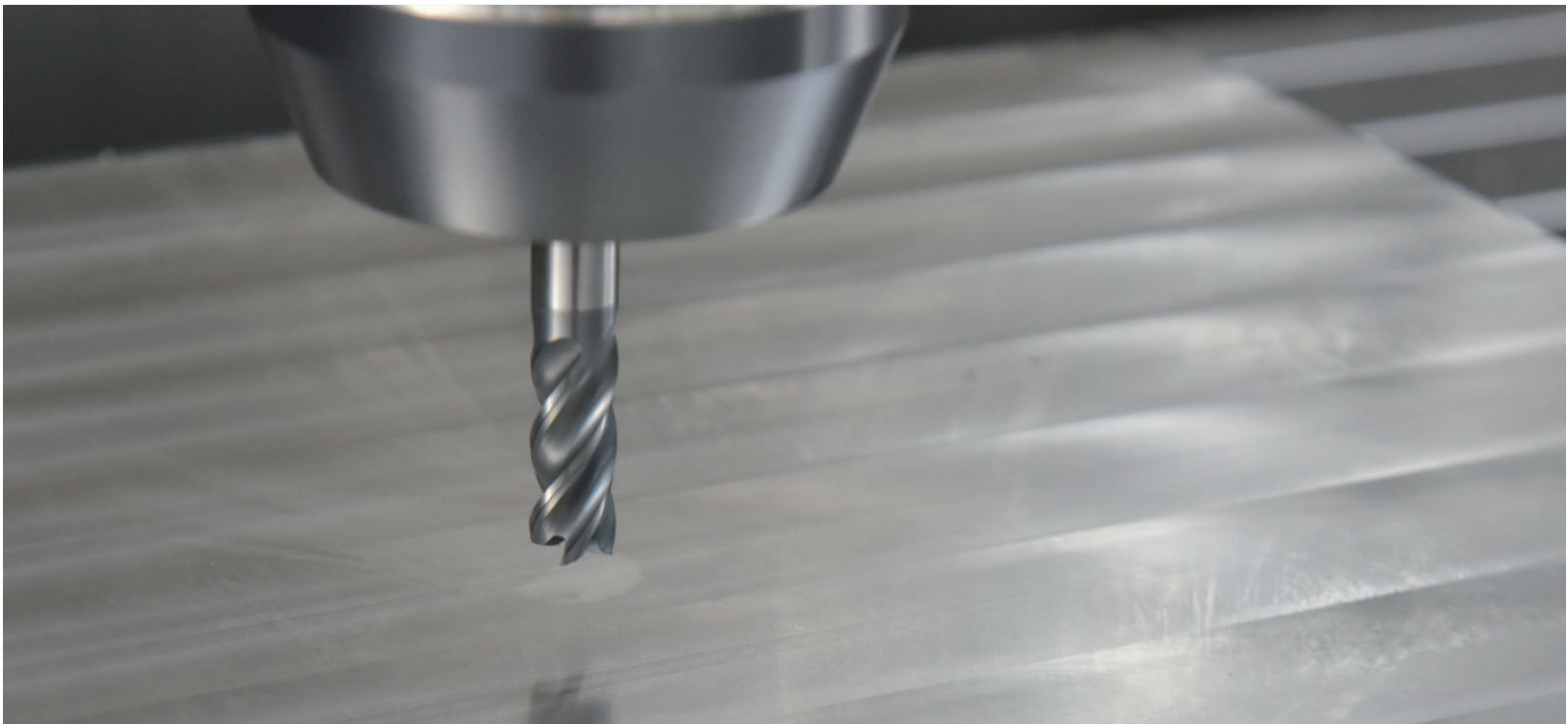








High-efficiency Machining for ISO P,M,K and S Material  
Achteck High-efficiency Universal End Mills in Pro Series













---M210, M216











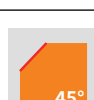




• Solid Carbide End Mills M210, M216

Series	Picture	Category	No. of Teeth	Helix angle	Application	Tolerance mm	Diameter mm	Application Material	Application
M210-4CS		PRO	Z=4	35°/38°		h9	3-20	Universal	Used in carbon steel, tool steel, alloyed steel. 4 cutting edge design for good surface quality. Different helix angle and uneven pitch. Forming grooves design for smooth chip removal. The corner chamfer can prevent edge breakage. The workpiece hardness is up to HRC50.
M210-4RS		PRO	Z=4	35°/38°		h9	4-12	Universal	Used in carbon steel, tool steel and alloyed steel. 4 cutting edge design for good surface quality. Different helix angle and uneven pitch. Forming grooves design for smooth chip removal. The corner radius can prevent edge breakage. The workpiece hardness is up to HRC50.
M216-4PS		PRO	Z=4-6	45°		h9	6-20	Universal	Used in steel, stainless steel rough milling. The corner chamfer can prevent edge breakage. Thanks for the fine pitch waved cutting edge, the tool has low cutting force and high chip removal rate.

◆ Icon Description

Icons	Description
	Slot milling and square shoulder milling
	Square shoulder milling Rough milling
	Square shoulder milling Finish milling
	High feed milling
	Dynamic milling Cycloid milling
	Profile milling
	Chamfering and deburring
	AlTiN coating
	Uncoated
	AlCrN coating
	TiSiAlCrN coating
	Cylindrical shank

Icons	Description
	Weldon Shank
	30° helix angle
	35° helix angle
	35°/38° helix angle
	40° helix angle
	45° helix angle
	37°/39°/41° helix angle
	Square
	Round corner
	Ball-nose
	Corner chamfer
	Chamfer
	Waved edge

