

NEW
PRODUCT!

M110, M115, M116

Universal Solid Carbide End Mills – PRO Line

For ISO P, M, K, S and H material high productivity machining

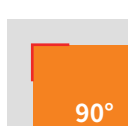
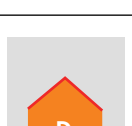


◆ Solid carbide end mills -Pro Line

Series	Picture	Catagory	Tooth	Helix angles	Application	Cutting edge tolerance mm	Diameter mm	Material	Information
M110-2ES		Pro line	Z=2	35°		+0.00 -0.02	3-20	Universal type	Use in carbon steel, tool steel, alloy steel. The workpiece hardness is up to HRC55°
M110-4ES		Pro line	Z=4	35°		+0.00 -0.02	3-20	Universal type	4 cutting edges can achieve better surface finishing. The workpiece hardness is up to HRC55°
M110-2BS		Pro line	Z=2	30°		≤6 ±0.01 >6 ±0.02	3-20	Universal type	Use in profiling machining. The workpiece hardness is up to HRC55°
M115-6ES		Pro line	Z=6	45°		+0.00 -0.02	6-18	Universal type	For high speed finishing cutting. Excellent surface finishing. First choice for side finish milling. The workpiece hardness is up to HRC55°
M116-4PS		Pro line	Z=4~6	45°		h10	6-20	P, M, S	For roughing cutting steel, stainless steel, titanium alloy, inconel (chrome nickel iron alloy), etc. Thanks for the fine pitch waved cutting edge, the tool has low cutting force and high chip removal rate

Icons description

Icons	Description
	Slot milling and shoulder milling applications
	Shoulder milling Rough machining
	Shoulder milling Finishing machining
	High feed milling machining
	Dynamic milling cycloid milling
	Profiling milling
	Chamfering and deburring
	AlTiN coating
	AlCrN coating
	Uncoated

Icons	Description
	30° Helix angles
	35° Helix angles
	45° Helix angles
	Cylinder shank HA DIN6535
	Flat 90°
	Nose radius CR
	Ball-nose End Mill BR
	Nose chamfer 45°
	Chamfer D
	Waved edge P

