

ETR *Epoch Turbo Rib* **ETRP** *Epoch Turbo Rib Pencil Neck* **4-Flute Deep Cutting End Mill for Rib Applications**

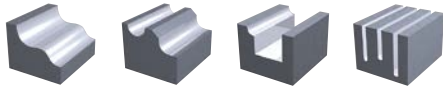
D1mm ~ D3mm

- **Special Diameters:**
1.25 | 1.75 | 2.5mm
- **CR: 0.2 | 0.3 | 0.5 | 0.8**
- l_n up to 50xD
- **Oval Geometry**
- **Compound Neck Shape**



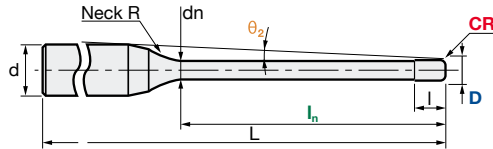
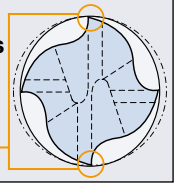
ETR | Epoch Turbo Rib

V max High Speed	▽ Roughing	▽▽ Semi-Finishing	HRC 65	Rib. Miniature	No. of Teeth 4
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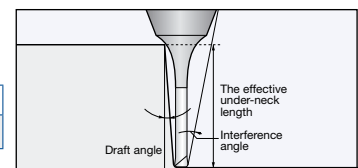
Oval Geometry for less vibrations

For tool setup be careful to measure main flute



Carbide Micro Grain	TH45+ Nano-PVD Coating	Rake Angle Negative
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Helix Angle 45°	R Tol. [mm] +/- 0.01	d Tol. h5
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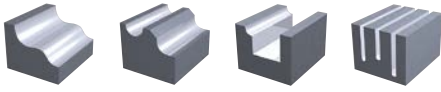
Size												Actual Effective Length in Incline Angles						
ID Code	Item Code	Z	D	CR	L _n	L	dn	L	d	Neck R	θ ₂ °	0.5°	1°	1.5°	2°	3°		
EP1763	ETR-4010-3-02-TH	4	1	0.2	3	1	0.94	50	6	4	9.66	3.69	3.86	4.01	4.14	4.39		
EP1764	ETR-4010-5-02-TH				5						8.52	5.79	6.01	6.21	6.38	6.75		
EP1765	ETR-4010-10-02-TH				10						6.58	10.98	11.32	11.58	12.09	13.39		
EP1766	ETR-4010-15-02-TH				15						5.35	16.15	16.55	17.24	18.07	20.03		
EP1767	ETR-4010-20-02-TH				20						4.51	21.29	21.92	22.94	24.06	26.66		
EP1768	ETR-4010-25-02-TH				25						3.90	26.41	27.37	28.64	30.04	33.30		
EP1769	ETR-4010-30-02-TH					30								31.52	32.82	34.34	36.02	39.94
EP1770	ETR-40125-5-02-TH		1.25			5	1.25	1.18			50	8.38	5.81	6.03	6.22	6.39	6.79	
EP1771	ETR-40125-10-02-TH					10						6.42	11.00	11.33	11.59	12.12	13.42	
EP1772	ETR-40125-15-02-TH					15						5.20	16.16	16.56	17.26	18.10	20.06	
EP1773	ETR-40125-20-02-TH					20						4.37	21.30	21.95	22.97	24.09	26.69	
EP1774	ETR-40125-25-02-TH					25						3.77	26.42	27.39	28.67	30.07	33.33	
EP1775	ETR-40125-30-02-TH					30								31.54	32.84	34.37	36.05	39.97
EP1776	ETR-4015-5-03-TH		1.5		0.3	5	1.5	1.42			50	8.28	5.83	6.05	6.23	6.40	6.79	
EP1777	ETR-4015-7.5-03-TH					7.5						7.14	8.43	8.70	8.93	9.14	10.10	
EP1778	ETR-4015-10-03-TH					10						6.28	11.02	11.34	11.60	12.13	13.42	
EP1779	ETR-4015-15-03-TH					15						5.05	16.18	16.57	17.28	18.11	20.06	
EP1780	ETR-4015-20-03-TH					20						4.23	21.31	21.96	22.98	24.09	26.69	
EP1781	ETR-4015-25-03-TH					25						3.63	26.43	27.41	28.68	30.08	33.33	
EP1782	ETR-4015-30-03-TH					30								31.55	32.86	34.38	36.06	39.97
EP1783	ETR-40175-5-03-TH		1.75			5	1.75	1.65			50	8.10	5.88	6.08	6.26	6.42	6.85	
EP1784	ETR-40175-10-03-TH					10						6.09	11.06	11.37	11.63	12.18	13.48	
EP1785	ETR-40175-20-03-TH					20						4.07	21.34	22.01	23.03	24.15	26.76	
EP1786	ETR-4020-6-05-TH		2		0.5	6	2	1.92			50	7.55	6.86	7.10	7.30	7.48	8.05	
EP1787	ETR-4020-10-05-TH	10				5.98			11.01	11.33		11.59	12.09	13.36				
EP1788	ETR-4020-15-05-TH	15				4.75			16.17	16.56		17.25	18.07	19.99				
EP1789	ETR-4020-20-05-TH	20				3.94			21.31	21.95		22.95	24.06	26.63				
EP1790	ETR-4020-25-05-TH	25				3.36			26.43	27.39		28.65	30.04	33.27				
EP1791	ETR-4020-30-05-TH	30				2.93			31.54	32.84		34.36	36.02	x				
EP1792	ETR-4020-35-05-TH	35				2.60			36.67	38.29		40.06	42.00	x				
EP1793	ETR-4020-40-05-TH	40				2.34			41.88	43.73		45.76	47.99	x				
EP1794	ETR-4025-10-05-TH	2.5			10	2.5	2.4	50	5.57	11.05	11.36	11.61	12.15	13.42				
EP1795	ETR-4025-20-05-TH				20			3.59	21.34	22.00	23.00	24.11	26.69					
EP1796	ETR-4025-30-05-TH				30			2.64	31.57	32.89	34.41	36.08	x					
EP1797	ETR-4025-40-05-TH				40			2.09	41.93	43.79	45.81	48.04	x					
EP1798	ETR-4030-10-08-TH	3		0.8	10	3	2.86	50	5.17	11.12	11.40	11.66	12.20	13.45				
EP1799	ETR-4030-20-08-TH				20			3.23	21.39	22.07	23.07	24.17	26.72					
EP1800	ETR-4030-30-08-TH				30			2.35	31.61	32.97	34.47	36.13	x					
EP1801	ETR-4030-40-08-TH				40			1.85	42.02	43.86	45.88	x	x					
EP1802	ETR-4030-50-08-TH				50			1.52	52.45	54.76	57.28	x	x					

x = no interference

Cutting Conditions		
D 1 – D 3:	Roughing: Page 4 – 5	Semi-Finishing: Page 4 – 5

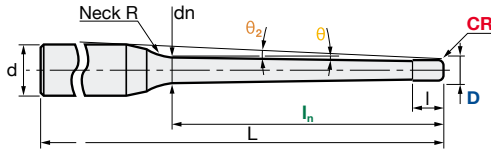
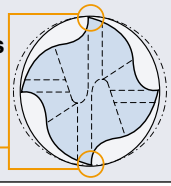
ETRP | Epoch Turbo Rib Pencil Neck

