036	20,600	142.9	20,600	129.9	15,000	85.0	12,200	76.8	11,200	59.8
		.118	.0032	19,500	135.0	19,500	122.8	14,100	79.9	11,500	72.4	10,600	56.7
		.157	.0028	17,500	121.3	17,500	110.2	12,700	72.0	10,300	65.0	9,500	50.8
		.197	.0027	15,900	110.2	15,900	100.0	11,600	65.7	9,400	59.1	8,700	46.5
		.236	.0026	14,600	101.2	14,600	92.1	10,600	60.2	8,600	54.3	8,000	42.9
		.315	.0026	12,500	86.6	12,500	78.7	9,100	51.6	7,400	46.5	6,800	36.2
		.394	.0024	10,900	75.6	10,900	68.5	8,000	45.3	6,500	40.9	6,000	32.3
		.472	.0018	9,700	67.3	9,700	61.0	7,100	40.2	5,700	35.8	5,300	28.3

4 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page 24.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (65～72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.079	.012	.098	.0038	20,600	142.9	20,600	129.9	15,000	85.0	12,200	76.8	11,200	59.8
		.118	.0034	19,500	135.0	19,500	122.8	14,100	79.9	11,500	72.4	10,600	56.7
		.157	.0029	17,500	121.3	17,500	110.2	12,700	72.0	10,300	65.0	9,500	50.8
		.197	.0029	15,900	110.2	15,900	100.0	11,600	65.7	9,400	59.1	8,700	46.5
		.236	.0028	14,600	101.2	14,600	92.1	10,600	60.2	8,600	54.3	8,000	42.9
		.315	.0027	12,500	86.6	12,500	78.7	9,100	51.6	7,400	46.5	6,800	36.2
		.394	.0025	10,900	75.6	10,900	68.5	8,000	45.3	6,500	40.9	6,000	32.3
		.472	.0019	9,700	67.3	9,700	61.0	7,100	40.2	5,700	35.8	5,300	28.3
	.020	.098	.0040	20,600	142.9	20,600	129.9	15,000	85.0	12,200	76.8	11,200	59.8
		.118	.0036	19,500	135.0	19,500	122.8	14,100	79.9	11,500	72.4	10,600	56.7
		.157	.0031	17,500	121.3	17,500	110.2	12,700	72.0	10,300	65.0	9,500	50.8
		.197	.0030	15,900	110.2	15,900	100.0	11,600	65.7	9,400	59.1	8,700	46.5
		.236	.0029	14,600	101.2	14,600	92.1	10,600	60.2	8,600	54.3	8,000	42.9
		.315	.0029	12,500	86.6	12,500	78.7	9,100	51.6	7,400	46.5	6,800	36.2
		.394	.0027	10,900	75.6	10,900	68.5	8,000	45.3	6,500	40.9	6,000	32.3
		.472	.0020	9,700	67.3	9,700	61.0	7,100	40.2	5,700	35.8	5,300	28.3
.118	.002	.157	.0018	18,600	116.1	18,600	105.5	13,500	68.9	11,000	62.2	10,200	49.2
		.236	.0017	15,400	96.1	15,400	87.4	11,200	57.1	9,100	51.6	8,400	40.6
		.315	.0017	13,100	81.9	13,100	74.4	9,500	48.4	7,700	43.7	7,100	34.3
		.394	.0016	11,400	71.3	11,400	64.6	8,300	42.5	6,700	37.8	6,200	29.9
		.472	.0015	10,100	63.0	10,100	57.1	7,300	37.4	5,900	33.5	5,500	26.4
		.551	.0014	9,000	56.3	9,000	51.2	6,600	33.9	5,300	29.9	4,900	23.6
		.630	.0013	8,200	51.2	8,200	46.5	5,900	29.9	4,800	27.2	4,500	21.7
		.709	.0012	7,500	46.9	7,500	42.5	5,400	27.6	4,400	24.8	4,100	19.7
		.787	.0009	6,900	42.9	6,900	39.0	5,000	25.6	4,100	23.2	3,800	18.5
	.004	.157	.0035	18,600	116.1	18,600	105.5	13,500	68.9	11,000	62.2	10,200	49.2
		.236	.0034	15,400	96.1	15,400	87.4	11,200	57.1	9,100	51.6	8,400	40.6
		.315	.0033	13,100	81.9	13,100	74.4	9,500	48.4	7,700	43.7	7,100	34.3
		.394	.0032	11,400	71.3	11,400	64.6	8,300	42.5	6,700	37.8	6,200	29.9
		.472	.0030	10,100	63.0	10,100	57.1	7,300	37.4	5,900	33.5	5,500	26.4
		.551	.0027	9,000	56.3	9,000	51.2	6,600	33.9	5,300	29.9	4,900	23.6
		.630	.0026	8,200	51.2	8,200	46.5	5,900	29.9	4,800	27.2	4,500	21.7
		.709	.0024	7,500	46.9	7,500	42.5	5,400	27.6	4,400	24.8	4,100	19.7
		.787	.0017	6,900	42.9	6,900	39.0	5,000	25.6	4,100	23.2	3,800	18.5
	.008	.157	.0040	18,600	116.1	18,600	105.5	13,500	68.9	11,000	62.2	10,200	49.2
		.236	.0039	15,400	96.1	15,400	87.4	11,200	57.1	9,100	51.6	8,400	40.6
		.315	.0037	13,100	81.9	13,100	74.4	9,500	48.4	7,700	43.7	7,100	34.3
		.394	.0036	11,400	71.3	11,400	64.6	8,300	42.5	6,700	37.8	6,200	29.9
		.472	.0033	10,100	63.0	10,100	57.1	7,300	37.4	5,900	33.5	5,500	26.4
		.551	.0031	9,000	56.3	9,000	51.2	6,600	33.9	5,300	29.9	4,900	23.6
		.630	.0030	8,200	51.2	8,200	46.5	5,900	29.9	4,800	27.2	4,500	21.7
		.709	.0027	7,500	46.9	7,500	42.5	5,400	27.6	4,400	24.8	4,100	19.7
		.787	.0020	6,900	42.9	6,900	39.0	5,000	25.6	4,100	23.2	3,800	18.5
	.012	.157	.0042	18,600	116.1	18,600	105.5	13,500	68.9	11,000	62.2	10,200	49.2
		.236	.0041	15,400	96.1	15,400	87.4	11,200	57.1	9,100	51.6	8,400	40.6
		.315	.0040	13,100	81.9	13,100	74.4	9,500	48.4	7,700	43.7	7,100	34.3
		.394	.0038	11,400	71.3	11,400	64.6	8,300	42.5	6,700	37.8	6,200	29.9
		.472	.0035	10,100	63.0	10,100	57.1	7,300	37.4	5,900	33.5	5,500	26.4
		.551	.0032	9,000	56.3	9,000	51.2	6,600	33.9	5,300	29.9	4,900	23.6
		.630	.0031	8,200	51.2	8,200	46.5	5,900	29.9	4,800	27.2	4,500	21.7
		.709	.0028	7,500	46.9	7,500	42.5	5,400	27.6	4,400	24.8	4,100	19.7
		.787	.0021	6,900	42.9	6,900	39.0	5,000	25.6	4,100	23.2	3,800	18.5
	.020	.157	.0044	18,600	116.1	18,600	105.5	13,500	68.9	11,000	62.2	10,200	49.2
		.236	.0043	15,400	96.1	15,400	87.4	11,200	57.1	9,100	51.6	8,400	40.6
		.315	.0042	13,100	81.9	13,100	74.4	9,500	48.4	7,700	43.7	7,100	34.3
		.394	.0040	11,400	71.3	11,400	64.6	8,300	42.5	6,700	37.8	6,200	29.9
		.472	.0037	10,100	63.0	10,100	57.1	7,300	37.4	5,900	33.5	5,500	26.4
		.551	.0034	9,000	56.3	9,000	51.2	6,600	33.9	5,300	29.9	4,900	23.6
		.630	.0033	8,200	51.2	8,200	46.5	5,900	29.9	4,800	27.2	4,500	21.7
		.709	.0030	7,500	46.9	7,500	42.5	5,400	27.6	4,400	24.8	4,100	19.7
		.787	.0022	6,900	42.9	6,900	39.0	5,000	25.6	4,100	23.2	3,800	18.5

【Note】 Refer to the comments and notes below the table on page 23 regarding usage.