• **Pro line of solid carbide end mills offer complete product range**

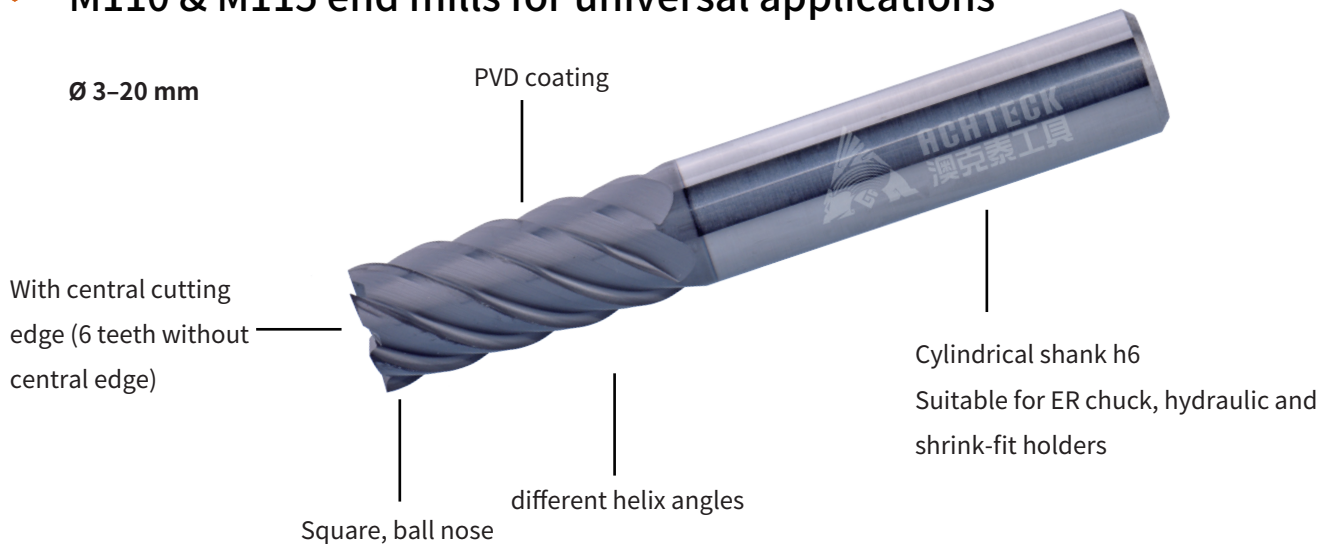
Tool

- Solide carbide end mills -- PRO series
- Metric
- 3 categories with 46 sizes
- Ball nose, square, wave edged, multi teeth
- With 2, 4, 5 or 6 cutting edges
- Ø3mm to 20 mm

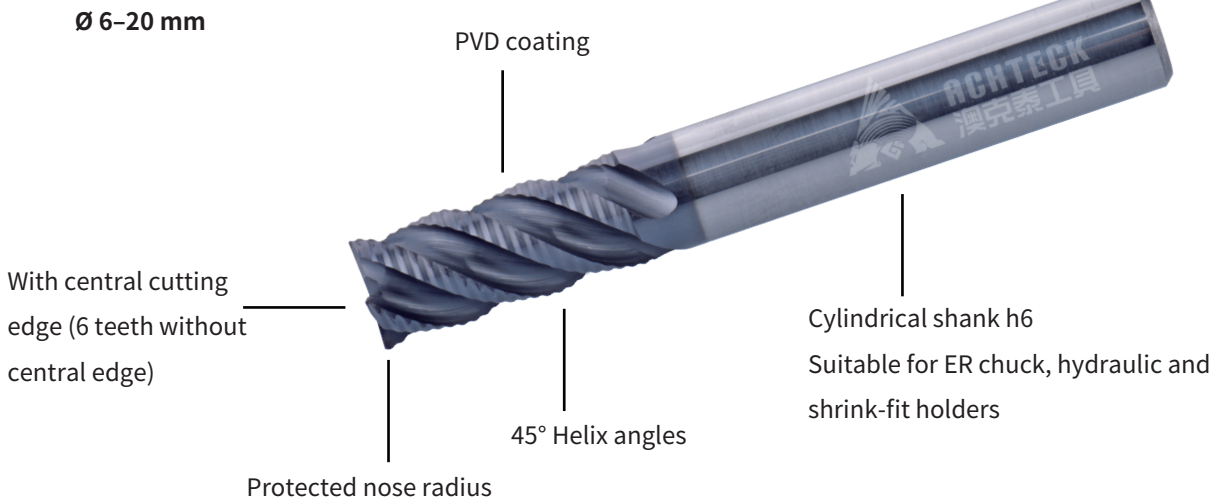
Application

- ISO workpiece material groups: P, M, K, S and H
- Side milling, slot milling, pocket milling, circular interpolated milling, ramping and profile milling
- Applications: general machinery, mold and die, automotive, aircraft and energy industry

• **M110 & M115 end mills for universal applications**



• **M116 rough machining end mills**



• Solid carbide end mill denomination

M	1	00
1	2	3

—

2	E	S
4	5	6

—

060	002	N
7	8	9

1
Tool category
M End mill

2
Generations
1

3
Series
00 General purpose end mills HRC45
10 General purpose end mills HRC55
16 Rough machining end mills
20 High performance end mills HRC40
30 Designed for steel milling
40 Designed for aluminium alloy milling
50 Designed for stainless steel milling
60 Designed for difficult machining material milling
70 Designed for hardened material milling
80&90 others

4
Number of teeth
2, 3, 4, 5, 6.....

5
Tool type
E Square
B Ball nose
R Rounded corner
C Chamfer
P With waved edges
W Forming
T Taper milling
H High feed milling

6
Length standard
S Standard total length
L Long version
XL Super long version
XXL Extra long version
SN Short cutting edge
SP long cutting edge

