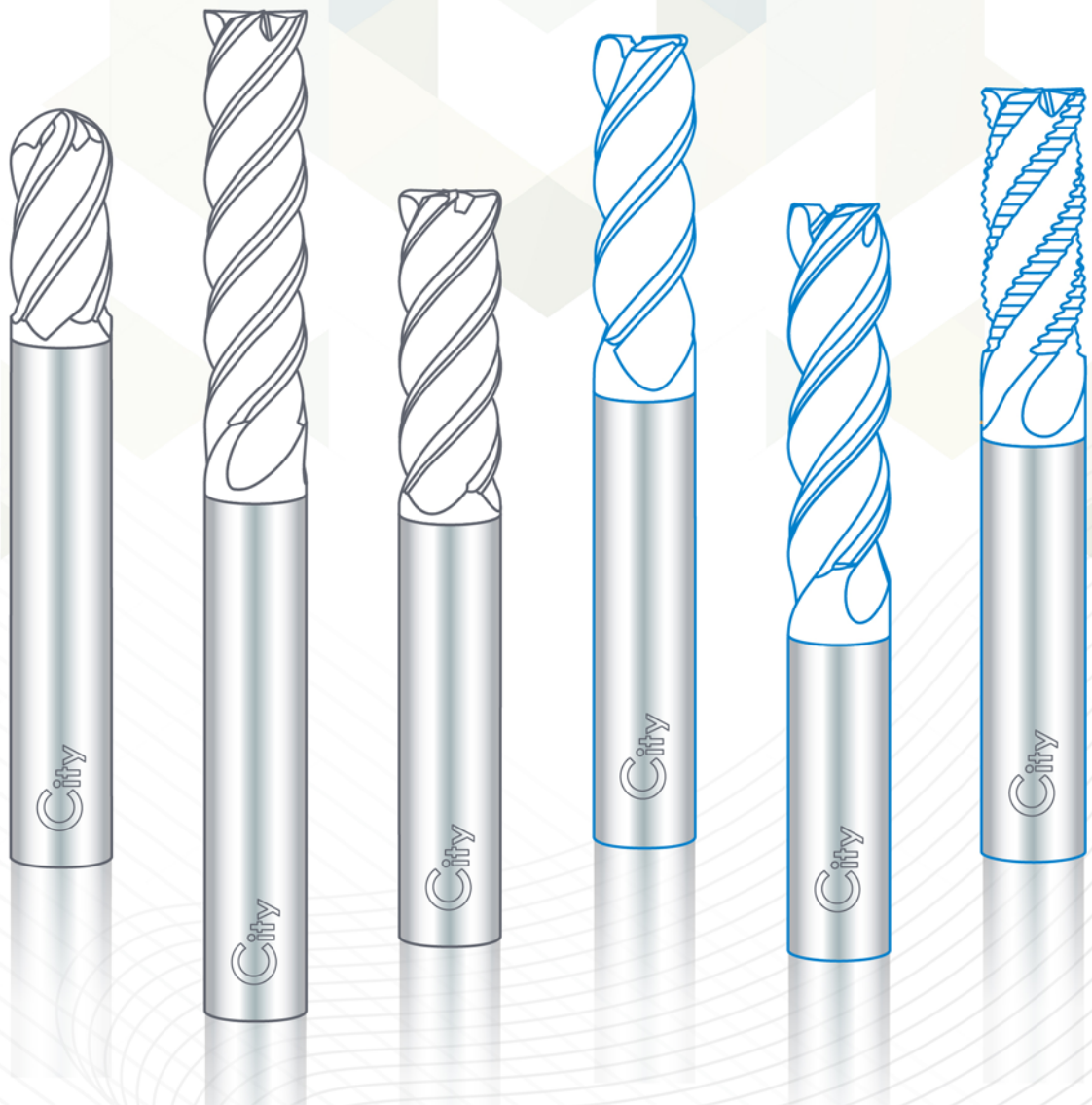




Solid carbide End Mills

— Inch Series —



About Us

Found in **1986**, **City Tools** is a leading solid carbide cutting tool manufacturer located in Taiwan.

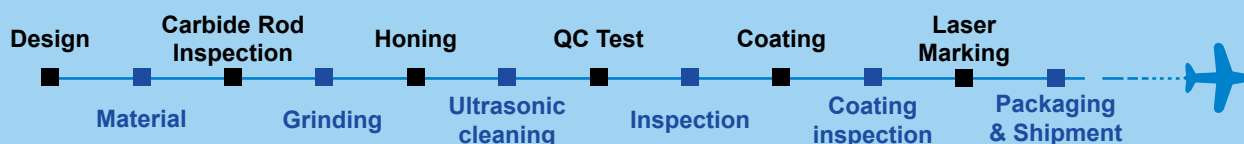
Our cutting tools are highly regarded in various industries such as Aerospace, Medical, Automotive, Electronic, Mechanical parts, Mold & Die, Woodworking tools, and Non-Metal processing applications.

We take pride in being **ISO9001:2000** certified, demonstrating our commitment to quality. By utilizing production equipment, including top-of-the-line CNC grinders and inspection machines from Germany, we ensure the precision and excellence quality of our tools.

To guarantee the quality assurance of each end mill, we conduct thorough inspections on 100% of our products during the production process. This meticulous attention to detail ensures that our customers receive cutting tools of the highest quality.



Manufacturing



Walter Grinding Machine

Production | *Ensure accuracy quality tools and Increase productivity*



Quality Management

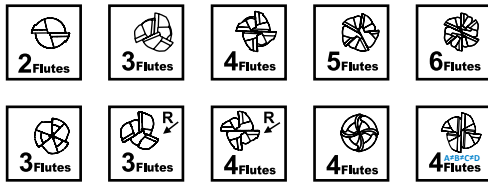
Full inspection on each tool with precised accuracy

| *100% comprehensive inspection with precised accuracy*

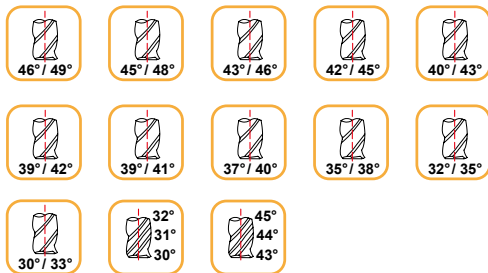


Icon Guide

Type of Variable Pitch



Variable helix angle



Honing Process



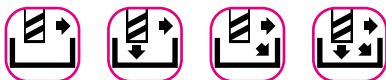
Type of cutting edge



IE



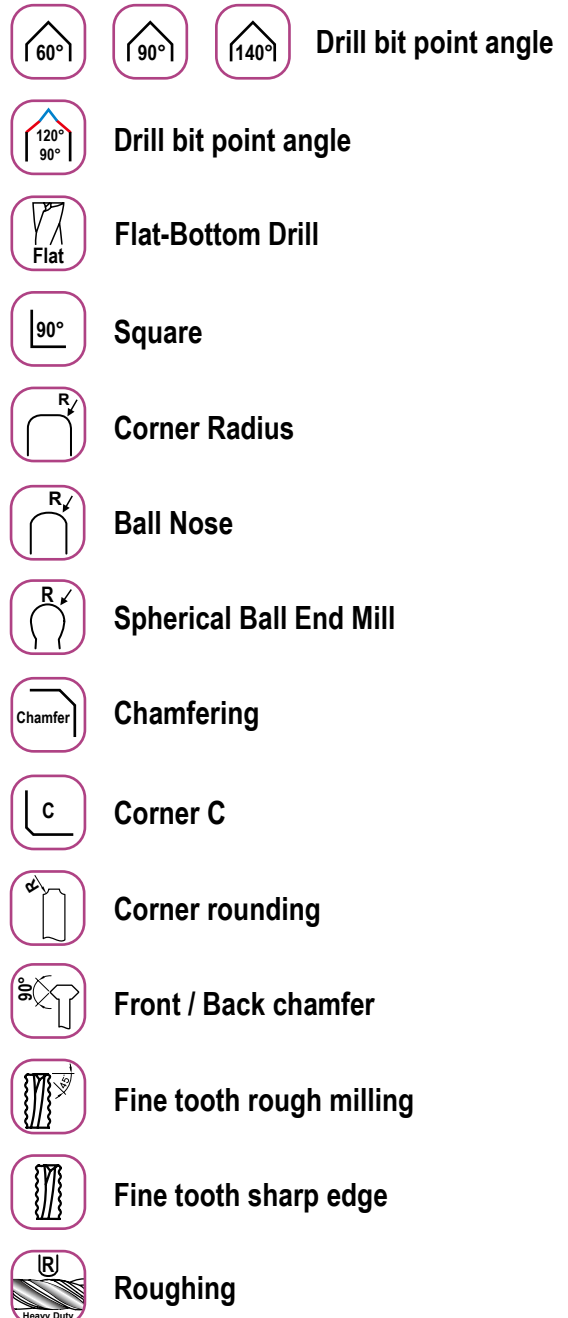
Processing direction



Work piece material hardness



Angle & Type of Cutting Edge



Icon Guide

Type of Coating



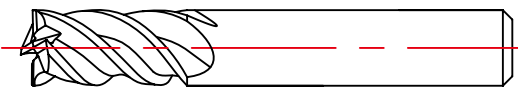
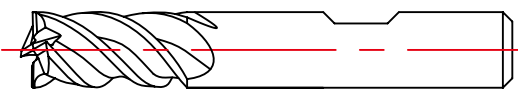
Code	Name	Oxidation Temperature	Surface Hardness(Hv)	Coefficient of Friction	Coating Thickness(μm)
TA	AlTiCrN	900°C	3200	0.5	0.4~0.4
TN	TiAlN	800°C	2600	0.4	0.4~0.4
TB	AlTiSiN-B	1100°C	3500	0.45	0.4~0.4
TO	AlTiSiN	1000°C	3200	0.45	0.4~0.4
Z3	AlTiSiZrN	1000°C	3000	0.4	0.4~0.4
DLC	Diamod	550°C	2500	0.1	0.8
TS	TA-C	1100°C	5500	0.1	0.1~1

※ Actual coating color may have slight difference due to coating temperature.

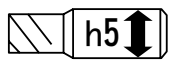
Solid Carbide Material

icon	Grade	Grain size	Cobalt	Hardness
	Ultrafine Micro Grain Carbide	0.2um~0.3um	8.2%	HRA93.7
	Ultra Micro Grain Carbide	0.4um~0.5um	12%	HRA92.7
	Super Micro Grain Carbide	0.6um~0.8um	10%	HRA92.3
	High Speed Steel	---	8%	HRC66~68

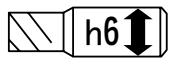
Optional Weldon Shank HB, HE Design

Form HA, plain	
Form HB, with drive flat	

High Precision Shank Tolerance



The h5 high precision tolerance, optimum concentricity and runout for precision chucks.



h6 high precision tolerance for HSS series, optimum concentricity and runout for precision chucks.

