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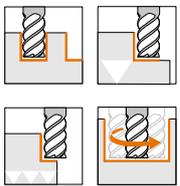
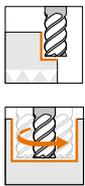
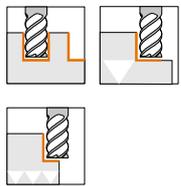
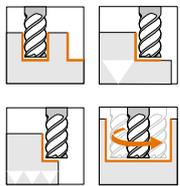


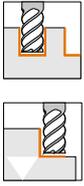
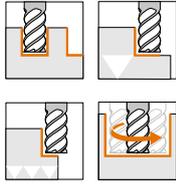
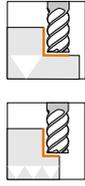
Solid End Mills

CUTTING TOOL CATALOGUE

Solid Carbide End Mills	426
Product Overview	428
Icon description	430
Denomination System	430
Square shoulder milling/Slot milling-M200 Series	431
Square shoulder milling/Slot milling-M205 Series	441
Square shoulder milling/Slot milling-M245 Series	442
Square shoulder milling/Slot milling-M210 Series	445
Square shoulder milling/Slot milling-M216 Series	448
Square shoulder milling/Slot milling-M150 Series	449
Square shoulder milling/Slot milling-M170 Series	451
Profile Milling-M200 Series	454
Profile Milling-M170 Series	456
Form milling Cutters-M180 Series	457
Square shoulder milling/Slot milling-M200/M205 Series Cutting Parameter	458
Square shoulder milling/Slot milling-M245 Series Cutting Parameter	461
Square shoulder milling/Slot milling-M210 Series Cutting Parameter	463
Square shoulder milling/Slot milling-M216 Series Cutting Parameter	466
Square shoulder milling/Slot milling-M150 Series Cutting Parameter	468
Square shoulder milling/Slot milling-M170 Series Cutting Parameter	471
Profile Milling-M200 Series Cutting Parameter	473
Profile Milling-M200 Series Cutting Parameter	474
Form milling-M180 Series Cutting Parameter	475

Product Overview of Solid Carbide End Mill Series

Product Name	Square Shoulder Milling			
Machining Application				
Category	ECO	ECO	ECO	PRO
Series	M200	M205	M245	M210
Illustration				
Diameter Range (mm)	1-20	6-20	1-20	3-20
No. of Teeth	2-4	6	2-3	4
Corner Radius (mm)	0.2-5			0.2-3
Length	S/SP/L/LP/X	S	S/L	S
Shank Type	Cylindrical/Weldon	Cylindrical	Cylindrical	Cylindrical/Weldon
Dimension Table Page	P431	P441	P442	P445
Cutting Data Table Page	P458	P460	P461	P463
P	••	••		••
M	•	•		•
K	••	••		••
N			••	
S				•
H				

Square Shoulder Milling			Profile Milling		Form Milling
					
PRO	PRO	PRO	ECO	PRO	ECO
M216	M150	M170	M200	M170	M180
					
6-20	1-20	4-16	1-20	2-16	6-16
4-6	4	4-6	2	2	4
	0.2-2	0.2-3	0.5-10	1-8	
S	S/L	S	S/L/X	S	S
Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical
P448	P449	P451	P454	P456	P457
P466	P468	P471	P473	P474	P475
••	••	•	••	•	••
••	••		•		•
•		•	••	•	••
					•
•	••				•
		••		••	

Solid Carbide End Mills

Icon Description

Icon	Description	Icon	Description	Icon	Description	Icon	Description
	Slot Milling And Square Shoulder Milling		Altin Coating		30° Helix Angle		Square
	Square Shoulder Milling Rough Milling		Alcrn Coating		35° Helix Angle		Round Corner
	Square Shoulder Milling Finsih Milling		Uncoated		35° /38° Helix Angle		Ball Nose
	High-Feed Milling		Tisialcrn Coating		36° /38° Helix Angle		Corner Chamfer
	Dynamic Milling Cycloid Milling		Altin/Zr Coating		40° Helix Angle		Chamfer
	Profifile Milling		Cylindrical Shank		37° /39° /41° Helix Angle		Waved Edge
	Chamfering & Deburring		Weldon Shank		45° Helix Angle		

Solid Carbide End Mill Denomination System

M	2	00	-	4	R	S	-	060	002	W
1	2	3	-	4	5	6	-	7	8	9

1- Tool Category
M milling cutter

2- Gen.
1
2

3- Series
00 Universal milling (HRC45)
10 High-efficiency universal milling
20 High-performance milling
30 Steel-specific milling
40 Aluminum milling
50 S.S. milling
60 Hard-to-cut materials milling
70 Harden steel milling
80&90 Others

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

5- Tool Type
E Flat end
B Ball nose
R Corner radius
C Chamfer
P Wavy edge
W Form milling
T Tapered
H High-feed

6- Length Standard
S Standard
L Long
X Extra-long
A Ultra-long
SN Shortened flute
SP Extended flute
LP Long & extended flute

7- Tool Diameter
060=6.0mm
200=20.0mm

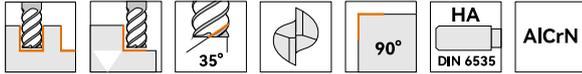
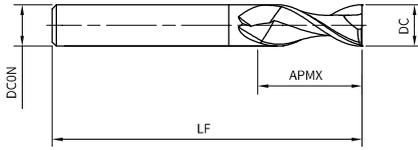
8- Corner Radius
002=0.2mm

9- Structure Type
N Straight neck
C Tapered neck
W Side lock shank
P Special shank dia.
Default: Standard necking

Solid Carbide End Mill M200

Eco line
2 flutes square end mill

Solid carbide end mill
Workpiece materials <HRC45



P	M	K	N	S	H
••	•	••			

•• 1st choice • 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M200-2ES-010	1	4	3	50	2	•
M200-2ES-015	1.5	4	4	50	2	•
M200-2ES-020	2	4	6	50	2	•
M200-2ES-025	2.5	4	8	50	2	•
M200-2ES-030	3	4	8	50	2	•
M200-2ES-040	4	4	12	50	2	•
M200-2ES-050	5	6	13	50	2	•
M200-2ES-060	6	6	16	50	2	•
M200-2ES-070	7	8	20	60	2	•
M200-2ES-080	8	8	20	60	2	•
M200-2ES-090	9	10	23	75	2	•
M200-2ES-100	10	10	25	75	2	•
M200-2ES-120	12	12	30	75	2	•
M200-2ES-140	14	14	34	100	2	•
M200-2ES-160	16	16	36	100	2	•
M200-2ES-180	18	18	40	100	2	•
M200-2ES-200	20	20	45	100	2	•

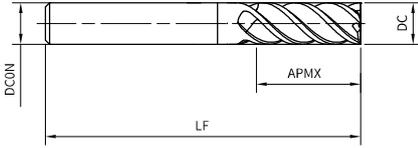
Solid Carbide End Mills

• :Standard stock ○ :Made-to-Order

Solid Carbide End Mill M200

Eco line
4 flutes square end mill

Solid carbide end mill
Workpiece materials <HRC45



● : 1st choice ● : 2nd choice

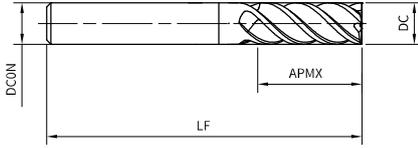
Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M200-4ES-010	1	4	3	50	4	●
M200-4ES-015	1.5	4	4	50	4	●
M200-4ES-020	2	4	6	50	4	●
M200-4ES-025	2.5	4	8	50	4	●
M200-4ES-030	3	4	8	50	4	●
M200-4ES-030P	3	6	8	50	4	●
M200-4ES-035	3.5	4	11	50	4	●
M200-4ES-040	4	4	12	50	4	●
M200-4ES-040P	4	6	12	50	4	●
M200-4ES-045	4.5	6	12	50	4	●
M200-4ES-050	5	6	13	50	4	●
M200-4ES-055	5.5	6	16	50	4	●
M200-4ES-060	6	6	16	50	4	●
M200-4ES-065	6.5	8	16	60	4	●
M200-4ES-070	7	8	20	60	4	●
M200-4ES-075	7.5	8	20	60	4	●
M200-4ES-080	8	8	20	60	4	●
M200-4ES-085	8.5	10	23	75	4	●
M200-4ES-090	9	10	23	75	4	●
M200-4ES-095	9.5	10	25	75	4	●
M200-4ES-100	10	10	25	75	4	●
M200-4ES-110	11	12	28	75	4	●
M200-4ES-120	12	12	30	75	4	●
M200-4ES-140	14	14	34	100	4	●
M200-4ES-160	16	16	36	100	4	●
M200-4ES-180	18	18	40	100	4	●
M200-4ES-200	20	20	45	100	4	●

● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M200

Eco line
4 flutes square end mill

Solid carbide end mill
Workpiece materials <HRC45



● ● 1st choice ● 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M200-4ESP-010	1	4	4	50	4	●
M200-4ESP-020	2	4	10	50	4	●
M200-4ESP-030	3	4	12	50	4	●
M200-4ESP-040	4	4	16	50	4	●
M200-4ESP-050	5	6	18	50	4	●
M200-4ESP-060	6	6	20	50	4	●
M200-4ESP-080	8	8	24	60	4	●
M200-4ESP-100	10	10	30	75	4	●
M200-4ESP-120	12	12	35	75	4	●
M200-4ESP-140	14	14	40	100	4	●
M200-4ESP-160	16	16	45	100	4	●
M200-4ESP-180	18	18	45	100	4	●

Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M200-4EL-030	3	4	15	60	4	●
M200-4EL-030P	3	6	15	60	4	●
M200-4EL-040	4	4	20	60	4	●
M200-4EL-050	5	6	25	75	4	●
M200-4EL-060	6	6	25	75	4	●
M200-4EL-080	8	8	30	75	4	●
M200-4EL-100	10	10	40	100	4	●
M200-4EL-120	12	12	45	100	4	●
M200-4EL-140	14	14	60	150	4	●
M200-4EL-160	16	16	70	150	4	●
M200-4EL-180	18	18	70	150	4	●
M200-4EL-200	20	20	70	150	4	●

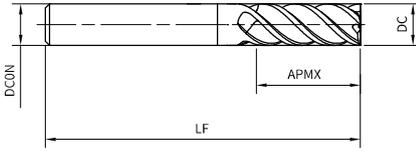
Solid Carbide End Mills

● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M200

Eco line
4 flutes square end mill

Solid carbide end mill
Workpiece materials <HRC45



● ● 1st choice ● 2nd choice

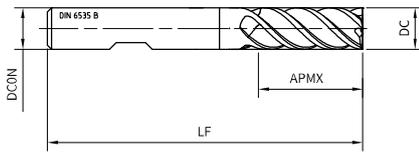
Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M200-4ELP-050	5	6	30	75	4	●
M200-4ELP-060	6	6	35	75	4	●
M200-4ELP-100	10	10	50	100	4	●
M200-4ELP-120	12	12	50	100	4	●
M200-4ELP-200	20	20	80	150	4	●

Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M200-4EX-040	4	4	30	75	4	●
M200-4EX-040P	4	6	20	75	4	●
M200-4EX-060	6	6	35	100	4	●
M200-4EX-080	8	8	35	100	4	●