V max High Speed	▽ Roughing	▽▽ Semi-Finishing	HRC 65	Rib. Miniature	No. of Teeth 4
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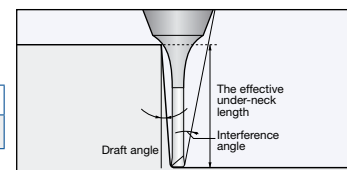
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Carbide Micro Grain	TH45+ Nano-PVD Coating	Rake Angle Negative
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Helix Angle 45°	R Tol. [mm] +/- 0.01	d Tol. h5
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Size													Actual Effective Length in Incline Angles						
ID Code	Item Code	Z	D	CR	I _n	I	dn	L	d	Neck R	θ°	θ ₂ °	0°	1°	1.5°	2°	3°		
EP676	ETRP-4010-5-0902-TH	4	1	0.2	5	1	1.066	60		4	0.9°	8.67	2.91	5.70	5.96	6.17	6.51		
EP677	ETRP-4010-10-0902-TH				10		1.223			7		6.78		11.04	11.60	12.03	12.70		
EP678	ETRP-4010-15-0902-TH				15		1.380			70		5.57		16.35	17.25	17.89	18.89		
EP679	ETRP-4010-20-0902-TH				20		1.537					4.72		21.42	22.49	23.22	24.80		
EP680	ETRP-4010-25-0902-TH				25		1.694					4.10		26.49	27.70	28.52	30.95		
EP681	ETRP-4010-30-0902-TH				30		1.851	80	3.62	31.55		32.90		33.79	37.09				
EP682	ETRP-4010-35-0902-TH				35		2.008		3.24	36.61		38.08		39.03	43.24				
EP683	ETRP-4010-40-0902-TH				40		2.165		2.94	41.67		43.25		44.54	x				
EP684	ETRP-4010-45-0902-TH				45		2.322	90	2.68	46.73		48.41		50.08	x				
EP685	ETRP-4010-50-0902-TH				50		2.480		2.47	51.78		53.56		55.62	x				
EP686	ETRP-40125-10-0902-TH		1.25		10	1.455	60		7	6.62		3.47	11.10	11.65	12.06	12.73			
EP687	ETRP-40125-20-0902-TH				20	1.769	70	4.57	21.49	22.52			23.25	24.86					
EP688	ETRP-40125-30-0902-TH				30	2.083	80	3.49	31.61	32.93			33.81	37.15					
EP689	ETRP-40125-40-0902-TH				40	2.397	90	2.82	41.73	43.28			44.59	x					
EP690	ETRP-40125-50-0902-TH				50	2.712	100	2.37	51.83	53.59			55.67	x					
EP691	ETRP-4015-10-0903-TH		1.5	0.3	10	1.5	1.687	60	7	6.47		10	4.04	11.15	11.67	12.08	12.74		
EP692	ETRP-4015-20-0903-TH				20		2.001	70	4.43	21.54			22.55	23.27	24.88				
EP693	ETRP-4015-30-0903-TH				30		2.315	80	3.36	31.66			32.95	33.83	37.17				
EP694	ETRP-4015-40-0903-TH				40		2.630	90	2.71	41.77			43.30	44.62	x				
EP695	ETRP-4015-50-0903-TH				50		2.944	100	2.27	51.88			53.60	55.70	x				
EP696	ETRP-40175-10-0903-TH		1.75		10		1.909	60	7	6.28			4.93	11.24	11.74	12.13	12.77		
EP697	ETRP-40175-20-0903-TH				20		2.223	70	4.26	21.64				22.61	23.32	24.97			
EP698	ETRP-40175-30-0903-TH				30		2.538	80	3.22	31.75				33.00	33.86	37.26			
EP699	ETRP-40175-40-0903-TH	40			2.852		90	2.59	41.86	43.34				44.70	x				
EP700	ETRP-40175-50-0903-TH	50			3.166		100	2.16	51.95	53.64				55.78	x				
EP701	ETRP-4020-20-0905-TH	2	0.5		20		2	2.486	70	7			4.12	10	4.54	21.29	22.10	22.67	24.86
EP702	ETRP-4020-30-0905-TH				30			2.800	80	3.10			31.69		32.96	33.83	37.16		
EP703	ETRP-4020-40-0905-TH				40			3.114	90	2.48			41.80		43.31	44.63	x		
EP704	ETRP-4020-50-0905-TH				50			3.428	100	2.07			51.90		53.16	55.71	x		
EP705	ETRP-4020-60-0905-TH				60			3.742	110	1.77			62.00		63.89	x	x		
EP706	ETRP-4025-20-0905-TH	2.5		20	2.5	2.950		70	7	3.76		10	5.68		21.39	22.16	22.72	24.98	
EP707	ETRP-4025-30-0905-TH			30		3.264		80	2.79	31.80			33.02		33.88	x			
EP708	ETRP-4025-40-0905-TH			40		3.578		90	2.22	41.90			43.36		44.73	x			
EP709	ETRP-4025-50-0905-TH			50		3.892		100	1.85	52.00			53.66		x	x			
EP710	ETRP-4025-60-0905-TH			60		4.207		110	1.58	62.09			63.93		x	x			
EP711	ETRP-4030-20-0908-TH	3		0.8	20	3		3.394	70	7		3.39	10		7.45	21.50	22.22	22.76	25.05
EP712	ETRP-4030-30-0908-TH				30			3.708	80	2.49		31.59			32.54	33.74	x		
EP713	ETRP-4030-40-0908-TH				40			4.022	90	1.96		42.03			43.42	x	x		
EP714	ETRP-4030-50-0908-TH				50			4.337	100	1.62		52.12			53.72	x	x		
EP715	ETRP-4030-60-0908-TH				60			4.651	110	1.37		62.20			x	x	x		

x = no interference

Cutting Conditions		
D 1 - D 3:	Roughing: Page 6 - 7	Semi-Finishing: Page 6 - 7

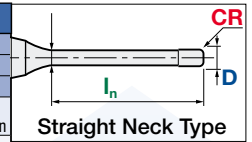


ETR			Recommended Cutting Conditions – Roughing ▽																				
Workpiece Material			I Copper							II Cast Iron, Carbon Steel, Alloy Steel (150~250HB)							III Tool Steel (25~35HRC)						
			a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min	a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min	a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min			
D	CR	l _n																					
1	0.2	3	0.085	0.500	38,200	120	0.052	7,980	0.085	0.500	35,000	110	0.044	6,120	0.085	0.500	30,300	95	0.040	4,840			
		5	0.051	0.500	35,000	110	0.052	7,320	0.051	0.500	31,800	100	0.044	5,560	0.051	0.500	27,100	85	0.040	4,330			
		10	0.026	0.500	35,000	110	0.052	7,320	0.026	0.500	31,800	100	0.044	5,560	0.026	0.500	27,100	85	0.040	4,330			
		15	0.017	0.500	31,500	99	0.052	6,580	0.017	0.500	28,700	90	0.044	5,020	0.017	0.500	24,400	77	0.040	3,890			
		20	0.013	0.500	31,500	99	0.052	6,580	0.013	0.500	28,700	90	0.044	5,020	0.013	0.500	24,400	77	0.040	3,890			
		25	0.010	0.500	28,000	88	0.052	5,850	0.010	0.500	25,500	80	0.044	4,460	0.010	0.500	21,700	68	0.040	3,460			
		30	0.009	0.500	26,300	83	0.052	5,500	0.009	0.500	23,900	75	0.044	4,180	0.009	0.500	20,300	64	0.040	3,240			
		5	0.080	0.625	30,600	120	0.068	8,370	0.080	0.625	28,000	110	0.057	6,380	0.080	0.625	24,200	95	0.053	5,150			
		10	0.040	0.625	28,000	110	0.068	7,660	0.040	0.625	25,500	100	0.057	5,810	0.040	0.625	21,700	85	0.053	4,620			
		15	0.026	0.625	28,000	110	0.068	7,660	0.026	0.625	25,500	100	0.057	5,810	0.026	0.625	21,700	85	0.053	4,620			
1.25	0.2	20	0.020	0.625	25,200	99	0.068	6,890	0.020	0.625	22,900	90	0.057	5,220	0.020	0.625	19,500	77	0.053	4,150			
		25	0.016	0.625	25,200	99	0.068	6,890	0.016	0.625	22,900	90	0.057	5,220	0.016	0.625	19,400	76	0.053	4,130			
		30	0.014	0.625	22,400	88	0.068	6,130	0.014	0.625	20,400	80	0.057	4,650	0.014	0.625	17,300	68	0.053	3,680			
		5	0.116	0.750	25,500	120	0.088	9,010	0.116	0.750	23,400	110	0.074	6,940	0.116	0.750	20,200	95	0.068	5,530			
		7.5	0.077	0.750	23,600	111	0.088	8,340	0.077	0.750	21,200	100	0.074	6,280	0.077	0.750	18,000	85	0.068	4,920			
1.5	0.3	10	0.058	0.750	23,400	110	0.088	8,270	0.058	0.750	21,200	100	0.074	6,280	0.058	0.750	18,000	85	0.068	4,920			
		15	0.039	0.750	23,600	111	0.088	8,340	0.039	0.750	21,200	100	0.074	6,280	0.039	0.750	18,000	85	0.068	4,920			
		20	0.029	0.750	21,000	99	0.088	7,420	0.029	0.750	19,100	90	0.074	5,660	0.029	0.750	16,200	76	0.068	4,430			
		25	0.023	0.750	21,200	100	0.088	7,490	0.023	0.750	19,100	90	0.074	5,660	0.023	0.750	16,100	76	0.068	4,400			
		30	0.020	0.750	21,000	99	0.088	7,420	0.020	0.750	19,100	90	0.074	5,660	0.020	0.750	16,200	76	0.068	4,430			
1.75	0.3	5	0.156	0.875	21,800	120	0.111	9,690	0.156	0.875	20,000	110	0.092	7,370	0.156	0.875	17,300	95	0.086	5,920			
		10	0.078	0.875	20,000	110	0.111	8,890	0.078	0.875	18,200	100	0.092	6,710	0.078	0.875	15,500	85	0.086	5,300			
		20	0.039	0.875	18,000	99	0.111	8,000	0.039	0.875	16,400	90	0.092	6,050	0.039	0.875	13,900	76	0.086	4,750			
2	0.5	6	0.184	1.000	19,100	120	0.137	10,450	0.184	1.000	17,500	110	0.114	7,980	0.184	1.000	15,100	95	0.104	6,250			
		10	0.111	1.000	17,500	110	0.137	9,580	0.111	1.000	15,900	100	0.114	7,250	0.111	1.000	13,500	85	0.104	5,590			
		15	0.074	1.000	17,500	110	0.137	9,580	0.074	1.000	15,900	100	0.114	7,250	0.074	1.000	13,500	85	0.104	5,590			
		20	0.055	1.000	17,500	110	0.137	9,580	0.055	1.000	15,900	100	0.114	7,250	0.055	1.000	13,500	85	0.104	5,590			
		25	0.054	1.000	15,800	99	0.137	8,650	0.054	1.000	14,300	90	0.114	6,520	0.054	1.000	12,100	76	0.104	5,010			
		30	0.045	1.000	15,800	99	0.137	8,650	0.045	1.000	14,300	90	0.114	6,520	0.045	1.000	12,200	77	0.104	5,050			
		35	0.044	1.000	15,800	99	0.137	8,650	0.044	1.000	14,300	90	0.114	6,520	0.044	1.000	12,100	76	0.104	5,010			
		40	0.038	1.000	15,800	99	0.137	8,650	0.038	1.000	14,300	90	0.114	6,520	0.038	1.000	12,200	77	0.104	5,050			
		10	0.160	1.250	14,000	110	0.183	10,270	0.160	1.250	12,700	100	0.153	7,770	0.160	1.250	10,800	85	0.137	5,910			
		20	0.080	1.250	14,000	110	0.183	10,270	0.080	1.250	12,700	100	0.153	7,770	0.080	1.250	10,800	85	0.137	5,910			
2.5	0.5	30	0.054	1.250	12,600	99	0.183	9,240	0.054	1.250	11,500	90	0.153	7,040	0.054	1.250	9,700	76	0.137	5,310			
		40	0.040	1.250	12,600	99	0.183	9,240	0.040	1.250	11,500	90	0.153	7,040	0.040	1.250	9,700	76	0.137	5,310			
		10	0.230	1.500	12,700	120	0.227	11,530	0.230	1.500	11,700	110	0.190	8,890	0.230	1.500	10,100	95	0.174	7,020			
		20	0.115	1.500	11,700	110	0.227	10,630	0.115	1.500	10,600	100	0.190	8,060	0.115	1.500	9,000	85	0.174	6,260			
		30	0.085	1.500	11,700	110	0.227	10,630	0.085	1.500	10,600	100	0.190	8,060	0.085	1.500	9,000	85	0.174	6,260			
3	0.8	40	0.058	1.500	10,500	99	0.227	9,540	0.058	1.500	9,600	90	0.190	7,300	0.058	1.500	8,100	76	0.174	5,630			
		50	0.046	1.500	10,500	99	0.227	9,540	0.046	1.500	9,600	90	0.190	7,300	0.046	1.500	8,100	76	0.174	5,630			