Type of cutting edge



Cutting Edge with Protection:

The cutting edge with protection mean a gashland on sharp edge to reduce sharpness which reducing edge chipping with longer tool life.



Sharp Edge:

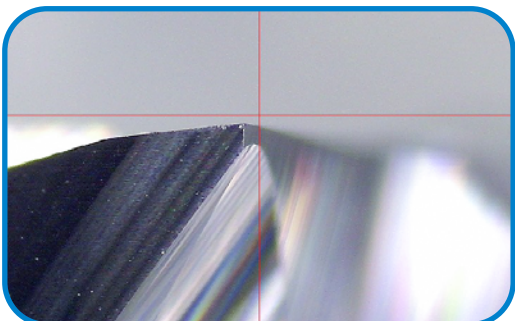
The sharp edge blade is used for cleaning out the workpiece on pin corners, which was remained on workpiece by tool with gashland.

Honing Process

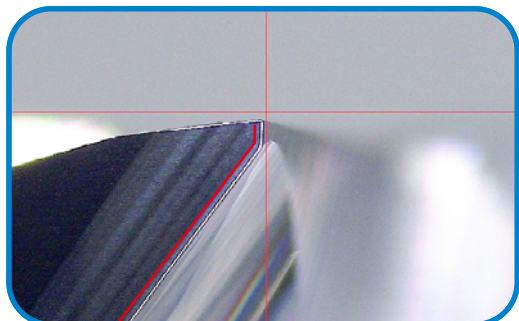
The honing process creates a micro R on the edge, it's enable to reduce chipping, enhancing coating adhesion and prolonging tool life.



without honing



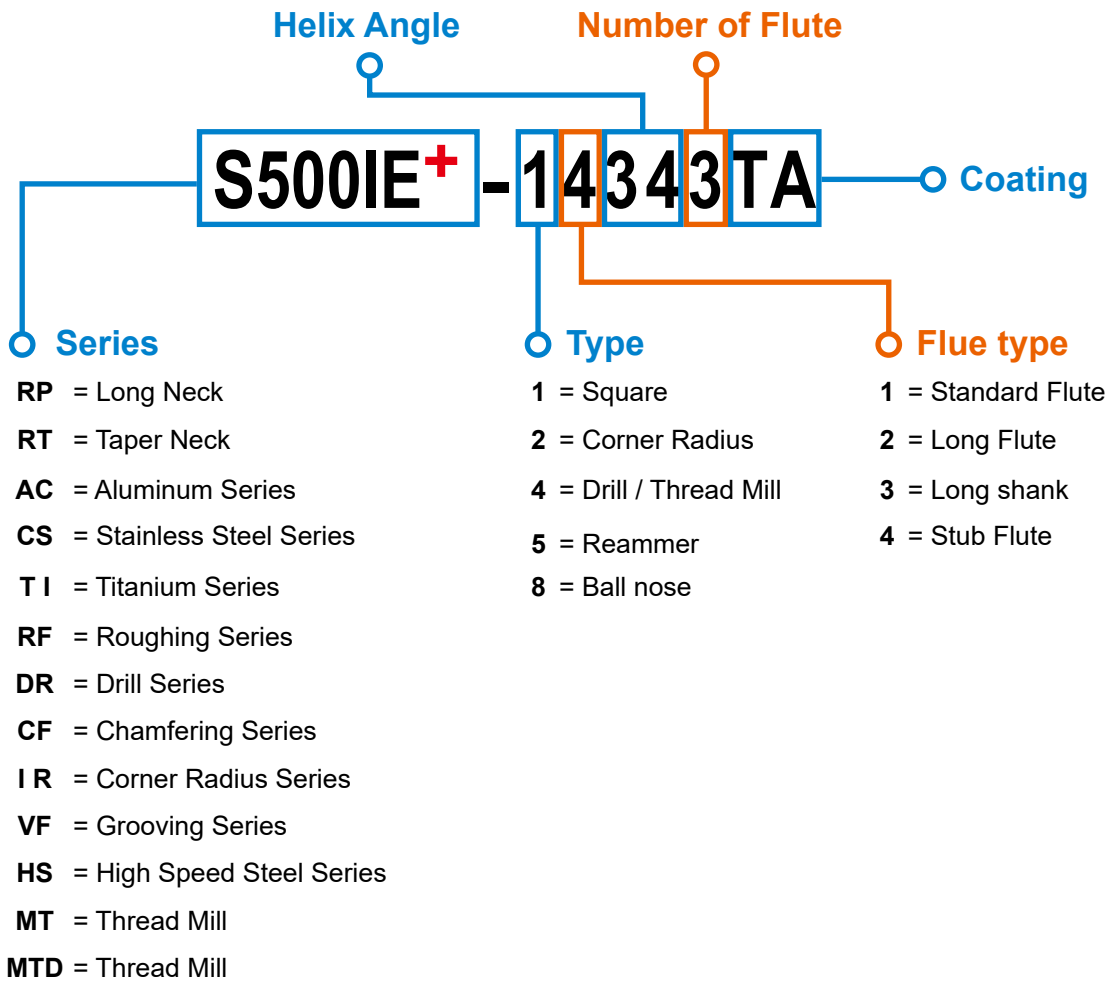
with honing



Material CHART

ISO	Group	Material	Tensile Strength N/mm2	Hardness HB
P	G1	Non-alloyed Steel, cast steel, free cutting steel	420 - 848	125 - 300
	G2	<24HRC Low-alloyed Steel, cast steel	600 - 1200	200 - 300
	G3	<30HRC Hi-alloyed Steel, cast steel, tool steel	680-1100	200- 325
M	G4	Stainless Steel, cast steel	600 - 820	180 - 240
K	G5	Gray Cast Iron, Ductile cast iron, Malleable cast iron		130 - 260
N	G6	Aluminium		60 - 130
	G7	Copper		90 - 110
	G8	Plastics, Hard rubber		
	G9	FRP CFRP Composite Material		
	G10	Graphite		
S	G11	High Temp Alloys		200 - 280
	G12	Nickel		320 - 350
	G13	Titanium	400 - 1,050	
H	G14	30-38HRC Hardened Steel		
	G15	38-48HRC Hardened Steel		
	G16	48-56HRC Hardened Steel		
	G17	56-65HRC Hardened Steel		

Coding Principle



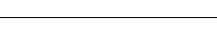
S500IE+-11434TA

I = Uneven flute
E = Variable helix angle

AC100IER+-11433TS

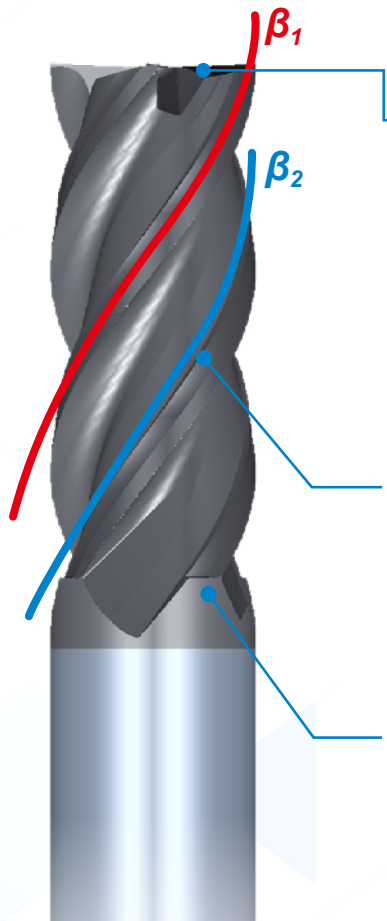
R = Heavy Duty Operation

INDEX

Appearance	Code No	Description	Pg
	S500IE ⁺ -11354TA	4-Flute / Square End Mill Variable Pitch / Variable Helix 35°/38°	10~11
	S500IE ⁺ -11434TA	4-Flute / Square End Mill - 3xD Variable Pitch / Variable Helix 43°/46°	12~13
	S500IE ⁺ -12434TA	4-Flute / Square End Mill - 4xD Variable Pitch / Variable Helix 43°/46°	14~15
	S500IE ⁺ -21434TA	4-Flute / Corner Radius - 3xD Variable Pitch / Variable Helix 43°/46°	16~17
	S500IE ⁺ -81354TA	4-Flute / Ball End - 2xD Variable Pitch / Variable Helix 35°/38°	18~19
	S500E ⁺ -11302TA	2-Flute / Square End Mill - 2.5xD Variable Helix 30°/33°	20~21
	S500E ⁺ -81302TA	2-Flute / Ball End - 2.5xD Variable Helix 30°/33°	22~23
	S500E ⁺ -11303TA	3-Flute / Square End Mill - 2.5xD Variable Helix 30°/31°/32°	24~25
	S500E ⁺ -81303TA	3-Flute / Ball End - 2.5xD Variable Helix 30°/31°/32°	26~27
	RF100IE ⁺ -11394TN	4-Flute / Chip breaker - Roughing End Mill - 2.5xD Variable Pitch / Variable Helix 39°/41°	28~29
	AC100IER ⁺ -11433TS	3-Flute / Aluminum / Square - 3xD Variable Pitch / Variable Helix 43°/44°/45°	30~31
	AC100IE ⁺ -21433TS	3-Flute / Aluminum / Corner Radius - 3xD Variable Pitch / Variable Helix 43°/44°/45°	32~33
	AC100E ⁺ -81432TS	2-Flute / Aluminum / Ball End - 3xD Variable Helix 43°/46°	34~35
	CS100IE ⁺ -11404Z3	4-Flute / Stainless Steel / Square - 2.5xD Variable Pitch / Variable Helix 40°/43°	36~37
	CS100IE ⁺ -21404Z3	4-Flute / Stainless Steel / Corner Radius - 2.5xD Variable Pitch / Variable Helix 40°/43°	38~39
	CS100IE ⁺ -81354Z3	4-Flute / Stainless Steel / Ball End - 2xD Variable Pitch / Variable Helix 35°/38°	40~41
	TI100IE ⁺ -11454Z3	4-Flute / Titanium / Square - 2.5xD Variable Pitch / Variable Helix 45°/48°	42~43
	TI100IE ⁺ -21454Z3	4-Flute / Titanium / Corner Radius - 2.5xD Variable Pitch / Variable Helix 45°/48°	44~45
	TI100IE ⁺ -81374Z3	4-Flute / Titanium / Ball End - 2xD Variable Pitch / Variable Helix 37°/40°	46~47

Anti-Vibration High Speed Cutting

**Ideal for Mild steels, Cast Irons,
Hardened steels with extended tool life.**

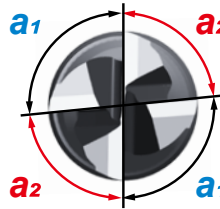


$\beta_1 \neq \beta_2$

Variable Helix Angle

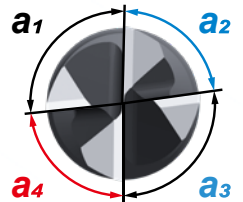
Anti-Vibration, Providing smooth and steady chip evaluation.

