

**NEW**  
**PRODUCT!**











**M110, M115, M116**

**Universal Solid Carbide End Mills – PRO Line**











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





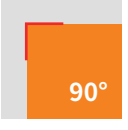


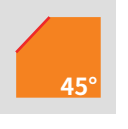




● Solid carbide end mills -Pro Line

Series	Picture	Category	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

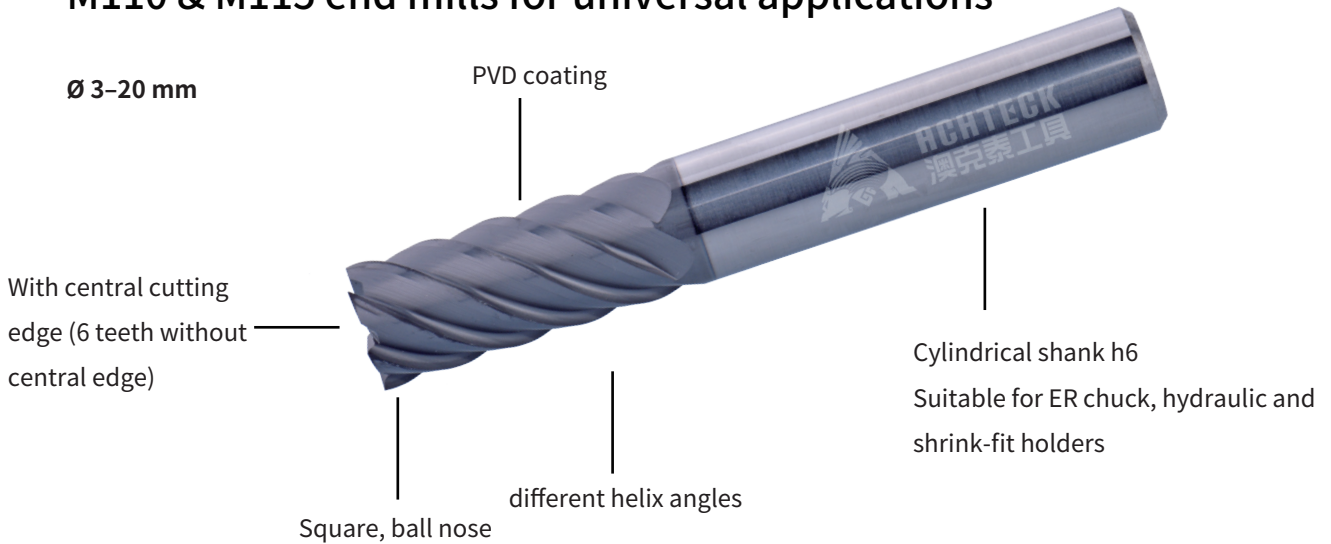
**Tool**

- 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

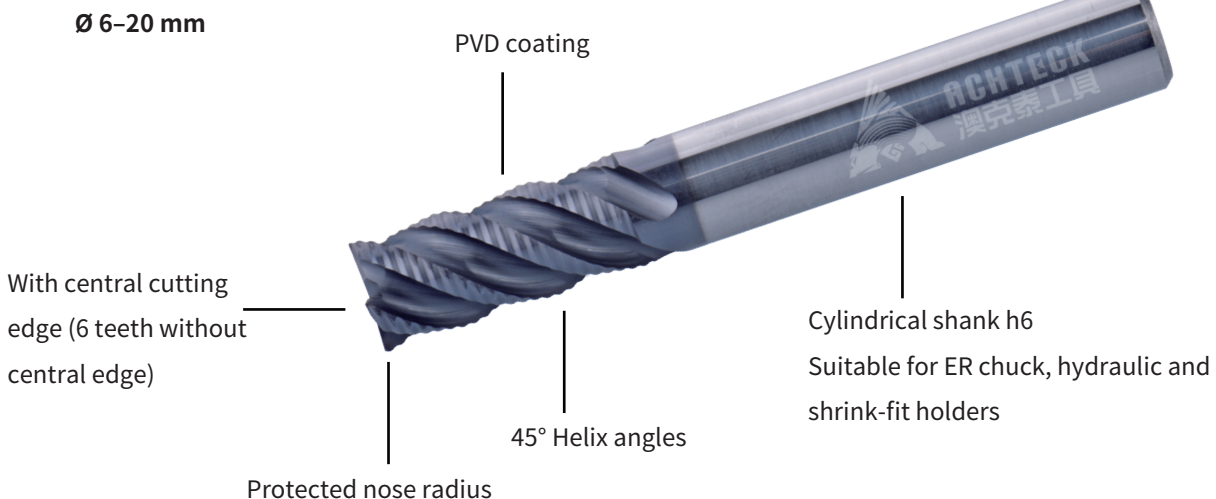
**Application**

- 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

<b>M</b>	<b>1</b>	<b>00</b>
1	2	3

<b>2</b>	<b>E</b>	<b>S</b>
4	5	6

<b>060</b>	<b>002</b>	<b>N</b>
7	8	9

<b>1</b>
<b>Tool category</b>
M End mill

<b>2</b>
<b>Generations</b>
1

<b>3</b>
<b>Series</b>
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

<b>4</b>
<b>Number of teeth</b>
2, 3, 4, 5, 6.....

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

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

<b>7</b>
<b>Tool diameter</b>
060=6.0mm
200=20.0mm

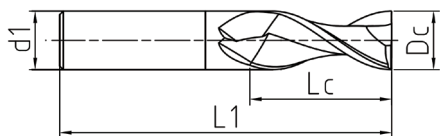
<b>8</b>
<b>Chamfer / nose radius size</b>
002=0.2mm

<b>9</b>
<b>Structure type</b>
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
●●	●	●●			●	

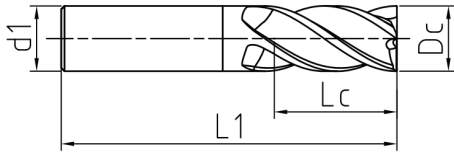
Product code	Dc mm +0.00/-0.02	d1 mm	Lc mm	L1 mm	Z	Stock
M110-2ES-030	3	4	8	50	2	●
M110-2ES-040	4	4	11	50	2	●
M110-2ES-050	5	6	13	50	2	●
M110-2ES-060	6	6	16	50	2	●
M110-2ES-080	8	8	20	60	2	●
M110-2ES-100	10	10	25	75	2	●
M110-2ES-120	12	12	32	75	2	●
M110-2ES-140	14	16	40	100	2	●
M110-2ES-160	16	16	40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

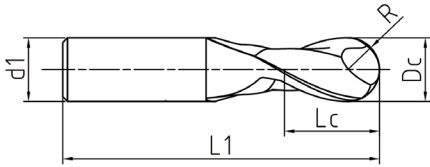
Product code	Dc mm +0.00/-0.02	d1 mm	Lc mm	L1 mm	Z	Stock