ETR		Recommended Cutting Conditions – Semi-Finishing ▽▽																					
Workpiece Material			I Copper							II Cast Iron, Carbon Steel, Alloy Steel (150–250HB)							III Tool Steel (25–35HRC)						
			a_p mm	a_e mm	n min ⁻¹	V_c m/min	f_z (mm/t)	V_f mm/min	a_p mm	a_e mm	n min ⁻¹	V_c m/min	f_z (mm/t)	V_f mm/min	a_p mm	a_e mm	n min ⁻¹	V_c m/min	f_z (mm/t)	V_f mm/min			
D	CR	l_n																					
1	0.2	3	0.043	0.043–0.129	28,000	88	0.016	1,790	0.043	0.043–0.129	24,500	77	0.015	1,470	0.043	0.043–0.129	22,900	72	0.014	1,280			
		5	0.026	0.026–0.078	25,500	80	0.016	1,630	0.026	0.026–0.078	22,300	70	0.015	1,340	0.026	0.026–0.078	20,700	65	0.014	1,160			
		10	0.013	0.013–0.039	25,500	80	0.016	1,630	0.013	0.013–0.039	22,300	70	0.015	1,340	0.013	0.013–0.039	20,700	65	0.014	1,160			
		15	0.009	0.009–0.026	22,900	72	0.016	1,470	0.009	0.009–0.026	20,100	63	0.015	1,210	0.009	0.009–0.026	18,600	58	0.014	1,040			
		20	0.007	0.007–0.020	22,900	72	0.016	1,470	0.007	0.007–0.020	20,100	63	0.015	1,210	0.007	0.007–0.020	18,600	58	0.014	1,040			
		25	0.005	0.005–0.016	20,400	64	0.016	1,310	0.005	0.005–0.016	17,800	56	0.015	1,070	0.005	0.005–0.016	16,600	52	0.014	930			
		30	0.004	0.004–0.013	19,100	60	0.016	1,220	0.004	0.004–0.013	16,700	52	0.015	1,000	0.004	0.004–0.013	15,500	49	0.014	870			
		5	0.032	0.032–0.096	22,400	88	0.022	1,970	0.032	0.032–0.096	19,600	77	0.021	1,650	0.032	0.032–0.096	18,300	72	0.020	1,460			
		10	0.016	0.016–0.049	20,400	80	0.022	1,800	0.016	0.016–0.049	17,800	70	0.021	1,500	0.016	0.016–0.049	16,600	65	0.020	1,330			
		15	0.011	0.011–0.033	20,400	80	0.022	1,800	0.011	0.011–0.033	17,800	70	0.021	1,500	0.011	0.011–0.033	16,600	65	0.020	1,330			
1.25	0.2	20	0.008	0.008–0.024	18,300	72	0.022	1,610	0.008	0.008–0.024	16,100	63	0.021	1,350	0.008	0.008–0.024	14,900	59	0.020	1,190			
		25	0.006	0.006–0.018	18,300	72	0.022	1,610	0.006	0.006–0.018	16,100	63	0.021	1,350	0.006	0.006–0.018	15,000	59	0.020	1,200			
		30	0.005	0.005–0.016	16,300	64	0.022	1,430	0.005	0.005–0.016	14,300	56	0.021	1,200	0.005	0.005–0.016	13,200	52	0.020	1,060			
		5	0.052	0.052–0.156	18,700	88	0.029	2,170	0.052	0.052–0.156	16,300	77	0.027	1,760	0.052	0.052–0.156	15,300	72	0.026	1,590			
1.5	0.3	7.5	0.035	0.035–0.105	17,000	80	0.029	1,970	0.035	0.035–0.105	14,900	70	0.027	1,610	0.035	0.035–0.105	13,800	65	0.026	1,440			
		10	0.026	0.026–0.077	17,000	80	0.029	1,970	0.026	0.026–0.077	14,900	70	0.027	1,610	0.026	0.026–0.077	13,800	65	0.026	1,440			
		15	0.017	0.017–0.051	17,000	80	0.029	1,970	0.017	0.017–0.051	14,900	70	0.027	1,610	0.017	0.017–0.051	13,800	65	0.026	1,440			
		20	0.013	0.013–0.038	15,300	72	0.029	1,770	0.013	0.013–0.038	13,400	63	0.027	1,450	0.013	0.013–0.038	12,400	58	0.026	1,290			
1.75	0.3	25	0.011	0.011–0.033	15,300	72	0.029	1,770	0.011	0.011–0.033	13,400	63	0.027	1,450	0.011	0.011–0.033	12,300	58	0.026	1,280			
		30	0.009	0.009–0.026	15,300	72	0.029	1,770	0.009	0.009–0.026	13,400	63	0.027	1,450	0.009	0.009–0.026	12,400	58	0.026	1,290			
		5	0.080	0.080–0.240	14,600	80	0.037	2,160	0.080	0.080–0.240	12,700	70	0.035	1,780	0.080	0.080–0.240	11,800	65	0.034	1,600			
		10	0.040	0.040–0.121	14,600	80	0.037	2,160	0.040	0.040–0.121	12,700	70	0.035	1,780	0.040	0.040–0.121	11,800	65	0.034	1,600			
2	0.5	20	0.020	0.020–0.060	13,100	72	0.037	1,940	0.020	0.020–0.060	11,500	63	0.035	1,610	0.020	0.020–0.060	11,800	65	0.034	1,600			
		6	0.080	0.080–0.240	14,000	88	0.046	2,580	0.080	0.080–0.240	12,300	77	0.044	2,160	0.080	0.080–0.240	11,500	72	0.042	1,930			
		10	0.048	0.048–0.144	12,700	80	0.046	2,340	0.048	0.048–0.144	11,100	70	0.044	1,950	0.048	0.048–0.144	10,400	65	0.042	1,750			
		15	0.032	0.032–0.096	12,700	80	0.046	2,340	0.032	0.032–0.096	11,100	70	0.044	1,950	0.032	0.032–0.096	10,400	65	0.042	1,750			
		20	0.024	0.024–0.072	12,700	80	0.046	2,340	0.024	0.024–0.072	11,100	70	0.044	1,950	0.024	0.024–0.072	10,400	65	0.042	1,750			
		25	0.019	0.019–0.057	11,500	72	0.046	2,120	0.019	0.019–0.057	10,000	63	0.044	1,760	0.019	0.019–0.057	9,200	58	0.042	1,550			
		30	0.016	0.016–0.048	11,500	72	0.046	2,120	0.016	0.016–0.048	10,000	63	0.044	1,760	0.016	0.016–0.048	9,300	58	0.042	1,560			
		35	0.014	0.014–0.042	11,500	72	0.046	2,120	0.014	0.014–0.042	10,000	63	0.044	1,760	0.014	0.014–0.042	9,200	58	0.042	1,550			
		40	0.012	0.012–0.036	11,500	72	0.046	2,120	0.012	0.012–0.036	10,000	63	0.044	1,760	0.012	0.012–0.036	9,300	58	0.042	1,560			
		10	0.078	0.078–0.234	10,200	80	0.061	2,490	0.078	0.078–0.234	8,900	70	0.059	2,100	0.078	0.078–0.234	8,300	65	0.057	1,890			
2.5	0.5	20	0.039	0.039–0.116	10,200	80	0.061	2,490	0.039	0.039–0.116	8,900	70	0.059	2,100	0.039	0.039–0.116	8,300	65	0.057	1,890			
		30	0.026	0.026–0.078	9,200	72	0.061	2,240	0.026	0.026–0.078	8,000	63	0.059	1,890	0.026	0.026–0.078	7,500	59	0.057	1,710			
		40	0.019	0.019–0.058	9,200	72	0.061	2,240	0.019	0.019–0.058	8,000	63	0.059	1,890	0.019	0.019–0.058	7,500	59	0.057	1,710			
		10	0.138	0.138–0.414	9,300	88	0.079	2,940	0.138	0.138–0.414	8,200	77	0.076	2,490	0.138	0.138–0.414	7,600	72	0.073	2,220			
3	0.8	20	0.069	0.069–0.207	8,500	80	0.079	2,690	0.069	0.069–0.207	7,400	70	0.076	2,250	0.069	0.069–0.207	6,900	65	0.073	2,010			
		30	0.046	0.046–0.138	8,500	80	0.079	2,690	0.046	0.046–0.138	7,400	70	0.076	2,250	0.046	0.046–0.138	6,900	65	0.073	2,010			
		40	0.035	0.035–0.104	7,600	72	0.079	2,400	0.035	0.035–0.104	6,700	63	0.076	2,040	0.035	0.035–0.104	6,200	58	0.073	1,810			
		50	0.028	0.028–0.083	7,600	72	0.079	2,400	0.028	0.028–0.083	6,700	63	0.076	2,040	0.028	0.028–0.083	6,200	58	0.073	1,810			