7
Tool diameter
060=6.0mm
200=20.0mm

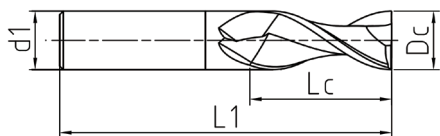
8
Chamfer / nose radius size
002=0.2mm

9
Structure type
N Straight necking
C Conical necking
P Special shank
Default: No necking

◆ Solid carbide end mill M110-2ES

Pro line

Up to HRC 55



P	M	K	N	S	H	O
●	●	●			●	

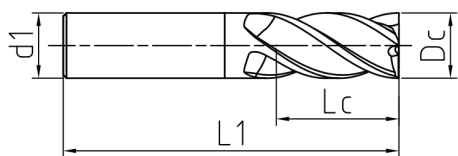
Product code	Dc mm +0.00/-0.02	d1 mm	Lc mm	L1 mm	Z	Stock
M110-2ES-030	3	4	8	50	2	●
M110-2ES-040	4	4	11	50	2	●
M110-2ES-050	5	6	13	50	2	●
M110-2ES-060	6	6	16	50	2	●
M110-2ES-080	8	8	20	60	2	●
M110-2ES-100	10	10	25	75	2	●
M110-2ES-120	12	12	32	75	2	●
M110-2ES-140	14	16	40	100	2	●
M110-2ES-160	16	16	40	100	2	●
M110-2ES-180	18	20	40	100	2	●
M110-2ES-200	20	20	45	100	2	●

Marked: ● Stocked ○ Non-stocked

◆ Carbide end mill M110-4ES

Pro line

Up to HRC 55



P	M	K	N	S	H	O
● ●	●	● ●			●	

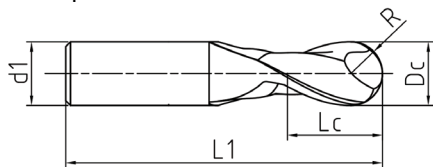
Product code	Dc mm +0.00/-0.02	d1 mm	Lc mm	L1 mm	Z	Stock
M110-4ES-030	3	4	8	50	4	●
M110-4ES-040	4	4	11	50	4	●
M110-4ES-050	5	6	13	50	4	●
M110-4ES-060	6	6	16	50	4	●
M110-4ES-080	8	8	20	60	4	●
M110-4ES-100	10	10	25	75	4	●
M110-4ES-120	12	12	32	75	4	●
M110-4ES-140	14	16	40	100	4	●
M110-4ES-160	16	16	40	100	4	●
M110-4ES-180	18	20	40	100	4	●
M110-4ES-200	20	20	45	100	4	●

Marked: ● Stocked ○ Non-stocked

◆ Carbide end mill M110-2BS

Pro line

Up to HRC 55



P	M	K	N	S	H	O
●●	●	●●			●	

Product code	Dc mm +0.00/-0.02	R mm ≤6 +0.01 >6 +0.02	d1 mm	Lc mm	L1 mm	Z	Stock
M110-2BS-030	3	1.5	4	6	50	2	●
M110-2BS-040	4	2	4	8	50	2	●
M110-2BS-050	5	2.5	6	10	50	2	●
M110-2BS-060	6	3	6	12	50	2	●
M110-2BS-070	7	3.5	8	14	60	2	●
M110-2BS-080	8	4	8	14	60	2	●
M110-2BS-090	9	4.5	10	18	75	2	●
M110-2BS-100	10	5	10	20	75	2	●
M110-2BS-120	12	6	12	24	75	2	●
M110-2BS-160	16	8	16	32	100	2	●
M110-2BS-200	20	10	20	40	100	2	●

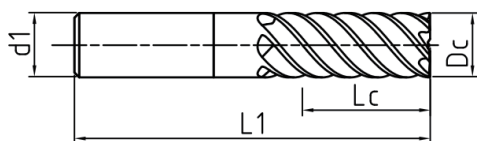
Marked: ● Stocked ○ Non-stocked

Carbide end mill M115

Pro line

Up to HRC 55

Without central cutting edge



P	M	K	N	S	H	O
● ●	●	● ●			●	

Product code	Dc mm +0.00/-0.03	d1 mm	Lc mm	L1 mm	Z	Stock
M115-6ES-060	6	6	16	50	6	○
M115-6ES-080	8	8	19	60	6	●
M115-6ES-100	10	10	22	75	6	●
M115-6ES-120	12	12	26	75	6	●
M115-6ES-140	14	14	30	90	6	●
M115-6ES-160	16	16	32	100	6	●
M115-6ES-180	18	18	38	100	6	●

