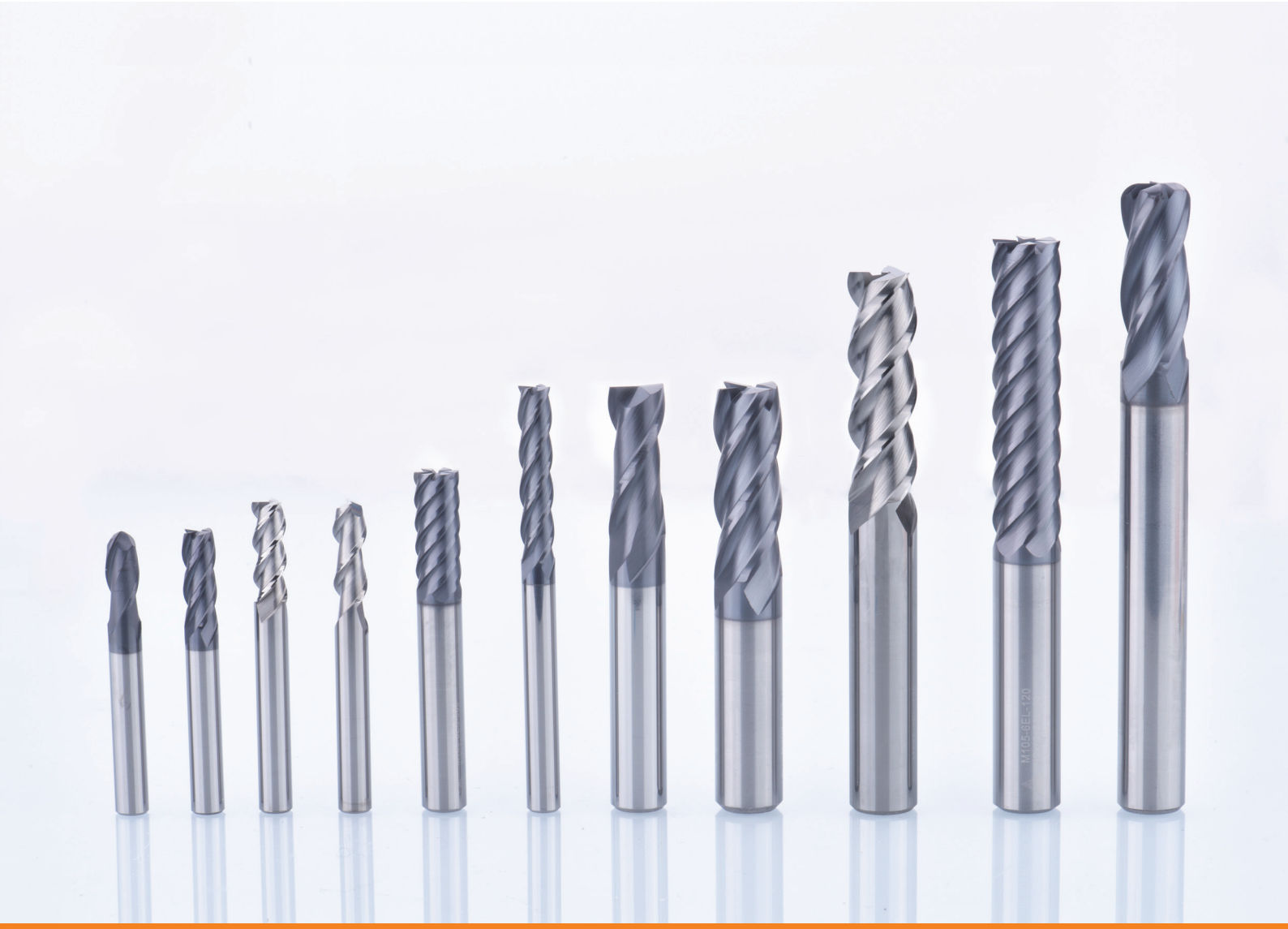
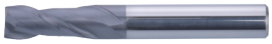
NEW
PRODUCT!

M100, M105, M145 ACHTECK Universal Solid Carbide End Mills—ECO Line

High performance-price ratio machining for ISO P, M, K and N material

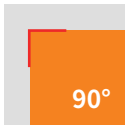
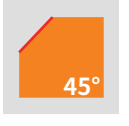


Solid carbide end mills- ECO Line

Series	Pictures	Catagory	Tooth	Helix angles	Application	Cutting edge tolerance mm	Diameter mm	Material	Information
M100-2ES		Eco line	Z=2	35°		+0.00 -0.03	1-20	Universal type	Used in carbon steel, tool steel, alloy steel machining. the workpiece hardness up to HRC45°
M100-4ES		Eco line	Z=4	35°		+0.00 -0.03	1-20	Universal type	Used in carbon steel, tool steel, alloy steel machining. with 4 cutting edges, it can achieve better surface roughness. the workpiece hardness up to HRC45°
M100-4EL		Eco line	Z=4	35°		+0.00 -0.03	3-20	Universal type	Used in carbon steel, tool steel, alloy steel machining. With 4 long edge design. the workpiece hardness up to HRC45°
M100-4RL		Eco line	Z=4	30°		R±0.02	4-12	Universal type	Used in carbon steel, tool steel, alloy steel machining. The corner radius can prevent edge breakage during high-speed cutting. The workpiece hardness up to HRC45°
M100-2BS		Eco line	Z=2	30°		≤6±0.01 >6±0.02	2-20	Universal type	Used in carbon steel, tool steel, alloy steel machining. For profile milling. The workpiece hardness up to HRC45°
M105-6ES		Eco line	Z=6	45°		+0.00 -0.03	4-20	Universal type	High speed cutting and high feed finishing cutting. The workpiece hardness up to HRC45°
M105-6EL		Eco line	Z=6	45°		+0.00 -0.03	6-20	Universal type	High speed cutting and high feed finishing cutting. With 6 long edge design. The workpiece hardness up to HRC45°
M145-2ES		Eco line	Z=2	45°		+0.00 -0.02	3-20	Aluminium alloy	Design for vibration resistance. With specially edge treatment. Better machined surface quality can be achieved.
M145-3ES		Eco line	Z=3	45°		+0.00 -0.02	3-20	Aluminium alloy	Design for vibration resistance. With specially edge treatment. Better machined surface quality can be achieved.
M145-3EL		Eco line	Z=3	45°		+0.00 -0.02	4-20	Aluminium alloy	Design for vibration resistance. With specially edge treatment. Better machined surface quality can be achieved.