## • Solid Carbide End Mills M210, M216

### Tool

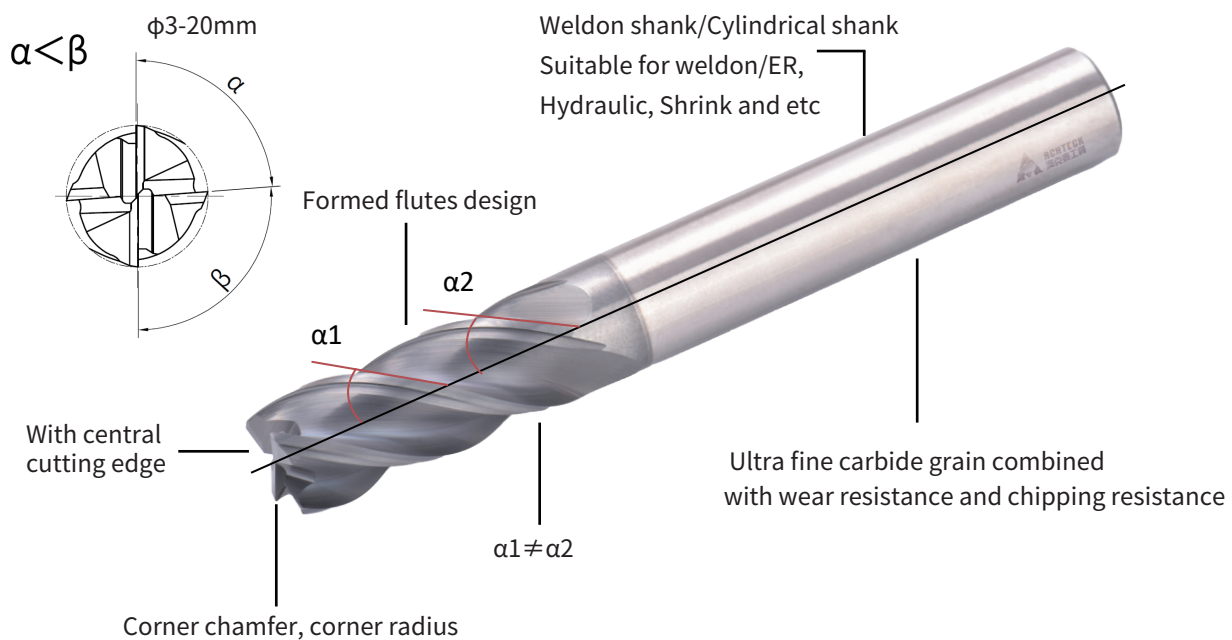
Solid carbide end mills Pro line

- Metric
- 3 types with 47 dimensions
- Corner chamfer, corner radius, waved cutting edge
- No. of teeth, 4 or 5 or 6
- Cutting diameter range D3-D20 mm

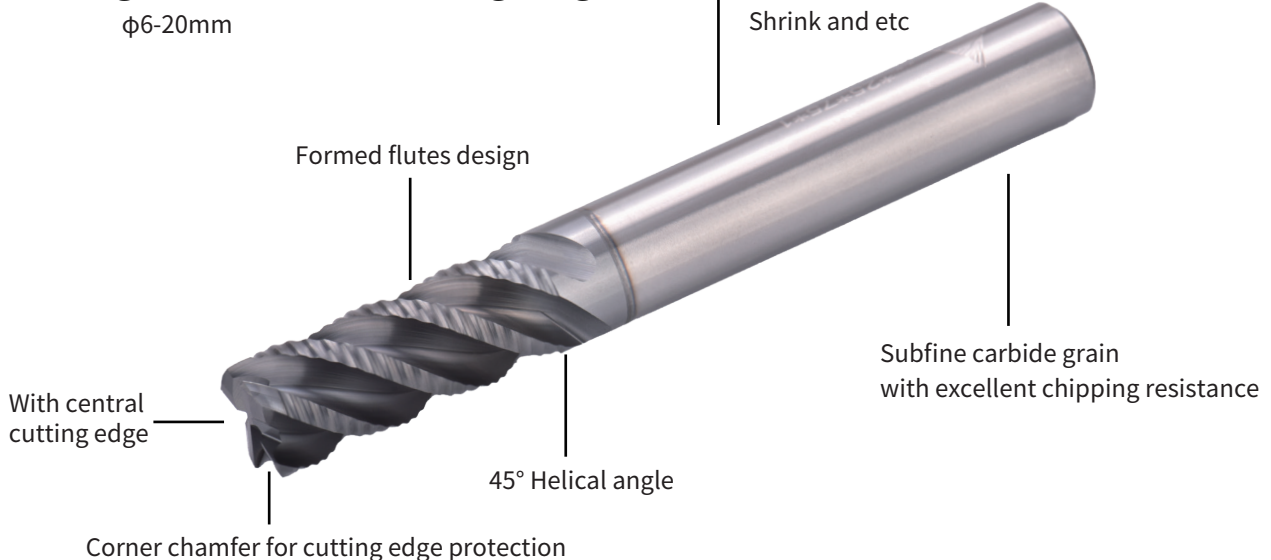
### Application

- ISO material group: P, M, K and S
- Side milling, Slot milling, Pocket milling, Helical interpolated milling, Ramp milling, Dynamic milling
- Application industry: General engineering, Mould & Die, Automobile, Aircraft and energy

## • High-efficiency Universal End Mills M210



## • Waved Edge End Mills for Roughing M216



• Solid Carbide End Mills Code keys

M	2	10		4	R	S		060	002	N
1	2	3	—	4	5	6	—	7	8	9

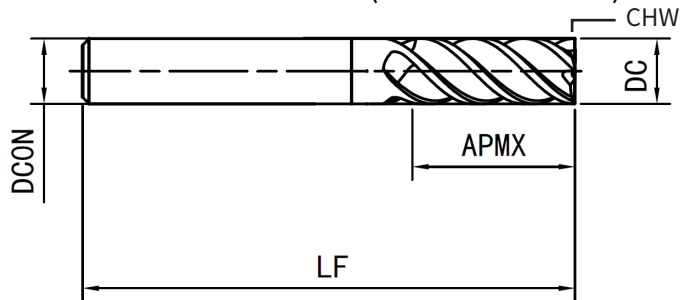
1	2	3	4	5
Tool Category	Generation	Series	number of teeth	Tool Type
M End Mill	1	00-09 Universal for working hardness under HRC45	2, 3, 4, 5, 6.....	E Square
		10-19 High-efficiency universal end mills		B Ball nose
		20-29 High performance end mills		R Corner radius
		30-39 Dedicated for steel		C Chamfer
		40-49 Dedicated for Aluminium alloy		P With waved edges
		50-59 Dedicated for stainless steel		W Forming end mills
		60-69 Dedicated for difficult machine materials		T Taper end mills
		70-79 Dedicated for hardened material		H High feed milling
		80-99 Others		