**Unique coating for wear
reduction and heat resistance.**



$a_1 \neq a_2$

Uneven Flute



$a_1 \neq a_2 \neq a_3 \neq a_4$

Optional Design,
available to order

This series is mainly focus on high speed cutting in roughing and semi-finishing process on hardness material <HRC55.

Special & Custom Tooling Services

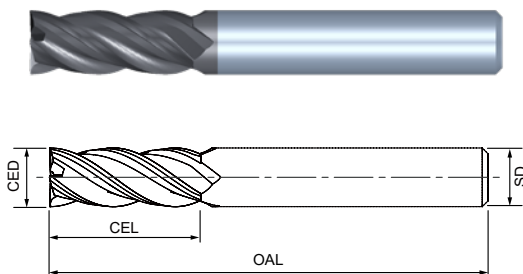
Customized acceptable !

Special Sizes, Cutting length, OAL, Helix angle and Coating types
are available upon request

SMG Carbide - Anti-Vibration Square End Mill

S500IE⁺ - 11354TA

- ♦ Square End Mills - 4-Flute
- ♦ Variable Pitch / Variable Helix 35° / 38°



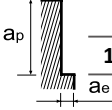
(unit : inch)

Code No.	CED	CEL	SD	OAL	Flute
S500IE ⁺ -11354TA	1/8	1/4	1/8	1-1/2	4
		3/8	1/8	1-1/2	
	3/16	3/8	3/16	2	
		5/8	3/16	2	
	1/4	1/2	1/4	2-1/2	
		3/4	1/4	2-1/2	
	5/16	1/2	5/16	2-1/2	
		13/16	5/16	2-1/2	
	3/8	5/8	3/8	2-1/2	
		1	3/8	3	
	7/16	7/8	7/16	2-3/4	
		1-1/8	7/16	2-3/4	
	1/2	1	1/2	3-1/4	
		1-1/4	1/2	3-1/4	
	5/8	1-1/4	5/8	3-1/2	
		1-1/2	5/8	3-1/2	
	3/4	1-1/2	3/4	4	
		1-5/8	3/4	4	

*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

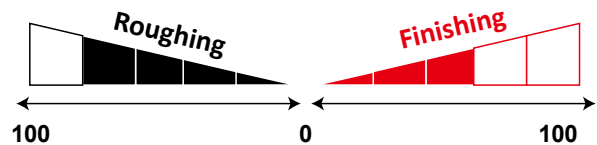
Recommended Cutting Condition

Side Milling

Work Material	Alloyed Steel 25~35HRC		Hardened Steel 35~45HRC		Hardened Steel 45~55HRC		Gray CastIron Malleable cast iron													
Cutting Condition	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min												
CED	a _p :1.5D	a _e :0.2D	a _p :1.5D	a _e :0.2D	a _p :1.5D	a _e :0.2D	a _p :1.5D	a _e :0.2D												
1/8	11,000	27.6	9,500	19.7	9,000	15.8	11,000	27.6												
3/16	7,600	31.5	6,600	21.7	6,100	18.5	7,600	31.5												
1/4	6,000	35.5	5,400	25.6	4,800	20.5	6,000	35.5												
5/16	4,800	36.7	4,200	25.6	3,800	20.5	4,800	36.7												
3/8	3,800	35.1	3,400	25.6	3,200	20.5	3,800	35.1												
7/16	3,350	33.9	3,100	23.6	2,800	18.5	3,350	33.9												
1/2	3,000	32.7	2,900	19.7	2,500	15.7	3,000	32.7												
5/8	2,400	24.5	2,200	15.7	1,900	12.6	2,400	24.5												
3/4	1,900	21.7	1,800	11.0	1,500	8.7	1,900	21.7												
Depth of cut			<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.2D</td></tr></table>		a _p	a _e	1.5D	0.2D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.2D</td></tr></table>		a _p	a _e	1.5D	0.2D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.2D</td></tr></table>		a _p	a _e	1.5D	0.2D
					a _p	a _e														
					1.5D	0.2D														
a _p	a _e																			
1.5D	0.2D																			
a _p	a _e																			
1.5D	0.2D																			

Work Material

P			K	H		
G1	G2	G3	G5	G14	G15	G16
●	●	●	●	●	●	○

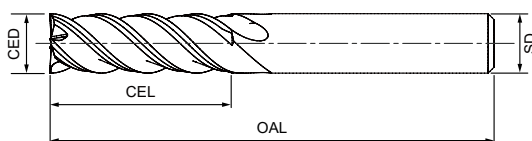


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Square End Mill

S500IE⁺ - 11434TA

- ♦ Square - 4-Flute / 3xD Cutting Length
- ♦ Variable Pitch / Variable Helix 43° / 46°



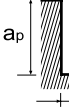
(unit : inch)

Code No.	CED	CEL	SD	OAL	Flute
S500IE ⁺ -11434TA	1/8	3/8	1/8	1-1/2	4
	3/16	9/16	3/16	2	
	1/4	3/4	1/4	2-1/2	
	5/16	15/16	5/16	2-1/2	
	3/8	1-1/8	3/8	3	
	7/16	1-5/16	7/16	3-1/4	
	1/2	1-1/2	1/2	3-1/4	
	5/8	1-7/8	5/8	3-3/4	
	3/4	2-1/4	3/4	4-1/2	

*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

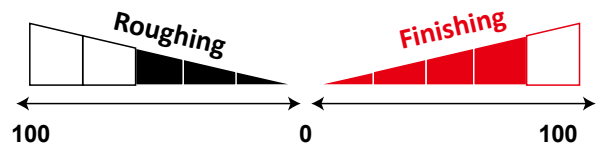
Recommended Cutting Condition

Side Milling

Work Material	Alloyed Steel 25~35HRC		Hardened Steel 35~45HRC		Hardened Steel 45~55HRC		Gray CastIron Malleable cast iron													
Cutting Condition	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min												
CED	a_p :1.5D	a_e :0.2D	a_p :1.5D	a_e :0.2D	a_p :1.5D	a_e :0.2D	a_p :1.5D	a_e :0.2D												
1/8	11,000	27.6	9,500	19.7	9,000	15.8	11,000	27.6												
3/16	7,600	31.5	6,600	21.7	6,100	18.5	7,600	31.5												
1/4	6,000	35.5	5,400	25.6	4,800	20.5	6,000	35.5												
5/16	4,800	36.7	4,200	25.6	3,800	20.5	4,800	36.7												
3/8	3,800	35.1	3,400	25.6	3,200	20.5	3,800	35.1												
7/16	3,350	33.9	3,100	23.6	2,800	18.5	3,350	33.9												
1/2	3,000	32.7	2,900	19.7	2,500	15.7	3,000	32.7												
5/8	2,400	24.5	2,200	15.7	1,900	12.6	2,400	24.5												
3/4	1,900	21.7	1,800	11.0	1,500	8.7	1,900	21.7												
Depth of cut			<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.2D</td></tr></table>		a_p	a_e	1.5D	0.2D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.2D</td></tr></table>		a_p	a_e	1.5D	0.2D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.2D</td></tr></table>		a_p	a_e	1.5D	0.2D
					a_p	a_e														
					1.5D	0.2D														
a_p	a_e																			
1.5D	0.2D																			
a_p	a_e																			
1.5D	0.2D																			

Work Material

P			K	H		
G1	G2	G3	G5	G14	G15	G16
●	●	●	○	●	●	●

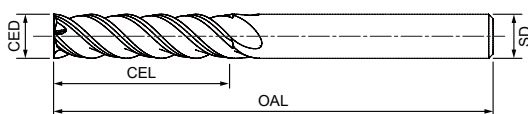


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Long Flute Type End Mill

S500IE⁺ - 12434TA

- ♦ Square - 4-Flute / 4xD Long Cutting Length
- ♦ Variable Pitch / Variable Helix 43° / 46°



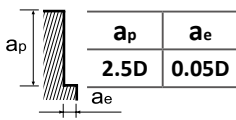
(unit : inch)

Code No.	CED	CEL	SD	OAL	Flute
S500IE ⁺ -12434TA	1/8	1/2	1/8	1-1/2	4
	3/16	3/4	3/16	2-1/2	
	1/4	1	1/4	3	
	5/16	1-1/4	5/16	3	
	3/8	1-1/2	3/8	3-1/2	
	7/16	1-3/4	7/16	3-1/2	
	1/2	2	1/2	4	
	5/8	2-1/2	5/8	5	
	3/4	3	3/4	5	

*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

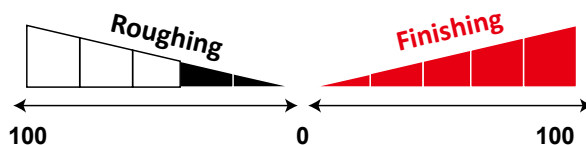
Recommended Cutting Condition

Side Milling

Work Material	Alloyed Steel 25~35HRC		Hardened Steel 35~45HRC		Hardened Steel 45~55HRC		Gray CastIron Malleable cast iron													
Cutting Condition	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min												
CED	a_p :2.5D	a_e :0.05D	a_p :2.5D	a_e :0.05D	a_p :2.5D	a_e :0.05D	a_p :2.5D	a_e :0.05D												
1/8	8,800	22.1	7,600	15.8	7,200	12.6	8,800	22.1												
3/16	6,080	25.2	5,280	21.7	4,880	18.5	6,080	25.2												
1/4	4,800	28.4	4,320	25.6	3,840	20.5	4,800	28.4												
5/16	3,840	29.3	3,360	25.6	3,040	20.5	3,840	29.3												
3/8	3,040	28.1	2,720	25.6	2,560	20.5	3,040	28.1												
7/16	2,680	27.1	2,480	23.6	2,240	18.5	2,680	27.1												
1/2	2,400	26.2	2,320	19.7	2,000	15.7	2,400	26.2												
5/8	1,920	19.6	1,760	15.7	1,520	12.6	1,920	19.6												
3/4	1,520	17.4	1,440	11.0	1,200	8.7	1,520	17.4												
Depth of cut			<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>2.5D</td><td>0.05D</td></tr></table>		a_p	a_e	2.5D	0.05D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>2.5D</td><td>0.05D</td></tr></table>		a_p	a_e	2.5D	0.05D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>2.5D</td><td>0.05D</td></tr></table>		a_p	a_e	2.5D	0.05D
					a_p	a_e														
2.5D	0.05D																			
a_p	a_e																			
2.5D	0.05D																			
a_p	a_e																			
2.5D	0.05D																			

