

## Micro Grain Solid Carbide End Mill

## EPISM-W-PN | Recommended Cutting Conditions Standard Side Milling (unstable cutting situation)



Material group	Example	Tensile strength	Parameter	Tool Diameter (mm)											
				Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	
Stainless Steel Ferritic, Martensitic	1.4034 (X46Cr13, 420) 1.4021 (X20Cr13, 420) 1.4112 (X90CrMoV18, 440B)	<750 N/mm <sup>2</sup>	V <sub>c</sub> m/min	72	72	72	72	72	72	72	72	72	72	76	
			n min <sup>-1</sup>	22,900	11,500	7,600	5,700	4,600	3,800	2,900	2,300	1,900	1,400	1,200	
			f <sub>z</sub> mm/tooth	0.005	0.01	0.017	0.023	0.03	0.036	0.048	0.06	0.066	0.083	0.096	
			V <sub>f</sub> mm/min	460	460	520	520	550	550	560	550	500	460	460	
			a <sub>p</sub> mm	1	2	3	4	5	6	8	10	12	16	20	
			a <sub>e</sub> mm	0.5	1	1.5	2	2.5	3	4	5	6	8	10	
			Q cm <sup>3</sup> /min	0.23	0.92	2.34	4.16	6.88	9.9	17.92	27.5	36	58.88	92	
Stainless Steel, Austenitic	1.4301 (X5CrNi18-10, 304) 1.4404 (X2CrNiMo17-12-2, 316L) 1.4571 (X6CrNiMoTi17-12-2, 316Ti)	750-850 N/mm <sup>2</sup>	V <sub>c</sub> m/min	60	60	60	60	60	60	60	60	60	60	63	
			n min <sup>-1</sup>	19,100	9,500	6,400	4,800	3,800	3,200	2,400	1,900	1,600	1,200	1,000	
			f <sub>z</sub> mm/tooth	0.004	0.008	0.014	0.019	0.025	0.03	0.04	0.05	0.055	0.069	0.08	
			V <sub>f</sub> mm/min	310	320	350	360	380	380	380	380	350	330	320	
			a <sub>p</sub> mm	1	2	3	4	5	6	8	10	12	16	20	
			a <sub>e</sub> mm	0.5	1	1.5	2	2.5	3	4	5	6	8	10	
			Q cm <sup>3</sup> /min	0.16	0.64	1.58	2.88	4.75	6.84	12.16	19	25.2	42.24	64	
Stainless Steel Duplex, Precipitation- hardenable	1.4542 (X5CrNiCuNb16-4, 17-4PH) 1.4501 (X2CrNiMoCuWN25-7-4, Super Duplex)	850-1100 N/mm <sup>2</sup>	V <sub>c</sub> m/min	48	48	48	48	48	48	48	48	48	48	50	
			n min <sup>-1</sup>	15,300	7,600	5,100	3,800	3,100	2,500	1,900	1,500	1,300	1,000	800	
			f <sub>z</sub> mm/tooth	0.003	0.006	0.011	0.015	0.02	0.024	0.032	0.04	0.044	0.055	0.064	
			V <sub>f</sub> mm/min	180	180	220	230	250	240	240	240	230	220	200	
			a <sub>p</sub> mm	1	2	3	4	5	6	8	10	12	16	20	
			a <sub>e</sub> mm	0.5	1	1.5	2	2.5	3	4	5	6	8	10	
			Q cm <sup>3</sup> /min	0.09	0.36	0.99	1.84	3.13	4.32	7.68	12	16.56	28.16	40	
Titanium, Ti alloys	3.7164 (TiAl6V4)	1100-1300 N/mm <sup>2</sup>	V <sub>c</sub> m/min	45	45	45	45	45	45	45	45	45	45	47	
			n min <sup>-1</sup>	14,300	7,200	4,800	3,600	2,900	2,400	1,800	1,400	1,200	900	700	
			f <sub>z</sub> mm/tooth	0.004	0.008	0.013	0.018	0.024	0.029	0.038	0.048	0.052	0.066	0.076	
			V <sub>f</sub> mm/min	230	230	250	260	280	280	270	270	250	240	210	
			a <sub>p</sub> mm	1	2	3	4	5	6	8	10	12	16	20	
			a <sub>e</sub> mm	0.5	1	1.5	2	2.5	3	4	5	6	8	10	
			Q cm <sup>3</sup> /min	0.12	0.46	1.13	2.08	3.5	5.04	8.64	13.5	18	30.72	42	
Super alloy, Heat-resistance alloy	Inconel 718 Hastelloy	>1300 N/mm <sup>2</sup>	V <sub>c</sub> m/min	24	24	24	24	24	24	24	24	24	24	25	
			n min <sup>-1</sup>	7,600	3,800	2,500	1,900	1,500	1,300	1,000	800	600	500	400	
			f <sub>z</sub> mm/tooth	0.002	0.005	0.008	0.011	0.015	0.018	0.024	0.03	0.033	0.041	0.048	
			V <sub>f</sub> mm/min	60	80	80	80	90	90	100	100	80	80	80	
			a <sub>p</sub> mm	1	2	3	4	5	6	8	10	12	16	20	
			a <sub>e</sub> mm	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.5	0.6	0.8	1	
			Q cm <sup>3</sup> /min	0.01	0.02	0.05	0.06	0.14	0.16	0.32	0.5	0.58	1.02	1.6	