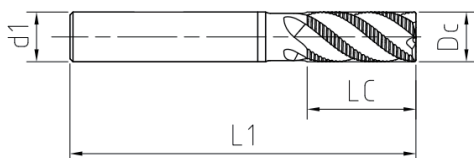
Marked: ● Stocked ○ Non-stocked

Solid carbide end mill M116

Pro line

Up to HRC 40

6 teeth without central cutting edge



P	M	K	N	S	H	O
●	●	●		●		

Product code	Dc mm h10	d1 mm	Lc mm	L1 mm	Z	Stock
M116-4PS-060	6	6	13	60	4	●
M116-4PS-080	8	8	19	65	4	●
M116-4PS-100	10	10	22	70	4	●
M116-4PS-120	12	12	26	80	4	●
M116-5PS-160	16	16	42	110	5	●
M116-6PS-200	20	20	48	110	6	●

Marked: ● Stocked ○ Non-stocked

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Solid carbide end mill Pro Line cutting parameters
 The recommended cutting parameters are theoretical values,
 it can be adjusted according to the real conditions

Machining Materials					
ISO	Material classification			Brinell hardness (HB/HRC)	Tensile strength (N/mm ²)
P	Unalloyed steel	C≤0.25%	Annealing	125	428
		0.25<C≤0.55%	Annealing	190	639
		0.25<C≤0.55%	Tempered	210	708
		C>0.55%	Annealing	190	639
		C>0.55%	Tempered	300	1013
		Free-Cutting Steel (short chip)	Annealing	220	745
	Low Alloy Steel	Annealing		175	591
		Tempered		300	1013
		Tempered		380	1282
		Tempered		430	1477
	High alloy steel and high alloy tool steel	Annealing		200	675
		Quenching and tempering		300	1013
		Quenching and tempering		400	1361
	Stainless steel	Ferrite / martensite, annealing		200	675
		Martensite, tempered		330	1114
M	Stainless steel	Austenite, Quenched		200	675
		Austenite, Precipitation Dispersion Hardening Stainless Steel(PH Stainless Steel)		300	1013
		Austenite_ Ferrite, duplex stainless steel		230	778
K	Malleable iron	Ferrite		200	400
		Pearlite		260	700
	Gray cast iron	Low tensile strength		180	200
		High tensile strength / austenite		245	350
	Nodular Cast Iron	Ferrite		155	400
		Pearlite		265	700
	Graphite Cast Iron GGV(CGI)			230	400
N	Forged aluminum alloy	Non-aging treatment		30	-
		Aging treatment		100	340
	Cast aluminium alloys	≤12 % silicon, Non-aging treatment		75	260
		≤12 % silicon, aging treatment		90	310
		>12 % silicon, Non-aging treatment		130	450
	Magnesium alloy			70	250
	Copper and copper alloys (bronze / brass)	Non alloy, electrolytic copper		100	340
		Brass, bronze, red brass		90	310
		Copper alloy, short chip		110	380
		High strength Ampco alloy		300	1010
S	Iron base alloy	Iron base	Annealing	200	680
			Aging treatment	280	940
		Nickel or cobalt based	Annealing	250	840
			Aging treatment	350	1180
			Casting	320	1080
	Titanium alloys	Pure titanium		200	680
		α Phase and β Phase alloy,aging treatment		375	1260
		β Phase alloy		410	1400
	Tungsten alloy			300	1010
	Molybdenum alloy			300	1010
H	Hardened steel	Quenching and tempering		50HRC	
		Quenching and tempering		55HRC	
		Quenching and tempering		60HRC	
	Hardened cast steel	Quenching and tempering		50HRC	