Work Material

P			K	H		
G1	G2	G3	G5	G14	G15	G16
●	●	●	○	●	●	●

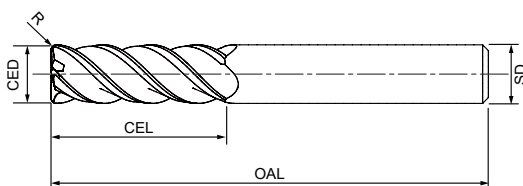


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Corner Radius End Mill

S500IE⁺ - 21434TA

- ◆ Corner Radius - 4-Flute / 3xD Cutting Length
- ◆ Variable Pitch / Variable Helix 43°/46°



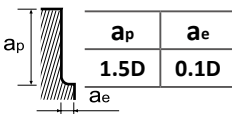
h5 (unit : inch)

Code No.	CED	CEL	SD	OAL	R	Flute
S500IE ⁺ -21434TA	1/8	3/8	1/8	1-1/2	0.010	4
					0.015	
	3/16	9/16	3/16	2	0.010	
					0.015	
	1/4	3/4	1/4	2-1/2	0.010	
					0.015	
	5/16	15/16	5/16	2-1/2	0.010	
					0.020	
	3/8	1-1/8	3/8	3	0.010	
					0.020	
	1/2	1-1/2	1/2	3-1/4	0.010	
					0.020	
	5/8	1-7/8	5/8	3-3/4	0.010	
					0.020	
	3/4	2-1/4	3/4	4-1/2	0.010	
					0.020	

*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

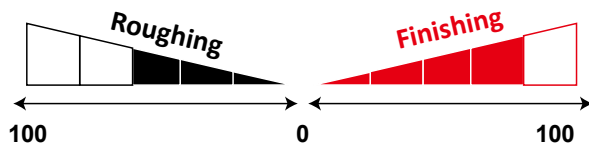
Recommended Cutting Condition

Side Milling

Work Material	Alloyed Steel 25~35HRC		Hardened Steel 35~45HRC		Hardened Steel 45~55HRC		Gray CastIron Malleable cast iron													
Cutting Condition	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min												
CED	a_p :1.5D	a_e :0.2D	a_p :1.5D	a_e :0.2D	a_p :1.5D	a_e :0.2D	a_p :1.5D	a_e :0.2D												
1/8	11,000	26.2	9,500	20.7	9,000	16.6	11,000	26.2												
3/16	7,600	30	6,600	21.7	6,100	18.5	7,600	30												
1/4	5,800	33.7	5,400	25.6	4,800	20.5	5,800	33.7												
5/16	4,800	34.8	4,200	25.6	3,800	20.5	4,800	34.8												
3/8	3,800	33.3	3,400	25.6	3,200	20.5	3,800	33.3												
1/2	3,000	31.1	2,900	23.6	2,500	18.5	3,000	31.1												
5/8	2,400	23.2	2,200	19.7	1,900	15.7	2,400	23.2												
3/4	1,900	20.6	1,800	15.7	1,500	12.6	1,900	20.6												
Depth of cut			<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.05D</td></tr></table>		a_p	a_e	1.5D	0.05D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.03D</td></tr></table>		a_p	a_e	1.5D	0.03D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.1D</td></tr></table>		a_p	a_e	1.5D	0.1D
					a_p	a_e														
1.5D	0.05D																			
a_p	a_e																			
1.5D	0.03D																			
a_p	a_e																			
1.5D	0.1D																			

Work Material

P			K	H		
G1	G2	G3	G5	G14	G15	G16
●	●	●	○	●	●	●

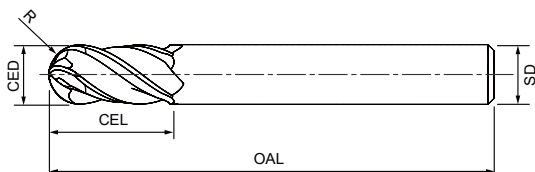
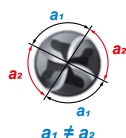


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Ball End Mill

S500IE⁺ - 81354TA

- ♦ Ball Nose - 4-Flute / 2xD Cutting Length
- ♦ Variable Pitch / Variable Helix 35°/38°



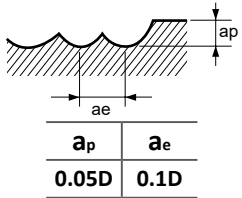
(unit : inch)

Code No.	Radius	CEL	SD	OAL	Flute
S500IE ⁺ -81354TA	1/8	1/4	1/8	1-1/2	4
	3/16	3/8	3/16	2	
	1/4	1/2	1/4	2-1/2	
	5/16	5/8	5/16	2-1/2	
	3/8	3/4	3/8	3	
	1/2	1	1/2	3-1/4	
	5/8	1-1/4	5/8	3-1/2	
	3/4	1-1/2	3/4	4	

*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

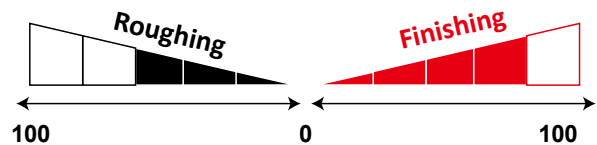
Recommended Cutting Condition

General Milling

Work Material	Alloyed Steel 25~35HRC		Hardened Steel 35~45HRC		Hardened Steel 45~55HRC		Gray CastIron Malleable cast iron													
Cutting Condition	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min												
R	$a_p:0.05D$	$a_e:0.1D$	$a_p:0.05D$	$a_e:0.1D$	$a_p:0.05D$	$a_e:0.1D$	$a_p:0.05D$	$a_e:0.1D$												
1/8 R	12,000	90.6	10,200	63.0	9,180	50.4	12,000	90.6												
3/16 R	8,300	74.9	7,000	21.7	6,300	18.5	8,300	74.9												
1/4 R	6,500	82.7	5,500	25.6	4,950	20.5	6,500	82.7												
5/16 R	5,200	85.1	4,400	25.6	3,960	20.5	5,200	85.1												
3/8 R	4,300	81.9	3,600	25.6	3,240	20.5	4,300	81.9												
1/2 R	3,200	74.9	2,700	23.6	2,430	18.5	3,200	74.9												
5/8 R	2,500	56.7	2,100	19.7	1,890	15.7	2,500	56.7												
3/4 R	2,000	45.3	1,700	15.7	1,530	12.6	2,000	45.3												
Depth of cut			<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>0.05D</td><td>0.1D</td></tr></table>		a_p	a_e	0.05D	0.1D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>0.05D</td><td>0.1D</td></tr></table>		a_p	a_e	0.05D	0.1D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>0.05D</td><td>0.1D</td></tr></table>		a_p	a_e	0.05D	0.1D
a_p	a_e																			
0.05D	0.1D																			
a_p	a_e																			
0.05D	0.1D																			
a_p	a_e																			
0.05D	0.1D																			

Work Material

P			K	H		
G1	G2	G3	G5	G14	G15	G16
●	●	●	●	●	●	○

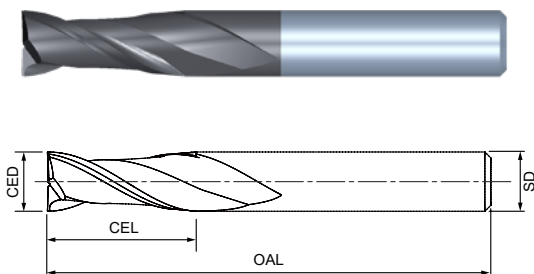


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Square End Mill

S500E⁺ - 11302TA

- ♦ Square - 2-Flute / 2.5xD Cutting Length
- ♦ Variable Helix Angle 30°/33°



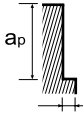
(unit : inch)

Code No.	CED	CEL	SD	OAL	Flute
S500E ⁺ -11302TA	1/8	5/16	1/8	1-1/2	2
	3/16	15/32	3/16	2	
	1/4	5/8	1/4	2-1/2	
	5/16	25/32	5/16	2-1/2	
	3/8	15/16	3/8	3	
	1/2	1-1/4	1/2	3-1/4	
	5/8	1-9/16	5/8	3-1/2	
	3/4	1-7/8	3/4	4	

*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

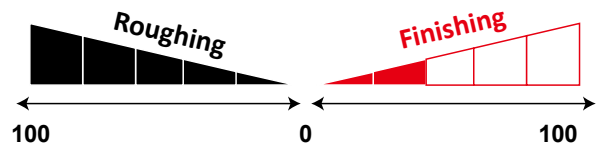
Recommended Cutting Condition

Side Milling

Work Material	Alloyed Steel 25~35HRC		Hardened Steel 35~45HRC		Hardened Steel 45~55HRC		Gray CastIron Malleable cast iron													
Cutting Condition	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min												
CED	a _p :1.5D	a _e :0.2D	a _p :1.5D	a _e :0.2D	a _p :1.5D	a _e :0.2D	a _p :1.5D	a _e :0.2D												
1/8	8,200	15	6,500	9.9	5,500	6.7	8,200	15.0												
3/16	5,500	17	4,300	21.7	3,600	18.5	5,500	17												
1/4	4,100	17.4	3,200	25.6	2,800	20.5	4,100	17.4												
5/16	3,300	17.4	2,600	25.6	2,200	20.5	3,300	17.4												
3/8	2,700	17	2,100	25.6	1,800	20.5	2,700	17												
1/2	2,000	15.8	1,600	23.6	1,400	18.5	2,000	15.8												
5/8	1,600	13.8	1,200	19.7	1,050	15.7	1,600	13.8												
3/4	1,300	10.7	1,000	15.7	850	12.6	1,300	10.7												
Depth of cut			<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.2D</td></tr></table>		a _p	a _e	1.5D	0.2D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.2D</td></tr></table>		a _p	a _e	1.5D	0.2D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.2D</td></tr></table>		a _p	a _e	1.5D	0.2D
					a _p	a _e														
1.5D	0.2D																			
a _p	a _e																			
1.5D	0.2D																			
a _p	a _e																			
1.5D	0.2D																			