**Please Note:****1. Please confirm your material type first.**

- If hardness harder than value in the same column: please follow by real hardness
- If hardness is lower than that value: please follow material type.

2. Use the high-rigidity and high accuracy machine as possible



## Micro Grain Solid Carbide End Mill

**EPISM-W-PN** | Recommended Cutting Conditions High Efficient Side Milling (stable cutting situation)



Material group	Example	Tensile strength	Parameter	Tool Diameter (mm)											
				Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	
Stainless Steel Ferritic, Martensitic	1.4034 (X46Cr13, 420) 1.4021 (X20Cr13, 420) 1.4112 (X90CrMoV18, 440B)	<750 N/mm <sup>2</sup>	<b>V<sub>c</sub></b> m/min	114	114	114	114	114	114	114	114	115	114	114	110
			<b>n</b> min <sup>-1</sup>	36,300	18,100	12,100	9,100	7,300	6,000	4,500	3,700	3,000	2,300	1,800	
			<b>f<sub>z</sub></b> mm/tooth	0.005	0.011	0.016	0.023	0.03	0.036	0.048	0.06	0.065	0.082	0.096	
			<b>V<sub>f</sub></b> mm/min	730	800	770	840	880	860	860	890	780	750	690	
			<b>a<sub>p</sub></b> mm	1	2	3	4	5	6	8	10	12	16	20	
			<b>a<sub>e</sub></b> mm	0.5	1	1.5	2	2.5	3	4	5	6	8	10	
			<b>Q</b> cm <sup>3</sup> /min	0.37	1.6	3.47	6.72	11	15.48	27.52	44.5	56.16	96	138	
Stainless Steel, Austenitic	1.4301 (X5CrNi18-10, 304) 1.4404 (X2CrNiMo17-12-2, 316L) 1.4571 (X6CrNiMoTi17-12-2, 316Ti)	750-850 N/mm <sup>2</sup>	<b>V<sub>c</sub></b> m/min	95	95	95	95	95	95	95	96	95	95	92	
			<b>n</b> min <sup>-1</sup>	30,030	15,015	9,975	7,560	5,985	5,040	3,780	3,045	2,520	1,890	1,470	
			<b>f<sub>z</sub></b> mm/tooth	0.004	0.009	0.013	0.019	0.025	0.03	0.04	0.05	0.054	0.068	0.08	
			<b>V<sub>f</sub></b> mm/min	460	490	510	550	570	580	580	580	520	490	450	
			<b>a<sub>p</sub></b> mm	1	2	3	4	5	6	8	10	12	16	20	
			<b>a<sub>e</sub></b> mm	0.5	1	1.5	2	2.5	3	4	5	6	8	10	
			<b>Q</b> cm <sup>3</sup> /min	0.23	0.98	2.3	4.4	7.13	10.44	18.56	29	37.44	62.72	90	