Icons description

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

Icons	Description
	30° Helix angle
	35° Helix angle
	45° Helix angle
	Cylinder shank
	Square
	Corner radius
	Ball-nose
	Corner chamfer
	Chamfer

ACHTECK ECO line of solid carbide end mills offer extremely high performance cost ratio and complete product range

Tool

– Solid carbide end mills —ECO series

– Metric

– 3 categories with 122 sizes

– Ball nose, square, rounded corner, multi teeth

– With 2, 3, 4 or 6 cutting edges

– Φ1mm - 20 mm

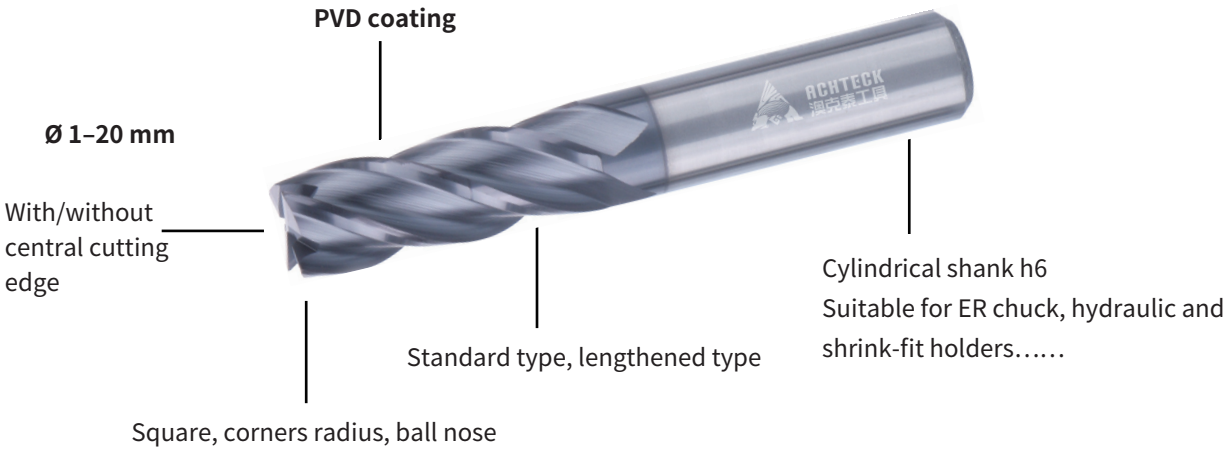
Application

– ISO workpiece material groups P, M, K and N

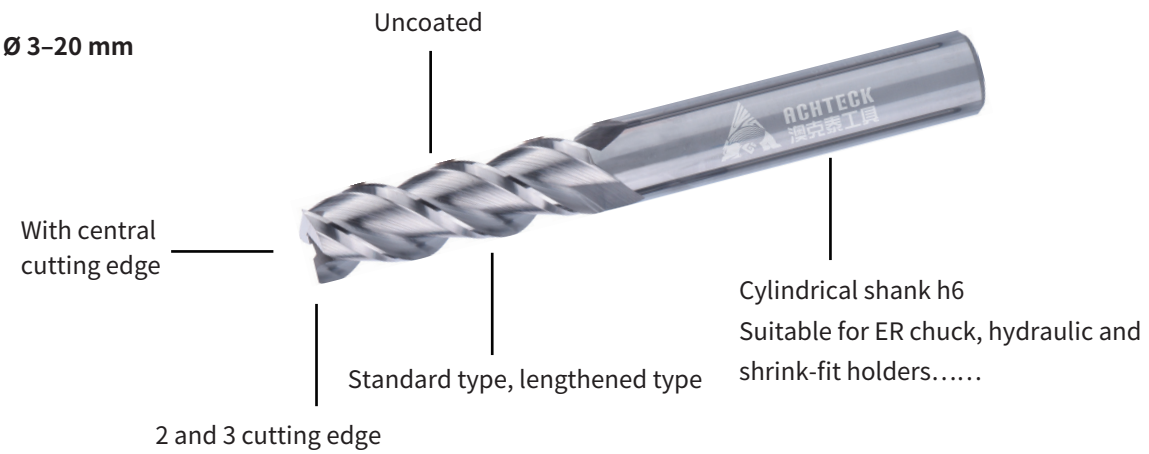
– Side milling, slot milling, pocket milling, helical plunging milling, ramping and profile milling

– Scope of application: general machinery, mold and die, automotive and energy industry

M100 & M105 universal end mills



M145 aluminum alloy solide carbide end mills



Naming rules for ACHTECK solid carbide end mills

M	1	00	—	2	E	S	—	060	002	N
1	2	3		4	5	6		7	8	9

1
Tool category
M End mill

2
Generations
1

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

4
Tooth No.
2,3,4,5,6……

5
Tool types
E Square
B Ball nose end mills
R Rounded corner end mills
C Chamfer end mills
P End mills with waved edges
W Form end mills
T Taper end mills
H High feed

6
Length standard
S Standard total length
L Long type
XL Super long type
XXL Extra-long type
SN Shortening cutting edge
SP Lengthening cutting edge

7
Tool diameter
060=6.0mm
200=20.0mm

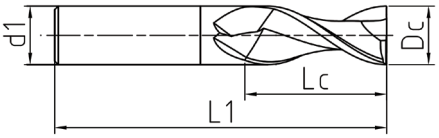
8
Chamfer size / Corner radius size
002=0.2mm

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

Solid carbide end mill M100

Eco line

Materials to HRC 45



P	M	K	N	S	H	O
●●	●	●	●			

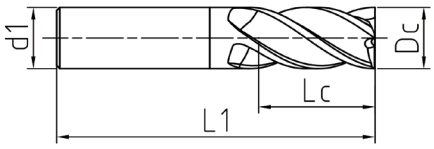
Product code	Dc mm +0.00/-0.03	d1 mm	Lc mm	L1 mm	Z	Stock
M100-2ES-010	1	4	3	50	2	●
M100-2ES-015	1.5	4	4	50	2	●
M100-2ES-020	2	4	6	50	2	●
M100-2ES-025	2.5	4	8	50	2	●
M100-2ES-030	3	4	8	50	2	●
M100-2ES-040	4	4	11	50	2	●
M100-2ES-050	5	6	13	50	2	●
M100-2ES-060	6	6	16	50	2	●
M100-2ES-070	7	8	20	60	2	●
M100-2ES-080	8	8	20	60	2	●
M100-2ES-100	10	10	25	75	2	●
M100-2ES-120	12	12	32	75	2	●
M100-2ES-140P	14	14	40	100	2	●
M100-2ES-140	14	16	40	100	2	●
M100-2ES-160	16	16	40	100	2	●
M100-2ES-180P	18	18	40	100	2	●
M100-2ES-180	18	20	40	100	2	●
M100-2ES-200	20	20	45	100	2	●