Recommended Cutting Conditions (Inch)

4 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page 24.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (65～72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.157	.004	.315	.0036	10,400	108.3	10,400	98.4	7,600	64.6	6,200	58.7	5,700	45.7
		.394	.0035	9,300	96.9	9,300	87.8	6,800	57.9	5,500	52.0	5,100	40.9
		.472	.0033	8,400	87.4	8,400	79.5	6,100	52.0	5,000	47.2	4,600	37.0
		.551	.0031	7,700	79.9	7,700	72.8	5,600	47.6	4,500	42.5	4,200	33.9
		.630	.0030	7,100	73.6	7,100	66.9	5,100	43.3	4,200	39.8	3,900	31.5
		.709	.0029	6,500	67.7	6,500	61.4	4,800	40.9	3,900	37.0	3,600	28.7
		.787	.0028	6,100	63.4	6,100	57.5	4,400	37.4	3,600	33.9	3,300	26.4
		.866	.0023	5,700	59.1	5,700	53.9	4,100	35.0	3,400	32.3	3,100	24.8
		.945	.0022	5,300	55.1	5,300	50.0	3,900	33.1	3,200	30.3	2,900	23.2
	.008	.315	.0050	10,400	108.3	10,400	98.4	7,600	64.6	6,200	58.7	5,700	45.7
		.394	.0048	9,300	96.9	9,300	87.8	6,800	57.9	5,500	52.0	5,100	40.9
		.472	.0046	8,400	87.4	8,400	79.5	6,100	52.0	5,000	47.2	4,600	37.0
		.551	.0043	7,700	79.9	7,700	72.8	5,600	47.6	4,500	42.5	4,200	33.9
		.630	.0041	7,100	73.6	7,100	66.9	5,100	43.3	4,200	39.8	3,900	31.5
		.709	.0040	6,500	67.7	6,500	61.4	4,800	40.9	3,900	37.0	3,600	28.7
		.787	.0038	6,100	63.4	6,100	57.5	4,400	37.4	3,600	33.9	3,300	26.4
		.866	.0032	5,700	59.1	5,700	53.9	4,100	35.0	3,400	32.3	3,100	24.8
		.945	.0030	5,300	55.1	5,300	50.0	3,900	33.1	3,200	30.3	2,900	23.2
	.012	.315	.0052	10,400	108.3	10,400	98.4	7,600	64.6	6,200	58.7	5,700	45.7
		.394	.0051	9,300	96.9	9,300	87.8	6,800	57.9	5,500	52.0	5,100	40.9
		.472	.0048	8,400	87.4	8,400	79.5	6,100	52.0	5,000	47.2	4,600	37.0
		.551	.0045	7,700	79.9	7,700	72.8	5,600	47.6	4,500	42.5	4,200	33.9
		.630	.0044	7,100	73.6	7,100	66.9	5,100	43.3	4,200	39.8	3,900	31.5
		.709	.0043	6,500	67.7	6,500	61.4	4,800	40.9	3,900	37.0	3,600	28.7
		.787	.0040	6,100	63.4	6,100	57.5	4,400	37.4	3,600	33.9	3,300	26.4
		.866	.0034	5,700	59.1	5,700	53.9	4,100	35.0	3,400	32.3	3,100	24.8
		.945	.0032	5,300	55.1	5,300	50.0	3,900	33.1	3,200	30.3	2,900	23.2
	.020	.315	.0054	10,400	108.3	10,400	98.4	7,600	64.6	6,200	58.7	5,700	45.7
		.394	.0052	9,300	96.9	9,300	87.8	6,800	57.9	5,500	52.0	5,100	40.9
		.472	.0050	8,400	87.4	8,400	79.5	6,100	52.0	5,000	47.2	4,600	37.0
		.551	.0046	7,700	79.9	7,700	72.8	5,600	47.6	4,500	42.5	4,200	33.9
		.630	.0045	7,100	73.6	7,100	66.9	5,100	43.3	4,200	39.8	3,900	31.5
		.709	.0044	6,500	67.7	6,500	61.4	4,800	40.9	3,900	37.0	3,600	28.7
		.787	.0042	6,100	63.4	6,100	57.5	4,400	37.4	3,600	33.9	3,300	26.4
		.866	.0035	5,700	59.1	5,700	53.9	4,100	35.0	3,400	32.3	3,100	24.8
		.945	.0033	5,300	55.1	5,300	50.0	3,900	33.1	3,200	30.3	2,900	23.2
	.039	.315	.0055	10,400	108.3	10,400	98.4	7,600	64.6	6,200	58.7	5,700	45.7
		.394	.0054	9,300	96.9	9,300	87.8	6,800	57.9	5,500	52.0	5,100	40.9
		.472	.0051	8,400	87.4	8,400	79.5	6,100	52.0	5,000	47.2	4,600	37.0
		.551	.0048	7,700	79.9	7,700	72.8	5,600	47.6	4,500	42.5	4,200	33.9
		.630	.0046	7,100	73.6	7,100	66.9	5,100	43.3	4,200	39.8	3,900	31.5
		.709	.0045	6,500	67.7	6,500	61.4	4,800	40.9	3,900	37.0	3,600	28.7
		.787	.0043	6,100	63.4	6,100	57.5	4,400	37.4	3,600	33.9	3,300	26.4
		.866	.0035	5,700	59.1	5,700	53.9	4,100	35.0	3,400	32.3	3,100	24.8
		.945	.0033	5,300	55.1	5,300	50.0	3,900	33.1	3,200	30.3	2,900	23.2
.197	.004	.394	.0038	9,300	128.7	9,300	117.3	6,800	77.2	5,500	69.3	5,100	54.7
		.591	.0032	7,400	102.4	7,400	93.3	5,400	61.4	4,400	55.5	4,000	42.9
		.787	.0030	6,100	84.6	6,100	76.8	4,400	50.0	3,600	45.3	3,300	35.4
		.984	.0030	5,200	72.0	5,200	65.4	3,800	42.9	3,100	39.0	2,800	29.9
	.008	.394	.0048	9,300	128.7	9,300	117.3	6,800	77.2	5,500	69.3	5,100	54.7
		.591	.0041	7,400	102.4	7,400	93.3	5,400	61.4	4,400	55.5	4,000	42.9
		.787	.0039	6,100	84.6	6,100	76.8	4,400	50.0	3,600	45.3	3,300	35.4
		.984	.0037	5,200	72.0	5,200	65.4	3,800	42.9	3,100	39.0	2,800	29.9
	.012	.394	.0065	9,300	128.7	9,300	117.3	6,800	77.2	5,500	69.3	5,100	54.7
		.591	.0055	7,400	102.4	7,400	93.3	5,400	61.4	4,400	55.5	4,000	42.9
		.787	.0052	6,100	84.6	6,100	76.8	4,400	50.0	3,600	45.3	3,300	35.4
		.984	.0051	5,200	72.0	5,200	65.4	3,800	42.9	3,100	39.0	2,800	29.9
	.020	.394	.0068	9,300	128.7	9,300	117.3	6,800	77.2	5,500	69.3	5,100	54.7
		.591	.0057	7,400	102.4	7,400	93.3	5,400	61.4	4,400	55.5	4,000	42.9
		.787	.0054	6,100	84.6	6,100	76.8	4,400	50.0	3,600	45.3	3,300	35.4
		.984	.0052	5,200	72.0	5,200	65.4	3,800	42.9	3,100	39.0	2,800	29.9

4 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page 24.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (65～72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.197	.039	.394	.0069	9,300	366.1	9,300	117.3	6,800	77.2	5,500	69.3	5,100	54.7
		.591	.0058	7,400	291.3	7,400	93.3	5,400	61.4	4,400	55.5	4,000	42.9
		.787	.0055	6,100	240.2	6,100	76.8	4,400	50.0	3,600	45.3	3,300	35.4
		.984	.0053	5,200	204.7	5,200	65.4	3,800	42.9	3,100	39.0	2,800	29.9
.236	.004	.472	.0039	8,300	326.8	8,300	117.7	6,100	78.0	4,900	69.3	4,500	54.3
		.709	.0035	6,500	255.9	6,500	92.1	4,700	59.8	3,800	53.9	3,500	42.1
		.945	.0032	5,300	208.7	5,300	75.2	3,900	49.6	3,100	44.1	2,900	35.0
		1.181	.0031	4,500	177.2	4,500	63.8	3,300	42.1	2,700	38.2	2,400	28.7
	.008	.472	.0070	8,300	326.8	8,300	117.7	6,100	78.0	4,900	69.3	4,500	54.3
		.709	.0062	6,500	255.9	6,500	92.1	4,700	59.8	3,800	53.9	3,500	42.1
		.945	.0058	5,300	208.7	5,300	75.2	3,900	49.6	3,100	44.1	2,900	35.0
		1.181	.0056	4,500	177.2	4,500	63.8	3,300	42.1	2,700	38.2	2,400	28.7
	.012	.472	.0074	8,300	326.8	8,300	117.7	6,100	78.0	4,900	69.3	4,500	54.3
		.709	.0065	6,500	255.9	6,500	92.1	4,700	59.8	3,800	53.9	3,500	42.1
		.945	.0061	5,300	208.7	5,300	75.2	3,900	49.6	3,100	44.1	2,900	35.0
		1.181	.0059	4,500	177.2	4,500	63.8	3,300	42.1	2,700	38.2	2,400	28.7
	.020	.472	.0076	8,300	326.8	8,300	117.7	6,100	78.0	4,900	69.3	4,500	54.3
		.709	.0068	6,500	255.9	6,500	92.1	4,700	59.8	3,800	53.9	3,500	42.1
		.945	.0063	5,300	208.7	5,300	75.2	3,900	49.6	3,100	44.1	2,900	35.0
		1.181	.0061	4,500	177.2	4,500	63.8	3,300	42.1	2,700	38.2	2,400	28.7
	.039	.472	.0078	8,300	326.8	8,300	117.7	6,100	78.0	4,900	69.3	4,500	54.3
		.709	.0069	6,500	255.9	6,500	92.1	4,700	59.8	3,800	53.9	3,500	42.1
		.945	.0065	5,300	208.7	5,300	75.2	3,900	49.6	3,100	44.1	2,900	35.0
		1.181	.0062	4,500	177.2	4,500	63.8	3,300	42.1	2,700	38.2	2,400	28.7