Stainless Steel Duplex, Precipitation- hardenable	1.4542 (X5CrNiCuNb16-4, 17-4PH) 1.4501 (X2CrNiMoCuWN25-7-4, Super Duplex)	850-1100 N/mm <sup>2</sup>	<b>V<sub>c</sub></b> m/min	76	76	76	76	76	76	76	76	77	76	76	74
			<b>n</b> min <sup>-1</sup>	24,200	12,100	8,100	6,000	4,800	4,000	3,000	2,500	2,000	1,500	1,200	
			<b>f<sub>z</sub></b> mm/tooth	0.003	0.007	0.01	0.015	0.02	0.024	0.032	0.04	0.043	0.054	0.064	
			<b>V<sub>f</sub></b> mm/min	290	340	320	360	380	380	380	400	340	320	310	
			<b>a<sub>p</sub></b> mm	1	2	3	4	5	6	8	10	12	16	20	
			<b>a<sub>e</sub></b> mm	0.5	1	1.5	2	2.5	3	4	5	6	8	10	
			<b>Q</b> cm <sup>3</sup> /min	0.15	0.68	1.44	2.88	4.75	6.84	12.16	20	24.48	40.96	62	
Titanium, Ti alloys	3.7164 (TiAl6V4)	1100-1300 N/mm <sup>2</sup>	<b>V<sub>c</sub></b> m/min	71	71	71	71	71	71	71	71	72	71	71	69
			<b>n</b> min <sup>-1</sup>	22,600	11,300	7,500	5,700	4,500	3,800	2,800	2,300	1,900	1,400	1,100	
			<b>f<sub>z</sub></b> mm/tooth	0.004	0.009	0.012	0.018	0.024	0.029	0.038	0.048	0.051	0.065	0.076	
			<b>V<sub>f</sub></b> mm/min	360	410	360	410	430	440	430	440	390	360	330	
			<b>a<sub>p</sub></b> mm	1	2	3	4	5	6	8	10	12	16	20	
			<b>a<sub>e</sub></b> mm	0.5	1	1.5	2	2.5	3	4	5	6	8	10	
			<b>Q</b> cm <sup>3</sup> /min	0.18	0.82	1.62	3.28	5.38	7.92	13.76	22	28.08	46.08	66	
Super alloy, Heat-resistance alloy	Inconel 718 Hastelloy	>1300 N/mm <sup>2</sup>	<b>V<sub>c</sub></b> m/min	38	38	38	38	38	38	38	38	38	38	38	37
			<b>n</b> min <sup>-1</sup>	12,100	6,000	4,000	3,000	2,400	2,000	1,500	1,200	1,000	800	600	
			<b>f<sub>z</sub></b> mm/tooth	0.002	0.005	0.008	0.011	0.015	0.018	0.024	0.03	0.032	0.041	0.048	
			<b>V<sub>f</sub></b> mm/min	100	120	130	130	140	140	140	140	130	130	120	
			<b>a<sub>p</sub></b> mm	1	2	3	4	5	6	8	10	12	16	20	
			<b>a<sub>e</sub></b> mm	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.5	0.6	0.8	1	
			<b>Q</b> cm <sup>3</sup> /min	0.01	0.02	0.08	0.1	0.21	0.25	0.45	0.7	0.94	1.66	2.4	

