

SMART MIRACLE END MILLS

CARBIDE

VQMHV

End mill, Medium length of cut, 4 flute, Irregular helix flutes


RECOMMENDED CUTTING CONDITIONS

Side milling

The rigidity of the machine or workpiece and chip discharge are sufficient at high efficiency conditions.
The rigidity of the machine or workpiece or chip discharge is insufficient at general-purpose conditions.


High efficiency conditions

Work material	Carbon steel, Alloy steel, Mild steel					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel					Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys					Hardened stainless steels, Cobalt chromium alloy				
	AISI 1045, AISI 4140, ASTM A36, AISI 1010					AISI P21, AISI P20, AISI 4340, SKD, SKT					AISI 304, AISI 316, Ti-6Al-4V					AISI 630, AISI 631 15-5PH, 17-4PH				
Dia. DC (mm)	Cutting speed (m/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	150	24000	2400	3	0.6	120	19000	1100	3	0.6	100	16000	830	3	0.6	75	12000	720	3	0.4
3	150	16000	2600	4.5	0.9	120	13000	1200	4.5	0.9	100	11000	880	4.5	0.9	75	8000	770	4.5	0.6
4	150	12000	2600	6	1.2	120	9500	1300	6	1.2	100	8000	900	6	1.2	75	6000	790	6	0.8
5	150	9500	2600	7.5	1.5	120	7600	1300	7.5	1.5	100	6400	900	7.5	1.5	75	4800	810	7.5	1
6	150	8000	2600	9	1.8	120	6400	1300	9	1.8	100	5300	1100	9	1.8	75	4000	810	9	1.2
8	150	6000	2500	12	2.4	120	4800	1300	12	2.4	100	4000	1200	12	2.4	75	3000	840	12	1.6
10	150	4800	2300	15	3	120	3800	1200	15	3	100	3200	1300	15	3	75	2400	770	15	2
12	150	4000	1900	18	3.6	120	3200	1200	18	3.6	100	2700	1200	18	3.6	75	2000	720	18	2.4
16	150	3000	1600	24	4.8	120	2400	960	24	4.8	100	2000	960	24	4.8	75	1500	600	24	3.2
20	150	2400	1300	30	6	120	1900	760	30	6	100	1600	770	30	6	75	1200	480	30	4
25	150	1900	1100	37.5	7.5	120	1500	600	37.5	7.5	100	1300	620	37.5	7.5	75	950	380	37.5	5



General-purpose conditions

Work material	Carbon steel, Alloy steel, Mild steel					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel					Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys					Hardened stainless steels, Cobalt chromium alloy				
	AISI 1045, AISI 4140, ASTM A36, AISI 1010					AISI P21, AISI P20, AISI 4340, SKD, SKT					AISI 304, AISI 316, Ti-6Al-4V					AISI 630, AISI 631 15-5PH, 17-4PH				
Dia. DC (mm)	Cutting speed (m/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	120	19000	1300	3	0.6	100	16000	630	3	0.6	80	13000	450	1.5	0.2	70	11000	440	3	0.4
3	120	13000	1400	4.5	0.9	100	11000	700	4.5	0.9	80	8500	450	2.2	0.3	70	7400	470	4.5	0.6
4	120	9500	1400	6	1.2	100	8000	700	6	1.2	80	6400	470	3	0.6	70	5600	490	6	0.8
5	120	7600	1400	7.5	1.5	100	6400	710	7.5	1.5	80	5100	470	4.5	0.9	70	4500	500	7.5	1
6	120	6400	1400	9	1.8	100	5300	710	9	1.8	80	4200	580	6	1.2	70	3700	500	9	1.2
8	120	4800	1300	12	2.4	100	4000	740	12	2.4	80	3200	630	7.5	1.5	70	2800	520	12	1.6
10	120	3800	1200	15	3	100	3200	680	15	3	80	2500	660	9	1.8	70	2200	460	15	2
12	120	3200	1000	18	3.6	100	2700	640	18	3.6	80	2100	610	12	2.4	70	1900	450	18	2.4
16	120	2400	860	24	4.8	100	2000	530	24	4.8	80	1600	510	15	3	70	1400	370	24	3.2
20	120	1900	680	30	6	100	1600	420	30	6	80	1300	410	18	3.6	70	1100	290	30	4
25	120	1500	390	37.5	7.5	100	1300	340	37.5	7.5	80	1000	210	24	4.8	70	890	230	37.5	5



- 1) SMART MIRACLE Coating is not energized because of its nature. Therefore, an external contact (voltaic type) tool setter cannot be used. An internal contact (non-voltaic) type or laser type tool setter is recommended to measure the length of the tool.
- 2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
- 3) Chattering can still occur if the machine rigidity and clamping method are insufficient. In these cases the feed and speed should be reduced proportionately.
- 4) When the depth of cut is smaller than shown the revolution and feed rate can be increased.