Solid Carbide End Mill M200

Eco line
4 flutes square end mill

Solid carbide end mill
Workpiece materials <HRC45



● ● 1st choice ● 2nd choice

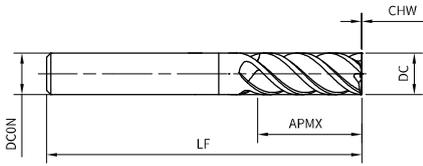
Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M200-4ES-030W	3	6	8	50	4	●
M200-4ES-050W	5	6	13	50	4	●
M200-4ES-060W	6	6	16	50	4	●
M200-4ES-080W	8	8	20	60	4	●
M200-4ES-100W	10	10	25	75	4	●
M200-4ES-120W	12	12	30	75	4	●
M200-4ES-140W	14	14	34	100	4	●
M200-4ES-160W	16	16	36	100	4	●
M200-4ES-180W	18	18	40	100	4	●
M200-4ES-200W	20	20	45	100	4	●

● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M200

Eco line
4 flutes end mill with corner chamfer

Solid carbide end mill
Workpiece materials <HRC45



P	M	K	N	S	H
••	•	••			

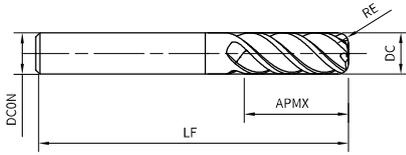
•• 1st choice • 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	CHW (mm)	APMX (mm)	LF (mm)	ZEFP	Stock
M200-4CS-040	4	4	C0.1	12	50	4	●
M200-4CS-050	5	6	C0.1	13	50	4	●
M200-4CS-060	6	6	C0.1	16	50	4	●
M200-4CS-080	8	8	C0.1	20	60	4	●
M200-4CS-100	10	10	C0.1	25	75	4	●
M200-4CS-120	12	12	C0.1	30	75	4	●
M200-4CS-140	14	14	C0.15	34	100	4	●
M200-4CS-160	16	16	C0.15	36	100	4	●
M200-4CS-180	18	18	C0.15	40	100	4	●
M200-4CS-200	20	20	C0.15	45	100	4	●

Solid Carbide End Mill M200

Eco line
4 flutes end mill with corner radius

Solid carbide end mill
Workpiece materials <HRC45



● ● 1st choice ● 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	RE (mm)	APMX (mm)	LF (mm)	ZEFP	Stock
M200-4RS-010002	1	4	R0.2	3	50	4	●
M200-4RS-015002	1.5	4	R0.2	4	50	4	●
M200-4RS-020002	2	4	R0.2	6	50	4	●
M200-4RS-030002	3	4	R0.2	8	50	4	●
M200-4RS-030003	3	4	R0.3	8	50	4	●
M200-4RS-030005	3	4	R0.5	8	50	4	●
M200-4RS-040002	4	4	R0.2	12	50	4	●
M200-4RS-040003	4	4	R0.3	12	50	4	●
M200-4RS-040005	4	4	R0.5	12	50	4	●
M200-4RS-040010	4	4	R1	12	50	4	●
M200-4RS-050002	5	6	R0.2	13	50	4	●
M200-4RS-050005	5	6	R0.5	13	50	4	●
M200-4RS-050010	5	6	R1	13	50	4	●
M200-4RS-050015	5	6	R1.5	13	50	4	●
M200-4RS-060002	6	6	R0.2	16	50	4	●
M200-4RS-060005	6	6	R0.5	16	50	4	●
M200-4RS-060010	6	6	R1	16	50	4	●
M200-4RS-060015	6	6	R1.5	16	50	4	●
M200-4RS-080002	8	8	R0.2	20	60	4	●
M200-4RS-080003	8	8	R0.3	20	60	4	●
M200-4RS-080005	8	8	R0.5	20	60	4	●
M200-4RS-080010	8	8	R1	20	60	4	●
M200-4RS-080015	8	8	R1.5	20	60	4	●
M200-4RS-080020	8	8	R2	20	60	4	●
M200-4RS-100002	10	10	R0.2	25	75	4	●
M200-4RS-100003	10	10	R0.3	25	75	4	●
M200-4RS-100005	10	10	R0.5	25	75	4	●

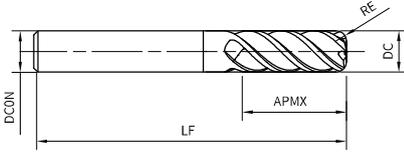
Solid Carbide End Mills

● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M200

Eco line
4 flutes end mill with corner radius

Solid carbide end mill
Workpiece materials <HRC45



● ● 1st choice ● 2nd choice

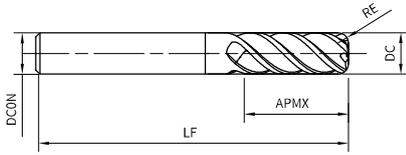
Product code	DC (mm) h9	DCON (mm) h6	RE (mm)	APMX (mm)	LF (mm)	ZEFP	Stock
M200-4RS-100010	10	10	R1	25	75	4	●
M200-4RS-100015	10	10	R1.5	25	75	4	●
M200-4RS-100020	10	10	R2	25	75	4	●
M200-4RS-100025	10	10	R2.5	25	75	4	●
M200-4RS-100030	10	10	R3	25	75	4	●
M200-4RS-120005	12	12	R0.5	30	75	4	●
M200-4RS-120010	12	12	R1	30	75	4	●
M200-4RS-120015	12	12	R1.5	30	75	4	●
M200-4RS-120020	12	12	R2	30	75	4	●
M200-4RS-120025	12	12	R2.5	30	75	4	●
M200-4RS-120030	12	12	R3	30	75	4	●
M200-4RS-140010	14	14	R1	34	100	4	●
M200-4RS-140020	14	14	R2	34	100	4	●
M200-4RS-160005	16	16	R0.5	36	100	4	●
M200-4RS-160010	16	16	R1	36	100	4	●
M200-4RS-160020	16	16	R2	36	100	4	●
M200-4RS-160030	16	16	R3	36	100	4	●
M200-4RS-160040	16	16	R4	36	100	4	●
M200-4RS-180010	18	18	R1	40	100	4	●
M200-4RS-180020	18	18	R2	40	100	4	●
M200-4RS-180040	18	18	R4	40	100	4	●
M200-4RS-200010	20	20	R1	45	100	4	●
M200-4RS-200020	20	20	R2	45	100	4	●
M200-4RS-200030	20	20	R3	45	100	4	●
M200-4RS-200040	20	20	R4	45	100	4	●
M200-4RS-200050	20	20	R5	45	100	4	●

● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M200

Eco line
4 flutes end mill with corner radius

Solid carbide end mill
Workpiece materials <HRC45



● ● 1st choice ● 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	RE (mm)	APMX (mm)	LF (mm)	ZEFP	Stock
M200-4RL-030005	3	4	R0.5	8	75	4	●
M200-4RL-040002	4	4	R0.2	12	75	4	●
M200-4RL-040005	4	4	R0.5	12	75	4	●
M200-4RL-040010	4	4	R1	12	75	4	●
M200-4RL-060002	6	6	R0.2	16	75	4	●
M200-4RL-060005	6	6	R0.5	16	75	4	●
M200-4RL-060010	6	6	R1	16	75	4	●
M200-4RL-060015	6	6	R1.5	16	75	4	●
M200-4RL-080005	8	8	R0.5	20	100	4	●
M200-4RL-080010	8	8	R1	20	100	4	●
M200-4RL-080015	8	8	R1.5	20	100	4	●
M200-4RL-080020	8	8	R2	20	100	4	●
M200-4RL-100005	10	10	R0.5	25	100	4	●
M200-4RL-100010	10	10	R1	25	100	4	●
M200-4RL-100015	10	10	R1.5	25	100	4	●
M200-4RL-100020	10	10	R2	25	100	4	●
M200-4RL-120005	12	12	R0.5	30	100	4	●
M200-4RL-120010	12	12	R1	30	100	4	●
M200-4RL-120015	12	12	R1.5	30	100	4	●
M200-4RL-120020	12	12	R2	30	100	4	●
M200-4RL-120025	12	12	R2.5	30	100	4	●
M200-4RL-120030	12	12	R3	30	100	4	●
M200-4RL-140020	14	14	R2	36	150	4	●
M200-4RL-160005	16	16	R0.5	36	150	4	●
M200-4RL-160010	16	16	R1	36	150	4	●
M200-4RL-160020	16	16	R2	36	150	4	●
M200-4RL-160030	16	16	R3	36	150	4	●
M200-4RL-160040	16	16	R4	36	150	4	●
M200-4RL-180010	18	18	R1	45	150	4	●
M200-4RL-180020	18	18	R2	45	150	4	●
M200-4RL-200010	20	20	R1	45	150	4	●
M200-4RL-200020	20	20	R2	45	150	4	●

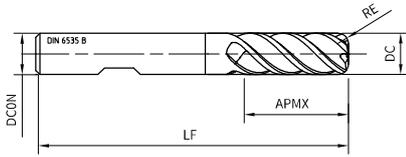
Solid Carbide End Mills

● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M200

Eco line
4 flutes end mill with corner radius

Solid carbide end mill
Workpiece materials <HRC45



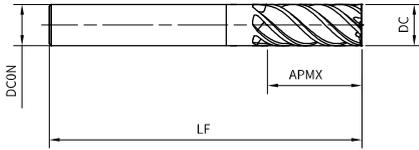
● ● 1st choice ● 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	RE (mm)	APMX (mm)	LF (mm)	ZEFP	Stock
M200-4RS-060005W	6	6	R0.5	16	50	4	●
M200-4RS-060010W	6	6	R1	16	50	4	●
M200-4RS-080005W	8	8	R0.5	20	60	4	●
M200-4RS-080010W	8	8	R1	20	60	4	●
M200-4RS-100005W	10	10	R0.5	25	75	4	●
M200-4RS-100010W	10	10	R1	25	75	4	●
M200-4RS-100015W	10	10	R1.5	25	75	4	●
M200-4RS-100020W	10	10	R2	25	75	4	●
M200-4RS-120005W	12	12	R0.5	30	75	4	●
M200-4RS-120010W	12	12	R1	30	75	4	●
M200-4RS-120015W	12	12	R1.5	30	75	4	●
M200-4RS-120020W	12	12	R2	30	75	4	●

Solid Carbide End Mill M205

Eco line
6 flutes square end mill

Solid carbide end mill
Workpiece materials <HRC45



P	M	K	N	S	H
••	•	••			

•• 1st choice • 2nd choice

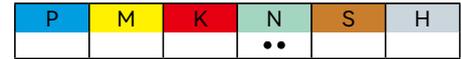
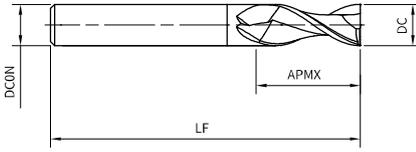
Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M205-6ES-060	6	6	16	50	6	•
M205-6ES-080	8	8	20	60	6	•
M205-6ES-100	10	10	25	75	6	•
M205-6ES-120	12	12	30	75	6	•
M205-6ES-140	14	14	34	100	6	•
M205-6ES-160	16	16	36	100	6	•
M205-6ES-180	18	18	40	100	6	•
M205-6ES-200	20	20	45	100	6	•

• : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M245

Eco line
2 flutes square end mill for aluminum

Solid carbide end mill



● 1st choice ● 2nd choice

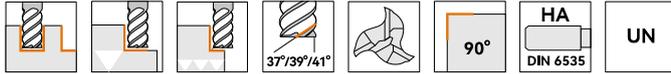
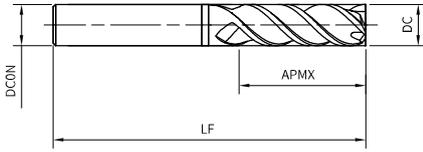
Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M245-2ES-030	3	4	8	50	2	●
M245-2ES-040	4	4	12	50	2	●
M245-2ES-050	5	6	13	50	2	●
M245-2ES-060	6	6	16	50	2	●
M245-2ES-080	8	8	20	60	2	●
M245-2ES-100	10	10	25	75	2	●
M245-2ES-120	12	12	30	75	2	●
M245-2ES-160	16	16	45	100	2	●
M245-2ES-200	20	20	45	100	2	●