(1) a_p indicates guidelines for Group 2 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (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 EPDREH4010-2-02-TH3 tool:
Cutting depth = .0019 inch (0.047mm) (a_p) × 1 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = .0015 inch (0.0376mm)

【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 (Inch)

4 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-efficiency cutting conditions, refer to page 19.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (65～72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.039	.001	.059	.0006	32,300	111.8	32,300	101.6	23,500	66.5	19,100	60.2	17,600	47.2
		.079	.0005	29,100	100.8	29,100	91.3	21,200	60.2	17,200	54.3	15,900	42.5
		.098	.0005	26,400	91.3	26,400	83.1	19,200	54.3	15,600	49.2	14,400	38.6
		.118	.0005	24,200	83.9	24,200	76.4	17,600	50.0	14,300	45.3	13,200	35.4
		.157	.0004	20,800	72.0	20,800	65.4	15,100	42.9	12,300	38.6	11,300	29.9
		.197	.0004	18,200	63.0	18,200	57.1	13,200	37.4	10,700	33.5	9,900	26.4
		.236	.0002	16,200	56.3	16,200	50.8	11,700	33.5	9,500	29.9	8,800	23.6
		.315	.0001	13,200	45.7	13,200	41.7	9,600	27.6	7,800	24.4	7,200	19.3
	.002	.059	.0015	32,300	111.8	32,300	101.6	23,500	66.5	19,100	60.2	17,600	47.2
		.079	.0011	29,100	100.8	29,100	91.3	21,200	60.2	17,200	54.3	15,900	42.5
		.098	.0011	26,400	91.3	26,400	83.1	19,200	54.3	15,600	49.2	14,400	38.6
		.118	.0010	24,200	83.9	24,200	76.4	17,600	50.0	14,300	45.3	13,200	35.4
		.157	.0009	20,800	72.0	20,800	65.4	15,100	42.9	12,300	38.6	11,300	29.9
		.197	.0009	18,200	63.0	18,200	57.1	13,200	37.4	10,700	33.5	9,900	26.4
		.236	.0005	16,200	56.3	16,200	50.8	11,700	33.5	9,500	29.9	8,800	23.6
		.315	.0003	13,200	45.7	13,200	41.7	9,600	27.6	7,800	24.4	7,200	19.3
	.004	.059	.0018	32,300	111.8	32,300	101.6	23,500	66.5	19,100	60.2	17,600	47.2
		.079	.0014	29,100	100.8	29,100	91.3	21,200	60.2	17,200	54.3	15,900	42.5
		.098	.0013	26,400	91.3	26,400	83.1	19,200	54.3	15,600	49.2	14,400	38.6
		.118	.0012	24,200	83.9	24,200	76.4	17,600	50.0	14,300	45.3	13,200	35.4
		.157	.0011	20,800	72.0	20,800	65.4	15,100	42.9	12,300	38.6	11,300	29.9
		.197	.0011	18,200	63.0	18,200	57.1	13,200	37.4	10,700	33.5	9,900	26.4
		.236	.0006	16,200	56.3	16,200	50.8	11,700	33.5	9,500	29.9	8,800	23.6
		.315	.0004	13,200	45.7	13,200	41.7	9,600	27.6	7,800	24.4	7,200	19.3
	.008	.059	.0020	32,300	111.8	32,300	101.6	23,500	66.5	19,100	60.2	17,600	47.2
		.079	.0015	29,100	100.8	29,100	91.3	21,200	60.2	17,200	54.3	15,900	42.5
		.098	.0015	26,400	91.3	26,400	83.1	19,200	54.3	15,600	49.2	14,400	38.6
		.118	.0014	24,200	83.9	24,200	76.4	17,600	50.0	14,300	45.3	13,200	35.4
		.157	.0013	20,800	72.0	20,800	65.4	15,100	42.9	12,300	38.6	11,300	29.9
		.197	.0012	18,200	63.0	18,200	57.1	13,200	37.4	10,700	33.5	9,900	26.4
		.236	.0007	16,200	56.3	16,200	50.8	11,700	33.5	9,500	29.9	8,800	23.6
		.315	.0004	13,200	45.7	13,200	41.7	9,600	27.6	7,800	24.4	7,200	19.3
	.012	.059	.0023	32,300	111.8	32,300	101.6	23,500	66.5	19,100	60.2	17,600	47.2
		.079	.0017	29,100	100.8	29,100	91.3	21,200	60.2	17,200	54.3	15,900	42.5
		.098	.0017	26,400	91.3	26,400	83.1	19,200	54.3	15,600	49.2	14,400	38.6
		.118	.0015	24,200	83.9	24,200	76.4	17,600	50.0	14,300	45.3	13,200	35.4
		.157	.0014	20,800	72.0	20,800	65.4	15,100	42.9	12,300	38.6	11,300	29.9
		.197	.0014	18,200	63.0	18,200	57.1	13,200	37.4	10,700	33.5	9,900	26.4
		.236	.0007	16,200	56.3	16,200	50.8	11,700	33.5	9,500	29.9	8,800	23.6
		.315	.0004	13,200	45.7	13,200	41.7	9,600	27.6	7,800	24.4	7,200	19.3
.059	.001	.079	.0006	22,300	108.3	22,300	98.4	16,300	64.6	13,200	58.3	12,200	45.7
		.118	.0005	19,300	93.7	19,300	85.4	14,100	55.9	11,500	50.8	10,500	39.4
		.157	.0005	17,100	83.1	17,100	75.6	12,500	49.2	10,100	44.9	9,300	35.0
		.197	.0004	15,300	74.0	15,300	67.3	11,100	44.1	9,000	39.8	8,400	31.5
		.236	.0004	13,900	67.3	13,900	61.0	10,000	39.8	8,200	36.2	7,600	28.3
		.315	.0003	12,600	61.0	12,600	55.5	9,200	36.6	7,500	33.1	6,900	26.0
		.394	.0003	11,600	56.3	11,600	51.2	8,500	33.5	6,900	30.3	6,300	23.6
		.472	.0002	10,000	48.8	10,000	44.5	7,300	29.1	5,900	26.0	5,500	20.5
	.002	.079	.0016	22,300	108.3	22,300	98.4	16,300	64.6	13,200	58.3	12,200	45.7
		.118	.0014	19,300	93.7	19,300	85.4	14,100	55.9	11,500	50.8	10,500	39.4
		.157	.0013	17,100	83.1	17,100	75.6	12,500	49.2	10,100	44.9	9,300	35.0
		.197	.0011	15,300	74.0	15,300	67.3	11,100	44.1	9,000	39.8	8,400	31.5
		.236	.0010	13,900	67.3	13,900	61.0	10,000	39.8	8,200	36.2	7,600	28.3
		.315	.0009	12,600	61.0	12,600	55.5	9,200	36.6	7,500	33.1	6,900	26.0
		.394	.0007	11,600	56.3	11,600	51.2	8,500	33.5	6,900	30.3	6,300	23.6
		.472	.0005	10,000	48.8	10,000	44.5	7,300	29.1	5,900	26.0	5,500	20.5
	.004	.079	.0026	22,300	108.3	22,300	98.4	16,300	64.6	13,200	58.3	12,200	45.7
		.118	.0023	19,300	93.7	19,300	85.4	14,100	55.9	11,500	50.8	10,500	39.4
		.157	.0021	17,100	83.1	17,100	75.6	12,500	49.2	10,100	44.9	9,300	35.0
		.197	.0019	15,300	74.0	15,300	67.3	11,100	44.1	9,000	39.8	8,400	31.5

4 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-efficiency cutting conditions, refer to page 19.

