CUTTING CONDITIONS

Milling | Endmills | Cutting conditions

AE-VML

Long Type (Applies to square / radius / chipbreaker type)

ae=0.05D • Standard side milling 3D

	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel SUS304 • SUS420 ≤200HB		Precipitation Stainless Steel SUS630		Titanium Alloy Ti-6Al-4V		Ni-Based Alloy Inconel 718	
Cutting Speed	160 (140-180) (m/min)		150 (130-170) (m/min)		140 (120-160) (m/min)		125 (100-140) (m/min)		115 (90-130) (m/min)		105 (80-120) (m/min)		85 (70-90) (m/min)	
Ø	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)
6	8.500	2.480	8.000	2.180	7.400	2.010	6.600	1.660	6.100	1.530	5.600	1.400	4.500	1.080
8	6.400	1.870	6.000	1.630	5.600	1.520	5.000	1.260	4.600	1.160	4.200	1.050	3.400	820
10	5.100	1.730	4.800	1.440	4.500	1.350	4.000	1.120	3.700	1.040	3.300	920	2.700	720
12	4.200	1.430	4.000	1.200	3.700	1.110	3.300	920	3.000	840	2.800	780	2.200	590
16	3.180	1.590	2.990	1.350	2.790	1.260	2.490	1.000	2.290	920	2.090	840	1.690	630
20	2.550	1.280	2.390	1.080	2.230	1.000	1.990	800	1.830	730	1.670	670	1.350	510
Depth of cut	ap: 3D, ae: 0,05D													

1. Use a rigid and precise machine and holder.
2. The rotational speed is calculated by the median of the recommended cutting speed. Adjustment may be necessary depending on the rigidity of the workpiece fixture and machine.
3. Please use a suitable fluid with high smoke retardant properties.
4. During dry (no fluid) milling, please use air blow to remove disposable chips from the milling area and to eliminate chip packing.
5. Please use water-soluble coolant when machining stainless steel.

ae=0.1D • High efficiency side milling 3D

	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel SUS304 • SUS420 ≤200HB		Precipitation Stainless Steel SUS630		Titanium Alloy Ti-6Al-4V	
Cutting Speed	220 (200-240) (m/min)		170 (150-190) (m/min)		135 (110-150) (m/min)		130 (110-150) (m/min)		120 (100-140) (m/min)		110 (90-130) (m/min)	
Ø	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)
6	11.700	3.180	9.000	2.270	7.200	1.810	6.900	1.600	6.400	1.480	5.800	1.340
8	8.800	2.390	6.800	1.710	5.400	1.360	5.200	1.210	4.800	1.120	4.400	1.020
10	7.000	2.240	5.400	1.510	4.300	1.200	4.100	1.070	3.800	990	3.500	910
12	5.800	1.860	4.500	1.260	3.600	1.010	3.500	910	3.200	830	2.900	750
16	4.380	1.970	3.380	1.350	2.690	1.080	2.590	910	2.390	840	2.190	770
20	3.500	1.580	2.710	1.080	2.150	860	2.070	720	1.910	670	1.750	610
Depth of cut	ap: 3D, ae: 0,1D											

ae=0.15D • High efficiency side milling 3D

	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel SUS304 • SUS420 ≤200HB		Precipitation Stainless Steel SUS630		Titanium Alloy Ti-6Al-4V	
Cutting Speed	140 (120-160) (m/min)		100 (80-120) (m/min)		90 (70-110) (m/min)		85 (60-100) (m/min)		75 (50-90) (m/min)		65 (40-80) (m/min)	
Ø	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)
6	7.400	1.860	5.600	1.300	4.800	1.110	4.500	950	4.000	840	3.400	720
8	5.600	1.410	4.200	970	3.600	840	3.400	720	3.000	640	2.600	550
10	4.500	1.350	3.300	860	2.900	750	2.700	650	2.400	580	2.100	510
12	3.700	1.110	2.800	730	2.400	620	2.300	550	2.000	480	1.700	410
16	2.790	1.120	1.990	700	1.790	630	1.690	570	1.490	510	1.290	420
20	2.230	890	1.590	560	1.430	500	1.350	460	1.190	400	1.040	340
Depth of cut	ap: 3D, ae: 0,15D											

ae≤0.2D • High efficiency side milling 3D

	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel SUS304 • SUS420 ≤200HB		Precipitation Stainless Steel SUS630		Titanium Alloy Ti-6Al-4V	
Cutting Speed	100 (80-120) (m/min)		80 (60-100) (m/min)		70 (50-90) (m/min)		65 (40-80) (m/min)		55 (30-70) (m/min)		45 (20-60) (m/min)	
Ø	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)
6	5.300	1.230	4.200	890	3.700	780	3.500	670	2.900	560	2.400	460
8	4.000	930	3.200	680	2.800	590	2.600	500	2.200	420	1.800	350
10	3.200	900	2.500	600	2.200	530	2.100	460	1.800	390	1.400	310
12	2.700	760	2.100	500	1.900	460	1.700	370	1.500	330	1.200	260
16	1.990	800	1.590	560	1.390	490	1.290	420	1.090	350	900	270
20	1.590	640	1.270	440	1.110	390	1.040	340	880	290	720	220
Depth of cut	ap: 3D, ae: 0,20D											