Solid Carbide End Mill M245

Eco line

3 flutes square end mill for aluminum

Solid carbide end mill



● 1st choice ● 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M245-3ES-010	1	4	3	50	3	●
M245-3ES-015	1.5	4	4	50	3	●
M245-3ES-020	2	4	6	50	3	●
M245-3ES-025	2.5	4	8	50	3	●
M245-3ES-030	3	4	8	50	3	●
M245-3ES-040	4	4	12	50	3	●
M245-3ES-050	5	6	13	50	3	●
M245-3ES-060	6	6	16	50	3	●
M245-3ES-080	8	8	20	60	3	●
M245-3ES-100	10	10	25	75	3	●
M245-3ES-120	12	12	30	75	3	●
M245-3ES-160	16	16	45	100	3	●
M245-3ES-180	18	18	45	100	3	●
M245-3ES-200	20	20	45	100	3	●

Solid Carbide End Mills

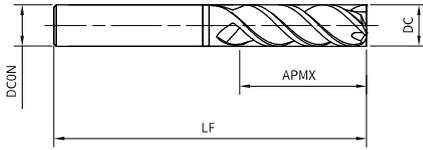
● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M245

Eco line

3 flutes square end mill for aluminum

Solid carbide end mill



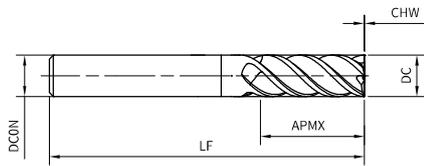
● 1st choice ● 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M245-3EL-040	4	4	16	60	3	●
M245-3EL-060	6	6	25	75	3	●
M245-3EL-080	8	8	32	75	3	●
M245-3EL-100	10	10	45	100	3	●
M245-3EL-120	12	12	50	100	3	●
M245-3EL-160	16	16	60	150	3	●
M245-3EL-200	20	20	70	150	3	●

Solid Carbide End Mill M210

Pro line
4 flutes end mill with corner chamfer

Solid carbide end mill
Workpiece materials <HRC50



P	M	K	N	S	H
••	•	••		•	

•• 1st choice • 2nd choice

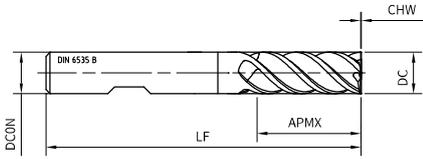
Product code	DC (mm) h9	DCON (mm) h6	CHW (mm)	APMX (mm)	LF (mm)	ZEFP	Stock
M210-4CS-030	3	4	C0.04	8	50	4	•
M210-4CS-040	4	4	C0.06	12	50	4	•
M210-4CS-050	5	6	C0.06	13	50	4	•
M210-4CS-060	6	6	C0.08	16	50	4	•
M210-4CS-080	8	8	C0.1	20	60	4	•
M210-4CS-100	10	10	C0.1	25	75	4	•
M210-4CS-120	12	12	C0.12	30	75	4	•
M210-4CS-140	14	14	C0.12	34	100	4	○
M210-4CS-160	16	16	C0.15	36	100	4	•
M210-4CS-180	18	18	C0.15	40	100	4	○
M210-4CS-200	20	20	C0.15	45	100	4	○

• : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M210

Pro line
4 flutes end mill with corner chamfer

Solid carbide end mill
Workpiece materials <HRC50



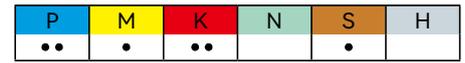
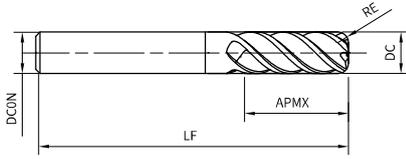
● ● 1st choice ● 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	CHW (mm)	APMX (mm)	LF (mm)	ZEFP	Stock
M210-4CS-050W	5	6	C0.06	13	50	4	○
M210-4CS-060W	6	6	C0.08	16	50	4	●
M210-4CS-080W	8	8	C0.1	20	60	4	●
M210-4CS-100W	10	10	C0.1	25	75	4	●
M210-4CS-120W	12	12	C0.12	30	75	4	●
M210-4CS-140W	14	14	C0.12	34	100	4	○
M210-4CS-160W	16	16	C0.15	36	100	4	○
M210-4CS-180W	18	18	C0.15	40	100	4	○
M210-4CS-200W	20	20	C0.15	45	100	4	○

Solid Carbide End Mill M210

Pro line
4 flutes end mill

Solid carbide end mill
Workpiece materials <HRC50



● ● 1st choice ● 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	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	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	16	50	4	●
M210-4RS-080005	8	8	R0.5	20	60	4	●
M210-4RS-080010	8	8	R1	20	60	4	●
M210-4RS-080015	8	8	R1.5	20	60	4	○
M210-4RS-080020	8	8	R2	20	60	4	●
M210-4RS-100005	10	10	R0.5	25	75	4	●
M210-4RS-100010	10	10	R1	25	75	4	●
M210-4RS-100015	10	10	R1.5	25	75	4	○
M210-4RS-100020	10	10	R2	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	30	75	4	●
M210-4RS-120015	12	12	R1.5	30	75	4	○
M210-4RS-120020	12	12	R2	30	75	4	●
M210-4RS-120025	12	12	R2.5	30	75	4	○
M210-4RS-120030	12	12	R3	30	75	4	○

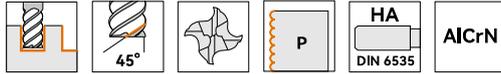
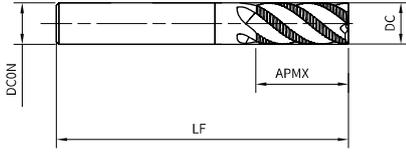
Solid Carbide End Mills

● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M216

Pro line
4/6 flutes end mill with roughing profile

Solid carbide end mill
Workpiece materials <HRC40



P	M	K	N	S	H
••	••	•		•	

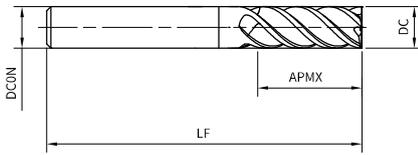
•• 1st choice • 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	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	•

Solid Carbide End Mill M150

Pro line
4 flutes square end mill

Solid carbide end mill



P	M	K	N	S	H
••	••			••	

•• 1st choice • 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M150-4ES-010	1	4	3	50	4	○
M150-4ES-015	1.5	4	4	50	4	○
M150-4ES-020	2	4	6	50	4	○
M150-4ES-025	2.5	4	8	50	4	○
M150-4ES-030	3	4	8	50	4	●
M150-4ES-040	4	4	12	50	4	●
M150-4ES-050	5	6	13	50	4	●
M150-4ES-060	6	6	16	50	4	●
M150-4ES-080	8	8	20	60	4	●
M150-4ES-100	10	10	25	75	4	●
M150-4ES-120	12	12	30	75	4	●
M150-4ES-160	16	16	36	100	4	●
M150-4ES-200	20	20	45	100	4	○

Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M150-4EL-030	3	4	15	60	4	○
M150-4EL-040	4	4	20	60	4	○
M150-4EL-060	6	6	25	75	4	○
M150-4EL-080	8	8	30	75	4	○
M150-4EL-100	10	10	40	100	4	○
M150-4EL-120	12	12	45	100	4	○

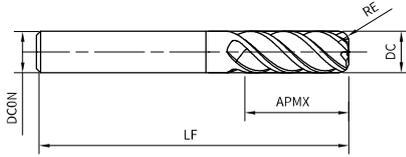
Solid Carbide End Mills

● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M150

Pro line
4 flutes end mill

Solid carbide end mill



● ● 1st choice ● 2nd choice

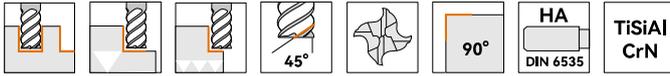
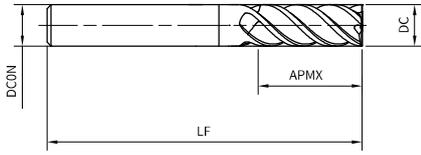
Product code	DC (mm) h9	DCON (mm) h6	RE (mm)	APMX (mm)	LF (mm)	ZEFP	Stock
M150-4RS-010002	1	4	R0.2	3	50	4	○
M150-4RS-015002	1.5	4	R0.2	4	50	4	○
M150-4RS-020002	2	4	R0.2	6	50	4	○
M150-4RS-020005	2	4	R0.5	6	50	4	○
M150-4RS-025005	2.5	4	R0.5	8	50	4	○
M150-4RS-030002	3	4	R0.2	8	50	4	○
M150-4RS-030005	3	4	R0.5	8	50	4	○
M150-4RS-040002	4	4	R0.2	12	50	4	●
M150-4RS-040005	4	4	R0.5	12	50	4	○
M150-4RS-040010	4	4	R1	12	50	4	○
M150-4RS-060002	6	6	R0.2	16	50	4	●
M150-4RS-060005	6	6	R0.5	16	50	4	○
M150-4RS-060010	6	6	R1	16	50	4	○
M150-4RS-080002	8	8	R0.2	20	60	4	●
M150-4RS-080005	8	8	R0.5	20	60	4	●
M150-4RS-080010	8	8	R1	20	60	4	●
M150-4RS-100005	10	10	R0.5	25	75	4	●
M150-4RS-100010	10	10	R1	25	75	4	●
M150-4RS-100020	10	10	R2	25	75	4	●
M150-4RS-120005	12	12	R0.5	30	75	4	●
M150-4RS-120010	12	12	R1	30	75	4	●
M150-4RS-120020	12	12	R2	30	75	4	●

● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M170

Pro line
4 flutes square end mill

Solid carbide end mill
Workpiece materials <HRC45-60



● : 1st choice ●● : 2nd choice

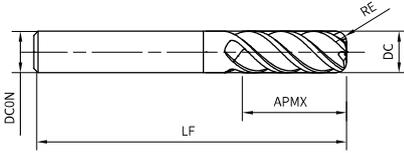
Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M170-4ES-040	4	4	12	50	4	●
M170-4ES-060	6	6	16	50	4	●
M170-4ES-080	8	8	20	60	4	●
M170-4ES-100	10	10	25	75	4	●
M170-4ES-120	12	12	30	75	4	●
M170-4ES-160	16	16	36	100	4	●

● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M170

Pro line
4 flutes end mill

Solid carbide end mill
Workpiece materials <HRC45-60



● : 1st choice ● : 2nd choice

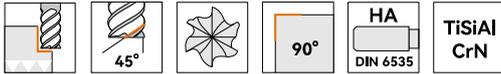
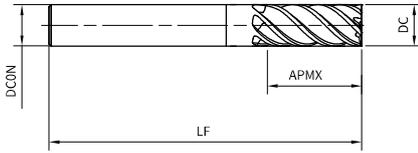
Product code	DC (mm) h9	DCON (mm) h6	RE (mm)	APMX (mm)	LF (mm)	ZEEP	Stock
M170-4RS-040002	4	4	R0.2	12	50	4	●
M170-4RS-040005	4	4	R0.5	12	50	4	●
M170-4RS-060002	6	6	R0.2	16	50	4	●
M170-4RS-060005	6	6	R0.5	16	50	4	●
M170-4RS-060010	6	6	R1	16	50	4	●
M170-4RS-080002	8	8	R0.2	20	60	4	●
M170-4RS-080005	8	8	R0.5	20	60	4	●
M170-4RS-080010	8	8	R1	20	60	4	●
M170-4RS-100002	10	10	R0.2	25	75	4	●
M170-4RS-100005	10	10	R0.5	25	75	4	●
M170-4RS-100010	10	10	R1	25	75	4	●
M170-4RS-100020	10	10	R2	25	75	4	●
M170-4RS-120005	12	12	R0.5	30	75	4	●
M170-4RS-120010	12	12	R1	30	75	4	●
M170-4RS-120020	12	12	R2	30	75	4	●
M170-4RS-120030	12	12	R3	30	75	4	●

● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M170

Pro line
5/6 flutes square end mill

Solid carbide end mill
Workpiece materials <HRC45-60



● ● 1st choice ● ● 2nd choice

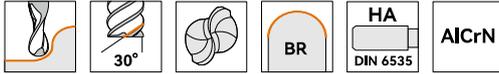
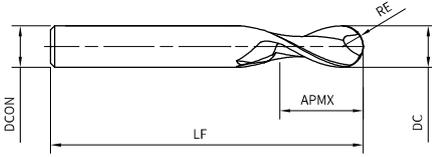
Product code	DC (mm) h9	DCON (mm) h6	APMX (mm)	LF (mm)	ZEFP	Stock
M170-5ES-040	4	4	12	50	5	●
M170-5ES-060	6	6	16	50	5	●
M170-6ES-080	8	8	20	60	6	●
M170-6ES-100	10	10	25	75	6	●
M170-6ES-120	12	12	30	75	6	●
M170-6ES-160	16	16	36	100	6	●

● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M200

Eco line
2 flutes ball nose end mill

Solid carbide end mill
Workpiece materials <HRC45



P	M	K	N	S	H
••	•	••			

•• 1st choice • 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	RE (mm)	APMX (mm)	LF (mm)	ZEFP	Stock
M200-2BS-010	1	4	R0.5	2	50	2	•
M200-2BS-015	1.5	4	R0.75	3	50	2	•
M200-2BS-020	2	4	R1	4	50	2	•
M200-2BS-025	2.5	4	R1.25	5	50	2	•
M200-2BS-030	3	4	R1.5	6	50	2	•
M200-2BS-040	4	4	R2	8	50	2	•
M200-2BS-050	5	6	R2.5	10	50	2	•
M200-2BS-060	6	6	R3	12	50	2	•
M200-2BS-070	7	8	R3.5	14	60	2	•
M200-2BS-080	8	8	R4	14	60	2	•
M200-2BS-100	10	10	R5	18	75	2	•
M200-2BS-110	11	12	R5.5	20	75	2	•
M200-2BS-120	12	12	R6	22	75	2	•
M200-2BS-140	14	14	R7	26	100	2	•
M200-2BS-160	16	16	R8	30	100	2	•
M200-2BS-180	18	18	R9	34	100	2	•
M200-2BS-200	20	20	R10	38	100	2	•

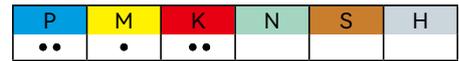
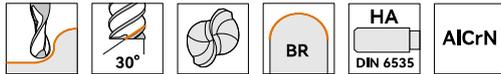
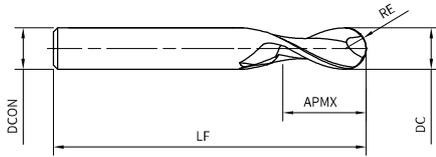
Solid Carbide
End Mills

• : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M200

Eco line
2 flutes ball nose end mill

Solid carbide end mill
Workpiece materials <HRC45



● : 1st choice ○ : 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	RE (mm)	APMX (mm)	LF (mm)	ZEFP	Stock
M200-2BL-010P	1	6	R0.5	2	75	2	●
M200-2BL-015P	1.5	6	R0.75	3	75	2	●
M200-2BL-020	2	4	R1	4	75	2	●
M200-2BL-020P	2	6	R1	4	75	2	●
M200-2BL-030	3	4	R1.5	6	75	2	●
M200-2BL-030P	3	6	R1.5	6	75	2	●
M200-2BL-040	4	4	R2	8	75	2	●
M200-2BL-050	5	6	R2.5	10	75	2	●
M200-2BL-060	6	6	R3	12	75	2	●
M200-2BL-080	8	8	R4	14	75	2	●
M200-2BL-090	9	10	R4.5	16	100	2	●
M200-2BL-100	10	10	R5	18	100	2	●
M200-2BL-110	11	12	R5.5	20	100	2	●
M200-2BL-120	12	12	R6	22	100	2	●
M200-2BL-140	14	14	R7	26	150	2	●
M200-2BL-160	16	16	R8	30	150	2	●
M200-2BL-180	18	18	R9	34	150	2	●
M200-2BL-200	20	20	R10	38	150	2	●

Product code	DC (mm) h7	DCON (mm) h6	RE (mm)	APMX (mm)	LF (mm)	ZEFP	Stock
M200-2BX-040	4	4	R2	8	100	2	●
M200-2BX-060	6	6	R3	12	100	2	●
M200-2BX-070	7	8	R3.5	14	100	2	●
M200-2BX-080	8	8	R4	14	100	2	●
M200-2BX-100	10	10	R5	18	150	2	●
M200-2BX-120	12	12	R6	22	150	2	●

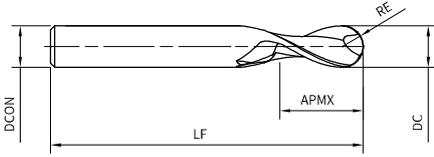
Solid Carbide End Mills

● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M170

Pro line
2 flutes ball nose end mill

Solid carbide end mill
Workpiece materials <HRC45-60



P	M	K	N	S	H
•		•			••

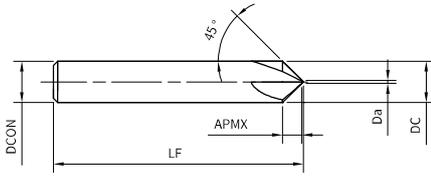
•• 1st choice • 2nd choice

Product code	DC (mm) h7	DCON (mm) h5	RE (mm)	APMX (mm)	LF (mm)	ZEFP	Stock
M170-2BS-020	2	4	R1	4	50	2	○
M170-2BS-030	3	4	R1.5	6	50	2	○
M170-2BS-040	4	4	R2	8	50	2	○
M170-2BS-060	6	6	R3	12	50	2	○
M170-2BS-080	8	8	R4	16	60	2	○
M170-2BS-100	10	10	R5	18	75	2	○
M170-2BS-120	12	12	R6	22	75	2	○
M170-2BS-160	16	16	R8	30	100	2	○

Solid Carbide End Mill M180

Eco line
4 flutes chamfer mill

Solid carbide end mill



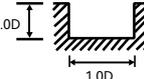
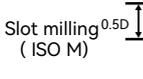
P	M	K	N	S	H
••	•	••	•	•	•

•• 1st choice • 2nd choice

Product code	DC (mm) h9	DCON (mm) h6	Da (mm)	APMX (mm)	LF (mm)	ZEFP	Stock
M180-4WS-060	6	6	1	2.5	50	4	•
M180-4WS-080	8	8	2	3	60	4	•
M180-4WS-100	10	10	1.5	4.25	75	4	•
M180-4WS-120	12	12	3	4.5	75	4	•
M180-4WS-160	16	16	4	6	100	4	•

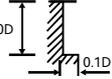
● : Standard stock ○ : Made-to-Order

Solid Carbide End Mill M200 Cutting Data Recommendation

Materials				M200-2ES Slot milling ^{1.0D} (ISO P/K)  Slot milling ^{0.5D} (ISO M) 											
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm ²)	Cutting speed Vc(m/min)	fz [mm/Tooth]								
							Mill diameter [mm]								
							2	4	6	8	10	12	14	16	20
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428	85-120	0.007	0.018	0.027	0.045	0.054	0.059	0.063	0.072	0.099
		0.25 < C ≤ 0.55%	Annealed	190	639	95-130	0.008	0.020	0.030	0.050	0.060	0.065	0.070	0.080	0.110
		0.25 < C ≤ 0.55%	Heat-treated	210	708	95-130	0.008	0.020	0.030	0.050	0.060	0.065	0.070	0.080	0.100
		C > 0.55%	Annealed	190	639	95-130	0.008	0.019	0.029	0.048	0.057	0.062	0.067	0.076	0.105
		C > 0.55%	Heat-treated	300	1013	75-100	0.007	0.018	0.027	0.045	0.054	0.059	0.063	0.072	0.099
		Free cutting steel	Annealed	220	745	80-120	0.008	0.019	0.029	0.048	0.057	0.062	0.067	0.076	0.105
	Low-alloyed steel	Annealed		175	591	100-120	0.008	0.019	0.029	0.048	0.057	0.062	0.067	0.076	0.105
		Heat-treated		300	1013	60-100	0.007	0.018	0.027	0.045	0.054	0.059	0.063	0.072	0.099
		Heat-treated		380	1282	60-100	0.007	0.017	0.026	0.043	0.052	0.056	0.060	0.069	0.095
	High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477	50-75	0.007	0.016	0.025	0.041	0.049	0.053	0.057	0.066	0.090
		Annealed		200	675	90-120	0.007	0.018	0.027	0.045	0.054	0.059	0.063	0.072	0.099
		Hardened and tempered		300	1013	75-100	0.007	0.018	0.027	0.045	0.054	0.059	0.063	0.072	0.099
	Stainless steels	Hardened and tempered		400	1361	50-80	0.007	0.017	0.026	0.043	0.052	0.056	0.060	0.069	0.095
		Ferritic/Martensite,Annealed		200	675	40-70	0.006	0.015	0.023	0.038	0.045	0.049	0.053	0.060	0.083
		Martensite,Heat-treated		330	1114	40-50	0.005	0.013	0.020	0.033	0.039	0.042	0.046	0.052	0.072
M		Austenitic,hardened		200	675	50-70	0.006	0.020	0.035	0.043	0.050	0.055	0.060	0.067	0.080
	Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013	30-50	0.005	0.016	0.028	0.034	0.040	0.044	0.048	0.054	0.064	
	Austenitic,ferritic,duplex		230	778	40-50	0.006	0.019	0.033	0.041	0.048	0.052	0.057	0.064	0.076	
K	Malleable cast iron	Ferritic		200	400	110-145	0.012	0.020	0.042	0.060	0.075	0.085	0.100	0.110	0.125
		Pearlitic		260	700	90-120	0.010	0.017	0.036	0.051	0.064	0.072	0.085	0.094	0.106
	Grey cast iron	Low tensile strength		180	200	120-130	0.012	0.020	0.042	0.060	0.075	0.085	0.100	0.110	0.125
		High tensile strength/Austenitic		245	350	100-120	0.011	0.018	0.038	0.054	0.068	0.077	0.090	0.099	0.113
	Nodular cast iron	Ferritic		155	400	100-120	0.012	0.020	0.042	0.060	0.075	0.085	0.100	0.110	0.125
		Pearlitic		265	700	85-115	0.010	0.017	0.036	0.051	0.064	0.072	0.085	0.094	0.106
	GGV(CGI)		230	400	60-95	0.010	0.016	0.034	0.048	0.060	0.068	0.080	0.088	0.100	
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										
			Aged	280	940										
		Ni or Co based	Annealed	250	840										
			Aged	350	1180										
			Cast	320	1080										
Titanium alloy	Pure Titanium		200	680											
	α and β alloy, aged		375	1260											
	β alloy		410	1400											
	Tungsten alloy		300	1010											
	Molybdenum alloy		300	1010											
H	Hardened steel	Hardened and tempered		50HRC	-										
		Hardened and tempered		55HRC	-										
		Hardened and tempered		60HRC	-										
		Chilled cast iron		Hardened and tempered	55HRC	-									

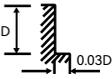
The cutting data are average recommended values. For special applications, adjustment is needed.