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.059	.004	.236	.0017	13,900	67.3	13,900	61.0	10,000	39.8	8,200	36.2	7,600	28.3
		.315	.0015	12,600	61.0	12,600	55.5	9,200	36.6	7,500	33.1	6,900	26.0
		.394	.0011	11,600	56.3	11,600	51.2	8,500	33.5	6,900	30.3	6,300	23.6
		.472	.0008	10,000	48.8	10,000	44.5	7,300	29.1	5,900	26.0	5,500	20.5
	.008	.079	.0027	22,300	108.3	22,300	98.4	16,300	64.6	13,200	58.3	12,200	45.7
		.118	.0024	19,300	93.7	19,300	85.4	14,100	55.9	11,500	50.8	10,500	39.4
		.157	.0022	17,100	83.1	17,100	75.6	12,500	49.2	10,100	44.9	9,300	35.0
		.197	.0020	15,300	74.0	15,300	67.3	11,100	44.1	9,000	39.8	8,400	31.5
		.236	.0018	13,900	67.3	13,900	61.0	10,000	39.8	8,200	36.2	7,600	28.3
		.315	.0015	12,600	61.0	12,600	55.5	9,200	36.6	7,500	33.1	6,900	26.0
		.394	.0012	11,600	56.3	11,600	51.2	8,500	33.5	6,900	30.3	6,300	23.6
		.472	.0008	10,000	48.8	10,000	44.5	7,300	29.1	5,900	26.0	5,500	20.5
	.012	.079	.0028	22,300	108.3	22,300	98.4	16,300	64.6	13,200	58.3	12,200	45.7
		.118	.0025	19,300	93.7	19,300	85.4	14,100	55.9	11,500	50.8	10,500	39.4
		.157	.0023	17,100	83.1	17,100	75.6	12,500	49.2	10,100	44.9	9,300	35.0
		.197	.0020	15,300	74.0	15,300	67.3	11,100	44.1	9,000	39.8	8,400	31.5
		.236	.0019	13,900	67.3	13,900	61.0	10,000	39.8	8,200	36.2	7,600	28.3
		.315	.0016	12,600	61.0	12,600	55.5	9,200	36.6	7,500	33.1	6,900	26.0
		.394	.0013	11,600	56.3	11,600	51.2	8,500	33.5	6,900	30.3	6,300	23.6
		.472	.0008	10,000	48.8	10,000	44.5	7,300	29.1	5,900	26.0	5,500	20.5
	.020	.079	.0028	22,300	108.3	22,300	98.4	16,300	64.6	13,200	58.3	12,200	45.7
		.118	.0026	19,300	93.7	19,300	85.4	14,100	55.9	11,500	50.8	10,500	39.4
		.157	.0023	17,100	83.1	17,100	75.6	12,500	49.2	10,100	44.9	9,300	35.0
		.197	.0020	15,300	74.0	15,300	67.3	11,100	44.1	9,000	39.8	8,400	31.5
		.236	.0019	13,900	67.3	13,900	61.0	10,000	39.8	8,200	36.2	7,600	28.3
		.315	.0016	12,600	61.0	12,600	55.5	9,200	36.6	7,500	33.1	6,900	26.0
		.394	.0013	11,600	56.3	11,600	51.2	8,500	33.5	6,900	30.3	6,300	23.6
		.472	.0009	10,000	48.8	10,000	44.5	7,300	29.1	5,900	26.0	5,500	20.5
.079	.001	.098	.0006	17,100	118.5	17,100	107.9	12,500	70.5	10,100	63.8	9,300	49.6
		.118	.0006	16,200	112.2	16,200	102.0	11,700	66.1	9,500	60.2	8,800	47.2
		.157	.0005	14,500	100.8	14,500	91.3	10,500	59.8	8,500	53.9	7,900	42.1
		.197	.0004	13,200	91.3	13,200	83.1	9,600	54.7	7,800	49.2	7,200	38.6
		.236	.0004	12,100	83.9	12,100	76.4	8,800	50.0	7,100	45.3	6,600	35.4
		.315	.0004	10,400	72.0	10,400	65.4	7,600	42.9	6,100	38.6	5,600	29.9
		.394	.0004	9,000	62.6	9,000	56.7	6,600	37.4	5,400	33.9	5,000	26.8
		.472	.0003	8,100	55.9	8,100	50.8	5,900	33.5	4,700	29.9	4,400	23.6
	.002	.098	.0016	17,100	118.5	17,100	107.9	12,500	70.5	10,100	63.8	9,300	49.6
		.118	.0014	16,200	112.2	16,200	102.0	11,700	66.1	9,500	60.2	8,800	47.2
		.157	.0012	14,500	100.8	14,500	91.3	10,500	59.8	8,500	53.9	7,900	42.1
		.197	.0012	13,200	91.3	13,200	83.1	9,600	54.7	7,800	49.2	7,200	38.6
		.236	.0011	12,100	83.9	12,100	76.4	8,800	50.0	7,100	45.3	6,600	35.4
		.315	.0011	10,400	72.0	10,400	65.4	7,600	42.9	6,100	38.6	5,600	29.9
		.394	.0010	9,000	62.6	9,000	56.7	6,600	37.4	5,400	33.9	5,000	26.8
		.472	.0008	8,100	55.9	8,100	50.8	5,900	33.5	4,700	29.9	4,400	23.6
	.004	.098	.0027	17,100	118.5	17,100	107.9	12,500	70.5	10,100	63.8	9,300	49.6
		.118	.0024	16,200	112.2	16,200	102.0	11,700	66.1	9,500	60.2	8,800	47.2
		.157	.0020	14,500	100.8	14,500	91.3	10,500	59.8	8,500	53.9	7,900	42.1
		.197	.0020	13,200	91.3	13,200	83.1	9,600	54.7	7,800	49.2	7,200	38.6
		.236	.0019	12,100	83.9	12,100	76.4	8,800	50.0	7,100	45.3	6,600	35.4
		.315	.0019	10,400	72.0	10,400	65.4	7,600	42.9	6,100	38.6	5,600	29.9
		.394	.0018	9,000	62.6	9,000	56.7	6,600	37.4	5,400	33.9	5,000	26.8
		.472	.0013	8,100	55.9	8,100	50.8	5,900	33.5	4,700	29.9	4,400	23.6
	.008	.098	.0030	17,100	118.5	17,100	107.9	12,500	70.5	10,100	63.8	9,300	49.6
		.118	.0027	16,200	112.2	16,200	102.0	11,700	66.1	9,500	60.2	8,800	47.2
		.157	.0023	14,500	100.8	14,500	91.3	10,500	59.8	8,500	53.9	7,900	42.1
		.197	.0022	13,200	91.3	13,200	83.1	9,600	54.7	7,800	49.2	7,200	38.6
		.236	.0022	12,100	83.9	12,100	76.4	8,800	50.0	7,100	45.3	6,600	35.4
		.315	.0021	10,400	72.0	10,400	65.4	7,600	42.9	6,100	38.6	5,600	29.9
		.394	.0020	9,000	62.6	9,000	56.7	6,600	37.4	5,400	33.9	5,000	26.8
		.472	.0015	8,100	55.9	8,100	50.8	5,900	33.5	4,700	29.9	4,400	23.6

【Note】 Refer to the comments and notes below the table on page 28 regarding usage.

Recommended Cutting Conditions (Inch)