ANPI NO.063

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Solid carbide end mill Pro Line cutting parameters
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Machining Materials					
ISO	Material classification			Brinell hardness (HB/HRC)	Tensile strength (N/mm ²)
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		0.25<C≤0.55%	Tempered	210	708
		C>0.55%	Annealing	190	639
		C>0.55%	Tempered	300	1013
		Free-Cutting Steel (short chip)	Annealing	220	745
	Low Alloy Steel	Annealing		175	591
		Tempered		300	1013
		Tempered		380	1282
		Tempered		430	1477
	High alloy steel and high alloy tool steel	Annealing		200	675
		Quenching and tempering		300	1013
		Quenching and tempering		400	1361
	Stainless steel	Ferrite / martensite, annealing		200	675
		Martensite, tempered		330	1114
M	Stainless steel	Austenite, Quenched		200	675
		Austenite, Precipitation Dispersion Hardening Stainless Steel(PH Stainless Steel)		300	1013
		Austenite_ Ferrite, duplex stainless steel		230	778
K	Malleable iron	Ferrite		200	400
		Pearlite		260	700
	Gray cast iron	Low tensile strength		180	200
		High tensile strength / austenite		245	350
	Nodular Cast Iron	Ferrite		155	400
		Pearlite		265	700
	Graphite Cast Iron GGV (CGI)			230	400
N	Forged aluminum alloy	Non-aging treatment		30	-
		Aging treatment		100	340
	Cast aluminium alloys	≤1 2 % silicon, Non-aging treatment		75	260
		≤1 2 % silicon, aging treatment		90	310
		>1 2 % silicon, Non-aging treatment		130	450
	Magnesium alloy			70	250
	Copper and copper alloys (bronze / brass)	Non alloy, electrolytic copper		100	340
		Brass, bronze, red brass		90	310
		Copper alloy, short chip		110	380
		High strength Ampco alloy		300	1010
S	Iron base alloy	Iron base	Annealing	200	680
			Aging treatment	280	940
		Nickel or cobalt based	Annealing	250	840
			Aging treatment	350	1180
			Casting	320	1080
	Titanium alloys	Pure titanium		200	680
		α Phase and β Phase alloy,aging treatment		375	1260
		β Phase alloy		410	1400
H	Hardened steel	Quenching and tempering		50HRC	
		Quenching and tempering		55HRC	
		Quenching and tempering		60HRC	
	Hardened cast steel	Quenching and tempering		50HRC	

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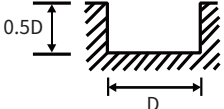
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Solid carbide end mill Pro Line cutting parameters
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		0.25<C≤0.55%	Tempered	210	708
		C>0.55%	Annealing	190	639
		C>0.55%	Tempered	300	1013
		Free-Cutting Steel (short chip)	Annealing	220	745
	Low Alloy Steel	Annealing		175	591
		Tempered		300	1013
		Tempered		380	1282
		Tempered		430	1477
	High alloy steel and high alloy tool steel	Annealing		200	675
		Quenching and tempering		300	1013
		Quenching and tempering		400	1361
	Stainless steel	Ferrite / martensite, annealing		200	675
		Martensite, tempered		330	1114
M	Stainless steel	Austenite, Quenched		200	675
		Austenite, Precipitation Dispersion Hardening Stainless Steel(PH Stainless Steel)		300	1013
		Austenite_ Ferrite, duplex stainless steel		230	778
K	Malleable iron	Ferrite		200	400
		Pearlite		260	700
	Gray cast iron	Low tensile strength		180	200
		High tensile strength / austenite		245	350
	Nodular Cast Iron	Ferrite		155	400
		Pearlite		265	700
N	Graphite Cast Iron GGV(CGI)			230	400
				230	400
	Forged aluminum alloy	Non-aging treatment		30	-
		Aging treatment		100	340
	Cast aluminium alloys	≤12 % silicon, Non-aging treatment		75	260
		≤12 % silicon, aging treatment		90	310
		>12 % silicon, Non-aging treatment		130	450
	Magnesium alloy			70	250
				100	340
				90	310
				110	380
S	Copper and copper alloys (bronze / brass)	High strength Ampco alloy		300	1010
				100	340
				90	310
				110	380
				300	1010
				300	1010
	Iron base alloy	Iron base	Annealing	200	680
			Aging treatment	280	940
		Nickel or cobalt based	Annealing	250	840
			Aging treatment	350	1180
			Casting	320	1080
				320	1080
	Titanium alloys	Pure titanium		200	680
		α Phase and β Phase alloy,aging treatment		375	1260
		β Phase alloy		410	1400
	Tungsten alloy			300	1010
	Molybdenum alloy			300	1010
				300	1010
H	Hardened steel	Quenching and tempering		50HRC	
		Quenching and tempering		55HRC	
		Quenching and tempering		60HRC	
	Hardened cast steel	Quenching and tempering		50HRC	