CUTTING CONDITIONS

Milling | Endmills | Cutting conditions

AE-VML

Long type (Applies to square / radius / chipbreaker type)

ae=0.05D • Standard side milling 4D

	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel SUS304 • SUS420 ≤200HB		Precipitation Stainless Steel SUS630		Titanium Alloy Ti-6Al-4V		Ni-Based Alloy Inconel 718	
Cutting Speed	140 (120-160) (m/min)		130 (110-150) (m/min)		120 (100-140) (m/min)		115 (90-130) (m/min)		105 (80-120) (m/min)		95 (70-110) (m/min)		75 (60-80) (m/min)	
Ø	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)
6	7.400	2.010	6.900	1.740	6.400	1.610	6.100	1.420	5.600	1.300	5.000	1.160	4.000	880
8	5.600	1.520	5.200	1.310	4.800	1.210	4.600	1.070	4.200	980	3.800	880	3.000	660
10	4.500	1.440	4.100	1.230	3.800	1.140	3.700	960	3.300	860	3.000	780	2.400	590
12	3.700	1.180	3.500	1.050	3.200	960	3.100	810	2.800	730	2.500	650	2.000	500
16	2.790	1.330	2.590	1.170	2.390	1.080	2.290	860	2.090	780	1.890	710	1.490	520
20	2.230	1.060	2.070	930	1.910	860	1.830	690	1.670	630	1.510	570	1.190	420
Depth of cut	ap: 4D, ae: 0,05D													

1. Use a rigid and precise machine and holder.
2. The rotational speed is calculated by the median of the recommended cutting speed. Adjustment may be necessary depending on the rigidity of the workpiece fixture and machine.
3. Please use a suitable fluid with high smoke retardant properties.
4. During dry (no fluid) milling, please use air blow to remove disposable chips from the milling area and to eliminate chip packing.
5. Please use water-soluble coolant when machining stainless steel.

ae=0.1D • High efficiency side milling 4D

	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel SUS304 • SUS420 ≤200HB		Precipitation Stainless Steel SUS630		Titanium Alloy Ti-6Al-4V	
Cutting Speed	200 (180-220) (m/min)		160 (140-180) (m/min)		130 (110-150) (m/min)		125 (100-140) (m/min)		115 (90-130) (m/min)		105 (80-120) (m/min)	
Ø	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)
6	10.600	2.670	8.500	1.970	6.900	1.600	6.600	1.400	6.100	1.290	5.600	1.190
8	8.000	2.020	6.400	1.480	5.200	1.210	5.000	1.060	4.600	980	4.200	890
10	6.400	1.920	5.100	1.330	4.100	1.070	4.000	950	3.700	890	3.300	790
12	5.300	1.590	4.200	1.090	3.500	910	3.300	790	3.000	720	2.800	670
16	3.980	1.690	3.180	1.190	2.590	970	2.490	870	2.290	800	2.090	730
20	3.180	1.350	2.550	960	2.070	780	1.990	700	1.830	640	1.670	580
Depth of cut	ap: 4D, ae: 0,1D											

ae=0.15D • High efficiency side milling 4D

	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel SUS304 • SUS420 ≤200HB		Precipitation Stainless Steel SUS630		Titanium Alloy Ti-6Al-4V	
Cutting Speed	135 (110-150) (m/min)		115 (100-140) (m/min)		85 (60-100) (m/min)		75 (50-90) (m/min)		65 (50-80) (m/min)		55 (40-70) (m/min)	
Ø	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)
6	7.200	1.670	6.100	1.290	4.500	950	4.000	770	3.400	650	2.900	560
8	5.400	1.250	4.600	980	3.400	720	3.000	580	2.600	500	2.200	430
10	4.300	1.200	3.700	890	2.700	650	2.400	530	2.100	460	1.800	400
12	3.600	1.010	3.100	740	2.300	550	2.000	440	1.700	370	1.500	330
16	2.690	1.080	2.290	800	1.690	590	1.490	480	1.290	420	1.090	330
20	2.150	860	1.830	640	1.350	470	1.190	390	1.040	340	880	260
Depth of cut	ap: 4D, ae: ≤0,15D											