4 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-efficiency cutting conditions, refer to page 19.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (65～72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.079	.012	.098	.0032	17,100	118.5	17,100	107.9	12,500	70.5	10,100	63.8	9,300	49.6
		.118	.0028	16,200	112.2	16,200	102.0	11,700	66.1	9,500	60.2	8,800	47.2
		.157	.0024	14,500	100.8	14,500	91.3	10,500	59.8	8,500	53.9	7,900	42.1
		.197	.0024	13,200	91.3	13,200	83.1	9,600	54.7	7,800	49.2	7,200	38.6
		.236	.0023	12,100	83.9	12,100	76.4	8,800	50.0	7,100	45.3	6,600	35.4
		.315	.0022	10,400	72.0	10,400	65.4	7,600	42.9	6,100	38.6	5,600	29.9
		.394	.0021	9,000	62.6	9,000	56.7	6,600	37.4	5,400	33.9	5,000	26.8
		.472	.0016	8,100	55.9	8,100	50.8	5,900	33.5	4,700	29.9	4,400	23.6
	.020	.098	.0033	17,100	118.5	17,100	107.9	12,500	70.5	10,100	63.8	9,300	49.6
		.118	.0030	16,200	112.2	16,200	102.0	11,700	66.1	9,500	60.2	8,800	47.2
		.157	.0026	14,500	100.8	14,500	91.3	10,500	59.8	8,500	53.9	7,900	42.1
		.197	.0025	13,200	91.3	13,200	83.1	9,600	54.7	7,800	49.2	7,200	38.6
		.236	.0024	12,100	83.9	12,100	76.4	8,800	50.0	7,100	45.3	6,600	35.4
		.315	.0024	10,400	72.0	10,400	65.4	7,600	42.9	6,100	38.6	5,600	29.9
		.394	.0022	9,000	62.6	9,000	56.7	6,600	37.4	5,400	33.9	5,000	26.8
		.472	.0017	8,100	55.9	8,100	50.8	5,900	33.5	4,700	29.9	4,400	23.6
.118	.002	.157	.0015	15,400	96.5	15,400	87.4	11,200	57.1	9,100	51.6	8,500	40.9
		.236	.0014	12,800	79.9	12,800	72.4	9,300	47.2	7,600	42.9	7,000	33.5
		.315	.0014	10,900	68.1	10,900	61.8	7,900	40.2	6,400	36.2	5,900	28.3
		.394	.0013	9,500	59.1	9,500	53.5	6,900	35.4	5,600	31.5	5,100	24.8
		.472	.0012	8,400	52.4	8,400	47.2	6,100	31.1	4,900	28.0	4,600	22.0
		.551	.0011	7,500	46.9	7,500	42.5	5,500	28.0	4,400	24.8	4,100	19.7
		.630	.0011	6,800	42.5	6,800	38.6	4,900	24.8	4,000	22.4	3,700	18.1
		.709	.0010	6,200	39.0	6,200	35.4	4,500	22.8	3,700	20.5	3,400	16.5
		.787	.0007	5,700	35.4	5,700	32.3	4,200	21.3	3,400	19.3	3,200	15.4
	.004	.157	.0030	15,400	96.5	15,400	87.4	11,200	57.1	9,100	51.6	8,500	40.9
		.236	.0028	12,800	79.9	12,800	72.4	9,300	47.2	7,600	42.9	7,000	33.5
		.315	.0028	10,900	68.1	10,900	61.8	7,900	40.2	6,400	36.2	5,900	28.3
		.394	.0027	9,500	59.1	9,500	53.5	6,900	35.4	5,600	31.5	5,100	24.8
		.472	.0025	8,400	52.4	8,400	47.2	6,100	31.1	4,900	28.0	4,600	22.0
		.551	.0023	7,500	46.9	7,500	42.5	5,500	28.0	4,400	24.8	4,100	19.7
		.630	.0022	6,800	42.5	6,800	38.6	4,900	24.8	4,000	22.4	3,700	18.1
		.709	.0020	6,200	39.0	6,200	35.4	4,500	22.8	3,700	20.5	3,400	16.5
		.787	.0015	5,700	35.4	5,700	32.3	4,200	21.3	3,400	19.3	3,200	15.4
	.008	.157	.0033	15,400	96.5	15,400	87.4	11,200	57.1	9,100	51.6	8,500	40.9
		.236	.0032	12,800	79.9	12,800	72.4	9,300	47.2	7,600	42.9	7,000	33.5
		.315	.0031	10,900	68.1	10,900	61.8	7,900	40.2	6,400	36.2	5,900	28.3
		.394	.0030	9,500	59.1	9,500	53.5	6,900	35.4	5,600	31.5	5,100	24.8
		.472	.0028	8,400	52.4	8,400	47.2	6,100	31.1	4,900	28.0	4,600	22.0
		.551	.0026	7,500	46.9	7,500	42.5	5,500	28.0	4,400	24.8	4,100	19.7
		.630	.0025	6,800	42.5	6,800	38.6	4,900	24.8	4,000	22.4	3,700	18.1
		.709	.0022	6,200	39.0	6,200	35.4	4,500	22.8	3,700	20.5	3,400	16.5
		.787	.0016	5,700	35.4	5,700	32.3	4,200	21.3	3,400	19.3	3,200	15.4
	.012	.157	.0035	15,400	96.5	15,400	87.4	11,200	57.1	9,100	51.6	8,500	40.9
		.236	.0034	12,800	79.9	12,800	72.4	9,300	47.2	7,600	42.9	7,000	33.5
		.315	.0033	10,900	68.1	10,900	61.8	7,900	40.2	6,400	36.2	5,900	28.3
		.394	.0031	9,500	59.1	9,500	53.5	6,900	35.4	5,600	31.5	5,100	24.8
		.472	.0029	8,400	52.4	8,400	47.2	6,100	31.1	4,900	28.0	4,600	22.0
		.551	.0027	7,500	46.9	7,500	42.5	5,500	28.0	4,400	24.8	4,100	19.7
		.630	.0026	6,800	42.5	6,800	38.6	4,900	24.8	4,000	22.4	3,700	18.1
		.709	.0024	6,200	39.0	6,200	35.4	4,500	22.8	3,700	20.5	3,400	16.5
		.787	.0017	5,700	35.4	5,700	32.3	4,200	21.3	3,400	19.3	3,200	15.4
	.020	.157	.0037	15,400	96.5	15,400	87.4	11,200	57.1	9,100	51.6	8,500	40.9
		.236	.0035	12,800	79.9	12,800	72.4	9,300	47.2	7,600	42.9	7,000	33.5
		.315	.0035	10,900	68.1	10,900	61.8	7,900	40.2	6,400	36.2	5,900	28.3
		.394	.0033	9,500	59.1	9,500	53.5	6,900	35.4	5,600	31.5	5,100	24.8
		.472	.0031	8,400	52.4	8,400	47.2	6,100	31.1	4,900	28.0	4,600	22.0
		.551	.0028	7,500	46.9	7,500	42.5	5,500	28.0	4,400	24.8	4,100	19.7
		.630	.0028	6,800	42.5	6,800	38.6	4,900	24.8	4,000	22.4	3,700	18.1
		.709	.0025	6,200	39.0	6,200	35.4	4,500	22.8	3,700	20.5	3,400	16.5
		.787	.0018	5,700	35.4	5,700	32.3	4,200	21.3	3,400	19.3	3,200	15.4

4 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-efficiency cutting conditions, refer to page 19.