ANPI NO.063

-  **Solid carbide end mill Pro Line cutting parameters**
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		0.25<C≤0.55%	Tempered	210	708
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		C>0.55%	Tempered	300	1013
		Free-Cutting Steel (short chip)	Annealing	220	745
	Low Alloy Steel	Annealing		175	591
		Tempered		300	1013
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	Nodular Cast Iron	Ferrite		155	400
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	Tungsten alloy			300	1010
	Molybdenum alloy			300	1010
H	Hardened steel	Quenching and tempering		50HRC	
		Quenching and tempering		55HRC	
		Quenching and tempering		60HRC	
	Hardened cast steel	Quenching and tempering		50HRC	

M116-4ES Slot milling 						
Cutting speed Vc(m/min)	fz[mm/tooth]					
	End mill diameter (mm)					
	6	8	10	12	16	20
80~100	0.035	0.055	0.069	0.082	0.088	0.089
75~90	0.035	0.055	0.069	0.082	0.088	0.089
75~90	0.035	0.055	0.069	0.082	0.088	0.089
75~90	0.035	0.055	0.069	0.082	0.088	0.089
60~70	0.030	0.050	0.060	0.072	0.075	0.078
75~90	0.035	0.055	0.069	0.082	0.088	0.089
75~90	0.035	0.055	0.069	0.082	0.088	0.089
60~70	0.030	0.050	0.060	0.072	0.075	0.078
60~70	0.030	0.050	0.060	0.072	0.075	0.078
55~60	0.030	0.050	0.060	0.072	0.075	0.078
75~85	0.035	0.055	0.069	0.082	0.088	0.089
60~70	0.030	0.050	0.060	0.072	0.075	0.078
55~60	0.030	0.050	0.060	0.072	0.075	0.078
45~50	0.035	0.055	0.069	0.082	0.088	0.089
40~50	0.030	0.050	0.060	0.072	0.075	0.078
40~50	0.020	0.045	0.051	0.055	0.062	0.075
35	0.020	0.045	0.051	0.055	0.062	0.075
40~50	0.020	0.045	0.051	0.055	0.062	0.075
70~80	0.035	0.055	0.069	0.082	0.088	0.089
70~80	0.035	0.055	0.069	0.082	0.088	0.089
70~80	0.035	0.055	0.069	0.082	0.088	0.089
70~80	0.035	0.055	0.069	0.082	0.088	0.089
70~80	0.035	0.055	0.069	0.082	0.088	0.089
65~75	0.035	0.055	0.069	0.082	0.088	0.089
70~80	0.035	0.055	0.069	0.082	0.088	0.089
45~55	0.025	0.050	0.055	0.060	0.070	0.075
35~45	0.020	0.045	0.051	0.055	0.062	0.075
45~55	0.020	0.045	0.051	0.055	0.062	0.075
35~45	0.020	0.045	0.051	0.055	0.062	0.075
35~45	0.020	0.045	0.051	0.055	0.062	0.075
45~55	0.020	0.045	0.051	0.055	0.062	0.075
30~40	0.015	0.035	0.041	0.045	0.052	0.065
20~25	0.015	0.035	0.041	0.045	0.052	0.065