Marked: ● Stocked ○ Non-stocked

Solid carbide end mill M100

Eco line

Materials to HRC 45



P	M	K	N	S	H	O
●●	●	●	●			

Product code	Dc mm +0.00/-0.03	d1 mm	Lc mm	L1 mm	Z	Stock
M100-4ES-010	1	4	3	50	4	●
M100-4ES-015	1.5	4	4	50	4	●
M100-4ES-020	2	4	6	50	4	●
M100-4ES-025	2.5	4	8	50	4	●
M100-4ES-030	3	4	8	50	4	●
M100-4ES-040	4	4	11	50	4	●
M100-4ES-040P	4	6	11	50	4	●
M100-4ES-050	5	6	13	50	4	●
M100-4ES-060	6	6	16	50	4	●
M100-4ES-070	7	8	20	60	4	●
M100-4ES-080	8	8	20	60	4	●
M100-4ES-090	9	10	20	75	4	●
M100-4ES-100	10	10	25	75	4	●
M100-4ES-110	11	12	30	75	4	●
M100-4ES-120	12	12	32	75	4	●
M100-4ES-140P	14	14	40	100	4	●
M100-4ES-140	14	16	40	100	4	●
M100-4ES-160	16	16	40	100	4	●
M100-4ES-180P	18	18	40	100	4	●
M100-4ES-180	18	20	40	100	4	●
M100-4ES-200	20	20	45	100	4	●

lengthened type

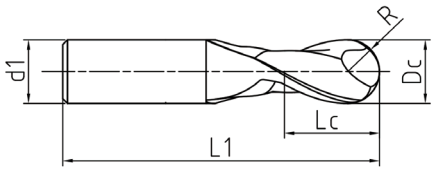
Product code	Dc mm +0.00/-0.03	d1 mm	Lc mm	L1 mm	Z	Stock
M100-4EL-030	3	4	15	60	4	●
M100-4EL-040	4	4	20	60	4	●
M100-4EL-050	5	6	25	75	4	●
M100-4EL-060	6	6	30	75	4	●
M100-4EL-080	8	8	35	100	4	●
M100-4EL-100	10	10	45	100	4	●
M100-4EL-120	12	12	45	100	4	●
M100-4EL-140	14	14	70	150	4	●
M100-4EL-160	16	16	70	150	4	●
M100-4EL-180	18	20	75	150	4	●
M100-4EL-200	20	20	75	150	4	●

Marked: ● Stocked ○ Non-stocked

Solid carbide end mill M100

Eco line

Materials to HRC 45



P	M	K	N	S	H	O
●●	●	●	●			

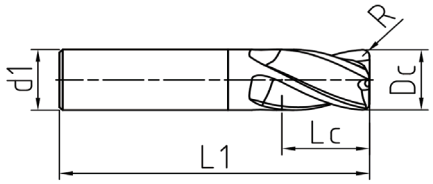
Product code	Dc mm +0.00/-0.03	R mm ≤6 +0.01 >6 +0.02	d1 mm	Lc mm	L1 mm	Z	Stock
M100-2BS-020	2	1	4	5	50	2	●
M100-2BS-030	3	1.5	4	6	50	2	●
M100-2BS-040	4	2	4	8	50	2	●
M100-2BS-050	5	2.5	6	10	50	2	●
M100-2BS-060	6	3	6	12	50	2	●
M100-2BS-080	8	4	8	14	60	2	●
M100-2BS-100	10	5	10	20	75	2	●
M100-2BS-120	12	6	12	24	75	2	●
M100-2BS-160	16	8	16	32	100	2	●
M100-2BS-200	20	10	20	40	100	2	●

Marked: ● Stocked ○ Non-stocked

Solid carbide end mill M100

Eco line

Materials to HRC 45



P	M	K	N	S	H	O
●●	●	●	●			

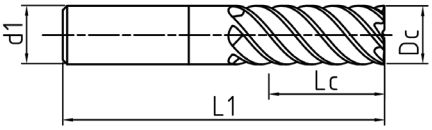
Product code	Dc mm +0.00/-0.03	R mm ±0.02	d1 mm	Lc mm	L1 mm	Z	Stock
M100-4RL-040002P	4	0.2	6	12	70	4	●
M100-4RL-040005P	4	0.5	6	12	70	4	●
M100-4RL-040010P	4	1.0	6	12	70	4	●
M100-4RL-060002	6	0.2	6	15	90	4	●
M100-4RL-060005	6	0.5	6	15	90	4	●
M100-4RL-060010	6	1.0	6	15	90	4	●
M100-4RL-080005	8	0.5	8	20	100	4	●
M100-4RL-080010	8	1.0	8	20	100	4	●
M100-4RL-080015	8	1.5	8	20	100	4	●
M100-4RL-080020	8	2.0	8	20	100	4	●
M100-4RL-100005	10	0.5	10	25	100	4	●
M100-4RL-100010	10	1.0	10	25	100	4	●
M100-4RL-100015	10	1.5	10	25	100	4	●
M100-4RL-100020	10	2.0	10	25	100	4	●
M100-4RL-100025	10	2.5	10	25	100	4	●
M100-4RL-120005	12	0.5	12	30	110	4	●
M100-4RL-120010	12	1.0	12	30	110	4	●
M100-4RL-120015	12	1.5	12	30	110	4	●
M100-4RL-120020	12	2.0	12	30	110	4	●
M100-4RL-120025	12	2.5	12	30	110	4	●
M100-4RL-120030	12	3.0	12	30	110	4	●

Marked: ● Stocked ○ Non-stocked

Solid carbide end mill M105

Eco line

Materials to HRC 45



P	M	K	N	S	H	O
●●	●	●	●			

Product code	Dc mm +0.00/-0.03	d1 mm	Lc mm	L1 mm	Z	Stock
M105-4ES-040	4	4	11	50	4	○
M105-6ES-050	5	6	13	50	6	●
M105-6ES-060	6	6	16	50	6	●
M105-6ES-080	8	8	19	60	6	●
M105-6ES-100	10	10	22	75	6	●
M105-6ES-120	12	12	26	75	6	●
M105-6ES-140	14	14	30	90	6	●
M105-6ES-160	16	16	32	100	6	●
M105-6ES-180	18	18	38	100	6	●
M105-6ES-200	20	20	38	100	6	●

lengthened type

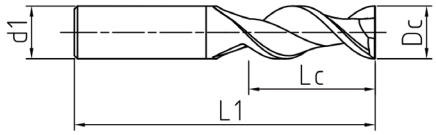
Product code	Dc mm +0.00/-0.03	d1 mm	Lc mm	L1 mm	Z	Stock
M105-6EL-060	6	6	25	80	6	●
M105-6EL-080	8	8	35	90	6	●
M105-6EL-100	10	10	45	100	6	●
M105-6EL-120	12	12	50	100	6	●
M105-6EL-160	16	16	65	150	6	●
M105-6EL-200	20	20	70	150	6	●