6	7	8	9
Length	Tool Diameter	Corner radius/Chamfer Size	Geometry Type
S Standard	Inch	Inch	N straight neck diameter
L Long	0.125=0.125 in=1/8 in	R015=0.015 in	C Conical necking
X Super long	0.188=0.188 in=3/16 in	Metric	P Special shank
A Extra long	Metric	002-0.2mm	W Weldon shank
SP Long cutting edge	060=6.0mm		Default: No necking
LP Long overall length& Long cutting edge	200=20.0mm		
SN Short cutting edge			

● End Mills M210

Pro line

End mills with 4 flutes (Corner chamfer)



P	M	K	N	S	H
●	●	●		●	

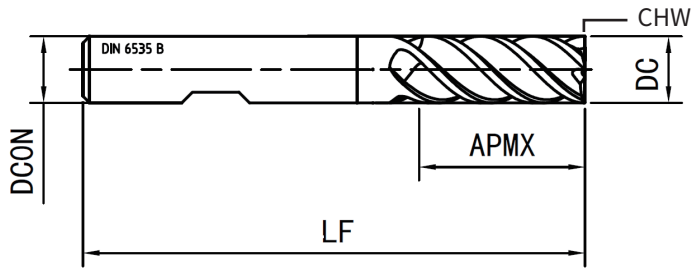
Product Code	Dc mm h9	DCON mm	CHW mm	APMX mm	LF mm	ZEFP	Stock
M210-4CS-030	3	4	0.04	8	50	4	●
M210-4CS-040	4	4	0.06	12	50	4	●
M210-4CS-050	5	6	0.06	13	50	4	●
M210-4CS-060	6	6	0.08	16	50	4	●
M210-4CS-080	8	8	0.10	20	60	4	●
M210-4CS-100	10	10	0.10	25	75	4	●
M210-4CS-120	12	12	0.12	30	75	4	●
M210-4CS-140	14	14	0.12	34	100	4	○
M210-4CS-160	16	16	0.15	36	100	4	●
M210-4CS-180	18	18	0.15	40	100	4	○
M210-4CS-200	20	20	0.15	45	100	4	○

Remark: ● Stocked ○ Non-stocked  
Special items can be ordered

● **End Mills M210**

**Pro line**

End Mills with 4 flutes (Corner chamfer)



P	M	K	N	S	H
●●	●	●●		●	

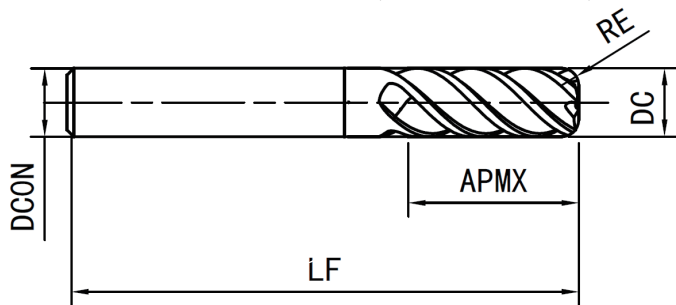
Product Code	Dc mm h9	DCON mm	CHW mm	APMX mm	LF mm	ZEFP	Stock
M210-4CS-050W	5	6	0.06	13	50	4	○
M210-4CS-060W	6	6	0.08	16	50	4	●
M210-4CS-080W	8	8	0.10	20	60	4	●
M210-4CS-100W	10	10	0.10	25	75	4	●
M210-4CS-120W	12	12	0.12	30	75	4	●
M210-4CS-140W	14	14	0.12	34	100	4	○
M210-4CS-160W	16	16	0.15	36	100	4	○
M210-4CS-180W	18	18	0.15	40	100	4	○
M210-4CS-200W	20	20	0.15	45	100	4	○

Remark: ● Stocked ○ Non-stocked  
Special items can be ordered

● **End Mills M210**

**Pro line**

End mills with 4 flutes (Corner radius)



P	M	K	N	S	H
●	●	●		●	

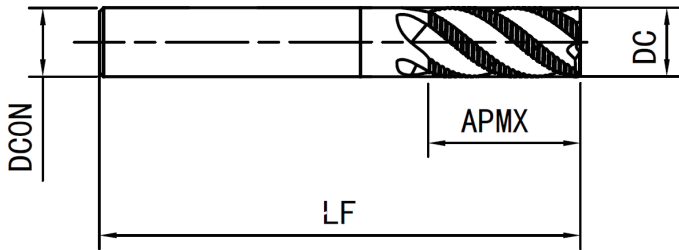
Product Code	Dc mm h9	DCON mm	RE mm	APMX mm	LF mm	ZEFP	Stock
M210-4RS-040002	4	4	R0.2	12	50	4	○
M210-4RS-040005	4	4	R0.5	12	50	4	●
M210-4RS-040010	4	4	R1.0	12	50	4	●
M210-4RS-060002	6	6	R0.2	16	50	4	○
M210-4RS-060005	6	6	R0.5	16	50	4	●
M210-4RS-060010	6	6	R1.0	16	50	4	●
M210-4RS-080005	8	8	R0.5	20	60	4	●
M210-4RS-080010	8	8	R1.0	20	60	4	●
M210-4RS-080015	8	8	R1.5	20	60	4	○
M210-4RS-080020	8	8	R2.0	20	60	4	●
M210-4RS-100005	10	10	R0.5	25	75	4	●
M210-4RS-100010	10	10	R1.0	25	75	4	●
M210-4RS-100015	10	10	R1.5	25	75	4	○
M210-4RS-100020	10	10	R2.0	25	75	4	●
M210-4RS-100025	10	10	R2.5	25	75	4	○
M210-4RS-120005	12	12	R0.5	30	75	4	●
M210-4RS-120010	12	12	R1.0	30	75	4	●
M210-4RS-120015	12	12	R1.5	30	75	4	○
M210-4RS-120020	12	12	R2.0	30	75	4	●
M210-4RS-120025	12	12	R2.5	30	75	4	○
M210-4RS-120030	12	12	R3.0	30	75	4	○