ETR Recommended Cutting Conditions – Roughing ▽																	
IV						V						VI					
Pre-Hardened Steel						Hardened Steel						Hardened Steel					
(35–45HRC)						(45–55HRC)						(55–65HRC)					
a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min	a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min	a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min
0.068	0.500	25,500	80	0.031	3,200	0.055	0.500	20,700	65	0.030	2,520	0.043	0.500	17,500	55	0.027	1,860
0.041	0.500	22,300	70	0.031	2,800	0.033	0.500	19,100	60	0.030	2,320	0.026	0.500	16,200	51	0.027	1,720
0.020	0.500	22,300	70	0.031	2,800	0.017	0.500	19,100	60	0.030	2,320	0.013	0.500	16,200	51	0.027	1,720
0.014	0.500	20,100	63	0.031	2,520	0.011	0.500	17,200	54	0.030	2,090	0.009	0.500	14,600	46	0.027	1,550
0.010	0.500	20,100	63	0.031	2,520	0.009	0.500	17,200	54	0.030	2,090	0.007	0.500	14,600	46	0.027	1,550
0.009	0.500	17,800	56	0.031	2,230	0.007	0.500	15,300	48	0.030	1,860	0.005	0.500	13,000	41	0.027	1,380
0.007	0.500	16,700	52	0.031	2,090	0.006	0.500	14,300	45	0.030	1,740	0.004	0.500	12,200	38	0.027	1,300
0.065	0.625	20,400	80	0.042	3,410	0.051	0.625	16,600	65	0.042	2,780	0.039	0.625	14,000	55	0.035	1,970
0.032	0.625	17,800	70	0.042	2,980	0.026	0.625	15,300	60	0.042	2,560	0.020	0.625	13,000	51	0.035	1,830
0.022	0.625	17,800	70	0.042	2,980	0.017	0.625	15,300	60	0.042	2,560	0.014	0.625	12,700	50	0.035	1,790
0.016	0.625	16,000	63	0.042	2,680	0.013	0.625	13,800	54	0.042	2,310	0.010	0.625	11,700	46	0.035	1,650
0.013	0.625	16,100	63	0.042	2,690	0.010	0.625	13,800	54	0.042	2,310	0.008	0.625	11,500	45	0.035	1,620
0.011	0.625	14,200	56	0.042	2,370	0.009	0.625	12,200	48	0.042	2,040	0.007	0.625	10,400	41	0.035	1,460
0.092	0.750	17,000	80	0.053	3,620	0.075	0.750	13,800	65	0.053	2,940	0.058	0.750	11,700	55	0.044	2,050
0.061	0.750	14,900	70	0.053	3,170	0.050	0.750	12,700	60	0.053	2,700	0.039	0.750	10,600	50	0.044	1,850
0.046	0.750	14,900	70	0.053	3,170	0.037	0.750	12,700	60	0.053	2,700	0.029	0.750	10,800	51	0.044	1,890
0.031	0.750	14,900	70	0.053	3,170	0.025	0.750	12,700	60	0.053	2,700	0.019	0.750	10,600	50	0.044	1,850
0.023	0.750	13,400	63	0.053	2,850	0.019	0.750	11,400	54	0.053	2,430	0.014	0.750	9,700	46	0.044	1,700
0.018	0.750	13,400	63	0.053	2,850	0.015	0.750	11,500	54	0.053	2,450	0.011	0.750	9,600	45	0.044	1,680
0.015	0.750	13,400	63	0.053	2,850	0.013	0.750	11,400	54	0.053	2,430	0.009	0.750	9,700	46	0.044	1,700
0.126	0.875	14,600	80	0.067	3,880	0.102	0.875	11,800	65	0.067	3,140	0.078	0.875	10,000	55	0.052	2,090
0.063	0.875	12,700	70	0.067	3,380	0.051	0.875	10,900	60	0.067	2,900	0.039	0.875	9,300	51	0.052	1,940
0.031	0.875	11,400	63	0.067	3,030	0.026	0.875	9,800	54	0.067	2,610	0.020	0.875	8,400	46	0.052	1,760
0.147	1.000	12,700	80	0.081	4,100	0.119	1.000	10,400	65	0.081	3,360	0.094	1.000	8,800	55	0.057	2,010
0.088	1.000	11,100	70	0.081	3,590	0.071	1.000	9,600	60	0.081	3,100	0.056	1.000	8,000	50	0.057	1,820
0.059	1.000	11,100	70	0.081	3,590	0.048	1.000	9,600	60	0.081	3,100	0.037	1.000	8,000	50	0.057	1,820
0.044	1.000	11,100	70	0.081	3,590	0.036	1.000	9,500	60	0.081	3,070	0.028	1.000	8,100	51	0.057	1,850
0.043	1.000	10,000	63	0.081	3,230	0.035	1.000	8,600	54	0.081	2,780	0.028	1.000	7,200	45	0.057	1,640
0.036	1.000	10,000	63	0.081	3,230	0.029	1.000	8,600	54	0.081	2,780	0.023	1.000	7,300	46	0.057	1,660
0.035	1.000	10,000	63	0.081	3,230	0.028	1.000	8,600	54	0.081	2,780	0.022	1.000	7,200	45	0.057	1,640
0.031	1.000	10,000	63	0.081	3,230	0.025	1.000	8,600	54	0.081	2,780	0.020	1.000	7,300	46	0.057	1,660
0.128	1.250	8,900	70	0.107	3,820	0.104	1.250	7,600	60	0.107	3,260	0.080	1.250	6,400	50	0.064	1,630
0.064	1.250	8,900	70	0.107	3,820	0.052	1.250	7,600	60	0.107	3,260	0.040	1.250	6,500	51	0.064	1,650
0.043	1.250	8,000	63	0.107	3,440	0.035	1.250	6,800	53	0.107	2,920	0.026	1.250	5,800	46	0.064	1,480
0.032	1.250	8,000	63	0.107	3,440	0.026	1.250	6,800	53	0.107	2,920	0.020	1.250	5,800	46	0.064	1,480
0.184	1.500	8,500	80	0.136	4,620	0.150	1.500	6,900	65	0.136	3,750	0.116	1.500	5,800	55	0.068	1,590
0.092	1.500	7,400	70	0.136	4,020	0.075	1.500	6,400	60	0.136	3,480	0.058	1.500	5,400	51	0.068	1,480
0.068	1.500	7,400	70	0.136	4,020	0.055	1.500	6,400	60	0.136	3,480	0.043	1.500	5,400	51	0.068	1,480
0.046	1.500	6,700	63	0.136	3,640	0.037	1.500	5,800	55	0.136	3,150	0.029	1.500	4,900	46	0.068	1,340
0.037	1.500	6,700	63	0.136	3,640	0.030	1.500	5,800	55	0.136	3,150	0.023	1.500	4,900	46	0.068	1,340



Straight Neck Type

PLEASE NOTE:

The values in these tables are only recommended under the following conditions:

1. The use of a machining centre and toolholder with highest precision, concentricity and rigidity

2. All components – including machine and controller – are of the latest technology



Modification if too high:

- Keep f_z stable
- Reduce rpm to set best result on non-HQ machines

ETR	Recommended Cutting Conditions – Semi-Finishing ▽▽																
IV						V						VI					
Pre-Hardened Steel						Hardened Steel						Hardened Steel					
(35–45HRC)						(45–55HRC)						(55–65HRC)					
a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min	a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min	a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min
0.033	0.033–0.100	21,000	66	0.015	1,260	0.030	0.030–0.090	19,100	60	0.013	990	0.027	0.027–0.081	15,900	50	0.012	760
0.020	0.020–0.059	19,100	60	0.015	1,150	0.018	0.018–0.055	17,500	55	0.013	910	0.016	0.016–0.047	14,300	45	0.012	690
0.010	0.010–0.029	19,100	60	0.015	1,150	0.009	0.009–0.027	17,500	55	0.013	910	0.008	0.008–0.023	14,300	45	0.012	690
0.007	0.007–0.020	17,200	54	0.015	1,030	0.006	0.006–0.018	15,800	50	0.013	820	0.005	0.005–0.016	12,900	41	0.012	620
0.005	0.005–0.015	17,200	54	0.015	1,030	0.005	0.005–0.014	15,800	50	0.013	820	0.004	0.004–0.012	12,900	41	0.012	620
0.004	0.004–0.012	15,300	48	0.015	920	0.004	0.004–0.011	14,000	44	0.013	730	0.003	0.003–0.009	11,500	36	0.012	550
0.003	0.003–0.010	14,300	45	0.015	860	0.003	0.003–0.009	13,100	41	0.013	680	0.003	0.003–0.008	10,700	34	0.012	510
0.024	0.024–0.072	16,800	66	0.020	1,340	0.022	0.022–0.066	15,300	60	0.018	1,100	0.020	0.020–0.060	12,700	50	0.017	860
0.012	0.012–0.037	15,300	60	0.020	1,220	0.011	0.011–0.034	14,000	55	0.018	1,010	0.010	0.010–0.029	11,500	45	0.017	780
0.008	0.008–0.024	15,300	60	0.020	1,220	0.008	0.008–0.024	14,000	55	0.018	1,010	0.007	0.007–0.021	11,500	45	0.017	780
0.006	0.006–0.018	13,800	54	0.020	1,100	0.006	0.006–0.017	12,600	49	0.018	910	0.005	0.005–0.015	10,300	40	0.017	700
0.005	0.005–0.015	13,800	54	0.020	1,100	0.005	0.005–0.015	12,500	49	0.018	900	0.004	0.004–0.012	10,200	40	0.017	690
0.004	0.004–0.012	12,200	48	0.020	980	0.004	0.004–0.011	11,200	44	0.018	810	0.003	0.003–0.010	9,200	36	0.017	630
0.038	0.038–0.114	14,000	66	0.027	1,510	0.036	0.036–0.108	12,700	60	0.024	1,220	0.030	0.030–0.060	10,600	50	0.021	890
0.025	0.025–0.075	12,700	60	0.027	1,370	0.024	0.024–0.072	11,700	55	0.024	1,120	0.020	0.020–0.060	9,600	45	0.021	810
0.019	0.019–0.057	12,700	60	0.027	1,370	0.018	0.018–0.054	11,700	55	0.024	1,120	0.015	0.015–0.046	9,600	45	0.021	810
0.013	0.013–0.039	12,700	60	0.027	1,370	0.012	0.012–0.036	11,700	55	0.024	1,120	0.011	0.011–0.033	9,600	45	0.021	810
0.010	0.010–0.029	11,500	54	0.027	1,240	0.009	0.009–0.027	10,500	49	0.024	1,010	0.008	0.008–0.023	8,600	41	0.021	720
0.007	0.007–0.021	11,500	54	0.027	1,240	0.007	0.007–0.021	10,400	49	0.024	1,000	0.006	0.006–0.018	8,700	41	0.021	730
0.006	0.006–0.019	11,500	54	0.027	1,240	0.006	0.006–0.018	10,500	49	0.024	1,010	0.005	0.005–0.015	8,600	41	0.021	720
0.060	0.060–0.180	10,900	60	0.034	1,480	0.056	0.056–0.168	10,000	55	0.030	1,200	0.048	0.048–0.144	8,200	45	0.027	890
0.030	0.030–0.091	10,900	60	0.034	1,480	0.028	0.028–0.085	10,000	55	0.030	1,200	0.024	0.024–0.072	8,200	45	0.027	890
0.015	0.015–0.045	9,800	54	0.034	1,330	0.014	0.014–0.042	9,000	49	0.030	1,080	0.012	0.012–0.036	8,200	45	0.027	890
0.060	0.060–0.180	10,500	66	0.042	1,760	0.057	0.057–0.171	9,600	60	0.037	1,420	0.047	0.047–0.141	8,000	50	0.033	1,060
0.036	0.036–0.108	9,600	60	0.042	1,610	0.034	0.034–0.102	8,800	55	0.037	1,300	0.028	0.012–0.038	7,200	45	0.033	950
0.024	0.024–0.072	9,600	60	0.042	1,610	0.023	0.023–0.069	8,800	55	0.037	1,300	0.019	0.012–0.039	7,200	45	0.033	950
0.018	0.018–0.054	9,600	60	0.042	1,610	0.017	0.017–0.050	8,800	55	0.037	1,300	0.014	0.014–0.043	7,200	45	0.033	950
0.014	0.014–0.042	8,600	54	0.042	1,440	0.013	0.013–0.039	8,000	50	0.037	1,180	0.012	0.012–0.036	6,400	40	0.033	840
0.012	0.012–0.036	8,600	54	0.042	1,440	0.011	0.011–0.034	7,900	50	0.037	1,170	0.010	0.010–0.029	6,400	40	0.033	840
0.010	0.010–0.030	8,600	54	0.042	1,440	0.009	0.009–0.027	8,000	50	0.037	1,180	0.008	0.008–0.024	6,400	40	0.033	840
0.009	0.009–0.027	8,600	54	0.042	1,440	0.008	0.008–0.025	7,900	50	0.037	1,170	0.007	0.007–0.022	6,400	40	0.033	840
0.058	0.058–0.174	7,600	60	0.057	1,730	0.054	0.054–0.162	7,000	55	0.050	1,400	0.046	0.046–0.138	5,700	45	0.045	1,030
0.029	0.029–0.087	7,600	60	0.057	1,730	0.027	0.027–0.081	7,000	55	0.050	1,400	0.023	0.023–0.070	5,700	45	0.045	1,030
0.019	0.019–0.058	6,900	54	0.057	1,570	0.018	0.018–0.054	6,300	49	0.050	1,260	0.016	0.016–0.047	5,200	41	0.045	940
0.015	0.015–0.044	6,900	54	0.057	1,570	0.014	0.014–0.041	6,300	49	0.050	1,260	0.012	0.012–0.035	5,200	41	0.045	940
0.104	0.104–0.312	7,000	66	0.072	2,020	0.096	0.096–0.288	6,400	60	0.064	1,640	0.082	0.082–0.246	5,300	50	0.056	1,190
0.052	0.052–0.155	6,400	60	0.072	1,840	0.048	0.048–0.145	5,800	55	0.064	1,480	0.041	0.041–0.124	4,800	45	0.056	1,080
0.035	0.035–0.104	6,400	60	0.072	1,840	0.032	0.032–0.097	5,800	55	0.064	1,480	0.028	0.028–0.083	4,800	45	0.056	1,080
0.026	0.026–0.078	5,700	54	0.072	1,640	0.024	0.024–0.072	5,300	50	0.064	1,360	0.021	0.021–0.062	4,300	41	0.056	960
0.021	0.021–0.062	5,700	54	0.072	1,640	0.019	0.019–0.058	5,300	50	0.064	1,360	0.017	0.017–0.050	4,300	41	0.056	960