Solid Carbide End Mill M200 Cutting Data Recommendation

Materials				M200-4ES, M200-4EL, M200-4EX, M200-4RL, M200-4ESP, M200-4ELP, M200-4RS, M200-4CS		Square shoulder milling (rough machining) 										
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm ²)	Cutting speed Vc(m/min)	fz [mm/Tooth]									
							Mill diameter [mm]									
						2	4	6	8	10	12	14	16	20		
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428	100-220	0.018	0.036	0.063	0.072	0.090	0.108	0.135	0.153	0.180	
		0.25 < C ≤ 0.55%	Annealed	190	639	140-250	0.020	0.040	0.070	0.080	0.100	0.120	0.150	0.170	0.200	
		0.25 < C ≤ 0.55%	Heat-treated	210	708	160-250	0.020	0.040	0.070	0.080	0.100	0.120	0.150	0.170	0.200	
		C > 0.55%	Annealed	190	639	160-250	0.019	0.038	0.067	0.076	0.095	0.114	0.143	0.162	0.190	
		C > 0.55%	Heat-treated	300	1013	120-190	0.018	0.036	0.063	0.072	0.090	0.108	0.135	0.153	0.180	
		Free cutting steel	Annealed	220	745	170-230	0.019	0.038	0.067	0.076	0.095	0.114	0.143	0.162	0.190	
		Low-alloyed steel	Annealed		175	591	170-220	0.019	0.038	0.067	0.076	0.095	0.114	0.143	0.162	0.190
	Heat-treated		300	1013	100-180	0.018	0.036	0.063	0.072	0.090	0.108	0.135	0.153	0.180		
	Heat-treated		380	1282	95-170	0.017	0.034	0.060	0.069	0.086	0.103	0.129	0.146	0.172		
		High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477	80-120	0.016	0.033	0.057	0.066	0.082	0.098	0.123	0.139	0.164
	Annealed		200	675	160-180	0.018	0.036	0.063	0.072	0.090	0.108	0.135	0.153	0.180		
	Hardened and tempered		300	1013	120-180	0.018	0.036	0.063	0.072	0.090	0.108	0.135	0.153	0.180		
		Stainless steels	Hardened and tempered		400	1361	90-130	0.017	0.034	0.060	0.069	0.086	0.103	0.129	0.146	0.172
	Ferritic/Martensite,Annealed		200	675	75-100	0.015	0.030	0.053	0.060	0.075	0.090	0.113	0.128	0.150		
			Martensite,Heat-treated		330	1114	55-980	0.013	0.026	0.046	0.052	0.065	0.078	0.098	0.111	0.130
M	Stainless steels	Austenitic,hardened		200	675	80-130	0.012	0.032	0.050	0.060	0.080	0.100	0.120	0.140	0.160	
		Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013	50-80	0.010	0.026	0.040	0.048	0.064	0.080	0.096	0.112	0.128	
		Austenitic,ferritic,duplex		230	778	50-90	0.011	0.030	0.048	0.057	0.076	0.095	0.114	0.133	0.152	
K	Malleable cast iron	Ferritic		200	400	180-250	0.020	0.040	0.070	0.090	0.120	0.140	0.160	0.180	0.220	
		Pearlitic		260	700	150-165	0.017	0.034	0.060	0.077	0.102	0.119	0.136	0.153	0.187	
	Grey cast iron	Low tensile strength		180	200	180-200	0.020	0.040	0.070	0.090	0.120	0.140	0.160	0.180	0.220	
		High tensile strength/Austenitic		245	350	160-200	0.018	0.036	0.063	0.081	0.108	0.126	0.144	0.162	0.198	
	Nodular cast iron	Ferritic		155	400	150-230	0.020	0.040	0.070	0.090	0.120	0.140	0.160	0.180	0.220	
		Pearlitic		265	700	150-195	0.017	0.034	0.060	0.077	0.102	0.119	0.136	0.153	0.187	
	GGV(CGI)			230	400	125-160	0.016	0.032	0.056	0.072	0.096	0.112	0.128	0.144	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											
			Aged	280	940											
		Ni or Co based	Annealed	250	840											
			Aged	350	1180											
		Cast			320	1080										
	Titanium alloy	Pure Titanium			200	680										
α and β alloy, aged			375	1260												
β alloy			410	1400												
Tungsten alloy			300	1010												
	Molybdenum alloy			300	1010											
H	Hardened steel	Hardened and tempered		50HRC	-											
		Hardened and tempered		55HRC	-											
		Hardened and tempered		60HRC	-											
	Chilled cast iron		Hardened and tempered		55HRC	-										

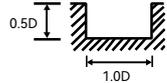
The cutting data are average recommended values. For special applications, adjustment is needed.

Solid Carbide End Mill M200/M205 Cutting Data Recommendation

Materials				M200-4ES, M200-4ESP, M200-4ELP M200-4EL, M200-4EX M200-4RS, M200-4RL M200-4CS, M205-6ES			Square shoulder milling ^{1.5D} (Finsih milling) 									
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm ²)	Cutting speed Vc(m/min)	fz [mm/Tooth]									
							Mill diameter [mm]									
						2	4	6	8	10	12	14	16	20		
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428	160-280	0.027	0.045	0.099	0.126	0.153	0.180	0.225	0.270	0.315	
		0.25 < C ≤ 0.55%	Annealed	190	639	180-300	0.030	0.050	0.110	0.140	0.170	0.200	0.250	0.300	0.350	
		0.25 < C ≤ 0.55%	Heat-treated	210	708	160-280	0.030	0.050	0.110	0.140	0.170	0.200	0.250	0.300	0.350	
		C > 0.55%	Annealed	190	639	180-300	0.029	0.048	0.105	0.133	0.162	0.190	0.238	0.285	0.333	
		C > 0.55%	Heat-treated	300	1013	100-210	0.027	0.045	0.099	0.126	0.153	0.180	0.225	0.270	0.315	
		Free cutting steel	Annealed	220	745	130-240	0.029	0.048	0.105	0.133	0.162	0.190	0.238	0.285	0.333	
		Low-alloyed steel	Annealed		175	591	160-240	0.029	0.048	0.105	0.133	0.162	0.190	0.238	0.285	0.333
	Heat-treated		300	1013	100-190	0.027	0.045	0.099	0.126	0.153	0.180	0.225	0.270	0.315		
	Heat-treated		380	1282	95-160	0.026	0.043	0.095	0.120	0.146	0.172	0.215	0.258	0.301		
		High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477	80-150	0.025	0.041	0.090	0.115	0.139	0.164	0.205	0.246	0.287
	Annealed		200	675	160-280	0.027	0.045	0.099	0.126	0.153	0.180	0.225	0.270	0.315		
	Hardened and tempered		300	1013	120-190	0.027	0.045	0.099	0.126	0.153	0.180	0.225	0.270	0.315		
		Stainless steels	Hardened and tempered		400	1361	85-120	0.026	0.043	0.095	0.120	0.146	0.172	0.215	0.258	0.301
	Ferritic/Martensite,Annealed		200	675	65-100	0.023	0.038	0.083	0.105	0.128	0.150	0.188	0.225	0.263		
			Martensite,Heat-treated		330	1114	55-90	0.020	0.033	0.072	0.091	0.111	0.130	0.163	0.195	0.228
M	Stainless steels	Austenitic,hardened		200	675	75-150	0.023	0.040	0.060	0.080	0.110	0.140	0.180	0.240	0.300	
		Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013	50-80	0.018	0.032	0.048	0.064	0.088	0.112	0.144	0.192	0.240	
		Austenitic,ferritic,duplex		230	778	70-80	0.022	0.038	0.057	0.076	0.105	0.133	0.171	0.228	0.285	
K	Malleable cast iron	Ferritic		200	400	200-300	0.030	0.080	0.130	0.160	0.200	0.250	0.300	0.350	0.400	
		Pearlitic		260	700	150-250	0.026	0.068	0.111	0.136	0.170	0.213	0.255	0.298	0.340	
	Grey cast iron	Low tensile strength		180	200	180-200	0.030	0.080	0.130	0.160	0.200	0.250	0.300	0.350	0.400	
		High tensile strength/Austenitic		245	350	160-260	0.027	0.072	0.117	0.144	0.180	0.225	0.270	0.315	0.360	
	Nodular cast iron	Ferritic		155	400	180-260	0.030	0.080	0.130	0.160	0.200	0.250	0.300	0.350	0.400	
		Pearlitic		265	700	150-220	0.026	0.068	0.111	0.136	0.170	0.213	0.255	0.298	0.340	
	GGV(CGI)		230	400	135-190	0.024	0.064	0.104	0.128	0.160	0.200	0.240	0.280	0.320		
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											
			Aged	280	940											
		Ni or Co based	Annealed	250	840											
			Aged	350	1180											
		Cast	320	1080												
	Titanium alloy	Pure Titanium		200	680											
α and β alloy, aged		375	1260													
β alloy		410	1400													
Tungsten alloy		300	1010													
Molybdenum alloy		300	1010													
H	Hardened steel	Hardened and tempered		50HRC	-											
		Hardened and tempered		55HRC	-											
		Hardened and tempered		60HRC	-											
	Chilled cast iron		Hardened and tempered		55HRC	-										

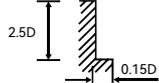
The cutting data are average recommended values. For special applications, adjustment is needed.

Solid Carbide End Mill M245 Cutting Data Recommendation

Materials				M245-2ES M245-3ES M245-3EL		Slot milling 									
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm ²)	Cutting speed Vc(m/min)	fz [mm/Tooth]								
							Mill diameter [mm]								
						2	4	6	8	10	12	14	16	20	
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428										
		0.25 < C ≤ 0.55%	Annealed	190	639										
		0.25 < C ≤ 0.55%	Heat-treated	210	708										
		C > 0.55%	Annealed	190	639										
		C > 0.55%	Heat-treated	300	1013										
		Free cutting steel	Annealed	220	745										
	Low-alloyed steel	Annealed		175	591										
		Heat-treated		300	1013										
		Heat-treated		380	1282										
	High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477										
		Annealed		200	675										
		Hardened and tempered		300	1013										
	Stainless steels	Hardened and tempered		400	1361										
		Ferritic/Martensite,Annealed		200	675										
	Stainless steels	Martensite,Heat-treated		330	1114										
Stainless steels		Austenitic,hardened		200	675										
	Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013											
	Austenitic,ferritic,duplex		230	778											
K	Malleable cast iron	Ferritic		200	400										
		Pearlitic		260	700										
	Grey cast iron	Low tensile strength		180	200										
		High tensile strength/Austenitic		245	350										
	Nodular cast iron	Ferritic		155	400										
		Pearlitic		265	700										
	GGV(CGI)		230	400											
N	Wrought aluminum alloy	Non-aging alloy		30	-	330-500	0.020	0.040	0.060	0.100	0.120	0.140	0.160	0.180	0.200
		Aged alloy		100	340	330-400	0.020	0.040	0.060	0.100	0.120	0.140	0.160	0.180	0.200
	Cast aluminum alloy	≤ 12% Si, non-aging alloy		75	260	330-400	0.020	0.040	0.060	0.100	0.120	0.140	0.160	0.180	0.200
		≤ 12% Si, aged alloy		90	310	330-400	0.020	0.040	0.060	0.100	0.120	0.140	0.160	0.180	0.200
		> 12% Si, non-aging alloy		130	450	150-300	0.017	0.034	0.051	0.085	0.102	0.119	0.136	0.153	0.170
	Magnesium alloy		70	250											
	Copper and copper alloy (bronze/brass)	Unalloyed,electrolytic copper		100	340	250-400	0.018	0.036	0.054	0.090	0.108	0.126	0.144	0.162	0.180
Brass,bronze,red brass		90	310	250-300	0.018	0.036	0.054	0.090	0.108	0.126	0.144	0.162	0.180		
Cu alloy,short chip		110	380	200-250	0.018	0.036	0.054	0.090	0.108	0.126	0.144	0.162	0.180		
High tensile,Ampco alloy		300	1010												
S	Fe-based alloy	Fe-based	Annealed	200	680										
			Aged	280	940										
		Ni or Co based	Annealed	250	840										
			Aged	350	1180										
	Titanium alloy	Cast		320	1080										
		Pure Titanium		200	680										
Tungsten alloy	α and β alloy, aged		375	1260											
	β alloy		410	1400											
Molybdenum alloy			300	1010											
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 M245 Cutting Data Recommendation