Remark: ● Stocked ○ Non-stocked  
Special items can be ordered

● End Mills M216

Pro line

End mills with 4-6 flutes for roughing



P	M	K	N	S	H
●	●	●		●	

Product Code	Dc mm h9	DCON mm	APMX mm	LF mm	ZEFP	Stock
M216-4PS-060	6	6	16	50	4	●
M216-4PS-080	8	8	20	60	4	●
M216-4PS-100	10	10	25	75	4	●
M216-4PS-120	12	12	30	75	4	●
M216-5PS-160	16	16	45	100	5	●
M216-6PS-200	20	20	45	100	6	○

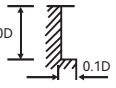
Remark: ● Stocked ○ Non-stocked  
Special items can be ordered

## Solid Carbide End Mill M210 Cutting Data Recommendation

		Materials				M210-4CS Slot milling <sup>1.0D</sup>		M210-4RS (ISO P/K)		Slot milling <sup>0.3-0.5D</sup>							
ISO	Workpiece Materials		Brinell Hardness(HB)	Tensile strength (N/mm <sup>2</sup> )	Cutting speed Vc(m/min)	fz [mm/Tooth]											
						Mill diameter [mm]											
						4	6	8	10	12	14	16	18	20			
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428	85-150	0.016	0.023	0.032	0.040	0.054	0.059	0.063	0.072	0.081		
		0.25 < C ≤ 0.55%	Annealed	190	639	110-150	0.018	0.025	0.035	0.044	0.060	0.065	0.070	0.080	0.090		
		0.25 < C ≤ 0.55%	Heat-treated	210	708	110-150	0.018	0.025	0.035	0.044	0.060	0.065	0.070	0.080	0.090		
		C > 0.55%	Annealed	190	639	100-120	0.017	0.024	0.033	0.042	0.057	0.062	0.067	0.076	0.086		
		C > 0.55%	Heat-treated	300	1013	80-110	0.016	0.023	0.032	0.040	0.054	0.059	0.063	0.072	0.081		
		Free cutting steel	Annealed	220	745	100-120	0.017	0.024	0.033	0.042	0.057	0.062	0.067	0.076	0.086		
	Low-alloyed steel	Annealed		175	591	100-120	0.017	0.024	0.033	0.042	0.057	0.062	0.067	0.076	0.086		
		Heat-treated		300	1013	80-110	0.016	0.023	0.032	0.040	0.054	0.059	0.063	0.072	0.081		
		Heat-treated		380	1282	80-100	0.015	0.022	0.030	0.038	0.052	0.056	0.060	0.069	0.077		
		Heat-treated		430	1477	70-110	0.015	0.021	0.029	0.036	0.049	0.053	0.057	0.066	0.074		
	High-alloyed steel and highalloyed tool steel	Annealed		200	675	100-120	0.016	0.023	0.032	0.040	0.054	0.059	0.063	0.072	0.081		
		Hardened and tempered		300	1013	80-100	0.016	0.023	0.032	0.040	0.054	0.059	0.063	0.072	0.081		
Hardened and tempered		400	1361	70-110	0.015	0.022	0.030	0.038	0.052	0.056	0.060	0.069	0.077				
Stainless steels	Ferritic/Martensite,Annealed		200	675	50-70	0.014	0.019	0.026	0.033	0.045	0.049	0.053	0.060	0.068			
	Martensite,Heat-treated		330	1114	40-60	0.012	0.016	0.023	0.029	0.039	0.042	0.046	0.052	0.059			
M	Stainless steels	Austenitic,hardened		200	675	60-80	0.017	0.025	0.035	0.040	0.045	0.050	0.060	0.070	0.080		
		Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013	30-45	0.014	0.020	0.028	0.032	0.036	0.040	0.048	0.056	0.064		
		Austenitic,ferritic,duplex		230	778	40-50	0.016	0.024	0.033	0.038	0.043	0.048	0.057	0.067	0.076		
K	Malleable cast iron	Ferritic		200	400	100-130	0.020	0.035	0.050	0.070	0.080	0.090	0.090	0.100	0.110		
		Pearlitic		260	700	90-120	0.017	0.030	0.043	0.060	0.068	0.077	0.077	0.085	0.094		
	Grey cast iron	Low tensile strength		180	200	120-130	0.020	0.035	0.050	0.070	0.080	0.090	0.090	0.100	0.110		
		High tensile strength/Austenitic		245	350	95-110	0.018	0.032	0.045	0.063	0.072	0.081	0.081	0.090	0.099		
	Nodular cast iron	Ferritic		155	400	110-130	0.020	0.035	0.050	0.070	0.080	0.090	0.090	0.100	0.110		
		Pearlitic		265	700	85-110	0.017	0.030	0.043	0.060	0.068	0.077	0.077	0.085	0.094		
GGV(CGI)				230	400	95-110	0.016	0.028	0.040	0.056	0.064	0.072	0.072	0.080	0.088		
N	Wrought aluminum alloy	Non-aging alloy		30	-												
		Aged alloy		100	340												
	Cast aluminum alloy	≤ 12% Si, non-aging alloy		75	260												
		≤ 12% Si, aged alloy		90	310												
		> 12% Si, non-aging alloy		130	450												
	Magnesium alloy				70	250											
	Copper and copper alloy (bronze/brass)	Unalloyed,electrolytic copper		100	340												
		Brass,bronze,red brass		90	310												
Cu alloy,short chip		110	380														
High tensile,Ampco alloy		300	1010														
S	Fe-based alloy	Fe-based	Annealed	200	680	40-55	0.011	0.019	0.025	0.035	0.045	0.060	0.070	0.070	0.080		
			Aged	280	940	30-40	0.009	0.015	0.020	0.028	0.036	0.048	0.056	0.056	0.064		
		Ni or Co based	Annealed	250	840	40-55	0.011	0.019	0.025	0.035	0.045	0.060	0.070	0.070	0.080		
			Aged	350	1180	30-40	0.009	0.015	0.020	0.028	0.036	0.048	0.056	0.056	0.064		
	Titanium alloy	Pure Titanium		200	680	40-55	0.012	0.021	0.028	0.039	0.050	0.066	0.077	0.077	0.088		
		α and β alloy, aged		375	1260	40-55	0.012	0.021	0.028	0.039	0.050	0.066	0.077	0.077	0.088		
		β alloy		410	1400	30-40	0.008	0.014	0.019	0.026	0.034	0.045	0.053	0.053	0.060		
	Tungsten alloy				300	1010	50-60	0.013	0.023	0.030	0.042	0.054	0.072	0.084	0.084	0.096	
	Molybdenum alloy				300	1010	50-60	0.013	0.023	0.030	0.042	0.054	0.072	0.084	0.084	0.096	
	H	Hardened steel	Hardened and tempered		50HRC	-											
Hardened and tempered			55HRC	-													
Hardened and tempered			60HRC	-													
Chilled cast iron		Hardened and tempered		55HRC	-												