Marked: ● Stocked ○ Non-stocked

Solid carbide end mill M145

Eco line

Designed for aluminum alloy



P	M	K	N	S	H	O
			● ●			

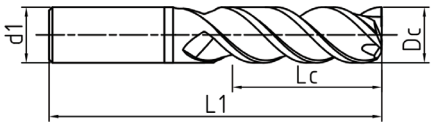
Product code	Dc mm +0.00/-0.02	d1 mm	Lc mm	L1 mm	Z	Stock
M145-2ES-030	3	4	11	50	2	●
M145-2ES-040	4	4	13	50	2	●
M145-2ES-050	5	6	17	55	2	●
M145-2ES-060	6	6	17	55	2	●
M145-2ES-080	8	8	22	65	2	●
M145-2ES-100	10	10	27	70	2	●
M145-2ES-120	12	12	32	80	2	●
M145-2ES-140	14	14	37	85	2	●
M145-2ES-160	16	16	42	100	2	●
M145-2ES-180P	18	16	48	110	2	●
M145-2ES-200	20	20	48	110	2	●

Marked: ● Stocked ○ Non-stocked

Solid carbide end mill M145

Eco line

Designed for aluminum alloy



P	M	K	N	S	H	O
			●●			

Product code	Dc mm +0.00/-0.02	d1 mm	Lc mm	L1 mm	Z	Stock
M145-3ES-030	3	4	11	50	3	●
M145-3ES-040	4	4	13	50	3	●
M145-3ES-050	5	6	17	55	3	●
M145-3ES-060	6	6	17	55	3	●
M145-3ES-080	8	8	22	65	3	●
M145-3ES-100	10	10	27	70	3	●
M145-3ES-120	12	12	32	80	3	●
M145-3ES-140	14	14	37	85	3	●
M145-3ES-160	16	16	42	100	3	●
M145-3ES-180P	18	16	48	110	3	●
M145-3ES-200	20	20	48	110	3	●

lengthened type

Product code	Dc mm +0.00/-0.02	d1 mm	Lc mm	L1 mm	Z	Stock
M145-3EL-040	4	4	16	70	3	●
M145-3EL-060	6	6	22	70	3	●
M145-3EL-080	8	8	28	80	3	●
M145-3EL-100	10	10	32	90	3	●
M145-3EL-120	12	12	38	95	3	●
M145-3EL-160	16	16	52	110	3	●
M145-3EL-200	20	20	55	110	3	●

Marked: ● Stocked ○ Non-stocked

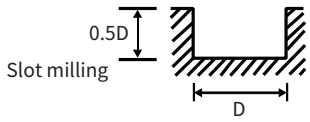
Solid carbide end mill Eco Line cutting parameters

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

Machining Materials

ISO	Material classification			Brinell hardness (HB/HRC)	Tensile strength (N/mm²)
P	Unalloyed steel	C≤0.25%	Annealing	125	428
		0.25<C≤0.55%	Annealing	190	639
		0.25<C≤0.55%	Tempered	210	708
		C>0.55%	Annealing	190	639
		C>0.55%	Tempered	300	1013
		Free-Cutting Steel (short chip)	Annealing	220	745
	Low Alloy Steel	Annealing		175	591
		Tempered		300	1013
		Tempered		380	1282
		Tempered		430	1477
	High alloy steel and high alloy tool steel	Annealing		200	675
		Quenching and tempering		300	1013
		Quenching and tempering		400	1361
	Stainless steel	Ferrite / martensite, annealing		200	675
		Martensite, tempered		330	1114
M	Stainless steel	Austenite, Quenched		200	675
		Austenite, Precipitation Dispersion Hardening Stainless Steel(PH Stainless Steel)		300	1013
		Austenite_ Ferrite, duplex stainless steel		230	778
K	Malleable iron	Ferrite		200	400
		Pearlite		260	700
	Gray cast iron	Low tensile strength		180	200
		High tensile strength / austenite		245	350
	Nodular Cast Iron	Ferrite		155	400
		Pearlite		265	700
	Graphite Cast Iron GGV(CGI)			230	400
N	Forged aluminum alloy	Non-aging treatment		30	-
		Aging treatment		100	340
	Cast aluminium alloys	≤12 % silicon, Non-aging treatment		75	260
		≤12 % silicon, aging treatment		90	310
		>12 % silicon, Non-aging treatment		130	450
	Magnesium alloy			70	250
	Copper and copper alloys (bronze / brass)	Non alloy, electrolytic copper		100	340
		Brass, bronze, red brass		90	310
		Copper alloy, short chip		110	380
		High strength Ampco alloy		300	1010
S	Iron base alloy	Iron base	Annealing	200	680
			Aging treatment	280	940
		Nickel or cobalt based	Annealing	250	840
			Aging treatment	350	1180
			Casting	320	1080
	Titanium alloys	Pure titanium		200	680
		α Phase and β Phase alloy,aging treatment		375	1260
		β Phase alloy		410	1400
	Tungsten alloy			300	1010
	Molybdenum alloy			300	1010
H	Hardened steel	Quenching and tempering		50HRC	
		Quenching and tempering		55HRC	
		Quenching and tempering		60HRC	
	Hardened cast steel	Quenching and tempering		50HRC	