Work Material

P			K	H		
G1	G2	G3	G5	G14	G15	G16
●	●	●	●	●	●	○

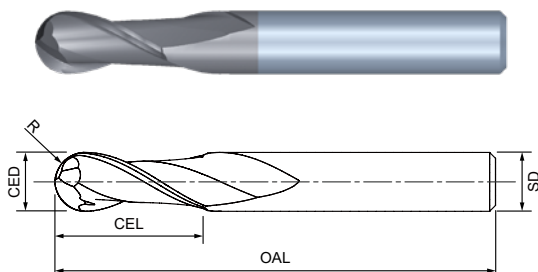


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Ball End Mill

S500E⁺ - 81302TA

- ♦ Ball Nose - 2-Flute / 2.5xD Cutting Length
- ♦ Variable Helix Angle 30°/33°



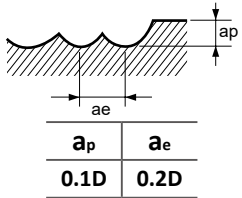
(unit : inch)

Code No.	Radius	CEL	SD	OAL	Flute
S500E ⁺ -81302TA	1/8	5/16	1/8	1-1/2	2
	3/16	15/32	3/16	2	
	1/4	5/8	1/4	2-1/2	
	5/16	25/32	5/16	2-1/2	
	3/8	15/16	3/8	3	
	1/2	1-1/4	1/2	3-1/4	
	5/8	1-9/16	5/8	3-1/2	
	3/4	1-7/8	3/4	4	

*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

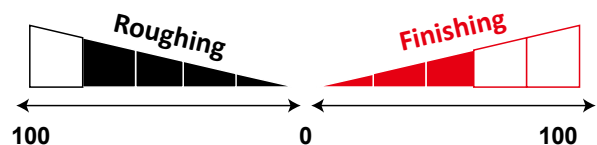
Recommended Cutting Condition

General Milling

Work Material	Alloyed Steel 25~35HRC		Hardened Steel 35~45HRC		Hardened Steel 45~55HRC		Gray CastIron Malleable cast iron																	
Cutting Condition	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min																
R	a_p :0.1D	a_e :0.2D	a_p :0.1D	a_e :0.2D	a_p :0.1D	a_e :0.2D	a_p :0.1D	a_e :0.2D																
1/8 R	12,000	27.6	11,000	18.9	9,200	15.8	12,000	27.6																
3/16 R	9,300	31.9	7,800	21.7	6,500	18.5	9,300	31.9																
1/4 R	7,000	31.9	5,800	25.6	4,700	20.5	7,000	31.9																
5/16 R	5,600	31.9	4,600	25.6	3,800	20.5	5,600	31.9																
3/8 R	4,600	31.9	3,800	25.6	3,100	20.5	4,600	31.9																
1/2 R	3,500	31.9	2,900	23.6	2,380	18.5	3,500	31.9																
5/8 R	2,700	31.5	2,200	19.7	1,900	15.7	2,700	31.5																
3/4 R	2,200	30.8	1,800	15.7	1,500	12.6	2,200	30.8																
Depth of cut	 <table><tr><td>a_p</td><td>a_e</td></tr><tr><td>0.1D</td><td>0.2D</td></tr></table>		a_p	a_e	0.1D	0.2D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>0.1D</td><td>0.2D</td></tr></table>		a_p	a_e	0.1D	0.2D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>0.1D</td><td>0.2D</td></tr></table>		a_p	a_e	0.1D	0.2D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>0.1D</td><td>0.2D</td></tr></table>		a_p	a_e	0.1D	0.2D
a_p	a_e																							
0.1D	0.2D																							
a_p	a_e																							
0.1D	0.2D																							
a_p	a_e																							
0.1D	0.2D																							
a_p	a_e																							
0.1D	0.2D																							

Work Material

P			K	H		
G1	G2	G3	G5	G14	G15	G16
●	●	●	●	●	●	○

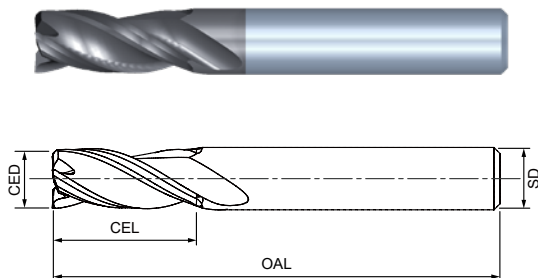


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Square End Mill

S500E⁺ - 11303TA

- ♦ Square - 3-Flute / 2.5xD Cutting Length
- ♦ Variable Helix Angle 30° /31° /32°



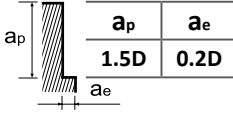
(unit : inch)

Code No.	CED	CEL	SD	OAL	Flute
S500E ⁺ -11303TA	1/8	5/16	1/8	1-1/2	3
	3/16	15/32	3/16	2	
	1/4	5/8	1/4	2-1/2	
	5/16	25/32	5/16	2-1/2	
	3/8	15/16	3/8	3	
	1/2	1-1/4	1/2	3-1/4	
	5/8	1-9/16	5/8	3-1/2	
	3/4	1-7/8	3/4	4	

*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

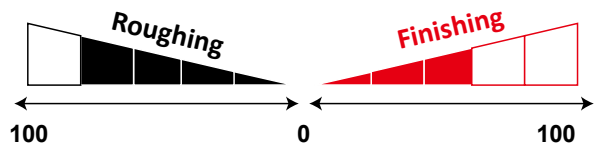
Recommended Cutting Condition

Side Milling

Work Material	Alloyed Steel 25~35HRC		Hardened Steel 35~45HRC		Hardened Steel 45~55HRC		Gray CastIron Malleable cast iron													
Cutting Condition	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min												
CED	a _p :1.5D	a _e :0.2D	a _p :1.5D	a _e :0.2D	a _p :1.5D	a _e :0.2D	a _p :1.5D	a _e :0.2D												
1/8	9,100	17.8	8,100	11.9	6,800	8.3	9,100	17.8												
3/16	6,300	20.1	5,700	21.7	5,100	18.5	6,300	20.1												
1/4	4,800	20.5	4,400	25.6	3,800	20.5	4,800	20.5												
5/16	3,900	20.5	3,500	25.6	3,100	20.5	3,900	20.5												
3/8	3,300	20.1	3,000	25.6	2,700	20.5	3,300	20.1												
1/2	2,400	18.9	2,200	23.6	1,900	18.5	2,400	18.9												
5/8	1,900	16.6	1,700	19.7	1,500	15.7	1,900	16.6												
3/4	1,500	12.6	1,320	15.7	1,200	12.6	1,500	12.6												
Depth of cut			<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.2D</td></tr></table>		a _p	a _e	1.5D	0.2D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.2D</td></tr></table>		a _p	a _e	1.5D	0.2D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.2D</td></tr></table>		a _p	a _e	1.5D	0.2D
					a _p	a _e														
					1.5D	0.2D														
a _p	a _e																			
1.5D	0.2D																			
a _p	a _e																			
1.5D	0.2D																			

Work Material

P			K	H		
G1	G2	G3	G5	G14	G15	G16
●	●	●	●	●	●	○

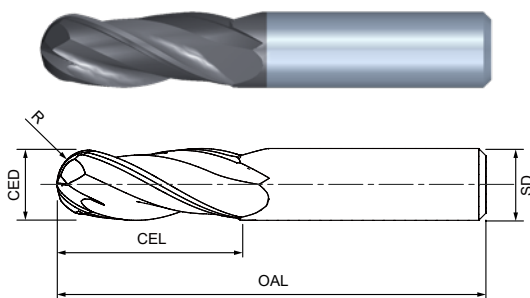


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Ball End Mill

S500E⁺ - 81303TA

- ♦ Ball Nose - 3-Flute / 2.5xD Cutting Length
- ♦ Variable Helix Angle 30° /31° /32°



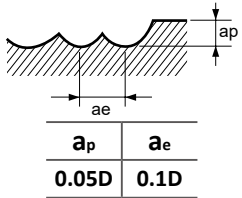
 h5 (unit : inch)

Code No.	Radius	CEL	SD	OAL	Flute
S500E ⁺ -81303TA	1/8	5/16	1/8	1-1/2	3
	3/16	15/32	3/16	2	
	1/4	5/8	1/4	2-1/2	
	5/16	25/32	5/16	2-1/2	
	3/8	15/16	3/8	3	
	1/2	1-1/4	1/2	3-1/4	
	5/8	1-9/16	5/8	3-1/2	
	3/4	1-7/8	3/4	4	

*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

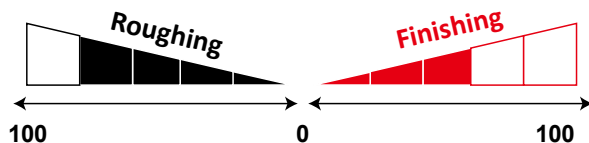
Recommended Cutting Condition

General Milling

Work Material	Alloyed Steel 25~35HRC		Hardened Steel 35~45HRC		Hardened Steel 45~55HRC		Gray CastIron Malleable cast iron													
Cutting Condition	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min												
R	a_p :0.05D	a_e :0.1D	a_p :0.05D	a_e :0.1D	a_p :0.05D	a_e :0.1D	a_p :0.05D	a_e :0.1D												
1/8 R	12,000	29.6	11,000	18.9	9,200	15.8	12,000	29.6												
3/16 R	9,300	34.3	7,800	21.7	6,500	18.5	9,300	34.3												
1/4 R	7,000	34.3	5,800	25.6	4,700	20.5	7,000	34.3												
5/16 R	5,600	34.3	4,600	25.6	3,800	20.5	5,600	34.3												
3/8 R	4,600	34.3	3,800	25.6	3,100	20.5	4,600	34.3												
1/2 R	3,500	34.3	2,900	23.6	2,380	18.5	3,500	34.3												
5/8 R	2,700	33.9	2,300	19.7	1,900	15.7	2,700	33.9												
3/4 R	2,200	22.1	1,900	15.7	1,500	12.6	2,200	22.1												
Depth of cut			<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>0.05D</td><td>0.1D</td></tr></table>		a_p	a_e	0.05D	0.1D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>0.05D</td><td>0.1D</td></tr></table>		a_p	a_e	0.05D	0.1D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>0.05D</td><td>0.1D</td></tr></table>		a_p	a_e	0.05D	0.1D
a_p	a_e																			
0.05D	0.1D																			
a_p	a_e																			
0.05D	0.1D																			
a_p	a_e																			
0.05D	0.1D																			

Work Material

P			K	H		
G1	G2	G3	G5	G14	G15	G16
●	●	●	●	●	●	○

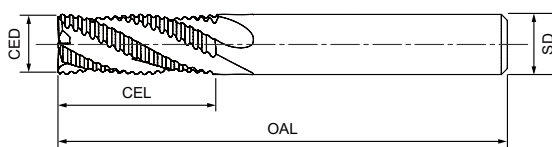


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Chip Breaker Roughing End Mill