M110-4ES-030	3	4	8	50	4	●
M110-4ES-040	4	4	11	50	4	●
M110-4ES-050	5	6	13	50	4	●
M110-4ES-060	6	6	16	50	4	●
M110-4ES-080	8	8	20	60	4	●
M110-4ES-100	10	10	25	75	4	●
M110-4ES-120	12	12	32	75	4	●
M110-4ES-140	14	16	40	100	4	●
M110-4ES-160	16	16	40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

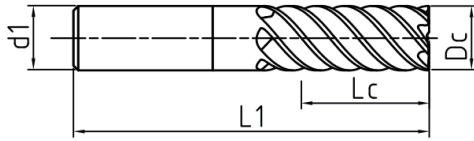
Marked: ● Stocked ○ Non-stocked

● 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	●

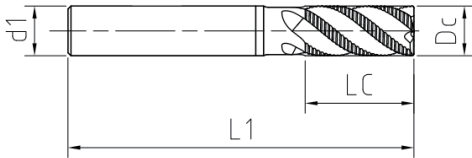
Marked: ● Stocked ○ Non-stocked

◆ **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

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

<b>Machining Materials</b>						
ISO	Material classification			Brinell hardness (HB/HRC)	Tensile strength (N/mm <sup>2</sup> )	
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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		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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	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
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		Austenite_ Ferrite, duplex stainless steel		230	778
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		Pearlite		260	700
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			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	
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		Quenching and tempering		60HRC		
	Hardened cast steel	Quenching and tempering		50HRC		



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

<b>Machining Materials</b>						
ISO	Material classification			Brinell hardness (HB/HRC)	Tensile strength (N/mm <sup>2</sup> )	
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	≤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	