M100-2ES



Cutting speed Vc(m/min)	fz[mm/tooth] End mill diameter (mm)								
	2	4	6	8	10	12	14	16	20
45-80	0.012	0.024	0.038	0.058	0.060	0.062	0.065	0.066	0.070
45~75	0.012	0.024	0.038	0.058	0.060	0.062	0.065	0.066	0.070
45~75	0.012	0.024	0.038	0.058	0.060	0.062	0.065	0.066	0.070
45~75	0.012	0.024	0.038	0.058	0.060	0.062	0.065	0.066	0.070
40~60	0.010	0.020	0.034	0.045	0.052	0.055	0.055	0.057	0.060
45~65	0.010	0.020	0.038	0.058	0.060	0.062	0.065	0.066	0.070
45~75	0.012	0.024	0.038	0.058	0.060	0.062	0.065	0.066	0.070
40~60	0.010	0.020	0.034	0.045	0.052	0.055	0.055	0.057	0.060
40~60	0.010	0.020	0.034	0.045	0.052	0.055	0.055	0.057	0.060
30~40	0.008	0.020	0.030	0.040	0.045	0.050	0.050	0.050	0.055
45~75	0.012	0.020	0.038	0.058	0.060	0.062	0.055	0.057	0.060
40~60	0.010	0.020	0.035	0.045	0.052	0.055	0.055	0.057	0.060
40~60	0.008	0.015	0.025	0.035	0.042	0.045	0.045	0.045	0.050
35~40	0.010	0.020	0.038	0.058	0.060	0.055	0.055	0.057	0.060
30~35	0.010	0.020	0.035	0.045	0.052	0.055	0.055	0.057	0.060
30~35	0.007	0.020	0.035	0.043	0.050	0.053	0.055	0.057	0.058
30	0.004	0.015	0.030	0.032	0.035	0.040	0.043	0.045	0.050
30~35	0.007	0.020	0.035	0.043	0.050	0.053	0.055	0.057	0.058
55~60	0.012	0.024	0.042	0.060	0.071	0.075	0.080	0.083	0.085
55~60	0.012	0.024	0.042	0.060	0.071	0.075	0.080	0.083	0.085
55~60	0.012	0.024	0.042	0.060	0.071	0.075	0.080	0.083	0.085
55~60	0.012	0.024	0.042	0.060	0.071	0.075	0.080	0.083	0.085
55~60	0.010	0.020	0.038	0.050	0.060	0.065	0.072	0.075	0.075
45~55	0.008	0.012	0.035	0.045	0.055	0.060	0.065	0.068	0.068
55~60	0.010	0.020	0.038	0.050	0.060	0.065	0.072	0.075	0.075

Solid carbide end mill Eco Line cutting parameters

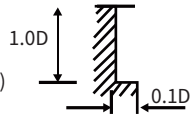
The specified cutting data are average recommended values.
For special applications, adjustment is recommended.

Machining Materials

ISO	Material classification			Brinell hardness (HB/HRC)	Tensile strength (N/mm²)
P	Unalloyed steel	C≤0.25%	Annealing	125	428
		0.25＜C≤0.55%	Annealing	190	639
		0.25＜C≤0.55%	Tempered	210	708
		C＞0.55%	Annealing	190	639
		C＞0.55%	Tempered	300	1013
		Free-Cutting Steel (short chip)	Annealing	220	745
	Low Alloy Steel	Annealing		175	591
		Tempered		300	1013
		Tempered		380	1282
		Tempered		430	1477
	High alloy steel and high alloy tool steel	Annealing		200	675
		Quenching and tempering		300	1013
		Quenching and tempering		400	1361
	Stainless steel	Ferrite / martensite, annealing		200	675
		Martensite, tempered		330	1114
M	Stainless steel	Austenite, Quenched		200	675
		Austenite, Precipitation Dispersion Hardening Stainless Steel(PH Stainless Steel)		300	1013
		Austenite_ Ferrite, duplex stainless steel		230	778
K	Malleable iron	Ferrite		200	400
		Pearlite		260	700
	Gray cast iron	Low tensile strength		180	200
		High tensile strength / austenite		245	350
	Nodular Cast Iron	Ferrite		155	400
		Pearlite		265	700
	Graphite Cast Iron GGV(CGI)			230	400
N	Forged aluminum alloy	Non-aging treatment		30	-
		Aging treatment		100	340
	Cast aluminium alloys	≤1 2 % silicon, Non-aging treatment		75	260
		≤1 2 % silicon, aging treatment		90	310
		＞1 2 % silicon, Non-aging treatment		130	450
	Magnesium alloy			70	250
	Copper and copper alloys (bronze / brass)	Non alloy, electrolytic copper		100	340
		Brass, bronze, red brass		90	310
		Copper alloy, short chip		110	380
		High strength Ampco alloy		300	1010
S	Iron base alloy	Iron base	Annealing	200	680
			Aging treatment	280	940
		Nickel or cobalt based	Annealing	250	840
			Aging treatment	350	1180
			Casting	320	1080
	Titanium alloys	Pure titanium		200	680
		α Phase and β Phase alloy,aging treatment		375	1260
		β Phase alloy		410	1400
	Tungsten alloy			300	1010
	Molybdenum alloy			300	1010
H	Hardened steel	Quenching and tempering		50HRC	
		Quenching and tempering		55HRC	
		Quenching and tempering		60HRC	
	Hardened cast steel	Quenching and tempering		50HRC	

M100-4ES，M100-4EL，M100-4RL

Shoulder milling
(Rough Machining)



Cutting speed Vc(m/min)	fz[mm/tooth] End mill diameter (mm)								
	2	4	6	8	10	12	14	16	20
60~90	0.006	0.020	0.038	0.042	0.050	0.052	0.060	0.066	0.070
60~85	0.006	0.020	0.038	0.042	0.050	0.052	0.060	0.066	0.070
60~85	0.006	0.020	0.038	0.042	0.050	0.052	0.060	0.066	0.070
60~85	0.006	0.020	0.038	0.042	0.050	0.052	0.060	0.066	0.070
55~65	0.005	0.015	0.034	0.035	0.045	0.052	0.060	0.066	0.070
60~85	0.005	0.015	0.038	0.042	0.050	0.052	0.060	0.066	0.070
60~85	0.006	0.020	0.038	0.042	0.050	0.052	0.060	0.066	0.070
45~60	0.005	0.015	0.034	0.035	0.045	0.048	0.055	0.057	0.060
45~60	0.005	0.015	0.034	0.035	0.045	0.048	0.055	0.057	0.060
40~45	0.004	0.015	0.030	0.030	0.040	0.045	0.050	0.050	0.055
60~80	0.006	0.015	0.038	0.042	0.050	0.052	0.055	0.057	0.060
50~60	0.006	0.015	0.035	0.042	0.045	0.048	0.055	0.057	0.060
40~45	0.005	0.012	0.025	0.030	0.040	0.042	0.045	0.045	0.050
50~70	0.006	0.015	0.038	0.042	0.050	0.052	0.055	0.057	0.060
35~45	0.005	0.015	0.035	0.035	0.045	0.048	0.055	0.057	0.060
35~45	0.005	0.018	0.035	0.041	0.043	0.053	0.055	0.057	0.058
35	0.005	0.012	0.030	0.032	0.035	0.040	0.043	0.045	0.050
35~45	0.005	0.018	0.035	0.041	0.043	0.053	0.055	0.057	0.058
55~60	0.012	0.024	0.042	0.065	0.071	0.075	0.080	0.083	0.080
55~60	0.012	0.024	0.042	0.065	0.071	0.075	0.080	0.083	0.080
55~60	0.012	0.024	0.042	0.065	0.071	0.075	0.080	0.083	0.080
55~60	0.012	0.024	0.042	0.065	0.071	0.075	0.080	0.083	0.080
55~60	0.010	0.020	0.038	0.055	0.060	0.065	0.072	0.075	0.072
45~55	0.008	0.012	0.035	0.045	0.055	0.060	0.065	0.068	0.065
55~60	0.010	0.020	0.038	0.055	0.060	0.065	0.072	0.075	0.072