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.157	.004	**.315**	.0030	8,600	89.8	**8,600**	**338.6**	**6,300**	**53.5**	**5,100**	**48.8**	**4,700**	**37.8**
		.394	.0029	7,700	80.3	**7,700**	**303.1**	**5,600**	**48.0**	**4,600**	**43.3**	**4,200**	**33.9**
		.472	.0028	7,000	72.4	**7,000**	**275.6**	**5,100**	**43.3**	**4,200**	**39.4**	**3,800**	**30.7**
		.551	.0026	6,400	66.1	**6,400**	**252.0**	**4,600**	**39.4**	**3,700**	**35.4**	**3,500**	**28.0**
		.630	.0025	5,900	61.0	**5,900**	**232.3**	**4,200**	**35.8**	**3,500**	**33.1**	**3,200**	**26.0**
		.709	.0024	5,400	56.3	**5,400**	**212.6**	**4,000**	**33.9**	**3,200**	**30.7**	**3,000**	**24.0**
		.787	.0023	5,100	52.8	**5,100**	**200.8**	**3,700**	**31.1**	**3,000**	**28.0**	**2,700**	**22.0**
		.866	.0019	4,700	49.2	**4,700**	**185.0**	**3,400**	**29.1**	**2,800**	**26.8**	**2,600**	**20.5**
		.945	.0018	4,400	45.7	**4,400**	**173.2**	**3,200**	**27.6**	**2,700**	**25.2**	**2,400**	**19.3**
	.008	**.315**	.0041	8,600	89.8	**8,600**	**338.6**	**6,300**	**53.5**	**5,100**	**48.8**	**4,700**	**37.8**
		.394	.0040	7,700	80.3	**7,700**	**303.1**	**5,600**	**48.0**	**4,600**	**43.3**	**4,200**	**33.9**
		.472	.0038	7,000	72.4	**7,000**	**275.6**	**5,100**	**43.3**	**4,200**	**39.4**	**3,800**	**30.7**
		.551	.0035	6,400	66.1	**6,400**	**252.0**	**4,600**	**39.4**	**3,700**	**35.4**	**3,500**	**28.0**
		.630	.0034	5,900	61.0	**5,900**	**232.3**	**4,200**	**35.8**	**3,500**	**33.1**	**3,200**	**26.0**
		.709	.0033	5,400	56.3	**5,400**	**212.6**	**4,000**	**33.9**	**3,200**	**30.7**	**3,000**	**24.0**
		.787	.0031	5,100	52.8	**5,100**	**200.8**	**3,700**	**31.1**	**3,000**	**28.0**	**2,700**	**22.0**
		.866	.0026	4,700	49.2	**4,700**	**185.0**	**3,400**	**29.1**	**2,800**	**26.8**	**2,600**	**20.5**
		.945	.0025	4,400	45.7	**4,400**	**173.2**	**3,200**	**27.6**	**2,700**	**25.2**	**2,400**	**19.3**
	.012	**.315**	.0043	8,600	89.8	**8,600**	**338.6**	**6,300**	**53.5**	**5,100**	**48.8**	**4,700**	**37.8**
		.394	.0042	7,700	80.3	**7,700**	**303.1**	**5,600**	**48.0**	**4,600**	**43.3**	**4,200**	**33.9**
		.472	.0040	7,000	72.4	**7,000**	**275.6**	**5,100**	**43.3**	**4,200**	**39.4**	**3,800**	**30.7**
		.551	.0037	6,400	66.1	**6,400**	**252.0**	**4,600**	**39.4**	**3,700**	**35.4**	**3,500**	**28.0**
		.630	.0036	5,900	61.0	**5,900**	**232.3**	**4,200**	**35.8**	**3,500**	**33.1**	**3,200**	**26.0**
		.709	.0035	5,400	56.3	**5,400**	**212.6**	**4,000**	**33.9**	**3,200**	**30.7**	**3,000**	**24.0**
		.787	.0033	5,100	52.8	**5,100**	**200.8**	**3,700**	**31.1**	**3,000**	**28.0**	**2,700**	**22.0**
		.866	.0028	4,700	49.2	**4,700**	**185.0**	**3,400**	**29.1**	**2,800**	**26.8**	**2,600**	**20.5**
		.945	.0026	4,400	45.7	**4,400**	**173.2**	**3,200**	**27.6**	**2,700**	**25.2**	**2,400**	**19.3**
	.020	**.315**	.0045	8,600	89.8	**8,600**	**338.6**	**6,300**	**53.5**	**5,100**	**48.8**	**4,700**	**37.8**
		.394	.0044	7,700	80.3	**7,700**	**303.1**	**5,600**	**48.0**	**4,600**	**43.3**	**4,200**	**33.9**
		.472	.0041	7,000	72.4	**7,000**	**275.6**	**5,100**	**43.3**	**4,200**	**39.4**	**3,800**	**30.7**
		.551	.0039	6,400	66.1	**6,400**	**252.0**	**4,600**	**39.4**	**3,700**	**35.4**	**3,500**	**28.0**
		.630	.0037	5,900	61.0	**5,900**	**232.3**	**4,200**	**35.8**	**3,500**	**33.1**	**3,200**	**26.0**
		.709	.0036	5,400	56.3	**5,400**	**212.6**	**4,000**	**33.9**	**3,200**	**30.7**	**3,000**	**24.0**
		.787	.0035	5,100	52.8	**5,100**	**200.8**	**3,700**	**31.1**	**3,000**	**28.0**	**2,700**	**22.0**
		.866	.0029	4,700	49.2	**4,700**	**185.0**	**3,400**	**29.1**	**2,800**	**26.8**	**2,600**	**20.5**
		.945	.0027	4,400	45.7	**4,400**	**173.2**	**3,200**	**27.6**	**2,700**	**25.2**	**2,400**	**19.3**
	.039	**.315**	.0046	8,600	89.8	**8,600**	**338.6**	**6,300**	**53.5**	**5,100**	**48.8**	**4,700**	**37.8**
		.394	.0044	7,700	80.3	**7,700**	**303.1**	**5,600**	**48.0**	**4,600**	**43.3**	**4,200**	**33.9**
		.472	.0043	7,000	72.4	**7,000**	**275.6**	**5,100**	**43.3**	**4,200**	**39.4**	**3,800**	**30.7**
		.551	.0039	6,400	66.1	**6,400**	**252.0**	**4,600**	**39.4**	**3,700**	**35.4**	**3,500**	**28.0**
		.630	.0038	5,900	61.0	**5,900**	**232.3**	**4,200**	**35.8**	**3,500**	**33.1**	**3,200**	**26.0**
		.709	.0037	5,400	56.3	**5,400**	**212.6**	**4,000**	**33.9**	**3,200**	**30.7**	**3,000**	**24.0**
		.787	.0035	5,100	52.8	**5,100**	**200.8**	**3,700**	**31.1**	**3,000**	**28.0**	**2,700**	**22.0**
		.866	.0030	4,700	49.2	**4,700**	**185.0**	**3,400**	**29.1**	**2,800**	**26.8**	**2,600**	**20.5**
		.945	.0028	4,400	45.7	**4,400**	**173.2**	**3,200**	**27.6**	**2,700**	**25.2**	**2,400**	**19.3**
.197	.004	**.394**	.0031	7,700	106.7	**7,700**	**303.1**	**5,600**	**64.2**	**4,600**	**57.5**	**4,200**	**45.3**
		.591	.0026	6,100	85.0	**6,100**	**240.2**	**4,500**	**50.8**	**3,700**	**46.1**	**3,300**	**35.4**
		.787	.0025	5,100	70.1	**5,100**	**200.8**	**3,700**	**41.3**	**3,000**	**37.4**	**2,700**	**29.5**
		.984	.0024	4,300	59.8	**4,300**	**169.3**	**3,200**	**35.4**	**2,600**	**32.3**	**2,300**	**24.8**
	.008	**.394**	.0040	7,700	106.7	**7,700**	**303.1**	**5,600**	**64.2**	**4,600**	**57.5**	**4,200**	**45.3**
		.591	.0034	6,100	85.0	**6,100**	**240.2**	**4,500**	**50.8**	**3,700**	**46.1**	**3,300**	**35.4**
		.787	.0032	5,100	70.1	**5,100**	**200.8**	**3,700**	**41.3**	**3,000**	**37.4**	**2,700**	**29.5**
		.984	.0031	4,300	59.8	**4,300**	**169.3**	**3,200**	**35.4**	**2,600**	**32.3**	**2,300**	**24.8**
	.012	**.394**	.0054	7,700	106.7	**7,700**	**303.1**	**5,600**	**64.2**	**4,600**	**57.5**	**4,200**	**45.3**
		.591	.0046	6,100	85.0	**6,100**	**240.2**	**4,500**	**50.8**	**3,700**	**46.1**	**3,300**	**35.4**
		.787	.0043	5,100	70.1	**5,100**	**200.8**	**3,700**	**41.3**	**3,000**	**37.4**	**2,700**	**29.5**
		.984	.0042	4,300	59.8	**4,300**	**169.3**	**3,200**	**35.4**	**2,600**	**32.3**	**2,300**	**24.8**
	.020	**.394**	.0056	7,700	106.7	**7,700**	**303.1**	**5,600**	**64.2**	**4,600**	**57.5**	**4,200**	**45.3**
		.591	.0047	6,100	85.0	**6,100**	**240.2**	**4,500**	**50.8**	**3,700**	**46.1**	**3,300**	**35.4**
		.787	.0045	5,100	70.1	**5,100**	**200.8**	**3,700**	**41.3**	**3,000**	**37.4**	**2,700**	**29.5**
		.984	.0043	4,300	59.8	**4,300**	**169.3**	**3,200**	**35.4**	**2,600**	**32.3**	**2,300**	**24.8**

【Note】Refer to the comments and notes below the table on page 28 regarding usage.

Recommended Cutting Conditions (Inch)

4 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-efficiency cutting conditions, refer to page 19.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (65～72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.197	.039	.394	.0057	7,700	106.7	7,700	97.2	5,600	64.2	4,600	57.5	4,200	45.3
		.591	.0048	6,100	85.0	6,100	77.6	4,500	50.8	3,700	46.1	3,300	35.4
		.787	.0046	5,100	70.1	5,100	63.8	3,700	41.3	3,000	37.4	2,700	29.5
		.984	.0044	4,300	59.8	4,300	54.3	3,200	35.4	2,600	32.3	2,300	24.8
.236	.004	.472	.0032	6,900	107.5	6,900	97.6	5,100	64.6	4,100	57.5	3,700	45.3
		.709	.0029	5,400	83.9	5,400	76.4	3,900	49.6	3,200	44.9	2,900	35.0
		.945	.0027	4,400	68.5	4,400	62.6	3,200	41.3	2,600	36.6	2,400	29.1
		1.181	.0026	3,700	58.3	3,700	52.8	2,700	35.0	2,200	31.9	2,000	24.0
	.008	.472	.0058	6,900	107.5	6,900	97.6	5,100	64.6	4,100	57.5	3,700	45.3
		.709	.0052	5,400	83.9	5,400	76.4	3,900	49.6	3,200	44.9	2,900	35.0
		.945	.0048	4,400	68.5	4,400	62.6	3,200	41.3	2,600	36.6	2,400	29.1
		1.181	.0046	3,700	58.3	3,700	52.8	2,700	35.0	2,200	31.9	2,000	24.0
	.012	.472	.0061	6,900	107.5	6,900	97.6	5,100	64.6	4,100	57.5	3,700	45.3
		.709	.0054	5,400	83.9	5,400	76.4	3,900	49.6	3,200	44.9	2,900	35.0
		.945	.0051	4,400	68.5	4,400	62.6	3,200	41.3	2,600	36.6	2,400	29.1
		1.181	.0049	3,700	58.3	3,700	52.8	2,700	35.0	2,200	31.9	2,000	24.0
	.020	.472	.0063	6,900	107.5	6,900	97.6	5,100	64.6	4,100	57.5	3,700	45.3
		.709	.0056	5,400	83.9	5,400	76.4	3,900	49.6	3,200	44.9	2,900	35.0
		.945	.0052	4,400	68.5	4,400	62.6	3,200	41.3	2,600	36.6	2,400	29.1
		1.181	.0050	3,700	58.3	3,700	52.8	2,700	35.0	2,200	31.9	2,000	24.0
	.039	.472	.0064	6,900	107.5	6,900	97.6	5,100	64.6	4,100	57.5	3,700	45.3
		.709	.0057	5,400	83.9	5,400	76.4	3,900	49.6	3,200	44.9	2,900	35.0
		.945	.0054	4,400	68.5	4,400	62.6	3,200	41.3	2,600	36.6	2,400	29.1
		1.181	.0052	3,700	58.3	3,700	52.8	2,700	35.0	2,200	31.9	2,000	24.0