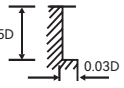
The cutting data are average recommended values. For special applications, adjustment is needed.

Solid Carbide End Mill M210 Cutting Data Recommendation

		Materials				M210-4CS M210-4RS	Square shoulder milling 1.0D (Rough milling)									
ISO	Workpiece Materials		Brinell Hardness(HB)	Tensile strength (N/mm <sup>2</sup> )	Cutting speed Vc(m/min)	fz [mm/Tooth]										
						Mill diameter [mm]										
						4	6	8	10	12	14	16	18	20		
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428	140-280	0.045	0.059	0.077	0.099	0.117	0.135	0.153	0.171	0.180	
		0.25 < C ≤ 0.55%	Annealed	190	639	180-280	0.050	0.065	0.085	0.110	0.130	0.150	0.170	0.190	0.200	
		0.25 < C ≤ 0.55%	Heat-treated	210	708	160-250	0.050	0.065	0.085	0.110	0.130	0.150	0.170	0.190	0.200	
		C > 0.55%	Annealed	190	639	160-280	0.048	0.062	0.081	0.105	0.124	0.143	0.162	0.181	0.190	
		C > 0.55%	Heat-treated	300	1013	120-200	0.045	0.059	0.077	0.099	0.117	0.135	0.153	0.171	0.180	
		Free cutting steel	Annealed	220	745	190-280	0.048	0.062	0.081	0.105	0.124	0.143	0.162	0.181	0.190	
	Low-alloyed steel	Annealed		175	591	200-280	0.048	0.062	0.081	0.105	0.124	0.143	0.162	0.181	0.190	
		Heat-treated		300	1013	120-190	0.045	0.059	0.077	0.099	0.117	0.135	0.153	0.171	0.180	
		Heat-treated		380	1282	110-160	0.043	0.056	0.073	0.095	0.112	0.129	0.146	0.163	0.172	
		Heat-treated		430	1477	90-110	0.041	0.053	0.070	0.090	0.107	0.123	0.139	0.156	0.164	
	High-alloyed steel and highalloyed tool steel	Annealed		200	675	160-250	0.045	0.059	0.077	0.099	0.117	0.135	0.153	0.171	0.180	
		Hardened and tempered		300	1013	120-190	0.045	0.059	0.077	0.099	0.117	0.135	0.153	0.171	0.180	
Hardened and tempered		400	1361	90-110	0.043	0.056	0.073	0.095	0.112	0.129	0.146	0.163	0.172			
Stainless steels	Ferritic/Martensite,Annealed		200	675	75-100	0.038	0.049	0.064	0.083	0.098	0.113	0.128	0.143	0.150		
	Martensite,Heat-treated		330	1114	60-90	0.033	0.042	0.055	0.072	0.085	0.098	0.111	0.124	0.130		
M	Stainless steels	Austenitic,hardened		200	675	100-130	0.036	0.050	0.068	0.085	0.100	0.115	0.130	0.150	0.160	
		Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013	60-90	0.029	0.040	0.054	0.068	0.080	0.092	0.104	0.120	0.128	
		Austenitic,ferritic,duplex		230	778	70-100	0.034	0.048	0.065	0.081	0.095	0.109	0.124	0.143	0.152	
K	Malleable cast iron	Ferritic		200	400	200-280	0.055	0.080	0.100	0.130	0.150	0.170	0.190	0.220	0.220	
		Pearlitic		260	700	180-250	0.047	0.068	0.085	0.111	0.128	0.145	0.162	0.187	0.187	
	Grey cast iron	Low tensile strength		180	200	200-280	0.055	0.080	0.100	0.130	0.150	0.170	0.190	0.220	0.220	
		High tensile strength/Austenitic		245	350	180-240	0.050	0.072	0.090	0.117	0.135	0.153	0.171	0.198	0.198	
	Nodular cast iron	Ferritic		155	400	180-240	0.055	0.080	0.100	0.130	0.150	0.170	0.190	0.220	0.220	
		Pearlitic		265	700	160-200	0.047	0.068	0.085	0.111	0.128	0.145	0.162	0.187	0.187	
GGV(CGI)				230	400	145-195	0.044	0.064	0.080	0.104	0.120	0.136	0.152	0.176	0.176	
N	Wrought aluminum alloy	Non-aging alloy		30	-											
		Aged alloy		100	340											
	Cast aluminum alloy	≤ 12% Si, non-aging alloy		75	260											
		≤ 12% Si, aged alloy		90	310											
		> 12% Si, non-aging alloy		130	450											
	Magnesium alloy				70	250										
	Copper and copper alloy(bronze/brass)	Unalloyed,electrolytic copper		100	340											
Brass,bronze,red brass		90	310													
Cu alloy,short chip		110	380													
High tensile,Ampco alloy		300	1010													
S	Fe-based alloy	Fe-based	Annealed	200	680	55-70	0.035	0.050	0.070	0.090	0.110	0.130	0.150	0.160	0.160	
			Aged	280	940	40-60	0.028	0.040	0.056	0.072	0.088	0.104	0.120	0.128	0.128	
		Ni or Co based	Annealed	250	840	60-80	0.035	0.050	0.070	0.090	0.110	0.130	0.150	0.160	0.160	
			Aged	350	1180	30-50	0.028	0.040	0.056	0.072	0.088	0.104	0.120	0.128	0.128	
	Titanium alloy	Pure Titanium		200	680	40-55	0.039	0.055	0.077	0.099	0.121	0.143	0.165	0.176	0.176	
		α and β alloy, aged		375	1260	50-70	0.039	0.055	0.077	0.099	0.121	0.143	0.165	0.176	0.176	
		β alloy		410	1400	35-50	0.026	0.038	0.053	0.068	0.083	0.098	0.113	0.120	0.120	
	Tungsten alloy				300	1010	60-85	0.042	0.060	0.084	0.108	0.132	0.156	0.180	0.192	0.192
	Molybdenum alloy				300	1010	70-95	0.042	0.060	0.084	0.108	0.132	0.156	0.180	0.192	0.192
	H	Hardened steel	Hardened and tempered		50HRC	-										
Hardened and tempered			55HRC	-												
Hardened and tempered			60HRC	-												
Chilled cast iron		Hardened and tempered		55HRC	-											