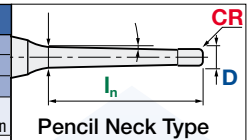


ETRP			Recommended Cutting Conditions – Roughing ▽																				
Workpiece Material			I Copper							II Cast Iron, Carbon Steel, Alloy Steel (150~250HB)							III Tool Steel (25~35HRC)						
			a_p mm	a_e mm	n min ⁻¹	V_c m/min	f_z (mm/t)	V_f mm/min	a_p mm	a_e mm	n min ⁻¹	V_c m/min	f_z (mm/t)	V_f mm/min	a_p mm	a_e mm	n min ⁻¹	V_c m/min	f_z (mm/t)	V_f mm/min			
D	CR	l_n	5	0.060	0.500	35,000	110	0.055	7,700	0.060	0.500	31,800	100	0.046	5,850	0.060	0.500	27,100	85	0.042	4,550		
1	0.2	10	0.030	0.500	35,000	110	0.055	7,700	0.030	0.500	31,800	100	0.046	5,850	0.030	0.500	27,100	85	0.042	4,550			
		15	0.020	0.500	31,500	99	0.055	6,930	0.020	0.500	28,700	90	0.046	5,280	0.020	0.500	24,400	77	0.042	4,100			
		20	0.015	0.500	31,500	99	0.055	6,930	0.015	0.500	28,700	90	0.046	5,280	0.015	0.500	24,400	77	0.042	4,100			
		25	0.012	0.500	28,000	88	0.055	6,160	0.012	0.500	25,500	80	0.046	4,690	0.012	0.500	21,700	68	0.042	3,650			
		30	0.010	0.500	26,300	83	0.055	5,790	0.010	0.500	23,900	75	0.046	4,400	0.010	0.500	20,300	64	0.042	3,410			
		35	0.009	0.500	24,500	77	0.055	5,390	0.009	0.500	22,300	70	0.046	4,100	0.009	0.500	18,900	59	0.042	3,180			
		40	0.008	0.500	22,800	72	0.055	5,020	0.008	0.500	20,700	65	0.046	3,810	0.008	0.500	17,600	55	0.042	2,960			
		45	0.007	0.500	21,000	66	0.055	4,620	0.007	0.500	19,100	60	0.046	3,510	0.007	0.500	16,200	51	0.042	2,720			
		50	0.006	0.500	17,500	55	0.055	3,850	0.006	0.500	15,900	50	0.046	2,930	0.006	0.500	13,500	42	0.042	2,270			
		1.25		10	0.047	0.625	28,000	110	0.072	8,060	0.047	0.625	25,500	100	0.060	6,120	0.047	0.625	21,700	85	0.056	4,860	
20	0.023			0.625	25,200	99	0.072	7,260	0.023	0.625	22,900	90	0.060	5,500	0.023	0.625	19,500	77	0.056	4,370			
30	0.016			0.625	22,400	88	0.072	6,450	0.016	0.625	20,400	80	0.060	4,900	0.016	0.625	17,300	68	0.056	3,880			
40	0.012			0.625	19,600	77	0.072	5,640	0.012	0.625	17,800	70	0.060	4,270	0.012	0.625	15,200	60	0.056	3,400			
50	0.009			0.625	18,200	71	0.072	5,240	0.009	0.625	16,600	65	0.060	3,980	0.009	0.625	14,100	55	0.056	3,160			
1.5		10	0.068	0.750	23,400	110	0.093	8,700	0.068	0.750	21,200	100	0.078	6,610	0.068	0.750	18,000	85	0.072	5,180			
		20	0.034	0.750	21,000	99	0.093	7,810	0.034	0.750	19,100	90	0.078	5,960	0.034	0.750	16,200	76	0.072	4,670			
		30	0.023	0.750	21,000	99	0.093	7,810	0.023	0.750	19,100	90	0.078	5,960	0.023	0.750	16,200	76	0.072	4,670			
		40	0.017	0.750	17,500	82	0.093	6,510	0.017	0.750	15,900	75	0.078	4,960	0.017	0.750	13,500	64	0.072	3,890			
		50	0.014	0.750	16,300	77	0.093	6,060	0.014	0.750	14,900	70	0.078	4,650	0.014	0.750	12,600	59	0.072	3,630			
1.75		10	0.092	0.875	20,000	110	0.117	9,360	0.092	0.875	18,200	100	0.097	7,060	0.092	0.875	15,500	85	0.090	5,580			
		20	0.046	0.875	18,000	99	0.117	8,420	0.046	0.875	16,400	90	0.097	6,360	0.046	0.875	13,900	76	0.090	5,000			
		30	0.031	0.875	18,000	99	0.117	8,420	0.031	0.875	16,400	90	0.097	6,360	0.031	0.875	13,900	76	0.090	5,000			
		40	0.023	0.875	16,000	88	0.117	7,490	0.023	0.875	14,600	80	0.097	5,660	0.023	0.875	12,400	68	0.090	4,460			
		50	0.018	0.875	15,000	82	0.117	7,020	0.018	0.875	13,600	75	0.097	5,280	0.018	0.875	11,600	64	0.090	4,180			
2	0.5	20	0.065	1.000	17,500	110	0.144	10,080	0.065	1.000	15,900	100	0.120	7,630	0.065	1.000	13,500	85	0.109	5,890			
		30	0.053	1.000	15,800	99	0.144	9,100	0.053	1.000	14,300	90	0.120	6,860	0.053	1.000	12,200	77	0.109	5,320			
		40	0.045	1.000	15,800	99	0.144	9,100	0.045	1.000	14,300	90	0.120	6,860	0.045	1.000	12,200	77	0.109	5,320			
		50	0.030	1.000	14,000	88	0.144	8,060	0.030	1.000	12,700	80	0.120	6,100	0.030	1.000	10,800	68	0.109	4,710			
		60	0.020	1.000	13,100	82	0.144	7,550	0.020	1.000	11,900	75	0.120	5,710	0.020	1.000	10,200	64	0.109	4,450			
2.5		20	0.094	1.250	14,000	110	0.193	10,810	0.094	1.250	12,700	100	0.161	8,180	0.094	1.250	10,800	85	0.144	6,220			
		30	0.063	1.250	12,600	99	0.193	9,730	0.063	1.250	11,500	90	0.161	7,410	0.063	1.250	9,700	76	0.144	5,590			
		40	0.047	1.250	12,600	99	0.193	9,730	0.047	1.250	11,500	90	0.161	7,410	0.047	1.250	9,700	76	0.144	5,590			
		50	0.038	1.250	12,600	99	0.193	9,730	0.038	1.250	11,500	90	0.161	7,410	0.038	1.250	9,700	76	0.144	5,590			
		60	0.031	1.250	11,200	88	0.193	8,650	0.031	1.250	10,200	80	0.161	6,570	0.031	1.250	8,700	68	0.144	5,010			
3	0.8	20	0.135	1.500	11,700	110	0.239	11,190	0.135	1.500	10,600	100	0.200	8,480	0.135	1.500	9,000	85	0.183	6,590			
		30	0.100	1.500	11,700	110	0.239	11,190	0.100	1.500	10,600	100	0.200	8,480	0.100	1.500	9,000	85	0.183	6,590			
		40	0.068	1.500	10,500	99	0.239	10,040	0.068	1.500	9,600	90	0.200	7,680	0.068	1.500	8,100	76	0.183	5,930			
		50	0.054	1.500	10,500	99	0.239	10,040	0.054	1.500	9,600	90	0.200	7,680	0.054	1.500	8,100	76	0.183	5,930			
		60	0.045	1.500	10,500	99	0.239	10,040	0.045	1.500	9,600	90	0.200	7,680	0.045	1.500	8,100	76	0.183	5,930			

ETRP		Recommended Cutting Conditions – Semi-Finishing ▽▽																				
Workpiece Material		I Copper							II Cast Iron, Carbon Steel, Alloy Steel (150–250HB)							III Tool Steel (25–35HRC)						
		a_p mm	a_e mm	n min ⁻¹	V_c m/min	f_z (mm/t)	V_f mm/min	a_p mm	a_e mm	n min ⁻¹	V_c m/min	f_z (mm/t)	V_f mm/min	a_p mm	a_e mm	n min ⁻¹	V_c m/min	f_z (mm/t)	V_f mm/min			
D	CR	l_n																				
1	0.2	5	0.026	0.026–0.078	25,500	80	0.016	1,630	0.026	0.026–0.078	22,300	70	0.015	1,340	0.026	0.026–0.078	20,700	65	0.014	1,160		
		10	0.013	0.013–0.039	25,500	80	0.016	1,630	0.013	0.013–0.039	22,300	70	0.015	1,340	0.013	0.013–0.039	20,700	65	0.014	1,160		
		15	0.009	0.009–0.026	22,900	72	0.016	1,470	0.009	0.009–0.026	20,100	63	0.015	1,210	0.009	0.009–0.026	18,600	58	0.014	1,040		
		20	0.007	0.007–0.020	22,900	72	0.016	1,470	0.007	0.007–0.020	20,100	63	0.015	1,210	0.007	0.007–0.020	18,600	58	0.014	1,040		
		25	0.005	0.005–0.016	20,400	64	0.016	1,310	0.005	0.005–0.016	17,800	56	0.015	1,070	0.005	0.005–0.016	16,600	52	0.014	930		
		30	0.004	0.004–0.013	19,100	60	0.016	1,220	0.004	0.004–0.013	16,700	52	0.015	1,000	0.004	0.004–0.013	15,500	49	0.014	870		
		35	0.004	0.004–0.011	17,800	56	0.016	1,140	0.004	0.004–0.011	15,600	49	0.015	940	0.004	0.004–0.011	14,500	46	0.014	810		
		40	0.003	0.003–0.010	16,600	52	0.016	1,060	0.003	0.003–0.010	14,500	46	0.015	870	0.003	0.003–0.010	13,500	42	0.014	760		
		45	0.003	0.003–0.009	15,300	48	0.016	980	0.003	0.003–0.009	13,400	42	0.015	800	0.003	0.003–0.009	12,400	39	0.014	690		
		50	0.003	0.003–0.008	12,700	40	0.016	810	0.003	0.003–0.008	11,100	35	0.015	670	0.003	0.003–0.008	10,400	33	0.014	580		
1.25		10	0.016	0.016–0.049	20,400	80	0.022	1,800	0.016	0.016–0.049	17,800	70	0.021	1,500	0.016	0.016–0.049	16,600	65	0.020	1,330		
		20	0.008	0.008–0.024	18,300	72	0.022	1,610	0.008	0.008–0.024	16,100	63	0.021	1,350	0.008	0.008–0.024	14,900	59	0.020	1,190		
		30	0.005	0.005–0.016	16,300	64	0.022	1,430	0.005	0.005–0.016	14,300	56	0.021	1,200	0.005	0.005–0.016	13,200	52	0.020	1,060		
		40	0.004	0.004–0.012	14,300	56	0.022	1,260	0.004	0.004–0.012	12,500	49	0.021	1,050	0.004	0.004–0.012	11,600	46	0.020	930		
		50	0.003	0.003–0.010	13,200	52	0.022	1,160	0.003	0.003–0.010	11,600	46	0.021	970	0.003	0.003–0.010	10,800	42	0.020	860		
1.5		10	0.026	0.026–0.077	17,000	80	0.029	1,970	0.026	0.026–0.077	14,900	70	0.027	1,610	0.026	0.026–0.077	13,800	65	0.026	1,440		
		20	0.013	0.013–0.038	15,500	72	0.029	1,770	0.013	0.013–0.038	13,400	63	0.027	1,450	0.013	0.013–0.038	12,400	58	0.026	1,290		
		30	0.009	0.009–0.026	15,300	72	0.029	1,770	0.009	0.009–0.026	13,400	63	0.027	1,450	0.009	0.009–0.026	12,400	58	0.026	1,290		
		40	0.006	0.006–0.019	12,700	60	0.029	1,470	0.006	0.006–0.019	11,100	52	0.027	1,200	0.006	0.006–0.019	10,400	49	0.026	1,080		
		50	0.005	0.005–0.015	11,900	56	0.029	1,380	0.005	0.005–0.015	10,400	49	0.027	1,120	0.005	0.005–0.015	9,700	46	0.026	1,010		
1.75		10	0.040	0.040–0.121	14,600	80	0.037	2,160	0.040	0.040–0.121	12,700	70	0.035	1,780	0.040	0.040–0.121	11,800	65	0.034	1,600		
		20	0.020	0.020–0.060	13,100	72	0.037	1,940	0.020	0.020–0.060	11,500	63	0.035	1,610	0.020	0.020–0.060	11,800	65	0.034	1,600		
		30	0.013	0.013–0.040	13,100	72	0.037	1,940	0.013	0.013–0.040	11,500	63	0.035	1,610	0.013	0.013–0.040	11,800	65	0.034	1,600		
		40	0.010	0.010–0.030	11,600	64	0.037	1,720	0.010	0.010–0.030	10,200	56	0.035	1,430	0.010	0.010–0.030	9,500	52	0.034	1,290		
		50	0.008	0.008–0.024	10,900	60	0.037	1,610	0.008	0.008–0.024	9,600	53	0.035	1,340	0.008	0.008–0.024	8,900	49	0.034	1,210		
2		20	0.024	0.024–0.072	12,700	80	0.046	2,340	0.024	0.024–0.072	11,100	70	0.044	1,950	0.024	0.024–0.072	10,400	65	0.042	1,750		
		30	0.016	0.016–0.048	11,500	72	0.046	2,120	0.016	0.016–0.048	10,000	63	0.044	1,760	0.016	0.016–0.048	9,300	58	0.042	1,560		
		40	0.012	0.012–0.036	11,500	72	0.046	2,120	0.012	0.012–0.036	10,000	63	0.044	1,760	0.012	0.012–0.036	9,300	58	0.042	1,560		
		50	0.010	0.010–0.029	10,200	64	0.046	1,880	0.010	0.010–0.029	8,900	56	0.044	1,570	0.010	0.010–0.029	8,300	52	0.042	1,390		
		60	0.008	0.008–0.024	9,600	60	0.046	1,770	0.008	0.008–0.024	8,400	53	0.044	1,480	0.008	0.008–0.024	7,800	49	0.042	1,310		
2.5		20	0.039	0.039–0.116	10,200	80	0.061	2,490	0.039	0.039–0.116	8,900	70	0.059	2,100	0.039	0.039–0.116	8,300	65	0.057	1,890		
		30	0.026	0.026–0.078	9,200	72	0.061	2,240	0.026	0.026–0.078	8,000	63	0.059	1,890	0.026	0.026–0.078	7,500	59	0.057	1,710		
		40	0.019	0.019–0.058	9,200	72	0.061	2,240	0.019	0.019–0.058	8,000	63	0.059	1,890	0.019	0.019–0.058	7,500	59	0.057	1,710		
		50	0.016	0.016–0.047	9,200	72	0.061	2,240	0.016	0.016–0.047	8,000	63	0.059	1,890	0.016	0.016–0.047	7,500	59	0.057	1,710		
		60	0.013	0.013–0.039	8,200	64	0.061	2,000	0.013	0.013–0.039	7,100	56	0.059	1,680	0.013	0.013–0.039	6,600	52	0.057	1,500		
3	0.8	20	0.069	0.069–0.207	8,500	80	0.079	2,690	0.069	0.069–0.207	7,400	70	0.076	2,250	0.069	0.069–0.207	6,900	65	0.073	2,010		
		30	0.046	0.046–0.138	8,500	80	0.079	2,690	0.046	0.046–0.138	7,400	70	0.076	2,250	0.046	0.046–0.138	6,900	65	0.073	2,010		
		40	0.035	0.035–0.104	7,600	72	0.079	2,400	0.035	0.035–0.104	6,700	63	0.076	2,040	0.035	0.035–0.104	6,200	58	0.073	1,810		
		50	0.028	0.028–0.083	7,600	72	0.079	2,400	0.028	0.028–0.083	6,700	63	0.076	2,040	0.028	0.028–0.083	6,200	58	0.073	1,810		
		60	0.023	0.023–0.069	7,600	72	0.079	2,400	0.023	0.023–0.069	6,700	63	0.076	2,040	0.023	0.023–0.069	6,200	58	0.073	1,810		