3. These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.

4. Please adjust it if chatter or abnormal vibration occurs.

5. Please setup feed 1/3 that of slotting parameter and step 0.1Dc for drilling application.

6. Please setup feed 70% of slotting parameter and ramping angle 3° for ramping application.

## Micro Grain Solid Carbide End Mill

## EPISM-W-PN | Recommended Cutting Conditions High Efficient Finishing



Material group	Example	Tensile strength	Parameter	Tool Diameter (mm)											
				Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	
Stainless Steel Ferritic, Martensitic	1.4034 (X46Cr13, 420) 1.4021 (X20Cr13, 420) 1.4112 (X90CrMoV18, 440B)	<750 N/mm <sup>2</sup>	V <sub>c</sub> m/min	119	119	119	119	119	120	118	121	118	121	121	
			n min <sup>-1</sup>	37,900	18,900	12,600	9,500	7,600	6,400	4,700	3,900	3,100	2,400	1,900	
			f <sub>z</sub> mm/tooth	0.005	0.01	0.014	0.02	0.028	0.032	0.043	0.054	0.059	0.073	0.086	
			V <sub>f</sub> mm/min	760	760	710	760	850	820	810	840	730	700	650	
			a <sub>p</sub> mm	1.5	3	4.5	6	7.5	9	12	15	18	24	30	
			a <sub>e</sub> mm	0.02	0.04	0.06	0.08	0.1	0.12	0.16	0.2	0.24	0.32	0.4	
			Q cm <sup>3</sup> /min	0.02	0.09	0.19	0.36	0.64	0.89	1.56	2.52	3.15	5.38	7.8	
Stainless Steel, Austenitic	1.4301 (X5CrNi18-10, 304) 1.4404 (X2CrNiMo17-12-2, 316L) 1.4571 (X6CrNiMoTi17-12-2, 316Ti)	750-850 N/mm <sup>2</sup>	V <sub>c</sub> m/min	99	99	99	99	99	100	98	101	98	101	101	
			n min <sup>-1</sup>	31,500	15,800	10,500	7,900	6,300	5,300	3,900	3,200	2,600	2,000	1,600	
			f <sub>z</sub> mm/tooth	0.004	0.008	0.012	0.017	0.023	0.027	0.036	0.045	0.049	0.061	0.072	
			V <sub>f</sub> mm/min	450	480	510	540	570	570	560	580	510	490	460	
			a <sub>p</sub> mm	1.5	3	4.5	6	7.5	9	12	15	18	24	30	
			a <sub>e</sub> mm	0.02	0.04	0.06	0.08	0.1	0.12	0.16	0.2	0.24	0.32	0.4	
			Q cm <sup>3</sup> /min	0.01	0.06	0.14	0.26	0.43	0.62	1.08	1.74	2.2	3.76	5.52	
Stainless Steel Duplex, Precipitation- hardenable	1.4542 (X5CrNiCuNb16-4, 17-4PH) 1.4501 (X2CrNiMoCuWN25-7-4, Super Duplex)	850-1100 N/mm <sup>2</sup>	V <sub>c</sub> m/min	79	79	79	79	79	80	78	81	78	81	81	
			n min <sup>-1</sup>	25,100	12,600	8,400	6,300	5,000	4,200	3,100	2,600	2,100	1,600	1,300	
			f <sub>z</sub> mm/tooth	0.003	0.006	0.01	0.014	0.018	0.022	0.029	0.036	0.039	0.049	0.058	
			V <sub>f</sub> mm/min	300	300	340	350	360	370	360	370	330	310	300	
			a <sub>p</sub> mm	1.5	3	4.5	6	7.5	9	12	15	18	24	30	
			a <sub>e</sub> mm	0.02	0.04	0.06	0.08	0.1	0.12	0.16	0.2	0.24	0.32	0.4	
			Q cm <sup>3</sup> /min	0.01	0.04	0.09	0.17	0.27	0.4	0.69	1.11	1.43	2.38	3.6	
Titanium, Ti alloys	3.7164 (TiAl6V4)	1100-1300 N/mm <sup>2</sup>	V <sub>c</sub> m/min	74	74	74	74	74	75	74	76	74	76	76	
			n min <sup>-1</sup>	23,600	11,800	7,900	5,900	4,700	4,000	2,900	2,400	2,000	1,500	1,200	
			f <sub>z</sub> mm/tooth	0.004	0.008	0.011	0.016	0.022	0.026	0.034	0.043	0.047	0.058	0.068	
			V <sub>f</sub> mm/min	380	380	350	380	410	420	390	410	380	350	330	
			a <sub>p</sub> mm	1.5	3	4.5	6	7.5	9	12	15	18	24	30	
			a <sub>e</sub> mm	0.02	0.04	0.06	0.08	0.1	0.12	0.16	0.2	0.24	0.32	0.4	
			Q cm <sup>3</sup> /min	0.01	0.05	0.09	0.18	0.31	0.45	0.75	1.23	1.64	2.69	3.96	
Super alloy, Heat-resistance alloy	Inconel 718 Hastelloy	>1300 N/mm <sup>2</sup>	V <sub>c</sub> m/min	40	40	40	40	40	40	39	40	39	40	40	
			n min <sup>-1</sup>	12,700	6,400	4,200	3,200	2,500	2,100	1,600	1,300	1,000	800	600	
			f <sub>z</sub> mm/tooth	0.002	0.005	0.007	0.01	0.014	0.016	0.022	0.027	0.029	0.037	0.043	
			V <sub>f</sub> mm/min	100	130	120	130	140	130	140	140	120	120	100	
			a <sub>p</sub> mm	1.5	3	4.5	6	7.5	9	12	15	18	24	30	
			a <sub>e</sub> mm	0.02	0.04	0.06	0.08	0.1	0.12	0.16	0.2	0.24	0.32	0.4	
			Q cm <sup>3</sup> /min	0	0.02	0.03	0.06	0.11	0.14	0.27	0.42	0.52	0.92	1.2	