The cutting data are average recommended values. For special applications, adjustment is needed.

Solid Carbide End Mill M210 Cutting Data Recommendation

Materials				M210-4CS M210-4RS		Square shoulder milling 1.5D (Finsih milling) 									
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm <sup>2</sup> )	Cutting speed Vc(m/min)	fz [mm/Tooth]								
							Mill diameter [mm]								
						4	6	8	10	12	14	16	18	20	
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428	160-280	0.063	0.090	0.117	0.144	0.171	0.198	0.234	0.261	0.288
		0.25 < C ≤ 0.55%	Annealed	190	639	220-340	0.070	0.100	0.130	0.160	0.190	0.220	0.260	0.290	0.320
		0.25 < C ≤ 0.55%	Heat-treated	210	708	220-340	0.070	0.100	0.130	0.160	0.190	0.220	0.260	0.290	0.320
		C > 0.55%	Annealed	190	639	200-320	0.067	0.095	0.124	0.152	0.181	0.209	0.247	0.276	0.304
		C > 0.55%	Heat-treated	300	1013	150-270	0.063	0.090	0.117	0.144	0.171	0.198	0.234	0.261	0.288
		Free cutting steel	Annealed	220	745	200-320	0.067	0.095	0.124	0.152	0.181	0.209	0.247	0.276	0.304
	Low-alloyed steel	Annealed		175	591	200-320	0.067	0.095	0.124	0.152	0.181	0.209	0.247	0.276	0.304
		Heat-treated		300	1013	150-270	0.063	0.090	0.117	0.144	0.171	0.198	0.234	0.261	0.288
		Heat-treated		380	1282	120-240	0.060	0.086	0.112	0.138	0.163	0.189	0.224	0.249	0.275
		Heat-treated		430	1477	100-210	0.057	0.082	0.107	0.131	0.156	0.180	0.213	0.238	0.262
	High-alloyed steel and highalloyed tool steel	Annealed		200	675	150-270	0.063	0.090	0.117	0.144	0.171	0.198	0.234	0.261	0.288
		Hardened and tempered		300	1013	150-270	0.063	0.090	0.117	0.144	0.171	0.198	0.234	0.261	0.288
		Hardened and tempered		400	1361	120-240	0.060	0.086	0.112	0.138	0.163	0.189	0.224	0.249	0.275
	Stainless steels	Ferritic/Martensite,Annealed		200	675	80-160	0.053	0.075	0.098	0.120	0.143	0.165	0.195	0.218	0.240
Martensite,Heat-treated		330	1114	60-120	0.046	0.065	0.085	0.104	0.124	0.143	0.169	0.189	0.208		
M	Stainless steels	Austenitic,hardened		200	675	100-160	0.056	0.077	0.099	0.120	0.144	0.168	0.192	0.216	0.240
		Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013	70-120	0.045	0.062	0.079	0.096	0.115	0.134	0.154	0.173	0.192
		Austenitic,ferritic,duplex		230	778	80-140	0.042	0.058	0.074	0.090	0.108	0.126	0.144	0.162	0.180
K	Malleable cast iron	Ferritic		200	400	210-310	0.080	0.110	0.140	0.170	0.208	0.246	0.284	0.322	0.360
		Pearlitic		260	700	180-280	0.068	0.094	0.119	0.145	0.177	0.209	0.241	0.274	0.306
	Grey cast iron	Low tensile strength		180	200	210-310	0.080	0.110	0.140	0.170	0.208	0.246	0.284	0.322	0.360
		High tensile strength/Austenitic		245	350	180-270	0.072	0.099	0.126	0.153	0.187	0.221	0.256	0.290	0.324
	Nodular cast iron	Ferritic		155	400	210-310	0.080	0.110	0.140	0.170	0.208	0.246	0.284	0.322	0.360
		Pearlitic		265	700	180-280	0.068	0.094	0.119	0.145	0.177	0.209	0.241	0.274	0.306
GGV(CGI)				230	400	150-210	0.064	0.088	0.112	0.136	0.166	0.197	0.227	0.258	0.288
N	Wrought aluminum alloy	Non-aging alloy		30	-										
		Aged alloy		100	340										
	Cast aluminum alloy	≤ 12% Si, non-aging alloy		75	260										
		≤ 12% Si, aged alloy		90	310										
		> 12% Si, non-aging alloy		130	450										
	Magnesium alloy			70	250										
	Copper and copper alloy(bronze/brass)	Unalloyed,electrolytic copper		100	340										
Brass,bronze,red brass		90	310												
Cu alloy,short chip		110	380												
High tensile,Ampco alloy				300	1010										
S	Fe-based alloy	Fe-based	Annealed	200	680	55-75	0.040	0.060	0.080	0.100	0.116	0.132	0.148	0.164	0.180
			Aged	280	940	40-60	0.032	0.048	0.064	0.080	0.093	0.106	0.118	0.131	0.144
		Ni or Co based	Annealed	250	840	55-75	0.040	0.060	0.080	0.100	0.116	0.132	0.148	0.164	0.180
			Aged	350	1180	40-60	0.032	0.048	0.064	0.080	0.093	0.106	0.118	0.131	0.144
	Titanium alloy	Pure Titanium		200	680	40-60	0.044	0.066	0.088	0.110	0.128	0.145	0.163	0.180	0.198
		α and β alloy, aged		375	1260	40-60	0.044	0.066	0.088	0.110	0.128	0.145	0.163	0.180	0.198
		β alloy		410	1400	35-55	0.030	0.045	0.060	0.075	0.087	0.099	0.111	0.123	0.135
	Tungsten alloy			300	1010	60-90	0.048	0.072	0.096	0.120	0.139	0.158	0.178	0.197	0.216
	Molybdenum alloy			300	1010	60-90	0.048	0.072	0.096	0.120	0.139	0.158	0.178	0.197	0.216
	H	Hardened steel	Hardened and tempered		50HRC	-									
Hardened and tempered			55HRC	-											
Hardened and tempered			60HRC	-											
Chilled cast iron		Hardened and tempered		55HRC	-										