RF100IE⁺ - 11394TN

- ♦ Chip Breaker Roughing End Mill
- ♦ Square - 4-Flute / 2.5xD Cutting Length
- ♦ Variable Pitch / Variable Helix 39° / 41°



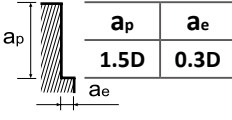
 (unit : inch)

Code No.	CED	CEL	SD	OAL	Flute
RF100IE ⁺ -11394TN	1/8	5/16	1/8	1-1/2	4
	3/16	15/32	3/16	2	
	1/4	5/8	1/4	2-1/2	
	5/16	25/32	5/16	2-1/2	
	3/8	15/16	3/8	3	
	1/2	1-1/4	1/2	3-1/4	
	5/8	1-9/16	5/8	3-1/2	
	3/4	1-7/8	3/4	4	

*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

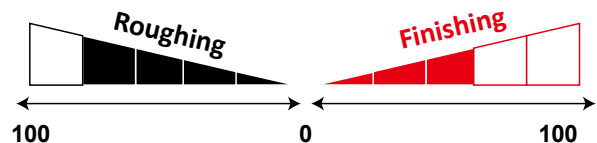
Recommended Cutting Condition

Side Milling

Work Material	Alloyed Steel 25~35HRC		Hardened Steel 35~45HRC		Hardened Steel 45~55HRC		Gray CastIron Malleable cast iron													
Cutting Condition	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min												
CED	a_p :1.5D	a_e :0.3D	a_p :1.5D	a_e :0.3D	a_p :1.5D	a_e :0.3D	a_p :1.5D	a_e :0.3D												
1/8	11,000	28.8	8,800	20.1	7,500	14.2	11,000	28.8												
3/16	8,000	32.7	6,400	21.7	5,400	18.5	8,000	32.7												
1/4	6,500	37.1	5,200	25.6	4,400	20.5	6,500	37.1												
5/16	5,200	38.2	4,160	25.6	3,500	20.5	5,200	38.2												
3/8	4,300	36.7	3,440	25.6	2,900	20.5	4,300	36.7												
1/2	3,200	33.9	2,560	23.6	2,100	18.5	3,200	33.9												
5/8	2,400	25.6	1,920	19.7	1,600	15.7	2,400	25.6												
3/4	1,800	22.5	1,440	15.7	1,200	12.6	1,800	22.5												
Depth of cut			<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.3D</td></tr></table>		a_p	a_e	1.5D	0.3D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.3D</td></tr></table>		a_p	a_e	1.5D	0.3D	<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>1.5D</td><td>0.3D</td></tr></table>		a_p	a_e	1.5D	0.3D
					a_p	a_e														
					1.5D	0.3D														
a_p	a_e																			
1.5D	0.3D																			
a_p	a_e																			
1.5D	0.3D																			

Work Material

P			K	H		
G1	G2	G3	G5	G14	G15	G16
●	●	●	●	●	●	○

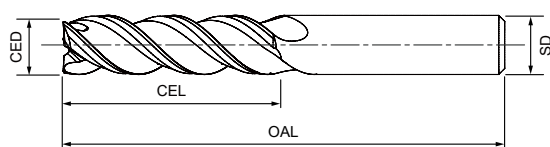
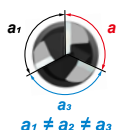


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration End Mill for Aluminum

AC100IER⁺ - 11433TS

- ♦ End Mill for Aluminum - Heavy Duty Roughing
- ♦ Square - 3-Flute / 3xD Cutting Length / Heavy Duty Roughing
- ♦ Variable Pitch / Variable Helix 43° / 44° / 45°



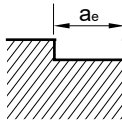
 (unit : inch)

Code No.	CED	CEL	SD	OAL	Flute
AC100IER ⁺ -11433TS	1/8	3/8	1/8	1-1/2	3
	3/16	9/16	3/16	2	
	1/4	3/4	1/4	2-1/2	
	5/16	15/16	5/16	2-1/2	
	3/8	1-1/8	3/8	3	
	1/2	1-1/2	1/2	3-1/4	
	5/8	1-7/8	5/8	3-3/4	
	3/4	2-1/4	3/4	4-1/2	

*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

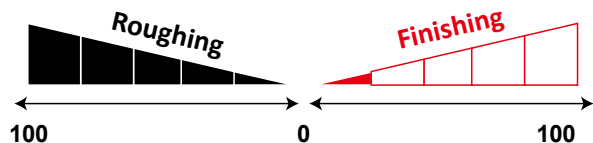
Recommended Cutting Condition

Side Milling

Work Material	Aluminum Alloy Side Milling		Copper Alloy Side Milling		Aluminum Alloy Slotting													
Cutting Condition	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min												
CED	a_p :1.5D	a_e :0.1D	a_p :1.5D	a_e :0.1D	a_p :0.5D	a_e :1.0D												
1/8	13,000	32.7	8,000	12.6	11,700	16.2												
3/16	8,900	36.3	5,300	21.7	9,000	18.5												
1/4	7,000	38.2	4,000	25.6	6,300	20.5												
5/16	5,600	38.2	3,200	25.6	5,040	20.5												
3/8	4,500	39.4	2,600	25.6	4,050	20.5												
1/2	3,300	38.6	2,000	23.6	3,000	18.5												
5/8	2,600	31.5	1,500	19.7	2,300	15.7												
3/4	2,150	25.6	1,250	15.7	1,900	12.6												
Depth of cut	 <table><tr><th>a_p</th><th>a_e</th></tr><tr><td>1.5D</td><td>0.1D</td></tr></table>		a_p	a_e	1.5D	0.1D	<table><tr><th>a_p</th><th>a_e</th></tr><tr><td>1.5D</td><td>0.1D</td></tr></table>		a_p	a_e	1.5D	0.1D	 <table><tr><th>a_p</th><th>a_e</th></tr><tr><td>0.5D</td><td>1.0D</td></tr></table>		a_p	a_e	0.5D	1.0D
a_p	a_e																	
1.5D	0.1D																	
a_p	a_e																	
1.5D	0.1D																	
a_p	a_e																	
0.5D	1.0D																	

Work Material

N	
G6	G7
●	●

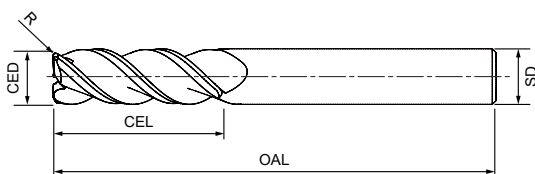
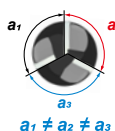


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Corner Radius End Mill for Aluminum

AC100IE⁺ - 21433TS

- ♦ End Mill for Aluminum
- ♦ Corner Radius - 3-Flute / 3xD Cutting Length
- ♦ Variable Pitch / Variable Helix 43° / 44° / 45°



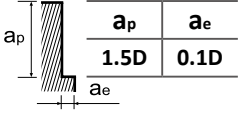
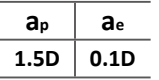
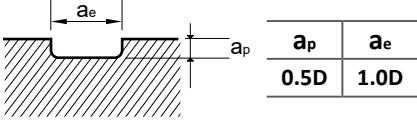
(unit : inch)

Code No.	CED	CEL	SD	OAL	R	Flute
AC100IE ⁺ -21433TS	1/8	3/8	1/8	1-1/2	0.010	3
					0.015	
	3/16	9/16	3/16	2	0.010	
					0.015	
	1/4	3/4	1/4	2-1/2	0.010	
					0.015	
	5/16	15/16	5/16	2-1/2	0.010	
					0.020	
	3/8	1-1/8	3/8	3	0.010	
					0.020	
	1/2	1-1/2	1/2	3-1/4	0.010	
					0.020	
	5/8	1-7/8	5/8	3-3/4	0.010	
					0.020	
	3/4	2-1/4	3/4	4-1/2	0.010	
					0.020	

*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

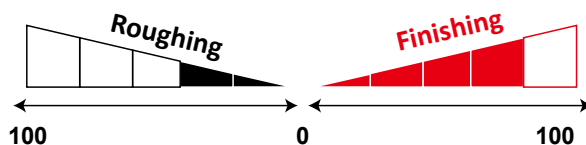
Recommended Cutting Condition

Side Milling

Work Material	Aluminum Alloy Side Milling		Copper Alloy Side Milling		Aluminum Alloy Slotting	
Cutting Condition	Speed RPM	Feed in/min	Speed RPM	Feed in/min	Speed RPM	Feed in/min
CED	$a_p:1.5D$	$a_e:0.1D$	$a_p:1.5D$	$a_e:0.1D$	$a_p:0.5D$	$a_e:1.0D$
1/8	13,000	34.3	8,000	12.6	11,700	16.2
3/16	9,000	37.8	5,300	21.7	9,000	18.5
1/4	7,000	39.4	4,000	25.6	6,300	20.5
5/16	5,800	39.4	3,200	25.6	5,040	20.5
3/8	4,800	39.4	2,600	25.6	4,050	20.5
1/2	3,500	39.4	2,000	23.6	3,000	18.5
5/8	2,700	33.1	1,500	19.7	2,300	15.7
3/4	2,150	26.8	1,250	15.7	1,900	12.6
Depth of cut						

Work Material

N	
G6	G7
●	●

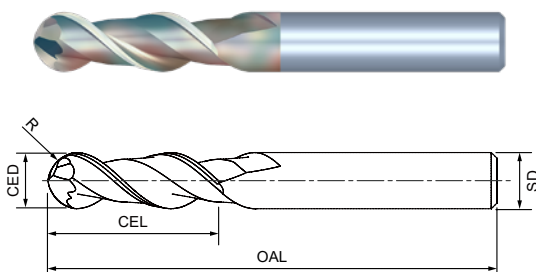


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Ball End Mill for Aluminum

AC100E⁺ - 81432TS

- ♦ End Mill for Aluminum
- ♦ Ball Nose - 2-Flute / 3xD Cutting Length
- ♦ Variable Helix 43° /46°

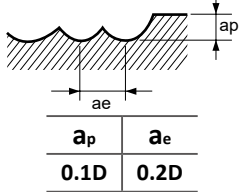


(unit : inch)

Code No.	Radius	CEL	SD	OAL	Flute
AC100E ⁺ -81432TS	1/8	3/8	1/8	1-1/2	2
	3/16	9/16	3/16	2	
	1/4	3/4	1/4	2-1/2	
	5/16	15/16	5/16	2-1/2	
	3/8	1-1/8	3/8	3	
	1/2	1-1/2	1/2	3-1/4	
	5/8	1-7/8	5/8	3-3/4	
	3/4	2-1/4	3/4	4-1/2	