Solid carbide end mill Eco Line cutting parameters

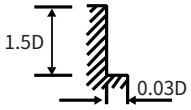
The specified cutting data are average recommended values.
For special applications, adjustment is recommended.

Machining Materials

ISO	Material classification			Brinell hardness (HB/HRC)	Tensile strength (N/mm²)
P	Unalloyed steel	C≤0.25%	Annealing	125	428
		0.25<C≤0.55%	Annealing	190	639
		0.25<C≤0.55%	Tempered	210	708
		C>0.55%	Annealing	190	639
		C>0.55%	Tempered	300	1013
		Free-Cutting Steel (short chip)	Annealing	220	745
	Low Alloy Steel	Annealing		175	591
		Tempered		300	1013
		Tempered		380	1282
		Tempered		430	1477
	High alloy steel and high alloy tool steel	Annealing		200	675
		Quenching and tempering		300	1013
		Quenching and tempering		400	1361
	Stainless steel	Ferrite / martensite, annealing		200	675
		Martensite, tempered		330	1114
M	Stainless steel	Austenite, Quenched		200	675
		Austenite, Precipitation Dispersion Hardening Stainless Steel(PH Stainless Steel)		300	1013
		Austenite_ Ferrite, duplex stainless steel		230	778
K	Malleable iron	Ferrite		200	400
		Pearlite		260	700
	Gray cast iron	Low tensile strength		180	200
		High tensile strength / austenite		245	350
	Nodular Cast Iron	Ferrite		155	400
		Pearlite		265	700
	Graphite Cast Iron GGV(CGI)			230	400
N	Forged aluminum alloy	Non-aging treatment		30	-
		Aging treatment		100	340
	Cast aluminium alloys	≤12 % silicon, Non-aging treatment		75	260
		≤12 % silicon, aging treatment		90	310
		>12 % silicon, Non-aging treatment		130	450
	Magnesium alloy			70	250
	Copper and copper alloys (bronze / brass)	Non alloy, electrolytic copper		100	340
		Brass, bronze, red brass		90	310
		Copper alloy, short chip		110	380
		High strength Ampco alloy		300	1010
S	Iron base alloy	Iron base	Annealing	200	680
			Aging treatment	280	940
		Nickel or cobalt based	Annealing	250	840
			Aging treatment	350	1180
			Casting	320	1080
	Titanium alloys	Pure titanium		200	680
		α Phase and β Phase alloy,aging treatment		375	1260
		β Phase alloy		410	1400
	Tungsten alloy			300	1010
	Molybdenum alloy			300	1010
H	Hardened steel	Quenching and tempering		50HRC	
		Quenching and tempering		55HRC	
		Quenching and tempering		60HRC	
	Hardened cast steel	Quenching and tempering		50HRC	

M100-4ES，M100-4EL，
M100-4RL，M105-6ES，M105-6EL

Shoulder milling
(Finish Machining)



Cutting speed Vc(m/min)	fz[mm/tooth] End mill diameter (mm)								
	2	4	6	8	10	12	14	16	20
80~100	0.006	0.020	0.030	0.038	0.045	0.052	0.058	0.062	0.070
75~90	0.006	0.020	0.030	0.038	0.045	0.052	0.058	0.062	0.070
75~90	0.006	0.020	0.030	0.038	0.045	0.052	0.058	0.062	0.070
75~90	0.006	0.020	0.030	0.038	0.045	0.052	0.058	0.062	0.070
60~70	0.006	0.020	0.030	0.038	0.045	0.052	0.058	0.062	0.070
75~90	0.006	0.020	0.030	0.038	0.045	0.052	0.058	0.062	0.070
75~90	0.006	0.020	0.030	0.038	0.045	0.052	0.058	0.062	0.070
60~70	0.005	0.015	0.026	0.035	0.042	0.048	0.055	0.057	0.060
60~70	0.005	0.015	0.026	0.035	0.042	0.048	0.055	0.057	0.060
55~60	0.005	0.015	0.025	0.030	0.040	0.045	0.050	0.050	0.055
75~85	0.005	0.015	0.026	0.035	0.042	0.048	0.055	0.057	0.060
60~70	0.005	0.015	0.026	0.035	0.042	0.048	0.055	0.057	0.060
55~60	0.004	0.012	0.025	0.030	0.040	0.045	0.050	0.050	0.055
50~70	0.005	0.015	0.026	0.035	0.042	0.048	0.055	0.057	0.060
40~50	0.004	0.015	0.025	0.030	0.040	0.045	0.050	0.050	0.055
40~50	0.010	0.018	0.038	0.041	0.043	0.053	0.055	0.057	0.058
40	0.005	0.012	0.030	0.032	0.035	0.040	0.043	0.045	0.050
40~50	0.005	0.018	0.038	0.041	0.043	0.053	0.055	0.057	0.058
70~80	0.010	0.021	0.030	0.038	0.045	0.052	0.058	0.062	0.070
70~80	0.010	0.021	0.030	0.038	0.045	0.052	0.058	0.062	0.070
70~80	0.010	0.021	0.030	0.038	0.045	0.052	0.058	0.062	0.070
70~80	0.010	0.021	0.030	0.038	0.045	0.052	0.058	0.062	0.070
70~80	0.009	0.018	0.028	0.035	0.040	0.050	0.052	0.060	0.065
65~75	0.009	0.018	0.028	0.035	0.040	0.050	0.052	0.060	0.065
70~80	0.009	0.018	0.028	0.035	0.040	0.050	0.052	0.060	0.065

Solid carbide end mill Eco Line cutting parameters

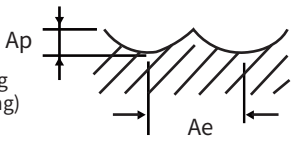
The specified cutting data are average recommended values.
For special applications, adjustment is recommended.