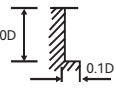
The cutting data are average recommended values. For special applications, adjustment is needed.

Solid Carbide End Mill M216 Cutting Data Recommendation

		Materials				M216-4PS M216-5PS M216-6PS	Slot milling 						
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm <sup>2</sup> )	Cutting speed Vc(m/min)	fz [mm/Tooth]						
							Mill diameter [mm]						
							6	8	10	12	16	20	
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428	95-145	0.024	0.032	0.039	0.047	0.063	0.080	
		0.25 < C ≤ 0.55%	Annealed	190	639	155-220	0.027	0.035	0.043	0.052	0.070	0.089	
		0.25 < C ≤ 0.55%	Heat-treated	210	708	155-220	0.027	0.035	0.043	0.052	0.070	0.089	
		C > 0.55%	Annealed	190	639	130-190	0.026	0.033	0.041	0.049	0.067	0.085	
		C > 0.55%	Heat-treated	300	1013	95-145	0.024	0.032	0.039	0.047	0.063	0.080	
		Free cutting steel	Annealed	220	745	130-190	0.026	0.033	0.041	0.049	0.067	0.085	
	Low-alloyed steel	Annealed		175	591	130-190	0.026	0.033	0.041	0.049	0.067	0.085	
		Heat-treated		300	1013	95-145	0.024	0.032	0.039	0.047	0.063	0.080	
		Heat-treated		380	1282	75-110	0.023	0.030	0.037	0.045	0.060	0.077	
		Heat-treated		430	1477	65-95	0.022	0.029	0.035	0.043	0.057	0.073	
	High-alloyed steel and highalloyed tool steel	Annealed		200	675	95-145	0.024	0.032	0.039	0.047	0.063	0.080	
		Hardened and tempered		300	1013	95-145	0.024	0.032	0.039	0.047	0.063	0.080	
		Hardened and tempered		400	1361	75-110	0.023	0.030	0.037	0.045	0.060	0.077	
	Stainless steels	Ferritic/Martensite,Annealed		200	675	45-70	0.020	0.026	0.032	0.039	0.053	0.067	
Martensite,Heat-treated		330	1114	32-50	0.018	0.023	0.028	0.034	0.046	0.058			
M	Stainless steels	Austenitic,hardened		200	675	45-65	0.020	0.026	0.032	0.038	0.050	0.062	
		Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013	28-42	0.016	0.021	0.026	0.030	0.040	0.050	
		Austenitic,ferritic,duplex		230	778	38-58	0.019	0.025	0.030	0.036	0.048	0.059	
K	Malleable cast iron	Ferritic		200	400	120-180	0.026	0.036	0.047	0.057	0.076	0.098	
		Pearlitic		260	700	95-145	0.022	0.031	0.040	0.048	0.065	0.083	
	Grey cast iron	Low tensile strength		180	200	120-180	0.026	0.036	0.047	0.057	0.076	0.098	
		High tensile strength/Austenitic		245	350	100-150	0.023	0.032	0.042	0.051	0.068	0.088	
	Nodular cast iron	Ferritic		155	400	120-180	0.026	0.036	0.047	0.057	0.076	0.098	
		Pearlitic		265	700	95-145	0.022	0.031	0.040	0.048	0.065	0.083	
GGV(CGI)				230	400	80-120	0.021	0.029	0.038	0.046	0.061	0.078	
N	Wrought aluminum alloy	Non-aging alloy		30	-								
		Aged alloy		100	340								
	Cast aluminum alloy	≤ 12% Si, non-aging alloy		75	260								
		≤ 12% Si, aged alloy		90	310								
		> 12% Si, non-aging alloy		130	450								
	Magnesium alloy				70	250							
	Copper and copper alloy(bronze/ brass)	Unalloyed,electrolytic copper		100	340								
		Brass,bronze,red brass		90	310								
Cu alloy,short chip		110	380										
High tensile,Ampco alloy		300	1010										
S	Fe-based alloy	Fe-based	Annealed	200	680	30-48	0.018	0.025	0.032	0.038	0.052	0.066	
			Aged	280	940	20-30	0.014	0.020	0.026	0.030	0.042	0.053	
		Ni or Co based	Annealed	250	840	30-48	0.018	0.025	0.032	0.038	0.052	0.066	
			Aged	350	1180	20-30	0.014	0.020	0.026	0.030	0.042	0.053	
			Cast	320	1080	20-30	0.014	0.020	0.026	0.030	0.042	0.053	
	Titanium alloy	Pure Titanium		200	680	30-50	0.020	0.028	0.035	0.042	0.057	0.073	
		α and β alloy, aged		375	1260	30-50	0.020	0.028	0.035	0.042	0.057	0.073	
		β alloy		410	1400	16-28	0.014	0.019	0.024	0.029	0.039	0.050	
	Tungsten alloy				300	1010	42-65	0.022	0.030	0.038	0.046	0.062	0.079
	Molybdenum alloy				300	1010	42-65	0.022	0.030	0.038	0.046	0.062	0.079
H	Hardened steel	Hardened and tempered		50HRC	-								
		Hardened and tempered		55HRC	-								
		Hardened and tempered		60HRC	-								
	Chilled cast iron		Hardened and tempered		55HRC	-							