(1) a_p indicates guidelines for Group 2 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (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 EPDREH4010-2-02-TH3 tool:
Cutting depth = .0015 inch (0.039mm) (a_p) × 1 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = .0012 inch (0.0312mm)

【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 (Metric)

2 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

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

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～65HRC)		4 Hardened Steel (65～68HRC)		5 Hardened Steel (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

【Note】 Refer to the comments and notes below the table on page 30 regarding usage.

Recommended Cutting Conditions (Metric)

2 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

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

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～65HRC)**		**Hardened Steel (65～68HRC)**		**Hardened Steel (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 indicates guidelines for Group 1 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (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 EPDREH2010-2-02-TH3 tool:
Cutting depth = 0.11 (a_p) × 0.85 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = 0.075 mm

【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.

2 Flutes

High efficiency cutting condition

High accuracy cutting condition

For detailed information on high-efficiency cutting conditions, refer to page 29.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～65HRC)		4 Hardened Steel (65～68HRC)		5 Hardened Steel (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 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
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

【Note】 Refer to the comments and notes below the table on page 32 regarding usage.

Recommended Cutting Conditions (Metric)

2 Flutes

High efficiency cutting condition

High accuracy cutting condition

For detailed information on high-efficiency cutting conditions, refer to page 29.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～65HRC)		4 Hardened Steel (65～68HRC)		5 Hardened Steel (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 indicates guidelines for Group 1 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (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 EPDREH2010-2-02-TH3 tool:
Cutting depth = 0.11 (a_p) × 0.85 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = 0.075 mm

【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 cuttiing condition

High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page 38.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (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

【Note】 Refer to the comments and notes below the table on page 37 regarding usage.

Recommended Cutting Conditions (Metric)

4 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page 38.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (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	0.052	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**
		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**
	0.3	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**
		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**
	0.5	2	0.087	26,900	3,310	**26,900**	**3,010**	**19,600**	**1,980**	**15,900**	**1,780**	**14,700**	**1,400**
		3	0.079	23,300	2,870	**23,300**	**2,610**	**17,000**	**1,710**	**13,800**	**1,550**	**12,700**	**1,210**
		4	0.071	20,600	2,540	**20,600**	**2,310**	**15,000**	**1,510**	**12,200**	**1,370**	**11,200**	**1,070**
		5	0.063	18,400	2,270	**18,400**	**2,060**	**13,400**	**1,350**	**10,900**	**1,220**	**10,100**	**960**
		6	0.058	16,700	2,060	**16,700**	**1,870**	**12,100**	**1,220**	**9,900**	**1,110**	**9,100**	**870**
		8	0.054	15,200	1,870	**15,200**	**1,700**	**11,100**	**1,120**	**9,000**	**1,010**	**8,300**	**790**
		10	0.049	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**
		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**
	0.05	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**
		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**
	0.1	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**
		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**
		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**

4 Flutes

High efficiency cuttiing condition

High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page 38.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (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
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**
		10	0.068	10,900	1,920	**10,900**	**1,740**	**8,000**	**1,150**	**6,500**	**1,040**	**6,000**	**820**
		12	0.051	9,700	1,710	**9,700**	**1,550**	**7,100**	**1,020**	**5,700**	**910**	**5,300**	**720**
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**

【Note】 Refer to the comments and notes below the table on page 37 regarding usage.

Recommended Cutting Conditions (Metric)

4 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page 38.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (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
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
		24	0.055	5,300	1,400	5,300	1,270	3,900	840	3,200	770	2,900	590
	0.2	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
		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
	0.3	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
		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
	0.5	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
		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
	1	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
		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
		24	0.085	5,300	1,400	5,300	1,270	3,900	840	3,200	770	2,900	590
5	0.1	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
		25	0.075	5,200	1,830	5,200	1,660	3,800	1,090	3,100	990	2,800	760
	0.2	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
		25	0.095	5,200	1,830	5,200	1,660	3,800	1,090	3,100	990	2,800	760
	0.3	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
		25	0.129	5,200	1,830	5,200	1,660	3,800	1,090	3,100	990	2,800	760
	0.5	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

4 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page 38.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (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**
		30	0.142	4,500	1,780	**4,500**	**1,620**	**3,300**	**1,070**	**2,700**	**970**	**2,400**	**730**
	0.3	12	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**
		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**
	0.5	12	0.193	8,300	3,290	**8,300**	**2,990**	**6,100**	**1,980**	**4,900**	**1,760**	**4,500**	**1,380**
		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**
	1	12	0.197	8,300	3,290	**8,300**	**2,990**	**6,100**	**1,980**	**4,900**	**1,760**	**4,500**	**1,380**
		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**

(1) a_p indicates guidelines for Group 2 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (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 EPDREH4010-2-02-TH3 tool:
Cutting depth = 0.047 (a_p) × 1 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = 0.0376 mm

【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 (Metric)

4 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-efficiency cutting conditions, refer to page 33.

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (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**	0.016	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**

4 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-efficiency cutting conditions, refer to page 33.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (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
		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
	0.3	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
		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
		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

【Note】 Refer to the comments and notes below the table on page 42 regarding usage.

Recommended Cutting Conditions (Metric)

4 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-efficiency cutting conditions, refer to page 33.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (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
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
		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
	0.5	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
		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
3	0.05	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
		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
		20	0.018	5,700	900	5,700	820	4,200	540	3,400	490	3,200	390
	0.1	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
		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
	0.2	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
		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
		20	0.041	5,700	900	5,700	820	4,200	540	3,400	490	3,200	390
	0.3	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
		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
	0.5	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
		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

4 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-efficiency cutting conditions, refer to page 33.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (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
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**

【Note】 Refer to the comments and notes below the table on page 42 regarding usage.

Recommended Cutting Conditions (Metric)

4 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-efficiency cutting conditions, refer to page 33.

Work material				1 Pre-hardened Steel (35～45HRC)		2 Hardened Steel (45～55HRC)		3 Hardened Steel (55～60HRC)		4 Hardened Steel (60～65HRC)		5 Hardened Steel (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**

(1) a_p indicates guidelines for Group 2 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (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 EPDREH4010-2-02-TH3 tool:
Cutting depth = 0.039 (a_p) × 1 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = 0.0312mm

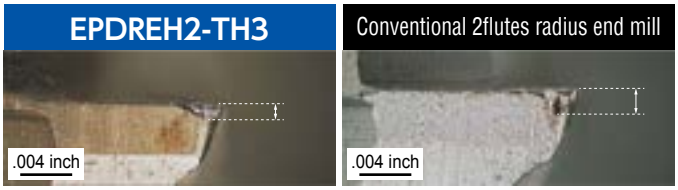
【Note】

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.