Machining Materials

ISO	Material classification			Brinell hardness (HB/HRC)	Tensile strength (N/mm²)
P	Unalloyed steel	C≤0.25%	Annealing	125	428
		0.25＜C≤0.55%	Annealing	190	639
		0.25＜C≤0.55%	Tempered	210	708
		C＞0.55%	Annealing	190	639
		C＞0.55%	Tempered	300	1013
		Free-Cutting Steel (short chip)	Annealing	220	745
	Low Alloy Steel	Annealing		175	591
		Tempered		300	1013
		Tempered		380	1282
		Tempered		430	1477
	High alloy steel and high alloy tool steel	Annealing		200	675
		Quenching and tempering		300	1013
		Quenching and tempering		400	1361
	Stainless steel	Ferrite / martensite, annealing		200	675
		Martensite, tempered		330	1114
M	Stainless steel	Austenite, Quenched		200	675
		Austenite, Precipitation Dispersion Hardening Stainless Steel(PH Stainless Steel)		300	1013
		Austenite_ Ferrite, duplex stainless steel		230	778
K	Malleable iron	Ferrite		200	400
		Pearlite		260	700
	Gray cast iron	Low tensile strength		180	200
		High tensile strength / austenite		245	350
	Nodular Cast Iron	Ferrite		155	400
		Pearlite		265	700
	Graphite Cast Iron GGV(CGI)			230	400
N	Forged aluminum alloy	Non-aging treatment		30	-
		Aging treatment		100	340
	Cast aluminium alloys	≤12 % silicon, Non-aging treatment		75	260
		≤12 % silicon, aging treatment		90	310
		＞12 % silicon, Non-aging treatment		130	450
	Magnesium alloy			70	250
	Copper and copper alloys (bronze / brass)	Non alloy, electrolytic copper		100	340
		Brass, bronze, red brass		90	310
		Copper alloy, short chip		110	380
		High strength Ampco alloy		300	1010
S	Iron base alloy	Iron base	Annealing	200	680
			Aging treatment	280	940
		Nickel or cobalt based	Annealing	250	840
			Aging treatment	350	1180
			Casting	320	1080
	Titanium alloys	Pure titanium		200	680
		α Phase and β Phase alloy,aging treatment		375	1260
		β Phase alloy		410	1400
	Tungsten alloy			300	1010
	Molybdenum alloy			300	1010
H	Hardened steel	Quenching and tempering		50HRC	
		Quenching and tempering		55HRC	
		Quenching and tempering		60HRC	
	Hardened cast steel	Quenching and tempering		50HRC	

M100-2BS

Profiling milling
(Finish Machining)



Cutting speed Vc(m/min)	fz[mm/tooth] End mill diameter (mm)								
	2	4	6	8	10	12	14	16	20
90~100	0.015	0.027	0.039	0.050	0.060	0.070	0.075	0.080	0.100
90~100	0.015	0.027	0.039	0.050	0.060	0.070	0.075	0.080	0.100
90~100	0.015	0.027	0.039	0.050	0.060	0.070	0.075	0.080	0.100
90~100	0.015	0.027	0.039	0.050	0.060	0.070	0.075	0.080	0.100
80~90	0.015	0.027	0.039	0.050	0.060	0.070	0.075	0.080	0.100
90~100	0.015	0.027	0.039	0.050	0.060	0.070	0.075	0.080	0.100
90~100	0.015	0.027	0.039	0.050	0.060	0.070	0.075	0.080	0.100
80~90	0.012	0.023	0.035	0.045	0.052	0.060	0.065	0.070	0.085
80~90	0.010	0.020	0.030	0.041	0.045	0.050	0.055	0.060	0.070
80~90	0.012	0.023	0.035	0.045	0.052	0.060	0.065	0.070	0.085
90~100	0.012	0.023	0.035	0.045	0.052	0.060	0.065	0.070	0.085
80~90	0.012	0.023	0.035	0.045	0.052	0.060	0.065	0.070	0.085
80~90	0.010	0.020	0.030	0.041	0.045	0.050	0.055	0.060	0.070
90~100	0.012	0.023	0.035	0.045	0.052	0.060	0.065	0.070	0.085
80~90	0.012	0.023	0.035	0.045	0.052	0.060	0.065	0.070	0.085
90~100	0.009	0.016	0.023	0.029	0.035	0.041	0.045	0.051	0.060
80~90	0.007	0.013	0.020	0.025	0.030	0.035	0.040	0.045	0.050
80~90	0.009	0.016	0.023	0.029	0.035	0.041	0.045	0.051	0.060
90~100	0.026	0.045	0.064	0.083	0.100	0.115	0.125	0.140	0.160
90~100	0.026	0.045	0.064	0.083	0.100	0.115	0.125	0.140	0.160
90~100	0.026	0.045	0.064	0.083	0.100	0.115	0.125	0.140	0.160
90~100	0.026	0.045	0.064	0.083	0.100	0.115	0.125	0.140	0.160
90~100	0.020	0.035	0.050	0.060	0.080	0.090	0.105	0.120	0.140
90~100	0.015	0.030	0.040	0.050	0.065	0.070	0.085	0.100	0.120
90~100	0.020	0.035	0.050	0.060	0.080	0.090	0.105	0.120	0.140

Solid carbide end mill Eco Line cutting parameters

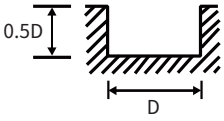
The specified cutting data are average recommended values.
For special applications, adjustment is recommended.