Materials				M245-2ES M245-3ES M245-3EL		Square shoulder milling 									
ISO	Workpiece Materials			Brinell Hardness (HB)	Tensile strength (N/mm ²)	Cutting speed Vc(m/min)	fz [mm/Tooth]								
							Mill diameter [mm]								
						2	4	6	8	10	12	14	16	20	
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428										
		0.25 < C ≤ 0.55%	Annealed	190	639										
		0.25 < C ≤ 0.55%	Heat-treated	210	708										
		C > 0.55%	Annealed	190	639										
		C > 0.55%	Heat-treated	300	1013										
	Free cutting steel	Annealed	220	745											
	Low-alloyed steel	Annealed		175	591										
		Heat-treated		300	1013										
		Heat-treated		380	1282										
	High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477										
Annealed		200	675												
Hardened and tempered		300	1013												
Stainless steels	Hardened and tempered		400	1361											
	Ferritic/Martensite, Annealed		200	675											
M	Stainless steels	Martensite, Heat-treated		330	1114										
		Austenitic, hardened		200	675										
		Austenitic, precipitation hardened stainless steel (PH stainless steel)		300	1013										
K	Malleable cast iron	Austenitic, ferritic, duplex		230	778										
		Ferritic		200	400										
	Grey cast iron	Pearlitic		260	700										
		Low tensile strength		180	200										
	Nodular cast iron	High tensile strength/Austenitic		245	350										
		Ferritic		155	400										
	GGV (CGI)		Pearlitic		265	700									
N	Wrought aluminum alloy	GGV (CGI)		230	400										
		Non-aging alloy		30	-	380-450	0.022	0.040	0.055	0.065	0.090	0.110	0.120	0.140	0.160
	Cast aluminum alloy	Aged alloy		100	340	320-380	0.022	0.040	0.055	0.065	0.090	0.110	0.120	0.140	0.160
		≤ 12% Si, non-aging alloy		75	260	260-300	0.022	0.040	0.055	0.065	0.090	0.110	0.120	0.140	0.160
		≤ 12% Si, aged alloy		90	310	260-300	0.022	0.040	0.055	0.065	0.090	0.110	0.120	0.140	0.160
	Magnesium alloy	> 12% Si, non-aging alloy		130	450	250-290	0.019	0.034	0.047	0.055	0.077	0.094	0.102	0.119	0.136
				70	250										
S	Copper and copper alloy (bronze/brass)	Unalloyed, electrolytic copper		100	340	280-350	0.020	0.036	0.050	0.059	0.081	0.099	0.108	0.126	0.144
		Brass, bronze, red brass		90	310	250-300	0.020	0.036	0.050	0.059	0.081	0.099	0.108	0.126	0.144
		Cu alloy, short chip		110	380	200-250	0.020	0.036	0.050	0.059	0.081	0.099	0.108	0.126	0.144
		High tensile, Ampco alloy		300	1010										
S	Fe-based alloy	Fe-based	Annealed	200	680										
			Aged	280	940										
		Ni or Co based	Annealed	250	840										
			Aged	350	1180										
	Titanium alloy	Cast		320	1080										
		Pure Titanium		200	680										
Tungsten alloy	α and β alloy, aged		375	1260											
	β alloy		410	1400											
H	Molybdenum alloy			300	1010										
				300	1010										
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.

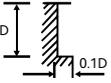
Solid Carbide End Mill M210 Cutting Data Recommendation

Materials				M210-4CS Slot milling ^{1.0D} M210-4RS (ISO P/K)		M210-4CS Slot milling ^{0.3-0.5D} (ISO M/S)										
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm ²)	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	
		Cast		320	1080	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.

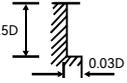
Solid Carbide End Mills

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 ²)	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		
		High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477	90-110	0.041	0.053	0.070	0.090	0.107	0.123	0.139	0.156	0.164
	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		
		Stainless steels	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
	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	
		Cast	320	1080	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	-										

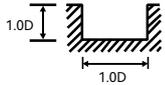
The cutting data are average recommended values. For special applications, adjustment is needed.

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 ²)	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		
		High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477	100-210	0.057	0.082	0.107	0.131	0.156	0.180	0.213	0.238	0.262
	Annealed		200	675	150-270	0.063	0.090	0.117	0.144	0.171	0.198	0.234	0.261	0.288		
		Stainless steels	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	
		Cast	320	1080	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	-										

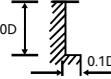
The cutting data are average recommended values. For special applications, adjustment is needed.

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 ²)	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
	High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477	65-95	0.022	0.029	0.035	0.043	0.057	0.073
		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
	Stainless steels	Hardened and tempered		400	1361	75-110	0.023	0.030	0.037	0.045	0.060	0.077
		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	-							

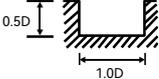
The cutting data are average recommended values. For special applications, adjustment is needed.

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 ²)	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
	High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477	118-168	0.045	0.059	0.072	0.086	0.119	0.149
		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
	Stainless steels	Hardened and tempered		400	1361	140-200	0.047	0.062	0.076	0.090	0.125	0.157
		Ferritic/Martensite,Annealed		200	675	85-125	0.041	0.054	0.066	0.079	0.109	0.137
	M	Stainless steels	Martensite,Heat-treated		330	1114	55-85	0.036	0.047	0.057	0.068	0.094
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	
K	Malleable cast iron	Austenitic,ferritic,duplex		230	778	70-110	0.039	0.051	0.063	0.075	0.103	0.129
		Ferritic		200	400	220-320	0.061	0.078	0.095	0.112	0.158	0.201
	Grey cast iron	Pearlitic		260	700	175-255	0.052	0.066	0.081	0.095	0.134	0.171
		Low tensile strength		180	200	220-320	0.061	0.078	0.095	0.112	0.158	0.201
	Nodular cast iron	High tensile strength/Austenitic		245	350	190-270	0.055	0.070	0.086	0.101	0.142	0.181
		Ferritic		155	400	220-320	0.061	0.078	0.095	0.112	0.158	0.201
	GGV(CGI)		Pearlitic		265	700	175-255	0.052	0.066	0.081	0.095	0.134
N	Wrought aluminum alloy	GGV(CGI)		230	400	150-210	0.049	0.062	0.076	0.090	0.126	0.161
		Non-aging alloy		30	-							
	Cast aluminum alloy	Aged alloy		100	340							
		≤ 12% Si, non-aging alloy		75	260							
		≤ 12% Si, aged alloy		90	310							
	Magnesium alloy	> 12% Si, non-aging alloy		130	450							
				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	-							

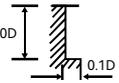
The cutting data are average recommended values. For special applications, adjustment is needed.

Solid Carbide End Mill M150 Cutting Data Recommendation

Materials						M150-4ES M150-4EL M150-4RS	Slot milling 								
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm ²)	Cutting speed Vc(m/min)	fz [mm/Tooth]								
							Mill diameter [mm]								
						2	4	6	8	10	12	16	20		
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428	90-140	0.014	0.022	0.031	0.039	0.047	0.056	0.075	0.095	
		0.25 < C ≤ 0.55%	Annealed	190	639	135-200	0.015	0.024	0.034	0.043	0.052	0.062	0.083	0.106	
		0.25 < C ≤ 0.55%	Heat-treated	210	708	135-200	0.015	0.024	0.034	0.043	0.052	0.062	0.083	0.106	
		C > 0.55%	Annealed	190	639	115-175	0.014	0.023	0.032	0.041	0.049	0.059	0.079	0.101	
		C > 0.55%	Heat-treated	300	1013	90-140	0.014	0.022	0.031	0.039	0.047	0.056	0.075	0.095	
		Free cutting steel	Annealed	220	745	115-175	0.014	0.023	0.032	0.041	0.049	0.059	0.079	0.101	
	Low-alloyed steel	Annealed		175	591	115-175	0.014	0.023	0.032	0.041	0.049	0.059	0.079	0.101	
		Heat-treated		300	1013	90-140	0.014	0.022	0.031	0.039	0.047	0.056	0.075	0.095	
		Heat-treated		380	1282	75-115	0.013	0.021	0.029	0.037	0.045	0.053	0.071	0.091	
	High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477	65-95	0.012	0.020	0.028	0.035	0.043	0.051	0.068	0.087	
		Annealed		200	675	90-140	0.014	0.022	0.031	0.039	0.047	0.056	0.075	0.095	
		Hardened and tempered		300	1013	90-140	0.014	0.022	0.031	0.039	0.047	0.056	0.075	0.095	
	Stainless steels	Hardened and tempered		400	1361	75-115	0.013	0.021	0.029	0.037	0.045	0.053	0.071	0.091	
		Ferritic/Martensite,Annealed		200	675	60-90	0.011	0.018	0.026	0.032	0.039	0.047	0.062	0.080	
	M	Stainless steels	Martensite,Heat-treated		330	1114	50-70	0.010	0.016	0.022	0.028	0.034	0.040	0.054	0.069
Austenitic,hardened			200	675	60-90	0.011	0.018	0.025	0.033	0.039	0.047	0.063	0.080		
Austenitic,precipitation hardened stainless steel(PH stainless steel)			300	1013	45-65	0.009	0.014	0.020	0.026	0.031	0.038	0.050	0.064		
K	Malleable cast iron	Austenitic,ferritic,duplex		230	778	55-80	0.010	0.017	0.024	0.031	0.037	0.045	0.060	0.076	
		Ferritic		200	400										
	Grey cast iron	Pearlitic		260	700										
		Low tensile strength		180	200										
	Nodular cast iron	High tensile strength/Austenitic		245	350										
		Ferritic		155	400										
N	Wrought aluminum alloy	Pearlitic		265	700										
		GGV(CGI)		230	400										
	Cast aluminum alloy	Ferritic		155	400										
		≤ 12% Si, non-aging alloy		75	260										
		≤ 12% Si, aged alloy		90	310										
	Copper and copper alloy (bronze/brass)	> 12% Si, non-aging alloy		130	450										
		Magnesium alloy		70	250										
		Unalloyed,electrolytic copper		100	340										
		Brass,bronze,red brass		90	310										
	S	Fe-based alloy	Cu alloy,short chip		110	380									
High tensile,Ampco alloy			300	1010											
Fe-based			Annealed	200	680	45-65	0.011	0.018	0.025	0.033	0.039	0.047	0.063	0.080	
Aged				280	940	35-50	0.009	0.014	0.020	0.026	0.031	0.038	0.050	0.064	
Titanium alloy		Ni or Co based		Annealed	250	840	45-65	0.011	0.018	0.025	0.033	0.039	0.047	0.063	0.080
		Aged			350	1180	35-50	0.009	0.014	0.020	0.026	0.031	0.038	0.050	0.064
		Cast		320	1080	35-50	0.009	0.014	0.020	0.026	0.031	0.038	0.050	0.064	
		Pure Titanium		200	680	55-75	0.012	0.020	0.028	0.036	0.043	0.052	0.069	0.088	
Tungsten alloy	α and β alloy, aged		375	1260	55-75	0.012	0.020	0.028	0.036	0.043	0.052	0.069	0.088		
	β alloy		410	1400	33-48	0.008	0.014	0.019	0.025	0.029	0.035	0.047	0.060		
H	Molybdenum alloy			300	1010	70-90	0.013	0.022	0.030	0.040	0.047	0.056	0.076	0.096	
				300	1010	70-90	0.013	0.022	0.030	0.040	0.047	0.056	0.076	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.