**Please Note:****1. Please confirm your material type first.**

- If hardness harder than value in the same column: please follow by real hardness
- If hardness is lower than that value: please follow material type.

2. Use the high-rigidity and high accuracy machine as possible



**Micro Grain Solid Carbide End Mill**
**EPISM-W-PN** | Recommended Cutting Conditions High Efficient Slot Milling (stable cutting situation)


Material group	Example	Tensile strength	Parameter	Tool Diameter (mm)											
				Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	
Stainless Steel Ferritic, Martensitic	1.4034 (X46Cr13, 420) 1.4021 (X20Cr13, 420) 1.4112 (X90CrMoV18, 440B)	<750 N/mm <sup>2</sup>	<b>V<sub>c</sub></b> m/min	66	66	66	66	66	66	66	66	68	68	66	68
			<b>n</b> min <sup>-1</sup>	21,000	10,500	7,000	5,300	4,200	3,500	2,600	2,200	1,800	1,300	1,100	
			<b>f<sub>z</sub></b> mm/tooth	0.004	0.007	0.012	0.017	0.023	0.026	0.036	0.046	0.048	0.06	0.073	
			<b>V<sub>f</sub></b> mm/min	340	290	340	360	390	360	370	400	350	310	320	
			<b>a<sub>p</sub></b> mm	1	2	3	4	5	6	8	10	12	16	20	
			<b>a<sub>e</sub></b> mm	1	2	3	4	5	6	8	10	12	16	20	
			<b>Q</b> cm <sup>3</sup> /min	0.34	1.16	3.06	5.76	9.75	12.96	23.68	40	50.4	79.36	128	
Stainless Steel, Austenitic	1.4301 (X5CrNi18-10, 304) 1.4404 (X2CrNiMo17-12-2, 316L) 1.4571 (X6CrNiMoTi17-12-2, 316Ti)	750-850 N/mm <sup>2</sup>	<b>V<sub>c</sub></b> m/min	55	55	55	55	55	55	55	57	57	55	57	
			<b>n</b> min <sup>-1</sup>	17,500	8,800	5,800	4,400	3,500	2,900	2,200	1,800	1,500	1,100	900	
			<b>f<sub>z</sub></b> mm/tooth	0.003	0.006	0.01	0.014	0.019	0.022	0.03	0.038	0.04	0.05	0.061	
			<b>V<sub>f</sub></b> mm/min	210	220	230	250	260	260	260	270	240	220	220	
			<b>a<sub>p</sub></b> mm	1	2	3	4	5	6	8	10	12	16	20	
			<b>a<sub>e</sub></b> mm	1	2	3	4	5	6	8	10	12	16	20	
			<b>Q</b> cm <sup>3</sup> /min	0.21	0.88	2.07	4	6.5	9.36	16.64	27	34.56	56.32	88	
Stainless Steel Duplex, Precipitation- hardenable	1.4542 (X5CrNiCuNb16-4, 17-4PH) 1.4501 (X2CrNiMoCuWN25-7-4, Super Duplex)	850-1100 N/mm <sup>2</sup>	<b>V<sub>c</sub></b> m/min	44	44	44	44	44	44	44	44	46	46	44	46
			<b>n</b> min <sup>-1</sup>	14,000	7,000	4,700	3,500	2,800	2,300	1,800	1,500	1,200	900	700	
			<b>f<sub>z</sub></b> mm/tooth	0.002	0.005	0.008	0.011	0.015	0.018	0.024	0.03	0.032	0.04	0.049	
			<b>V<sub>f</sub></b> mm/min	110	140	150	150	170	170	170	180	150	140	140	
			<b>a<sub>p</sub></b> mm	1	2	3	4	5	6	8	10	12	16	20	
			<b>a<sub>e</sub></b> mm	1	2	3	4	5	6	8	10	12	16	20	
			<b>Q</b> cm <sup>3</sup> /min	0.11	0.56	1.35	2.4	4.25	6.12	10.88	18	21.6	35.84	56	
Titanium, Ti alloys	3.7164 (TiAl6V4)	1100-1300 N/mm <sup>2</sup>	<b>V<sub>c</sub></b> m/min	41	41	41	41	41	41	41	41	43	43	41	43
			<b>n</b> min <sup>-1</sup>	13,100	6,500	4,400	3,300	2,600	2,200	1,600	1,400	1,100	800	700	
			<b>f<sub>z</sub></b> mm/tooth	0.003	0.006	0.01	0.013	0.018	0.021	0.029	0.036	0.038	0.048	0.058	
			<b>V<sub>f</sub></b> mm/min	160	160	180	170	190	180	190	200	170	150	160	
			<b>a<sub>p</sub></b> mm	1	2	3	4	5	6	8	10	12	16	20	
			<b>a<sub>e</sub></b> mm	1	2	3	4	5	6	8	10	12	16	20	
			<b>Q</b> cm <sup>3</sup> /min	0.16	0.64	1.62	2.72	4.75	6.48	12.16	20	24.48	38.4	64	
Super alloy, Heat-resistance alloy	Inconel 718 Hastelloy	>1300 N/mm <sup>2</sup>	<b>V<sub>c</sub></b> m/min	19	19	19	19	19	19	19	19	20	20	19	20
			<b>n</b> min <sup>-1</sup>	6,000	3,000	2,000	1,500	1,200	1,000	800	600	500	400	300	
			<b>f<sub>z</sub></b> mm/tooth	0.002	0.004	0.006	0.008	0.011	0.013	0.018	0.023	0.024	0.03	0.037	
			<b>V<sub>f</sub></b> mm/min	50	50	50	50	50	50	60	60	50	50	40	
			<b>a<sub>p</sub></b> mm	0.5	1	1.5	2	2.5	3	4	5	6	8	10	
			<b>a<sub>e</sub></b> mm	1	2	3	4	5	6	8	10	12	16	20	
			<b>Q</b> cm <sup>3</sup> /min	0.03	0.1	0.23	0.4	0.63	0.9	1.92	3	3.6	6.4	8	

