

Correction factor by overhang length (Shoulder Milling)

Use by multiplying the recommended cutting condition by the correction factor by overhang length.
Refer to each recommended condition for the Long cutting, offset type and lollipop type.

(mm)

L/D	Carbon steel, Alloy steel, Mild steel, Copper, Copper alloys AISI 1045, AISI 4140, ASTM A36, AISI 1010				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel AISI P21, AISI P20, AISI 4340, SKD, SKT				Austenitic stainless steel, Ferritic and Martensitic stainless steels, Titanium alloy AISI 304, AISI 316, AISI 304LN, AISI 316LN, AISI 410, AISI 430, AISI 431, AISI 420J2, Ti-6Al-4V			
	Cutting Speed (m/min)	Revolution (min ⁻¹)	Feed per Tooth (mm/t.)	Width of Cut ae	Cutting Speed (m/min)	Revolution (min ⁻¹)	Feed per Tooth (mm/t.)	Width of Cut ae	Cutting Speed (m/min)	Revolution (min ⁻¹)	Feed per Tooth (mm/t.)	Width of Cut ae
2	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
3	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
4	80%	80%	90%	70%	80%	80%	90%	70%	80%	80%	90%	70%
5	60%	60%	80%	40%	60%	60%	80%	40%	60%	60%	80%	40%
6	50%	50%	70%	30%	50%	50%	70%	30%	50%	50%	70%	30%
7	40%	40%	70%	20%	40%	40%	70%	20%	30%	30%	60%	20%
8	40%	40%	60%	10%	40%	40%	60%	10%	30%	30%	50%	10%
9	30%	30%	60%	10%	30%	30%	60%	10%	20%	20%	50%	10%

L/D	Precipitation hardening stainless steel, Cobalt chromium alloy AISI 630, AISI 631				Heat resistant alloys Inconel718			
	Cutting Speed (m/min)	Revolution (min ⁻¹)	Feed per Tooth (mm/t.)	Width of Cut ae	Cutting Speed (m/min)	Revolution (min ⁻¹)	Feed per Tooth (mm/t.)	Width of Cut ae
2	100%	100%	100%	100%	100%	100%	100%	100%
3	100%	100%	100%	100%	100%	100%	100%	100%
4	80%	80%	90%	70%	80%	80%	90%	70%
5	60%	60%	80%	40%	60%	60%	80%	40%
6	50%	50%	70%	30%	50%	50%	70%	30%
7	30%	30%	60%	20%	30%	30%	60%	20%
8	30%	30%	50%	10%	30%	30%	50%	10%
9	20%	20%	50%	10%	20%	20%	50%	10%

RECOMMENDED CUTTING CONDITIONS

■ Shoulder milling (L/D=3)

Other than the L/D = 3, use following recommended cutting conditions by multiplying the page 5 correction factor by overhang length.

(mm)

Dia. DC	Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel AISI P21, AISI P20, AISI 4340, SKD, SKT						Austenitic stainless steel, Ferritic and Martensitic stainless steels AISI 304, AISI 316, AISI 304LN, AISI 316LN, AISI 410, AISI 430, AISI 431, AISI 420J2						Precipitation hardening stainless steel, Cobalt chromium alloy, Titanium alloy AISI 630, AISI 631, Ti-6Al-4V					
	Cutting Speed (m/min)	Revolution (min ⁻¹)	Feed per Tooth (mm/t.)	Feed rate (mm/min)	Depth of cut ap	Width of Cut ae	Cutting Speed (m/min)	Revolution (min ⁻¹)	Feed per Tooth (mm/t.)	Feed rate (mm/min)	Depth of cut ap	Width of Cut ae	Cutting Speed (m/min)	Revolution (min ⁻¹)	Feed per Tooth (mm/t.)	Feed rate (mm/min)	Depth of cut ap	Width of Cut ae
10	200	6400	0.07	2700	10	1.0	150	4800	0.07	2000	10	1.0	100	3200	0.07	1300	10	1.0
12	200	5300	0.085	2700	12	1.2	150	4000	0.085	2000	12	1.2	100	2700	0.085	1400	12	1.2
16	200	4000	0.088	2100	16	1.6	150	3000	0.088	1600	16	1.6	100	2000	0.088	1100	16	1.6
20	200	3200	0.1	1900	20	2.0	150	2400	0.1	1400	20	2.0	100	1600	0.1	1000	20	2.0
25	200	2500	0.1	1500	25	2.5	150	1900	0.1	1100	25	2.5	100	1300	0.1	800	25	2.5

Depth of cut

The diagram shows a cross-section of a shoulder being milled. The depth of cut is labeled as 'ap' and the width of cut is labeled as 'ae'.

Dia. DC	Heat resistant alloys Inconel718					
	Cutting Speed (m/min)	Revolution (min ⁻¹)	Feed per Tooth (mm/t.)	Feed rate (mm/min)	Depth of cut ap	Width of Cut ae
10	40	1300	0.033	260	10	0.5
12	40	1100	0.035	230	12	0.6
16	40	800	0.038	180	16	0.8
20	40	640	0.04	150	20	1.0
25	40	510	0.04	120	25	1.3

Depth of cut

The diagram shows a cross-section of a shoulder being milled. The depth of cut is labeled as 'ap' and the width of cut is labeled as 'ae'.

Note 1) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece material installation is poor, vibration or abnormal sounds can occur. In that case, please adjust the revolution, feed rate and depth of cut.

Note 2) The revolution and feed rate can be increased at smaller depth of cut.

Note 3) For stainless steel, titanium alloys and heat resistant alloys, the use of water-soluble coolant is effective.