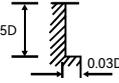
Solid Carbide End Mill M150 Cutting Data Recommendation

Materials						M150-4ES M150-4EL M150-4RS	Square shoulder milling 1.0D (Rough milling) 								
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm ²)	Cutting speed Vc(m/min)	fz [mm/Tooth]								
							Mill diameter [mm]								
						2	4	6	8	10	12	16	20		
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428	120-220	0.031	0.050	0.068	0.086	0.106	0.125	0.162	0.201	
		0.25 < C ≤ 0.55%	Annealed	190	639	220-320	0.034	0.055	0.076	0.096	0.118	0.139	0.180	0.223	
		0.25 < C ≤ 0.55%	Heat-treated	210	708	220-320	0.034	0.055	0.076	0.096	0.118	0.139	0.180	0.223	
		C > 0.55%	Annealed	190	639	180-280	0.032	0.052	0.072	0.091	0.112	0.132	0.171	0.212	
		C > 0.55%	Heat-treated	300	1013	110-210	0.031	0.050	0.068	0.086	0.106	0.125	0.162	0.201	
		Free cutting steel	Annealed	220	745	180-280	0.032	0.052	0.072	0.091	0.112	0.132	0.171	0.212	
		Low-alloyed steel	Annealed		175	591	180-280	0.032	0.052	0.072	0.091	0.112	0.132	0.171	0.212
			Heat-treated		300	1013	110-210	0.031	0.050	0.068	0.086	0.106	0.125	0.162	0.201
			Heat-treated		380	1282	85-165	0.029	0.047	0.065	0.083	0.101	0.119	0.155	0.192
		High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477	65-135	0.028	0.045	0.062	0.079	0.097	0.114	0.147	0.183
			Annealed		200	675	110-210	0.031	0.050	0.068	0.086	0.106	0.125	0.162	0.201
			Hardened and tempered		300	1013	110-210	0.031	0.050	0.068	0.086	0.106	0.125	0.162	0.201
		Stainless steels	Hardened and tempered		400	1361	85-165	0.029	0.047	0.065	0.083	0.101	0.119	0.155	0.192
			Ferritic/Martensite,Annealed		200	675	70-130	0.026	0.041	0.057	0.072	0.088	0.104	0.135	0.167
			Martensite,Heat-treated		330	1114	40-80	0.022	0.036	0.049	0.062	0.077	0.090	0.117	0.145
M	Stainless steels	Austenitic,hardened		200	675	70-130	0.023	0.037	0.051	0.065	0.078	0.092	0.121	0.158	
		Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013	45-75	0.018	0.029	0.041	0.052	0.062	0.074	0.097	0.127	
		Austenitic,ferritic,duplex		230	778	70-110	0.022	0.035	0.049	0.062	0.074	0.088	0.115	0.150	
K	Malleable cast iron	Ferritic		200	400										
		Pearlitic		260	700										
	Grey cast iron	Low tensile strength		180	200										
		High tensile strength/Austenitic		245	350										
	Nodular cast iron	Ferritic		155	400										
		Pearlitic		265	700										
	GGV(CGI)		230	400											
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	40-80	0.025	0.040	0.055	0.088	0.085	0.099	0.126	0.151	
			Aged	280	940	20-45	0.020	0.032	0.044	0.071	0.068	0.079	0.101	0.121	
		Ni or Co based	Annealed	250	840	40-80	0.025	0.040	0.055	0.088	0.085	0.099	0.126	0.151	
			Aged	350	1180	20-45	0.020	0.032	0.044	0.071	0.068	0.079	0.101	0.121	
		Cast	320	1080	20-45	0.020	0.032	0.044	0.071	0.068	0.079	0.101	0.121		
	Titanium alloy	Pure Titanium		200	680	55-85	0.028	0.044	0.061	0.097	0.094	0.109	0.139	0.166	
		α and β alloy, aged		375	1260	55-85	0.028	0.044	0.061	0.097	0.094	0.109	0.139	0.166	
		β alloy		410	1400	18-40	0.019	0.030	0.041	0.066	0.064	0.074	0.095	0.113	
	Tungsten alloy		300	1010	80-120	0.030	0.048	0.066	0.106	0.102	0.119	0.151	0.181		
	Molybdenum alloy		300	1010	80-120	0.030	0.048	0.066	0.106	0.102	0.119	0.151	0.181		
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.

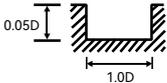
Solid Carbide End Mills

Solid Carbide End Mill M150 Cutting Data Recommendation

Materials						M150-4ES M150-4EL M150-4RS	Square shoulder milling ^{1.5D} (Finsih milling) 							
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm ²)	Cutting speed Vc(m/min)	fz [mm/Tooth]							
							Mill diameter [mm]							
						2	4	6	8	10	12	16	20	
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428	160-260	0.050	0.080	0.110	0.140	0.171	0.202	0.261	0.324
		0.25 < C ≤ 0.55%	Annealed	190	639	260-360	0.055	0.089	0.122	0.155	0.190	0.224	0.290	0.360
		0.25 < C ≤ 0.55%	Heat-treated	210	708	260-360	0.055	0.089	0.122	0.155	0.190	0.224	0.290	0.360
		C > 0.55%	Annealed	190	639	220-320	0.052	0.085	0.116	0.147	0.181	0.213	0.276	0.342
		C > 0.55%	Heat-treated	300	1013	150-250	0.050	0.080	0.110	0.140	0.171	0.202	0.261	0.324
		Free cutting steel	Annealed	220	745	220-320	0.052	0.085	0.116	0.147	0.181	0.213	0.276	0.342
	Low-alloyed steel	Annealed		175	591	220-320	0.052	0.085	0.116	0.147	0.181	0.213	0.276	0.342
		Heat-treated		300	1013	150-250	0.050	0.080	0.110	0.140	0.171	0.202	0.261	0.324
		Heat-treated		380	1282	125-205	0.047	0.077	0.105	0.133	0.163	0.193	0.249	0.310
	High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477	105-175	0.045	0.073	0.100	0.127	0.156	0.184	0.238	0.295
		Annealed		200	675	150-250	0.050	0.080	0.110	0.140	0.171	0.202	0.261	0.324
		Hardened and tempered		300	1013	150-250	0.050	0.080	0.110	0.140	0.171	0.202	0.261	0.324
	Stainless steels	Hardened and tempered		400	1361	125-205	0.047	0.077	0.105	0.133	0.163	0.193	0.249	0.310
		Ferritic/Martensite,Annealed		200	675	90-150	0.041	0.067	0.092	0.116	0.143	0.168	0.218	0.270
	M	Martensite,Heat-treated		330	1114	60-100	0.036	0.058	0.079	0.101	0.124	0.146	0.189	0.234
Stainless steels		Austenitic,hardened		200	675	90-150	0.042	0.067	0.093	0.118	0.142	0.168	0.220	0.288
		Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013	65-95	0.034	0.054	0.074	0.094	0.114	0.134	0.176	0.230
	Austenitic,ferritic,duplex		230	778	90-130	0.040	0.064	0.088	0.112	0.135	0.160	0.209	0.274	
K	Malleable cast iron	Ferritic		200	400									
		Pearlitic		260	700									
	Grey cast iron	Low tensile strength		180	200									
		High tensile strength/Austenitic		245	350									
	Nodular cast iron	Ferritic		155	400									
		Pearlitic		265	700									
GGV(CGI)		230	400											
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	55-95	0.042	0.067	0.092	0.147	0.142	0.165	0.210	0.252
			Aged	280	940	35-60	0.034	0.054	0.074	0.118	0.114	0.132	0.168	0.202
		Ni or Co based	Annealed	250	840	55-95	0.042	0.067	0.092	0.147	0.142	0.165	0.210	0.252
			Aged	350	1180	35-60	0.034	0.054	0.074	0.118	0.114	0.132	0.168	0.202
	Titanium alloy	Cast		320	1080	35-60	0.034	0.054	0.074	0.118	0.114	0.132	0.168	0.202
		Pure Titanium		200	680	70-100	0.046	0.074	0.101	0.162	0.156	0.182	0.231	0.277
		α and β alloy, aged		375	1260	70-100	0.046	0.074	0.101	0.162	0.156	0.182	0.231	0.277
		β alloy		410	1400	30-55	0.032	0.050	0.069	0.110	0.107	0.124	0.158	0.189
Tungsten alloy		300	1010	100-140	0.050	0.080	0.110	0.176	0.170	0.198	0.252	0.302		
Molybdenum alloy		300	1010	100-140	0.050	0.080	0.110	0.176	0.170	0.198	0.252	0.302		
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.

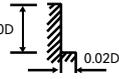
Solid Carbide End Mill M170 Cutting Data Recommendation

Materials				M170-4ES M170-4RS		Slot milling 						
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm ²)	Cutting speed Vc(m/min)	fz [mm/Tooth]					
							Mill diameter [mm]					
						4	6	8	10	12	16	
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428							
		0.25 < C ≤ 0.55%	Annealed	190	639							
		0.25 < C ≤ 0.55%	Heat-treated	210	708							
		C > 0.55%	Annealed	190	639							
		C > 0.55%	Heat-treated	300	1013	140-200	0.019	0.041	0.064	0.087	0.106	0.128
		Free cutting steel	Annealed	220	745							
	Low-alloyed steel	Annealed		175	591							
		Heat-treated		300	1013	140-200	0.019	0.041	0.064	0.087	0.106	0.128
		Heat-treated		380	1282	120-170	0.018	0.037	0.058	0.079	0.097	0.116
	High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477	110-150	0.016	0.034	0.053	0.072	0.088	0.106
Annealed		200	675									
Stainless steels	Ferritic/Martensite,Annealed		200	675								
	Martensite,Heat-treated		330	1114								
M	Stainless steels	Austenitic,hardened		200	675							
		Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013							
		Austenitic,ferritic,duplex		230	778							
K	Malleable cast iron	Ferritic		200	400	200-300	0.026	0.052	0.076	0.105	0.125	0.150
		Pearlitic		260	700	180-260	0.022	0.044	0.065	0.089	0.106	0.128
	Grey cast iron	Low tensile strength		180	200	200-300	0.026	0.052	0.076	0.105	0.125	0.150
		High tensile strength/Austenitic		245	350	190-280	0.023	0.047	0.068	0.095	0.113	0.135
	Nodular cast iron	Ferritic		155	400	200-300	0.026	0.052	0.076	0.105	0.125	0.150
		Pearlitic		265	700	180-260	0.022	0.044	0.065	0.089	0.106	0.128
	GGV(CGI)		230	400	160-240	0.021	0.042	0.061	0.084	0.100	0.120	
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							
			Aged	280	940							
		Ni or Co based	Annealed	250	840							
			Aged	350	1180							
		Cast		320	1080							
Titanium alloy	Pure Titanium		200	680								
	α and β alloy, aged		375	1260								
	β alloy		410	1400								
Tungsten alloy		300	1010									
Molybdenum alloy		300	1010									
H	Hardened steel	Hardened and tempered		50HRC	-	90-130	0.010	0.021	0.033	0.045	0.055	0.066
		Hardened and tempered		55HRC	-	35-80	0.007	0.015	0.023	0.032	0.039	0.046
		Hardened and tempered		60HRC	-	30-75	0.006	0.013	0.020	0.027	0.033	0.040
	Chilled cast iron		Hardened and tempered		55HRC	-	80-120	0.009	0.019	0.030	0.041	0.050