3. These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.

4. Please adjust it if chatter or abnormal vibration occurs.

5. Please setup feed 1/3 that of slotting parameter and step 0.1Dc for drilling application.

6. Please setup feed 70% of slotting parameter and ramping angle 3° for ramping application.

EPSM-W-PN | Recommended Cutting Conditions Standard Slot Milling (unstable cutting situation)



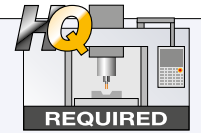
Material group	Example	Tensile strength	Parameter	Tool Diameter (mm)											
				Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	
Stainless Steel Ferritic, Martensitic	1.4034 (X46Cr13, 420) 1.4021 (X20Cr13, 420) 1.4112 (X90CrMoV18, 440B)	<750 N/mm <sup>2</sup>	V <sub>c</sub> m/min	73	73	73	73	73	73	73	76	76	73	76	
			n min <sup>-1</sup>	23,200	11,600	7,700	5,800	4,600	3,900	2,900	2,400	2,000	1,500	1,200	
			f <sub>z</sub> mm/tooth	0.004	0.007	0.013	0.018	0.024	0.028	0.038	0.048	0.05	0.064	0.077	
			V <sub>f</sub> mm/min	370	320	400	420	440	440	460	400	380	370		
			a <sub>p</sub> mm	0.5	1	1.5	2	2.5	3	4	5	6	8	10	
			a <sub>e</sub> mm	1	2	3	4	5	6	8	10	12	16	20	
			Q cm <sup>3</sup> /min	0.19	0.64	1.8	3.36	5.5	7.92	14.08	23	28.8	48.64	74	
Stainless Steel, Austenitic	1.4301 (X5CrNi18-10, 304) 1.4404 (X2CrNiMo17-12-2, 316L) 1.4571 (X6CrNiMoTi17-12-2, 316Ti)	750-850 N/mm <sup>2</sup>	V <sub>c</sub> m/min	61	61	61	61	61	61	61	63	63	61	63	
			n min <sup>-1</sup>	17,500	8,800	5,800	4,400	3,500	2,900	2,200	1,800	1,500	1,100	900	
			f <sub>z</sub> mm/tooth	0.003	0.006	0.011	0.015	0.02	0.023	0.032	0.04	0.042	0.053	0.064	
			V <sub>f</sub> mm/min	210	220	230	250	260	260	260	270	240	220	220	
			a <sub>p</sub> mm	0.5	1	1.5	2	2.5	3	4	5	6	8	10	
			a <sub>e</sub> mm	1	2	3	4	5	6	8	10	12	16	20	
			Q cm <sup>3</sup> /min	0.11	0.44	1.04	2	3.25	4.68	8.32	13.5	17.28	28.16	44	
Stainless Steel Duplex, Precipitation- hardenable	1.4542 (X5CrNiCuNb16-4, 17-4PH) 1.4501 (X2CrNiMoCuWN25-7-4, Super Duplex)	850-1100 N/mm <sup>2</sup>	V <sub>c</sub> m/min	49	49	49	49	49	49	49	49	50	50	49	50
			n min <sup>-1</sup>	15,600	7,800	5,200	3,900	3,100	2,600	1,900	1,600	1,300	1,000	800	