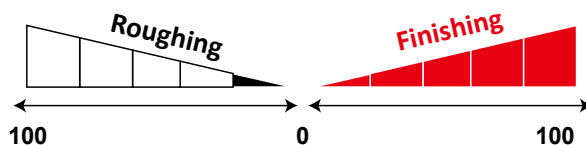
*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

General Milling

Work Material	Aluminum Alloy Side Milling		Copper Alloy Side Milling					
Cutting Condition	Speed RPM	Feed in/min	Speed RPM	Feed in/min				
R	a_p :0.1D	a_e :0.2D	a_p :0.1D	a_e :0.2D				
1/8 R	15,000	35.5	9,000	21.3				
3/16 R	11,000	41.4	6,600	21.7				
1/4 R	9,000	41.4	5,400	25.6				
5/16 R	7,200	41.4	4,320	25.6				
3/8 R	6,300	41.4	3,780	25.6				
1/2 R	4,500	41.4	2,700	23.6				
5/8 R	3,400	39.4	2,040	19.7				
3/4 R	2,600	31.5	1,560	15.7				
Depth of cut			<table><tr><td>a_p</td><td>a_e</td></tr><tr><td>0.1D</td><td>0.2D</td></tr></table>		a_p	a_e	0.1D	0.2D
a_p	a_e							
0.1D	0.2D							

Work Material

N	
G6	G7
●	●

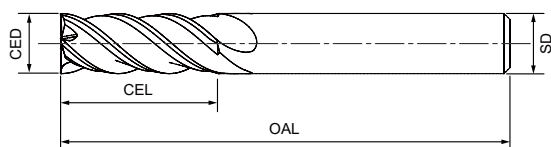
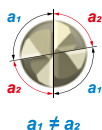


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Stainless Steel End Mill

CS100IE⁺ - 11404Z3

- ♦ End Mill for Stainless Steel
- ♦ Square - 4-Flute / 2.5xD Cutting Length
- ♦ Variable Pitch / Variable Helix 40° / 43°

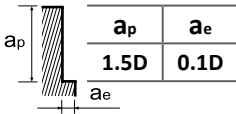


(unit : inch)

Code No.	CED	CEL	SD	OAL	Flute
CS100IE ⁺ -11404Z3	1/8	5/16	1/8	1-1/2	4
	3/16	15/32	3/16	2	
	1/4	5/8	1/4	2-1/2	
	5/16	25/32	5/16	2-1/2	
	3/8	15/16	3/8	3	
	1/2	1-1/4	1/2	3-1/4	
	5/8	1-9/16	5/8	3-1/2	
	3/4	1-7/8	3/4	4	

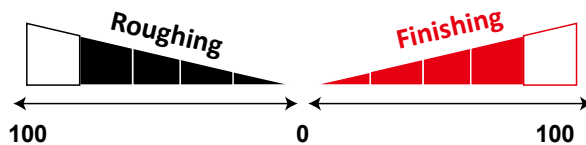
*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

Side Milling

Work Material	Stainless Steel	
Cutting Condition	Speed RPM	Feed in/min
CED	a_p :1.5D	a_e :0.1D
1/8	8,000	14.2
3/16	5,600	15.8
1/4	4,500	18.2
5/16	3,600	18.6
3/8	3,000	18.6
1/2	2,200	18.2
5/8	1,700	17.0
3/4	1,330	15.8
Depth of cut		

Work Material

M
G4
•

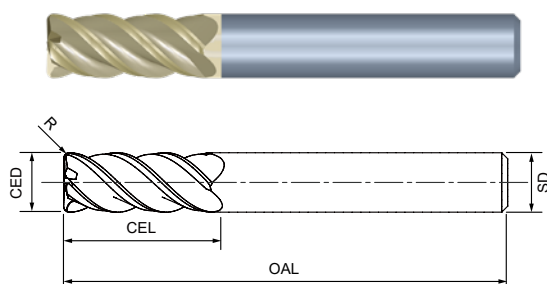


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Stainless Steel Corner Radius End Mill

CS100IE⁺ - 21404Z3

- End Mill for Stainless Steel
- Corner Radius - 4-Flute / 2.5xD Cutting Length
- Variable Pitch / Variable Helix 40° / 43°

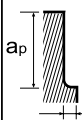


(unit : inch)

Code No.	CED	CEL	SD	OAL	R	Flute
CS100IE ⁺ -21404Z3	1/8	5/16	1/8	1-1/2	0.010	4
					0.015	
	3/16	15/32	3/16	2	0.010	
					0.015	
	1/4	5/8	1/4	2-1/2	0.010	
					0.015	
	5/16	25/32	5/16	2-1/2	0.010	
					0.020	
	3/8	15/16	3/8	3	0.010	
					0.020	
	1/2	1-1/4	1/2	3-1/4	0.010	
					0.020	
	5/8	1-9/16	5/8	3-1/2	0.010	
					0.020	
	3/4	1-7/8	3/4	4	0.010	
					0.020	

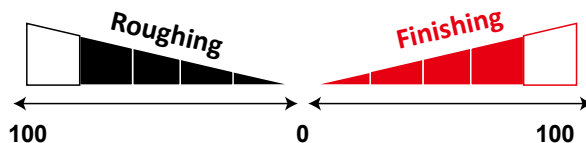
*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

Side Milling

Work Material	Stainless Steel	
Cutting Condition	Speed RPM	Feed in/min
CED	a_p :1.5D	a_e :0.1D
1/8	8,000	14.2
3/16	5,600	15.8
1/4	4,500	18.2
5/16	3,600	18.6
3/8	3,000	18.6
1/2	2,200	18.2
5/8	1,700	17.0
3/4	1,330	15.8
Depth of cut		
	a_p 1.5D	a_e 0.1D

Work Material

M
G4
●

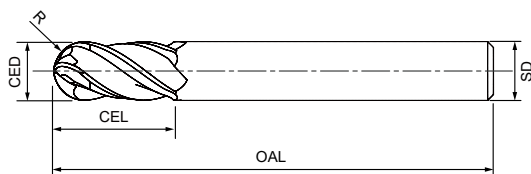
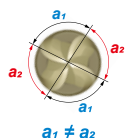


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Stainless Steel Ball End Mill

CS100IE⁺ - 81354Z3

- End Mill for Stainless Steel
- Ball Nose - 4-Flute / 2xD Cutting Length
- Variable Pitch / Variable Helix 35° / 38°

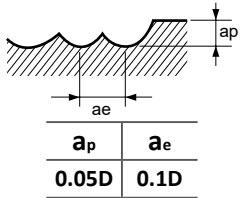


(unit : inch)

Code No.	Radius	CEL	SD	OAL	Flute
CS100IE ⁺ -81354Z3	1/8	1/4	1/8	1-1/2	4
	3/16	3/8	3/16	2	
	1/4	1/2	1/4	2-1/2	
	5/16	5/8	5/16	2-1/2	
	3/8	3/4	3/8	3	
	1/2	1	1/2	3-1/4	
	5/8	1-1/4	5/8	3-1/2	
	3/4	1-1/2	3/4	4	

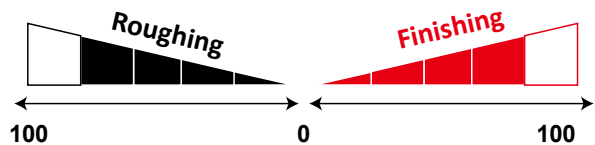
*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

General Milling

Work Material	Stainless Steel	
Cutting Condition	Speed RPM	Feed in/min
R	$a_p:0.05D$	$a_e:0.1D$
1/8 R	9,000	28.4
3/16 R	6,300	33.1
1/4 R	5,000	33.1
5/16 R	4,000	33.1
3/8 R	3,300	33.1
1/2 R	2,300	33.1
5/8 R	1,900	31.5
3/4 R	1,500	25.2
Depth of cut		
	a_p	a_e
	0.05D	0.1D

Work Material

M
G4
•

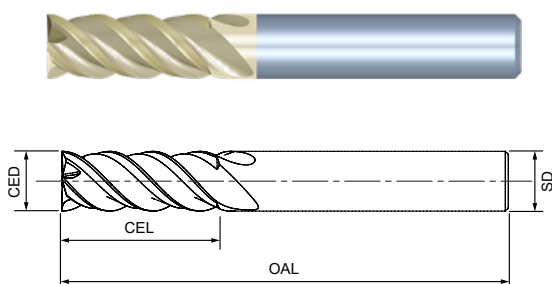
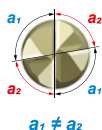


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration End Mill for Titanium

TI100IE⁺ - 11454Z3

- ♦ End Mill for Titanium
- ♦ Square - 4-Flute / 2.5xD Cutting Length
- ♦ Variable Pitch / Variable Helix 45° / 48°



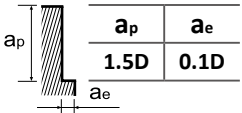
(unit : inch)

Code No.	CED	CEL	SD	OAL	Flute
TI100IE ⁺ -11454Z3	1/8	5/16	1/8	1-1/2	4
	3/16	15/32	3/16	2	
	1/4	5/8	1/4	2-1/2	
	5/16	25/32	5/16	2-1/2	
	3/8	15/16	3/8	3	
	1/2	1-1/4	1/2	3-1/4	
	5/8	1-9/16	5/8	3-1/2	
	3/4	1-7/8	3/4	4	

*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

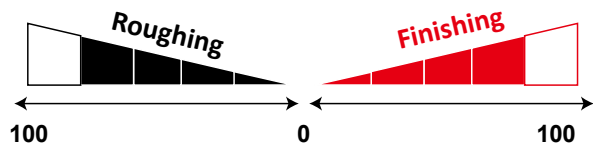
Recommended Cutting Condition

Side Milling

Work Material	Titanium	
Cutting Condition	Speed RPM	Feed in/min
CED	a_p :1.5D	a_e :0.1D
1/8	8,000	14.2
3/16	5,600	15.8
1/4	4,500	18.2
5/16	3,600	18.6
3/8	3,000	18.6
1/2	2,200	18.2
5/8	1,700	17.0
3/4	1,330	15.8
Depth of cut		
	a_p	a_e
	1.5D	0.1D

Work Material

S		
G11	G12	G12
●	●	●

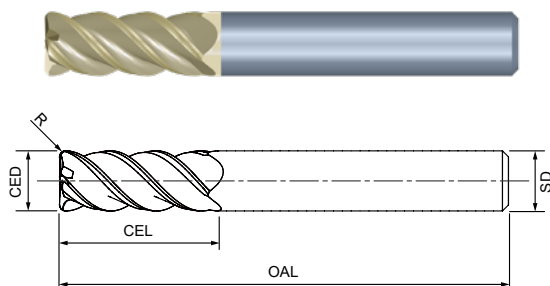


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Corner Radius End Mill for Titanium