ETRP	Recommended Cutting Conditions – Roughing ▽																
IV						V						VI					
Pre-Hardened Steel						Hardened Steel						Hardened Steel					
(35–45HRC)						(45–55HRC)						(55–65HRC)					
a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min	a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min	a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min
0.048	0.500	22,300	70	0.033	2,940	0.039	0.500	19,100	60	0.032	2,440	0.030	0.500	16,200	51	0.028	1,810
0.024	0.500	22,300	70	0.033	2,940	0.020	0.500	19,100	60	0.032	2,440	0.015	0.500	16,200	51	0.028	1,810
0.016	0.500	20,100	63	0.033	2,650	0.013	0.500	17,200	54	0.032	2,200	0.010	0.500	14,600	46	0.028	1,640
0.012	0.500	20,100	63	0.033	2,650	0.010	0.500	17,200	54	0.032	2,200	0.008	0.500	14,600	46	0.028	1,640
0.010	0.500	17,800	56	0.033	2,350	0.008	0.500	15,300	48	0.032	1,960	0.006	0.500	13,000	41	0.028	1,460
0.008	0.500	16,700	52	0.033	2,200	0.007	0.500	14,300	45	0.032	1,830	0.005	0.500	12,200	38	0.028	1,370
0.007	0.500	15,600	49	0.033	2,060	0.006	0.500	13,400	42	0.032	1,720	0.004	0.500	11,400	36	0.028	1,280
0.006	0.500	14,500	46	0.033	1,910	0.005	0.500	12,400	39	0.032	1,590	0.004	0.500	10,600	33	0.028	1,190
0.005	0.500	13,400	42	0.033	1,770	0.004	0.500	11,500	36	0.032	1,470	0.003	0.500	9,700	30	0.028	1,090
0.005	0.500	11,200	35	0.033	1,480	0.004	0.500	9,600	30	0.032	1,230	0.003	0.500	8,100	25	0.028	910
0.038	0.625	17,800	70	0.044	3,130	0.030	0.625	15,300	60	0.044	2,690	0.023	0.625	13,000	51	0.037	1,920
0.019	0.625	16,000	63	0.044	2,820	0.015	0.625	13,800	54	0.044	2,430	0.012	0.625	11,700	46	0.037	1,730
0.013	0.625	14,200	56	0.044	2,500	0.010	0.625	12,200	48	0.044	2,150	0.008	0.625	10,400	41	0.037	1,540
0.009	0.625	12,500	49	0.044	2,200	0.008	0.625	10,700	42	0.044	1,880	0.006	0.625	9,100	36	0.037	1,350
0.008	0.625	11,600	46	0.044	2,040	0.006	0.625	9,900	39	0.044	1,740	0.005	0.625	8,400	33	0.037	1,240
0.054	0.750	14,900	70	0.056	3,340	0.044	0.750	12,700	60	0.056	2,840	0.034	0.750	10,800	51	0.046	1,990
0.027	0.750	13,400	63	0.056	3,000	0.022	0.750	11,400	54	0.056	2,550	0.017	0.750	9,700	46	0.046	1,780
0.018	0.750	13,400	63	0.056	3,000	0.015	0.750	11,400	54	0.056	2,550	0.011	0.750	9,700	46	0.046	1,780
0.014	0.750	11,200	53	0.056	2,510	0.011	0.750	9,500	45	0.056	2,130	0.008	0.750	8,100	38	0.046	1,490
0.011	0.750	10,400	49	0.056	2,330	0.009	0.750	8,900	42	0.056	1,990	0.007	0.750	7,600	36	0.046	1,400
0.074	0.875	12,700	70	0.070	3,560	0.060	0.875	10,900	60	0.070	3,050	0.046	0.875	9,300	51	0.055	2,050
0.037	0.875	11,400	63	0.070	3,190	0.030	0.875	9,800	54	0.070	2,740	0.023	0.875	8,400	46	0.055	1,850
0.025	0.875	11,400	63	0.070	3,190	0.020	0.875	9,800	54	0.070	2,740	0.015	0.875	8,400	46	0.055	1,850
0.018	0.875	10,200	56	0.070	2,860	0.015	0.875	8,700	48	0.070	2,440	0.011	0.875	7,400	41	0.055	1,630
0.015	0.875	9,500	52	0.070	2,660	0.012	0.875	8,200	45	0.070	2,300	0.009	0.875	7,000	38	0.055	1,540
0.052	1.000	11,100	70	0.085	3,770	0.042	1.000	9,500	60	0.085	3,230	0.033	1.000	8,100	51	0.060	1,940
0.042	1.000	10,000	63	0.085	3,400	0.034	1.000	8,600	54	0.085	2,920	0.027	1.000	7,300	46	0.060	1,750
0.036	1.000	10,000	63	0.085	3,400	0.029	1.000	8,600	54	0.085	2,920	0.023	1.000	7,300	46	0.060	1,750
0.024	1.000	8,900	56	0.085	3,030	0.020	1.000	7,600	48	0.085	2,580	0.015	1.000	6,500	41	0.060	1,560
0.016	1.000	8,300	52	0.085	2,820	0.013	1.000	7,100	45	0.085	2,410	0.010	1.000	6,100	38	0.060	1,460
0.075	1.250	8,900	70	0.113	4,020	0.061	1.250	7,600	60	0.113	3,440	0.047	1.250	6,500	51	0.067	1,740
0.050	1.250	8,000	63	0.113	3,620	0.041	1.250	6,800	53	0.113	3,070	0.031	1.250	5,800	46	0.067	1,550
0.038	1.250	8,000	63	0.113	3,620	0.030	1.250	6,800	53	0.113	3,070	0.023	1.250	5,800	46	0.067	1,550
0.030	1.250	8,000	63	0.113	3,620	0.024	1.250	6,800	53	0.113	3,070	0.019	1.250	5,800	46	0.067	1,550
0.025	1.250	7,100	56	0.113	3,210	0.020	1.250	6,100	48	0.113	2,760	0.016	1.250	5,200	41	0.067	1,390
0.108	1.500	7,400	70	0.143	4,230	0.088	1.500	6,400	60	0.143	3,660	0.068	1.500	5,400	51	0.072	1,560
0.080	1.500	7,400	70	0.143	4,230	0.065	1.500	6,400	60	0.143	3,660	0.050	1.500	5,400	51	0.072	1,560
0.054	1.500	6,700	63	0.143	3,830	0.044	1.500	5,800	55	0.143	3,320	0.034	1.500	4,900	46	0.072	1,410
0.043	1.500	6,700	63	0.143	3,830	0.035	1.500	5,800	55	0.143	3,320	0.027	1.500	4,900	46	0.072	1,410
0.036	1.500	6,700	63	0.143	3,830	0.029	1.500	5,800	55	0.143	3,320	0.023	1.500	4,900	46	0.072	1,410