- Solid carbide end mill Pro Line cutting parameters**
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		C>0.55%	Tempered	300	1013
		Free-Cutting Steel (short chip)	Annealing	220	745
	Low Alloy Steel	Annealing		175	591
		Tempered		300	1013
		Tempered		380	1282
		Tempered		430	1477
	High alloy steel and high alloy tool steel	Annealing		200	675
		Quenching and tempering		300	1013
		Quenching and tempering		400	1361
	Stainless steel	Ferrite / martensite, annealing		200	675
		Martensite, tempered		330	1114
M	Stainless steel	Austenite, Quenched		200	675
		Austenite, Precipitation Dispersion Hardening Stainless Steel(PH Stainless Steel)		300	1013
		Austenite_ Ferrite, duplex stainless steel		230	778
K	Malleable iron	Ferrite		200	400
		Pearlite		260	700
	Gray cast iron	Low tensile strength		180	200
		High tensile strength / austenite		245	350
	Nodular Cast Iron	Ferrite		155	400
		Pearlite		265	700
	Graphite Cast Iron GGV (CGI)			230	400
N	Forged aluminum alloy	Non-aging treatment		30	-
		Aging treatment		100	340
	Cast aluminium alloys	≤1 2 % silicon, Non-aging treatment		75	260
		≤1 2 % silicon, aging treatment		90	310
		>1 2 % silicon, Non-aging treatment		130	450
	Magnesium alloy			70	250
	Copper and copper alloys (bronze / brass)	Non alloy, electrolytic copper		100	340
		Brass, bronze, red brass		90	310
		Copper alloy, short chip		110	380
		High strength Ampco alloy		300	1010
S	Iron base alloy	Iron base	Annealing	200	680
			Aging treatment	280	940
		Nickel or cobalt based	Annealing	250	840
			Aging treatment	350	1180
			Casting	320	1080
	Titanium alloys	Pure titanium		200	680
		α Phase and β Phase alloy,aging treatment		375	1260
		β Phase alloy		410	1400
	Tungsten alloy			300	1010
	Molybdenum alloy			300	1010
H	Hardened steel	Quenching and tempering		50HRC	
		Quenching and tempering		55HRC	
		Quenching and tempering		60HRC	
	Hardened cast steel	Quenching and tempering		50HRC	

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Solid carbide end mill Pro Line cutting parameters
 The recommended cutting parameters are theoretical values,
 it can be adjusted according to the real conditions

Machining Materials					
ISO	Material classification			Brinell hardness (HB/HRC)	Tensile strength (N/mm ²)
P	Unalloyed steel	C≤0.25%	Annealing	125	428
		0.25<C≤0.55%	Annealing	190	639
		0.25<C≤0.55%	Tempered	210	708
		C>0.55%	Annealing	190	639
		C>0.55%	Tempered	300	1013
		Free-Cutting Steel (short chip)	Annealing	220	745
	Low Alloy Steel	Annealing		175	591
		Tempered		300	1013
		Tempered		380	1282
		Tempered		430	1477
	High alloy steel and high alloy tool steel	Annealing		200	675
		Quenching and tempering		300	1013
		Quenching and tempering		400	1361
	Stainless steel	Ferrite / martensite, annealing		200	675
		Martensite, tempered		330	1114
M	Stainless steel	Austenite, Quenched		200	675
		Austenite, Precipitation Dispersion Hardening Stainless Steel(PH Stainless Steel)		300	1013
		Austenite_ Ferrite, duplex stainless steel		230	778
K	Malleable iron	Ferrite		200	400
		Pearlite		260	700
	Gray cast iron	Low tensile strength		180	200
		High tensile strength / austenite		245	350
	Nodular Cast Iron	Ferrite		155	400
		Pearlite		265	700
	Graphite Cast Iron GGV(CGI)			230	400
N	Forged aluminum alloy	Non-aging treatment		30	-
		Aging treatment		100	340
	Cast aluminium alloys	≤12 % silicon, Non-aging treatment		75	260
		≤12 % silicon, aging treatment		90	310
		>12 % silicon, Non-aging treatment		130	450
	Magnesium alloy			70	250
	Copper and copper alloys (bronze / brass)	Non alloy, electrolytic copper		100	340
		Brass, bronze, red brass		90	310
		Copper alloy, short chip		110	380
		High strength Ampco alloy		300	1010
S	Iron base alloy	Iron base	Annealing	200	680
			Aging treatment	280	940
		Nickel or cobalt based	Annealing	250	840
			Aging treatment	350	1180
			Casting	320	1080
	Titanium alloys	Pure titanium		200	680
		α Phase and β Phase alloy,aging treatment		375	1260
		β Phase alloy		410	1400
	Tungsten alloy			300	1010
	Molybdenum alloy			300	1010
H	Hardened steel	Quenching and tempering		50HRC	
		Quenching and tempering		55HRC	
		Quenching and tempering		60HRC	
	Hardened cast steel	Quenching and tempering		50HRC	

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