Machining Materials

ISO	Material classification			Brinell hardness (HB/HRC)	Tensile strength (N/mm²)
P	Unalloyed steel	C≤0.25%	Annealing	125	428
		0.25＜C≤0.55%	Annealing	190	639
		0.25＜C≤0.55%	Tempered	210	708
		C＞0.55%	Annealing	190	639
		C＞0.55%	Tempered	300	1013
		Free-Cutting Steel (short chip)	Annealing	220	745
	Low Alloy Steel	Annealing		175	591
		Tempered		300	1013
		Tempered		380	1282
		Tempered		430	1477
	High alloy steel and high alloy tool steel	Annealing		200	675
		Quenching and tempering		300	1013
		Quenching and tempering		400	1361
	Stainless steel	Ferrite / martensite, annealing		200	675
		Martensite, tempered		330	1114
M	Stainless steel	Austenite, Quenched		200	675
		Austenite, Precipitation Dispersion Hardening Stainless Steel(PH Stainless Steel)		300	1013
		Austenite_ Ferrite, duplex stainless steel		230	778
K	Malleable iron	Ferrite		200	400
		Pearlite		260	700
	Gray cast iron	Low tensile strength		180	200
		High tensile strength / austenite		245	350
	Nodular Cast Iron	Ferrite		155	400
		Pearlite		265	700
	Graphite Cast Iron GGV(CGI)			230	400
N	Forged aluminum alloy	Non-aging treatment		30	-
		Aging treatment		100	340
	Cast aluminium alloys	≤12 % silicon, Non-aging treatment		75	260
		≤12 % silicon, aging treatment		90	310
		＞12 % silicon, Non-aging treatment		130	450
	Magnesium alloy			70	250
	Copper and copper alloys (bronze / brass)	Non alloy, electrolytic copper		100	340
		Brass, bronze, red brass		90	310
		Copper alloy, short chip		110	380
		High strength Ampco alloy		300	1010
S	Iron base alloy	Iron base	Annealing	200	680
			Aging treatment	280	940
		Nickel or cobalt based	Annealing	250	840
			Aging treatment	350	1180
			Casting	320	1080
	Titanium alloys	Pure titanium		200	680
		α Phase and β Phase alloy,aging treatment		375	1260
		β Phase alloy		410	1400
	Tungsten alloy			300	1010
	Molybdenum alloy			300	1010
H	Hardened steel	Quenching and tempering		50HRC	
		Quenching and tempering		55HRC	
		Quenching and tempering		60HRC	
	Hardened cast steel	Quenching and tempering		50HRC	

M145-2ES，M145-3ES，M145-3EL

Slot milling



Cutting speed Vc(m/min)	fz[mm/tooth] End mill diameter (mm)								
	2	4	6	8	10	12	14	16	20
150~200	0.030	0.050	0.065	0.085	0.100	0.120	0.140	0.160	0.180
120~150	0.030	0.050	0.065	0.085	0.100	0.120	0.140	0.160	0.180
150~200	0.030	0.050	0.065	0.085	0.100	0.120	0.140	0.160	0.180
130~150	0.030	0.050	0.065	0.085	0.100	0.120	0.140	0.160	0.180
120~130	0.030	0.050	0.065	0.085	0.100	0.120	0.140	0.160	0.180
150~200	0.030	0.050	0.065	0.085	0.100	0.120	0.140	0.160	0.180
120~150	0.030	0.050	0.065	0.085	0.100	0.120	0.140	0.160	0.180
120~150	0.030	0.050	0.065	0.085	0.100	0.120	0.140	0.160	0.180
120~150	0.030	0.050	0.065	0.085	0.100	0.120	0.140	0.160	0.180

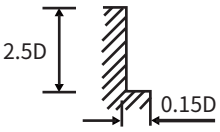
Solid carbide end mill Eco Line cutting parameters

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

Machining Materials

ISO	Material classification			Brinell hardness (HB/HRC)	Tensile strength (N/mm²)
P	Unalloyed steel	C≤0.25%	Annealing	125	428
		0.25＜C≤0.55%	Annealing	190	639
		0.25＜C≤0.55%	Tempered	210	708
		C＞0.55%	Annealing	190	639
		C＞0.55%	Tempered	300	1013
		Free-Cutting Steel (short chip)	Annealing	220	745
	Low Alloy Steel	Annealing		175	591
		Tempered		300	1013
		Tempered		380	1282
		Tempered		430	1477
	High alloy steel and high alloy tool steel	Annealing		200	675
		Quenching and tempering		300	1013
		Quenching and tempering		400	1361
	Stainless steel	Ferrite / martensite, annealing		200	675
		Martensite, tempered		330	1114
M	Stainless steel	Austenite, Quenched		200	675
		Austenite, Precipitation Dispersion Hardening Stainless Steel(PH Stainless Steel)		300	1013
		Austenite_ Ferrite, duplex stainless steel		230	778
K	Malleable iron	Ferrite		200	400
		Pearlite		260	700
	Gray cast iron	Low tensile strength		180	200
		High tensile strength / austenite		245	350
	Nodular Cast Iron	Ferrite		155	400
		Pearlite		265	700
	Graphite Cast Iron GGV(CGI)			230	400
N	Forged aluminum alloy	Non-aging treatment		30	-
		Aging treatment		100	340
	Cast aluminium alloys	≤12 % silicon, Non-aging treatment		75	260
		≤12 % silicon, aging treatment		90	310
		＞12 % silicon, Non-aging treatment		130	450
	Magnesium alloy			70	250
	Copper and copper alloys (bronze / brass)	Non alloy, electrolytic copper		100	340
		Brass, bronze, red brass		90	310
		Copper alloy, short chip		110	380
		High strength Ampco alloy		300	1010
S	Iron base alloy	Iron base	Annealing	200	680
			Aging treatment	280	940
		Nickel or cobalt based	Annealing	250	840
			Aging treatment	350	1180
			Casting	320	1080
	Titanium alloys	Pure titanium		200	680
		α Phase and β Phase alloy,aging treatment		375	1260
		β Phase alloy		410	1400
	Tungsten alloy			300	1010
	Molybdenum alloy			300	1010
H	Hardened steel	Quenching and tempering		50HRC	
		Quenching and tempering		55HRC	
		Quenching and tempering		60HRC	
	Hardened cast steel	Quenching and tempering		50HRC	

M145-2ES，M145-3ES，M145-3EL　　Shoulder milling



Cutting speed Vc(m/min)	fz[mm/tooth] End mill diameter (mm)								
	2	4	6	8	10	12	14	16	20
150~200	0.025	0.040	0.055	0.065	0.090	0.110	0.120	0.140	0.160
120~150	0.025	0.040	0.055	0.065	0.090	0.110	0.120	0.140	0.160
150~200	0.025	0.040	0.055	0.065	0.090	0.110	0.120	0.140	0.160
120~150	0.025	0.040	0.055	0.065	0.090	0.110	0.120	0.140	0.160
120~150	0.025	0.040	0.055	0.065	0.090	0.110	0.120	0.140	0.160
150~170	0.025	0.040	0.055	0.065	0.090	0.110	0.120	0.140	0.160
120~150	0.025	0.040	0.055	0.065	0.090	0.110	0.120	0.140	0.160
120~150	0.025	0.040	0.055	0.065	0.090	0.110	0.120	0.140	0.160
120~150	0.025	0.040	0.055	0.065	0.090	0.110	0.120	0.140	0.160