Pencil Neck Type

PLEASE NOTE:

The values in these tables are only recommended under the following conditions:

1. The use of a machining centre and toolholder with highest precision, concentricity and rigidity

2. All components – including machine and controller – are of the latest technology



Modification if too high:

- Keep f_z stable
- Reduce rpm to set best result on non-HQ machines

Recommended Cutting Conditions – Semi-Finishing ▽▽																	
IV						V						VI					
Pre-Hardened Steel						Hardened Steel						Hardened Steel					
(35–45HRC)						(45–55HRC)						(55–65HRC)					
a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min	a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min	a _p mm	a _e mm	n min ⁻¹	V _c m/min	f _z (mm/t)	V _f mm/min
0.020	0.020–0.059	19,100	60	0.015	1,150	0.018	0.018–0.055	17,500	55	0.013	910	0.016	0.016–0.047	14,300	45	0.012	690
0.010	0.010–0.029	19,100	60	0.015	1,150	0.009	0.009–0.027	17,500	55	0.013	910	0.008	0.008–0.023	14,300	45	0.012	690
0.007	0.007–0.020	17,200	54	0.015	1,030	0.006	0.006–0.018	15,800	50	0.013	820	0.005	0.005–0.016	12,900	41	0.012	620
0.005	0.005–0.015	17,200	54	0.015	1,030	0.005	0.005–0.014	15,800	50	0.013	820	0.004	0.004–0.012	12,900	41	0.012	620
0.004	0.004–0.012	15,300	48	0.015	920	0.004	0.004–0.011	14,000	44	0.013	730	0.003	0.003–0.009	11,500	36	0.012	550
0.003	0.003–0.010	14,300	45	0.015	860	0.003	0.003–0.009	13,100	41	0.013	680	0.003	0.003–0.008	10,700	34	0.012	510
0.003	0.003–0.008	13,400	42	0.015	800	0.003	0.003–0.008	12,300	39	0.013	640	0.002	0.002–0.007	10,000	31	0.012	480
0.002	0.002–0.007	12,400	39	0.015	740	0.002	0.002–0.007	11,400	36	0.013	590	0.002	0.002–0.006	9,300	29	0.012	450
0.002	0.002–0.007	11,500	36	0.015	690	0.002	0.002–0.006	10,500	33	0.013	550	0.002	0.002–0.005	8,600	27	0.012	410
0.002	0.002–0.006	9,600	30	0.015	580	0.002	0.002–0.005	8,800	28	0.013	460	0.002	0.002–0.005	7,200	23	0.012	350
0.012	0.012–0.037	15,300	60	0.020	1,220	0.011	0.011–0.034	14,000	55	0.018	1,010	0.010	0.010–0.029	11,500	45	0.017	780
0.006	0.006–0.018	13,800	54	0.020	1,100	0.006	0.006–0.017	12,600	49	0.018	910	0.005	0.005–0.015	10,300	40	0.017	700
0.004	0.004–0.012	12,200	48	0.020	980	0.004	0.004–0.011	11,200	44	0.018	810	0.003	0.003–0.010	9,200	36	0.017	630
0.003	0.003–0.009	10,700	42	0.020	860	0.003	0.003–0.009	9,800	38	0.018	710	0.002	0.002–0.007	8,000	31	0.017	540
0.002	0.002–0.007	9,900	39	0.020	790	0.002	0.002–0.007	9,100	36	0.018	660	0.002	0.002–0.006	7,500	29	0.017	510
0.019	0.019–0.057	12,700	60	0.027	1,370	0.018	0.018–0.054	11,700	55	0.024	1,120	0.015	0.015–0.046	9,600	45	0.021	810
0.010	0.010–0.029	11,500	54	0.027	1,240	0.009	0.009–0.027	10,500	49	0.024	1,010	0.008	0.008–0.023	8,600	41	0.021	720
0.006	0.006–0.019	11,500	54	0.027	1,240	0.006	0.006–0.018	10,500	49	0.024	1,010	0.005	0.005–0.015	8,600	41	0.021	720
0.005	0.005–0.014	9,600	45	0.027	1,040	0.004	0.004–0.013	8,800	41	0.024	840	0.004	0.004–0.011	7,200	34	0.021	600
0.004	0.004–0.011	8,900	42	0.027	960	0.004	0.004–0.011	8,200	39	0.024	790	0.003	0.003–0.009	6,600	32	0.021	560
0.030	0.030–0.091	10,900	60	0.034	1,480	0.028	0.028–0.085	10,000	55	0.030	1,200	0.024	0.024–0.072	8,200	45	0.027	890
0.015	0.015–0.045	9,800	54	0.034	1,330	0.014	0.014–0.042	9,000	49	0.030	1,080	0.012	0.012–0.036	8,200	45	0.027	890
0.010	0.010–0.030	8,900	54	0.034	1,330	0.009	0.009–0.028	9,000	49	0.030	1,080	0.008	0.008–0.024	8,200	45	0.027	890
0.008	0.008–0.023	8,700	48	0.034	1,180	0.007	0.007–0.021	8,000	44	0.030	960	0.006	0.006–0.018	6,600	36	0.027	710
0.006	0.006–0.018	8,200	45	0.034	1,120	0.006	0.006–0.017	7,500	41	0.030	900	0.005	0.005–0.014	6,100	34	0.027	660
0.018	0.018–0.054	9,600	60	0.042	1,610	0.017	0.017–0.050	8,800	55	0.037	1,300	0.014	0.014–0.043	7,200	45	0.033	950
0.012	0.012–0.036	8,600	54	0.042	1,440	0.011	0.011–0.034	7,900	50	0.037	1,170	0.010	0.010–0.029	6,400	40	0.033	840
0.009	0.009–0.027	8,600	54	0.042	1,440	0.008	0.008–0.025	7,900	50	0.037	1,170	0.007	0.007–0.022	6,400	40	0.033	840
0.007	0.007–0.022	7,600	48	0.042	1,280	0.007	0.007–0.020	7,000	44	0.037	1,040	0.006	0.006–0.017	5,700	36	0.033	750
0.006	0.006–0.018	7,200	45	0.042	1,210	0.006	0.006–0.017	6,600	41	0.037	980	0.005	0.005–0.014	5,400	34	0.033	710
0.029	0.029–0.087	7,600	60	0.057	1,730	0.027	0.027–0.081	7,000	55	0.050	1,400	0.023	0.023–0.070	5,700	45	0.045	1,030
0.019	0.019–0.058	6,900	54	0.057	1,570	0.018	0.018–0.054	6,300	49	0.050	1,260	0.016	0.016–0.047	5,200	41	0.045	940
0.015	0.015–0.044	6,900	54	0.057	1,570	0.014	0.014–0.041	6,300	49	0.050	1,260	0.012	0.012–0.035	5,200	41	0.045	940
0.012	0.012–0.035	6,900	54	0.057	1,570	0.011	0.011–0.033	6,300	49	0.050	1,260	0.009	0.009–0.028	5,200	41	0.045	940
0.010	0.010–0.029	6,100	48	0.057	1,390	0.009	0.009–0.027	5,600	44	0.050	1,120	0.008	0.008–0.023	4,600	36	0.045	830
0.052	0.052–0.155	6,400	60	0.072	1,840	0.048	0.048–0.145	5,800	55	0.064	1,480	0.041	0.041–0.124	4,800	45	0.056	1,080
0.035	0.035–0.104	6,400	60	0.072	1,840	0.032	0.032–0.097	5,800	55	0.064	1,480	0.028	0.028–0.083	4,800	45	0.056	1,080
0.026	0.026–0.078	5,700	54	0.072	1,640	0.024	0.024–0.072	5,300	50	0.064	1,360	0.021	0.021–0.062	4,300	41	0.056	960
0.021	0.021–0.062	5,700	54	0.072	1,640	0.019	0.019–0.058	5,300	50	0.064	1,360	0.017	0.017–0.050	4,300	41	0.056	960
0.017	0.017–0.052	5,700	54	0.072	1,640	0.016	0.016–0.048	5,300	50	0.064	1,360	0.014	0.014–0.041	4,300	41	0.056	960

Always up to date: Please check our P50 QuickFinder



ATTENTIONS ON SAFETY

1. Cautions regarding handling

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

2. Cautions regarding mounting

- (1) Before use, check the outside appearance of the tool for scratches, cracks, etc. and that it is firmly mounted in the collet chuck, etc.
- (2) When preparing for use, be sure that the inserts are firmly mounted in place and that they are firmly mounted on the arbor, etc.
- (3) If abnormal chattering, etc. occurs during use, stop the machine immediately and remove the cause of the chattering.

3. Cautions during use

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

4. Cautions regarding regrinding

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

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