			f <sub>z</sub> mm/tooth	0.002	0.005	0.009	0.012	0.016	0.018	0.026	0.032	0.034	0.042	0.051	
			V <sub>f</sub> mm/min	120	160	190	190	200	190	200	200	180	170	160	
			a <sub>p</sub> mm	0.5	1	1.5	2	2.5	3	4	5	6	8	10	
			a <sub>e</sub> mm	1	2	3	4	5	6	8	10	12	16	20	
			Q cm <sup>3</sup> /min	0.06	0.32	0.86	1.52	2.5	3.42	6.4	10	12.96	21.76	32	
Titanium, Ti alloys	3.7164 (TiAl6V4)	1100-1300 N/mm <sup>2</sup>	V <sub>c</sub> m/min	46	46	46	46	46	46	46	47	47	46	47	
			n min <sup>-1</sup>	14,600	7,300	4,900	3,700	2,900	2,400	1,800	1,500	1,200	900	700	
			f <sub>z</sub> mm/tooth	0.003	0.006	0.01	0.014	0.019	0.022	0.03	0.038	0.04	0.05	0.061	
			V <sub>f</sub> mm/min	180	180	200	210	220	210	220	230	190	180	170	
			a <sub>p</sub> mm	0.5	1	1.5	2	2.5	3	4	5	6	8	10	
			a <sub>e</sub> mm	1	2	3	4	5	6	8	10	12	16	20	
			Q cm <sup>3</sup> /min	0.09	0.36	0.9	1.68	2.75	3.78	7.04	11.5	13.68	23.04	34	
Super alloy, Heat-resist- ance alloy	Inconel 718 Hastelloy	>1300 N/mm <sup>2</sup>	V <sub>c</sub> m/min	24	24	24	24	24	24	24	24	25	25	24	25
			n min <sup>-1</sup>	7,600	3,800	2,500	1,900	1,500	1,300	1,000	800	700	500	400	
			f <sub>z</sub> mm/tooth	0.002	0.004	0.007	0.009	0.012	0.014	0.019	0.024	0.025	0.032	0.038	
			V <sub>f</sub> mm/min	60	60	70	70	70	70	80	80	70	60	60	
			a <sub>p</sub> mm	0.25	0.5	0.75	1	1.25	1.5	2	2.5	3	4	5	
			a <sub>e</sub> mm	1	2	3	4	5	6	8	10	12	16	20	
			Q cm <sup>3</sup> /min	0.02	0.06	0.16	0.28	0.44	0.63	1.28	2	2.52	3.84	6	

**Please Note:**

**1. Please confirm your material type first.**

- If hardness harder than value in the same column: please follow by real hardness
- If hardness is lower than that value: please follow material type.

2. Use the high-rigidity and high accuracy machine as possible



3. These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.

4. Please adjust it if chatter or abnormal vibration occurs.

5. Please setup feed 1/3 that of slotting parameter and step 0.1Dc for drilling application.

6. Please setup feed 70% of slotting parameter and ramping angle 3° for ramping application.

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