The cutting data are average recommended values. For special applications, adjustment is needed.

Solid Carbide End Mill M216 Cutting Data Recommendation

Materials				M216-4PS M216-5PS M216-6PS		Square shoulder milling 1.0D (Rough milling) 						
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm <sup>2</sup> )	Cutting speed Vc(m/min)	fz [mm/Tooth]					
							Mill diameter [mm]					
						6	8	10	12	16	20	
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428	170-260	0.050	0.065	0.079	0.095	0.131	0.164
		0.25 < C ≤ 0.55%	Annealed	190	639	280-400	0.055	0.072	0.088	0.105	0.145	0.182
		0.25 < C ≤ 0.55%	Heat-treated	210	708	280-400	0.055	0.072	0.088	0.105	0.145	0.182
		C > 0.55%	Annealed	190	639	240-340	0.052	0.068	0.084	0.100	0.138	0.173
		C > 0.55%	Heat-treated	300	1013	168-248	0.050	0.065	0.079	0.095	0.131	0.164
		Free cutting steel	Annealed	220	745	240-340	0.052	0.068	0.084	0.100	0.138	0.173
	Low-alloyed steel	Annealed		175	591	240-340	0.052	0.068	0.084	0.100	0.138	0.173
		Heat-treated		300	1013	168-248	0.050	0.065	0.079	0.095	0.131	0.164
		Heat-treated		380	1282	140-200	0.047	0.062	0.076	0.090	0.125	0.157
		Heat-treated		430	1477	118-168	0.045	0.059	0.072	0.086	0.119	0.149
	High-alloyed steel and highalloyed tool steel	Annealed		200	675	168-248	0.050	0.065	0.079	0.095	0.131	0.164
		Hardened and tempered		300	1013	168-248	0.050	0.065	0.079	0.095	0.131	0.164
		Hardened and tempered		400	1361	140-200	0.047	0.062	0.076	0.090	0.125	0.157
	Stainless steels	Ferritic/Martensite,Annealed		200	675	85-125	0.041	0.054	0.066	0.079	0.109	0.137
Martensite,Heat-treated		330	1114	55-85	0.036	0.047	0.057	0.068	0.094	0.118		
M	Stainless steels	Austenitic,hardened		200	675	85-125	0.041	0.054	0.066	0.079	0.108	0.136
		Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013	50-80	0.033	0.043	0.053	0.063	0.086	0.109
		Austenitic,ferritic,duplex		230	778	70-110	0.039	0.051	0.063	0.075	0.103	0.129
K	Malleable cast iron	Ferritic		200	400	220-320	0.061	0.078	0.095	0.112	0.158	0.201
		Pearlitic		260	700	175-255	0.052	0.066	0.081	0.095	0.134	0.171
	Grey cast iron	Low tensile strength		180	200	220-320	0.061	0.078	0.095	0.112	0.158	0.201
		High tensile strength/Austenitic		245	350	190-270	0.055	0.070	0.086	0.101	0.142	0.181
	Nodular cast iron	Ferritic		155	400	220-320	0.061	0.078	0.095	0.112	0.158	0.201
		Pearlitic		265	700	175-255	0.052	0.066	0.081	0.095	0.134	0.171
GGV(CGI)			230	400	150-210	0.049	0.062	0.076	0.090	0.126	0.161	
N	Wrought aluminum alloy	Non-aging alloy		30	-							
		Aged alloy		100	340							
	Cast aluminum alloy	≤ 12% Si, non-aging alloy		75	260							
		≤ 12% Si, aged alloy		90	310							
		> 12% Si, non-aging alloy		130	450							
	Magnesium alloy			70	250							
	Copper and copper alloy(bronze/brass)	Unalloyed,electrolytic copper		100	340							
Brass,bronze,red brass		90	310									
Cu alloy,short chip		110	380									
High tensile,Ampco alloy		300	1010									
S	Fe-based alloy	Fe-based	Annealed	200	680	55-80	0.041	0.054	0.066	0.079	0.108	0.136
			Aged	280	940	34-50	0.033	0.043	0.053	0.063	0.086	0.109
		Ni or Co based	Annealed	250	840	55-80	0.041	0.054	0.066	0.079	0.108	0.136
			Aged	350	1180	34-50	0.033	0.043	0.053	0.063	0.086	0.109
			Cast	320	1080	34-50	0.033	0.043	0.053	0.063	0.086	0.109
	Titanium alloy	Pure Titanium		200	680	60-90	0.045	0.059	0.073	0.087	0.119	0.150
		α and β alloy, aged		375	1260	60-90	0.045	0.059	0.073	0.087	0.119	0.150
		β alloy		410	1400	30-45	0.031	0.041	0.050	0.059	0.081	0.102
	Tungsten alloy			300	1010	75-115	0.049	0.065	0.079	0.095	0.130	0.163
	Molybdenum alloy			300	1010	75-115	0.049	0.065	0.079	0.095	0.130	0.163
H	Hardened steel	Hardened and tempered		50HRC	-							
		Hardened and tempered		55HRC	-							
		Hardened and tempered		60HRC	-							
	Chilled cast iron		Hardened and tempered		55HRC	-						

The cutting data are average recommended values. For special applications, adjustment is needed.