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

Solid Carbide End Mills

Solid Carbide End Mill M170 Cutting Data Recommendation

Materials				M170-4ES M170-4RS M170-6ES		Square shoulder milling 1.0D (Finsih milling) 						
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm ²)	Cutting speed Vc(m/min)	fz [mm/Tooth]					
							Mill diameter [mm]					
						4	6	8	10	12	16	
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428							
		0.25 < C ≤ 0.55%	Annealed	190	639							
		0.25 < C ≤ 0.55%	Heat-treated	210	708							
		C > 0.55%	Annealed	190	639							
		C > 0.55%	Heat-treated	300	1013	200-300	0.080	0.126	0.170	0.216	0.237	0.266
		Free cutting steel	Annealed	220	745							
	Low-alloyed steel	Annealed		175	591							
		Heat-treated		300	1013	200-300	0.080	0.126	0.170	0.216	0.237	0.266
		Heat-treated		380	1282	180-260	0.076	0.120	0.162	0.206	0.226	0.254
	High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477	170-260	0.073	0.115	0.155	0.197	0.216	0.242
Annealed		200	675									
Stainless steels	Hardened and tempered		300	1013	200-300	0.080	0.126	0.170	0.216	0.237	0.266	
	Hardened and tempered		400	1361	180-260	0.076	0.120	0.162	0.206	0.226	0.254	
Stainless steels	Ferritic/Martensite,Annealed		200	675								
	Martensite,Heat-treated		330	1114								
M	Stainless steels	Austenitic,hardened		200	675							
		Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013							
		Austenitic,ferritic,duplex		230	778							
K	Malleable cast iron	Ferritic		200	400	230-340	0.090	0.140	0.190	0.240	0.164	0.296
		Pearlitic		260	700	220-310	0.077	0.119	0.162	0.204	0.139	0.252
	Grey cast iron	Low tensile strength		180	200	230-340	0.090	0.140	0.190	0.240	0.164	0.296
		High tensile strength/Austenitic		245	350	230-320	0.081	0.126	0.171	0.216	0.148	0.266
	Nodular cast iron	Ferritic		155	400	230-340	0.090	0.140	0.190	0.240	0.164	0.296
		Pearlitic		265	700	220-310	0.077	0.119	0.162	0.204	0.139	0.252
	GGV(CGI)			230	400	210-310	0.072	0.112	0.152	0.192	0.131	0.237
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							
			Aged	280	940							
		Ni or Co based	Annealed	250	840							
			Aged	350	1180							
	Cast		320	1080								
	Titanium alloy	Pure Titanium		200	680							
α and β alloy, aged		375	1260									
β alloy		410	1400									
Tungsten alloy			300	1010								
Molybdenum alloy			300	1010								
H	Hardened steel	Hardened and tempered		50HRC	-	190-280	0.045	0.070	0.095	0.120	0.132	0.148
		Hardened and tempered		55HRC	-	110-160	0.032	0.049	0.067	0.084	0.092	0.104
		Hardened and tempered		60HRC	-	80-140	0.027	0.042	0.057	0.072	0.079	0.089
	Chilled cast iron		Hardened and tempered		55HRC	-	170-260	0.041	0.063	0.086	0.108	0.119

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

Solid Carbide End Mill M200 Cutting Data Recommendation

Materials				M200-2BS M200-2BL M200-2BX		Profile milling (Finsih milling) Ap = 0.2 D Ae = 0.3 D										
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm ²)	Cutting speed Vc(m/min)	fz [mm/Tooth]									
							Mill diameter [mm]									
						2	4	6	8	10	12	14	16	20		
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428	140-240	0.018	0.047	0.076	0.104	0.135	0.149	0.162	0.176	0.189	
		0.25 < C ≤ 0.55%	Annealed	190	639	230-330	0.020	0.052	0.084	0.116	0.150	0.165	0.180	0.195	0.210	
		0.25 < C ≤ 0.55%	Heat-treated	210	708	230-330	0.020	0.052	0.084	0.116	0.150	0.165	0.180	0.195	0.210	
		C > 0.55%	Annealed	190	639	190-310	0.019	0.049	0.080	0.110	0.143	0.157	0.171	0.185	0.200	
		C > 0.55%	Heat-treated	300	1013	140-240	0.018	0.047	0.076	0.104	0.135	0.149	0.162	0.176	0.189	
		Free cutting steel	Annealed	220	745	190-310	0.019	0.049	0.080	0.110	0.143	0.157	0.171	0.185	0.200	
		Low-alloyed steel	Annealed		175	591	190-310	0.019	0.049	0.080	0.110	0.143	0.157	0.171	0.185	0.200
	Heat-treated		300	1013	140-240	0.018	0.047	0.076	0.104	0.135	0.149	0.162	0.176	0.189		
	Heat-treated		380	1282	110-210	0.017	0.045	0.072	0.100	0.129	0.142	0.155	0.168	0.181		
		High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477	90-190	0.016	0.043	0.069	0.095	0.123	0.135	0.148	0.160	0.172
	Annealed		200	675	140-240	0.018	0.047	0.076	0.104	0.135	0.149	0.162	0.176	0.189		
	Hardened and tempered		300	1013	140-240	0.018	0.047	0.076	0.104	0.135	0.149	0.162	0.176	0.189		
		Stainless steels	Hardened and tempered		400	1361	110-210	0.017	0.045	0.072	0.100	0.129	0.142	0.155	0.168	0.181
	Ferritic/Martensite,Annealed		200	675	65-135	0.015	0.039	0.063	0.087	0.113	0.124	0.135	0.146	0.158		
		Martensite,Heat-treated		330	1114	48-108	0.013	0.034	0.055	0.075	0.098	0.107	0.117	0.127	0.137	
M	Stainless steels	Austenitic,hardened		200	675	85-145	0.014	0.040	0.065	0.090	0.120	0.145	0.168	0.190	0.210	
		Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013	40-100	0.011	0.032	0.052	0.072	0.096	0.116	0.134	0.152	0.168	
		Austenitic,ferritic,duplex		230	778	55-125	0.013	0.038	0.062	0.086	0.114	0.138	0.160	0.181	0.200	
K	Malleable cast iron	Ferritic		200	400	190-310	0.020	0.050	0.080	0.110	0.145	0.160	0.178	0.190	0.212	
		Pearlitic		260	700	150-260	0.017	0.043	0.068	0.094	0.123	0.136	0.151	0.162	0.180	
	Grey cast iron	Low tensile strength		180	200	190-310	0.020	0.050	0.080	0.110	0.145	0.160	0.178	0.190	0.212	
		High tensile strength/Austenitic		245	350	160-270	0.018	0.045	0.072	0.099	0.131	0.144	0.160	0.171	0.191	
	Nodular cast iron	Ferritic		155	400	190-310	0.020	0.050	0.080	0.110	0.145	0.160	0.178	0.190	0.212	
		Pearlitic		265	700	150-260	0.017	0.043	0.068	0.094	0.123	0.136	0.151	0.162	0.180	
	GGV(CGI)		230	400	120-230	0.016	0.040	0.064	0.088	0.116	0.128	0.142	0.152	0.170		
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											
			Aged	280	940											
		Ni or Co based	Annealed	250	840											
			Aged	350	1180											
		Cast		320	1080											
	Titanium alloy	Pure Titanium		200	680											
α and β alloy, aged		375	1260													
β alloy		410	1400													
Tungsten alloy		300	1010													
	Molybdenum alloy		300	1010												
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 Mills

Solid Carbide End Mill M170 Cutting Data Recommendation

Materials				M170-2BS		Profile milling (Finish milling) Ap = 0.1 D Ae = 0.02 D						
ISO	Workpiece Materials			Brinell Hardness(HB)	Tensile strength (N/mm ²)	Cutting speed Vc(m/min)	fz [mm/Tooth]					
							Mill diameter [mm]					
						4	6	8	10	12	16	
P	Unalloyed steel	C ≤ 0.25%	Annealed	125	428							
		0.25 < C ≤ 0.55%	Annealed	190	639							
		0.25 < C ≤ 0.55%	Heat-treated	210	708							
		C > 0.55%	Annealed	190	639							
		C > 0.55%	Heat-treated	300	1013	180-250	0.064	0.096	0.128	0.150	0.165	0.190
		Free cutting steel	Annealed	220	745							
	Low-alloyed steel	Annealed		175	591							
		Heat-treated		300	1013	180-250	0.064	0.096	0.128	0.150	0.165	0.190
		Heat-treated		380	1282	150-220	0.061	0.092	0.122	0.143	0.158	0.182
	High-alloyed steel and highalloyed tool steel	Heat-treated		430	1477	140-210	0.058	0.087	0.117	0.137	0.150	0.173
Annealed		200	675									
Stainless steels	Hardened and tempered		300	1013	180-250	0.064	0.096	0.128	0.150	0.165	0.190	
	Hardened and tempered		400	1361	150-220	0.061	0.092	0.122	0.143	0.158	0.182	
Stainless steels	Ferritic/Martensite,Annealed		200	675								
	Martensite,Heat-treated		330	1114								
M	Stainless steels	Austenitic,hardened		200	675							
		Austenitic,precipitation hardened stainless steel(PH stainless steel)		300	1013							
		Austenitic,ferritic,duplex		230	778							
K	Malleable cast iron	Ferritic		200	400	220-300	0.120	0.160	0.200	0.250	0.270	0.310
		Pearlitic		260	700	210-290	0.102	0.136	0.170	0.213	0.230	0.264
	Grey cast iron	Low tensile strength		180	200	220-300	0.120	0.160	0.200	0.250	0.270	0.310
		High tensile strength/Austenitic		245	350	215-285	0.108	0.144	0.180	0.225	0.243	0.279
	Nodular cast iron	Ferritic		155	400	220-300	0.120	0.160	0.200	0.250	0.270	0.310
		Pearlitic		265	700	210-290	0.102	0.136	0.170	0.213	0.230	0.264
	GGV(CGI)		230	400	200-280	0.096	0.128	0.160	0.200	0.216	0.248	
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							
			Aged	280	940							
		Ni or Co based	Annealed	250	840							
			Aged	350	1180							
		Cast	320	1080								
	Titanium alloy	Pure Titanium		200	680							
α and β alloy, aged		375	1260									
β alloy		410	1400									
Tungsten alloy			300	1010								
Molybdenum alloy			300	1010								
H	Hardened steel	Hardened and tempered		50HRC	-	180-250	0.064	0.096	0.128	0.150	0.165	0.190
		Hardened and tempered		55HRC	-	140-210	0.045	0.067	0.090	0.105	0.116	0.133
		Hardened and tempered		60HRC	-	70-140	0.038	0.058	0.077	0.090	0.099	0.114
	Chilled cast iron	Hardened and tempered		55HRC	-	150-220	0.058	0.086	0.115	0.135	0.149	0.171

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