Field data

Tool wear after 66 minutes of machining D2 (58 HRC)

2 Flutes

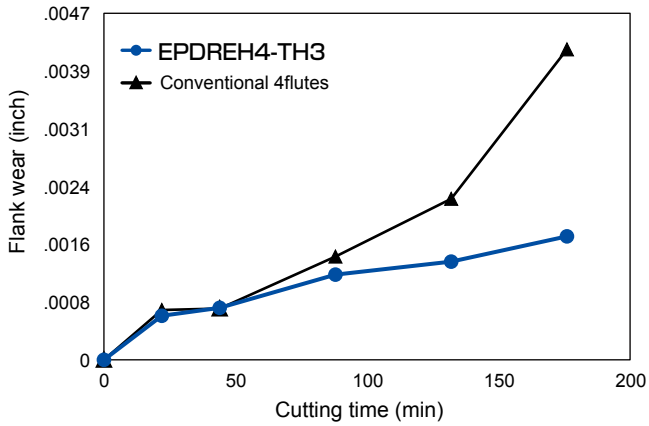


Flank wear .002 inch　　Flank wear .003 inch

Tool size : φ0.8×R0.05 (DC .031 inch × R .002 inch)
Under neck length 2mm (.079 inch)
Work material : PD613(58HRC)
Machine : Vertical MC (HSK-F63)
Cutting method : Contour pocketing
(Pocket size : .394×.394×.020 inch)
Cutting conditions : n=23,000min^{-1} (v_c=190 SFM)
v_f=27.6 IPM (f_z=.001 IPT)
a_p .001 inch a_e .006 inch Mist blow

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

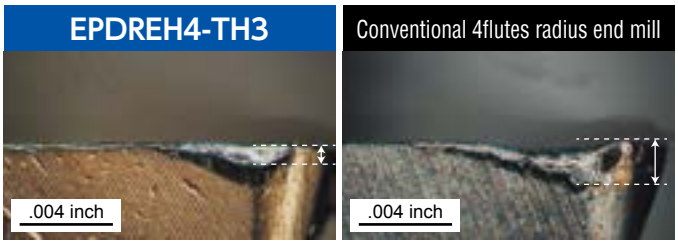
4 Flutes



Tool size : φ3×R0.1 (DC .118 inch × R .004 inch)
Under neck length 12mm (.472 inch)
Work material：STAVAX(51HRC)
Machine：Vertical MC (HSK-A63)
Cutting method：Bottom face cutting
Cutting conditions：n=11,000min^{-1} (v_c=341 SFM)
v_f=63.0 IPM (f_z=.001 IPT)
a_p .003 inch a_e .031 inch Mist blow

Tool wear after 60 minutes of machining VANADIS23 (61 HRC)

4 Flutes



Flank wear .001 inch　　Flank wear .002 inch

Tool size : φ1×R0.1 (DC .039 inch × R .004 inch)
Under neck length 8mm (.315 inch)
Work material：VANADIS23(62HRC)
Machine：Vertical MC (HSK-E32)
Cutting method：Bottom face cutting
Cutting conditions：n=10,000min^{-1} (v_c=102 SFM)
v_f=25.6 IPM (f_z=.001 IPT)
a_p .0002 inch a_e .008 inch Mist blow

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

Field data

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

2 Flutes

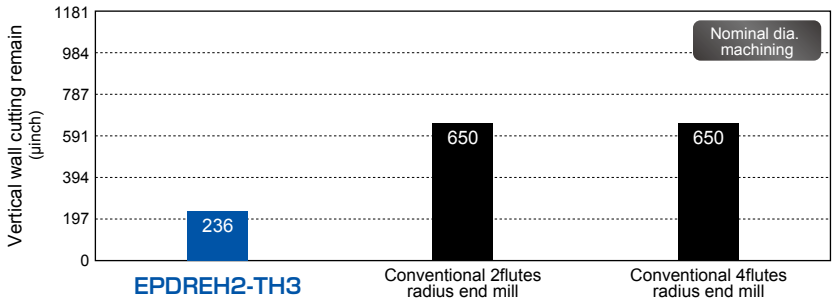
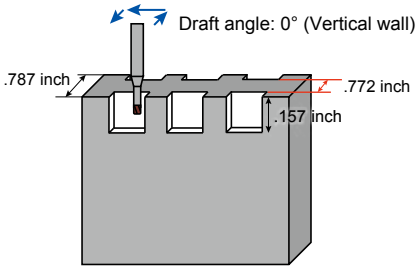


Figure Machining shape



Finishing time: 10 mins

Tool size：φ0.8×R0.2 (DC .031 inch × R .008 inch) Under neck length 4mm (.157 inch)
Work material：PD613(58HRC) Machine：Vertical MC (HSK-E25)
Cutting conditions：n=23,000min^{-1} (v_c=190 SFM)
v_f=23.6 IPM (2flutes f_z=.0005 IPT, 4flutes f_z=.0003 IPT)
a_p .001 inch a_e .002 inch Mist blow

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

Bottom face finishing example

2 Flutes

Tool size：φ1×R0.2 (DC .039 inch × R .008 inch)
Under neck length 2mm (.079 inch)
Work material：STAVAX(52HRC)
Machine：Vertical MC (HSK-E32)
Cutting conditions：
n=40,000min^{-1} (v_c=410 SFM)
v_f=15.6 IPM (f_z=.0002 IPT)
a_p .0002 inch a_e .0002 inch
Water base Wet

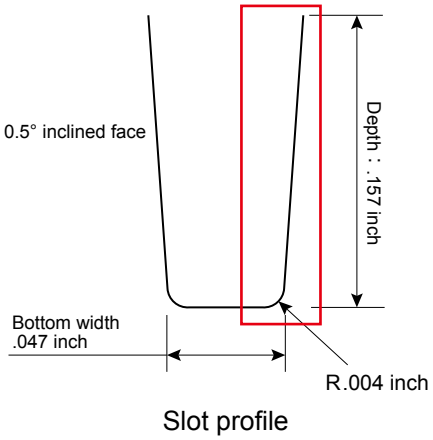
Maintains a smooth high-quality surface even after 11 hours of continuous milling

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

Deep slot machining example

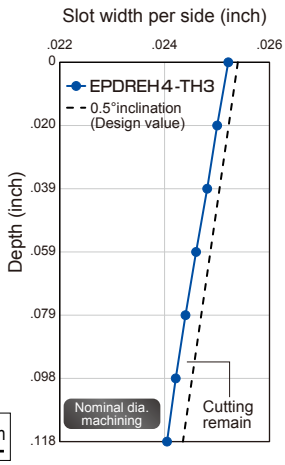
4 Flutes

Contour finishing, deep slot profile, work material: D2 (60 HRC), machining time: 30 mins

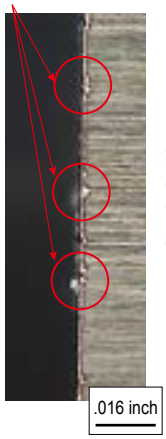


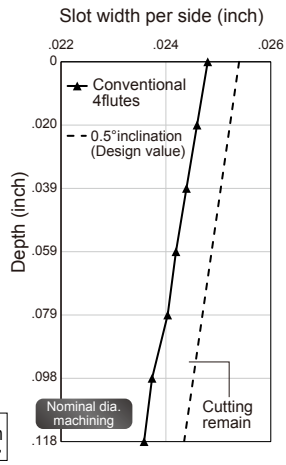
EPDREH4-TH3 | Conventional 4flutes radius end mill

No burrs



Burrs





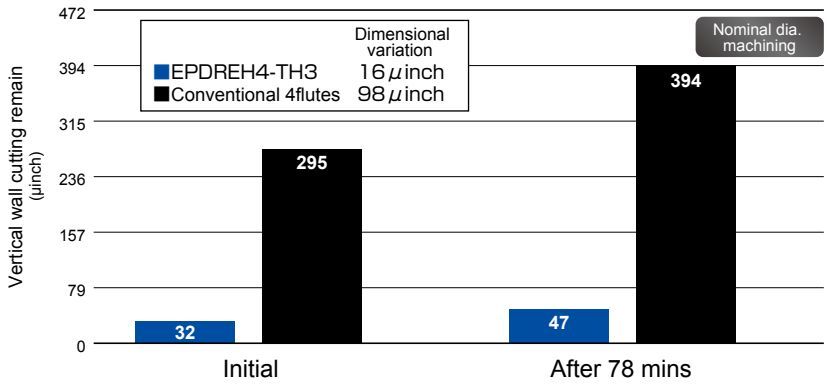
Tool size：φ1×R0.1 (DC .039 inch × R .004 inch) Under neck length 4mm (.157 inch) Work material：D2 (60HRC)
Machine：Vertical MC (HSK-E25) Cutting conditions：n=18,200min^{-1}(v_c=187 SFM) v_f=51.6 IPM (f_z=.0007 IPT) a_p .002 inch a_e .008 inch Air blow

Deep slots can be milled with precision and without burrs

Vertical wall finishing example

4 Flutes

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



Machining shape φ.347 inch × Depth .059 inch

Process	Tools	Tool dia.	Corner radius RE	Revolution n (min^{-1})	Cutting speed v_c (SFM)	Feed rate v_f (IPM)	Feed per tooth f_z (IPT)	a_p (inch)	Finishing allowance (inch)	Coolant
Semi-finishing	EPDREH4010-3-01-TH3	1	0.1	25,000	259	23.6	.0002	.002	.0004	Mist blow
FInishing	EPDREH4010-3-01-TH3	1	0.1	25,000	259	11.8	.0001	.001	0	Mist blow

Offers high-accuracy machining with dimensional variation of just 16 μinch after 1 hour of finishing machining

Notes

⚠ Safety notes

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 thelocal laws and regulations regarding prevention of hazards due to specified chemical substances.

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