TI100IE⁺ - 21454Z3

- ◆ End Mill for Titanium
- ◆ Corner Radius - 4-Flute / 2.5xD Cutting Length
- ◆ Variable Pitch / Variable Helix 45° / 48°

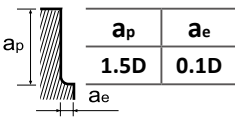


(unit : inch)

Code No.	CED	CEL	SD	OAL	R	Flute
TI100IE ⁺ -21454Z3	1/8	5/16	1/8	1-1/2	0.010	4
					0.015	
	3/16	15/32	3/16	2	0.010	
					0.015	
	1/4	5/8	1/4	2-1/2	0.010	
					0.015	
	5/16	25/32	5/16	2-1/2	0.010	
					0.020	
	3/8	15/16	3/8	3	0.010	
					0.020	
	1/2	1-1/4	1/2	3-1/4	0.010	
					0.020	
	5/8	1-9/16	5/8	3-1/2	0.010	
					0.020	
	3/4	1-7/8	3/4	4	0.010	
					0.020	

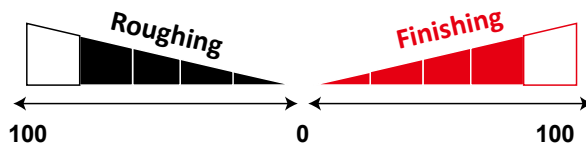
*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

Side Milling

Work Material	Titanium	
Cutting Condition	Speed RPM	Feed in/min
CED	$a_p:1.5D$	$a_e:0.1D$
1/8	8,000	14.2
3/16	5,600	15.8
1/4	4,500	18.2
5/16	3,600	18.6
3/8	3,000	18.6
1/2	2,200	18.2
5/8	1,700	17.0
3/4	1,330	15.8
Depth of cut		

Work Material

S		
G11	G12	G12
●	●	●

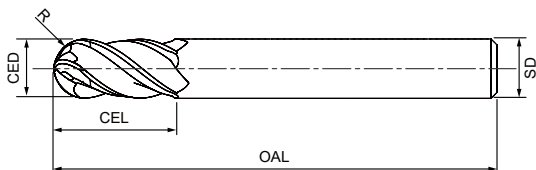
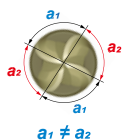


1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

SMG Carbide - Anti-Vibration Ball End Mill for Titanium

TI100IE⁺ - 81374Z3

- ♦ End Mill for Titanium
- ♦ Ball Nose - 4-Flute / 2xD Cutting Length
- ♦ Variable Pitch / Variable Helix 37° / 40°

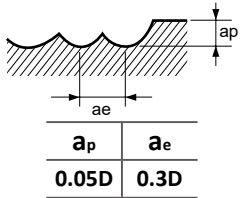


(unit : inch)

Code No.	Radius	CEL	SD	OAL	Flute
TI100IE ⁺ -81374Z3	1/8	1/4	1/8	1-1/2	4
	3/16	3/8	3/16	2	
	1/4	1/2	1/4	2-1/2	
	5/16	5/8	5/16	2-1/2	
	3/8	3/4	3/8	3	
	1/2	1	1/2	3-1/4	
	5/8	1-1/4	5/8	3-1/2	
	3/4	1-1/2	3/4	4	

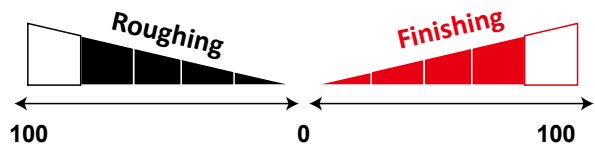
*Customized Special Sizes, Cutting length, OAL, Helix angle and Coating types are available to order.

General Milling

Work Material	Titanium	
Cutting Condition	Speed RPM	Feed in/min
R	$a_p:0.05D$	$a_e:0.3D$
1/8 R	9,000	28.4
3/16 R	6,300	33.1
1/4 R	5,000	33.1
5/16 R	4,000	33.1
3/8 R	3,300	33.1
1/2 R	2,300	33.1
5/8 R	1,900	31.5
3/4 R	1,500	25.2
Depth of cut		
	a_p	a_e
	0.05D	0.3D

Work Material

S		
G11	G12	G12
●	●	●



1. Please select high rigid tool holder and collet chuck during machining.
2. Please select the suitable coolant fluid.
3. For dry cutting, please use air blow for chip removal and cooling.
4. These cutting data are for reference only. Please adjust the cutting speed according to machine capability and working conditions.
5. If vibrations occur during cutting process, adjust and reduce the cutting speed.

Technical Data

Causes and troubleshooting for cutting problem

This table is the guideline for common problems and troubleshooting. In some cases, multiple factors overlap and this is not necessarily the only countermeasure.

Problem	Possible Causes	Solution
Edge Chipping	Cutting speed too fast	Reduce cutting feed per tooth
	Too fast on first entering cut	Reduce initial cut feed rate
	Depth of cut too much	Reduce the speed of feed rate
	Cutting speed too fast	Reduce the spindle speed
	Spindle speed too slow	Increase the spindle speed
	Insufficient mechanical, chuck rigidity	Reduce spindle speed & feed rate, reduce cut per-tooth, use tool with less number flute
	Too much run-out	Check and tighten the tool holder, use shrink fit holder
	Insufficient of machine power	Reduce spindle speed & feed rate, reduce cut per-tooth, use tool with less number flute
	Workpiece fixture rigidity insufficient	Reduce spindle speed & feed rate, reduce cut per-tooth, use tool with less number flute, change direction to upcut.
	Tool overhang	Reduce spindle & feed rate, reduce the cut per-tooth, use shrink fit holder.
Breakage	Feed rate too fast	Adjust and slow down speed
	High amount of chip evacuation	Reduce the feed amount per-tooth
	Chip packing	Reduce speed and feed, increasing cutting fluid or pressure air
	Tooling worn-out	Regularly check tools of wear or re-sharpening in earlier stage
Short tool life	Too much friction on cutting	Re-sharpened in earlier stage
	Tough workpiece material	Select higher grade of tool material
	Cutting rake angle too sharp	Select tool with lower rake angle or negative angle
Burr	Cutting speed too slow	Increase the spindle speed
	Feed rate too fast	Reduce the feeding amount per-tooth
	Too much of depth of cut	Decrease the depth of cut. Separate the cutting processes in roughing and finishing.
	Tool worn-out	Change a new tool or re-sharpening in earlier stage.
	Tool rake angle too small	Use a tool with bigger rake angle
	Cutting direction	Change it to down-cut.
Easy to worn-out	Workpiece material too hard	Select higher grade of tool material and coating type
	Chip jamming	Reduce cutting speed or clean chip with cutting fluid or air gun
	Cutting edge too sharp	Select tool with lower rake angle or negative angle
Chattering, noise	Cutting speed too fast	Reduce the spindle speed
	Resonance, vibration	Adjust feed rate to the area that has no resonance.

Problem	Possible Causes	Solution
Chattering, noise	Mechanical, chuck rigidity Not enough	Reduce the cutting amount Ae or change tool with less number of flutes
	Insufficient of tool rigidity	Change it to solid carbide tool. Increase the diameter of the tool. Use a short flute length tool. Reduce the overhang length.
	High number of tool flute	Use tool with less number of flutes
	Too long overhang	Increase the tool diameter. Use shrink fit holder. Decrease the spindle speed and depth of cut.
	Too much of cutting resistance	Decrease the depth of cut. Change it to roughing end mill. Use a tool with less flutes.

Formulas for Cutting

Cutting Speed $V_c = \frac{\pi \times CED \times n}{12}$

Spindle Speed $n = V_c \div \pi \div CED \times 12$

Feed $V_f = n \times fz \times Z$

Feed per Tooth $F_z = \frac{V_f}{n \times Z}$

Vc = Cutting Speed (inch/min)

π = 3.14

CED = Cutting Diameter (inch)

n = Spindle Speed (rpm.)

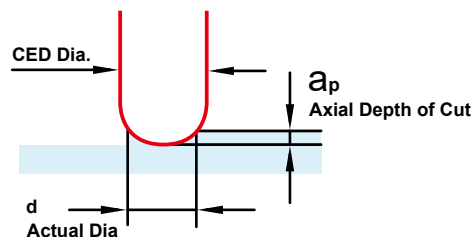
Vf = Feed (inch/min)

fz = Feed per Tooth (inch/tooth)

Z = Number of Flute

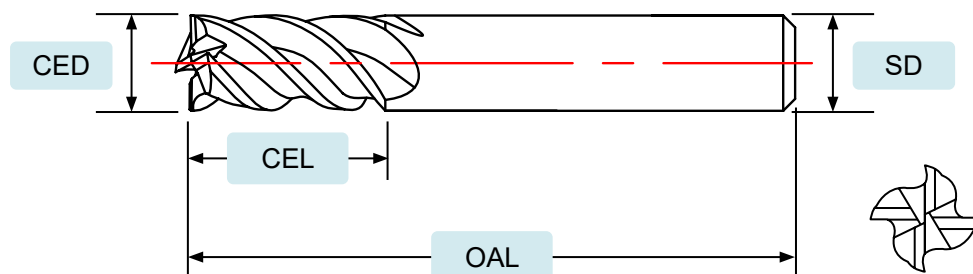
Calculation of actual dia. for Ball Nose

$$d = 2\sqrt{a_p (CED - a_p)}$$



Customized Tools

Dimensions



CED: _____

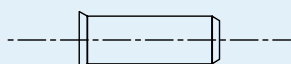
SD : _____

CEL : _____

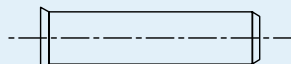
OAL : _____

Shank Type

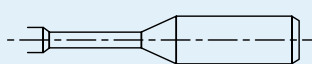
Standard



Long Shank



Long Neck



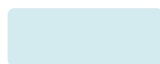
Tapered Neck



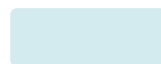
Tool Type



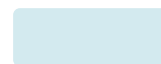
Square Type



Ball nose Type



Corner Radius



Material Coating

Application

Require quantity

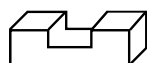


workpiece
material

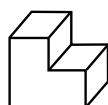
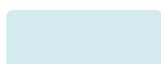
Hardness



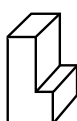
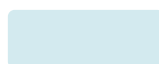
Operation



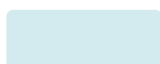
Slotting



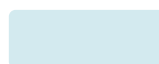
Roughing



Finishing



Tracing



Depth of cut: _____

Width of cut: _____



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