MOLDINO
The Edge To Innovation

ARPF

Radius Precision ARPF

Additional lineup of helical cutting edge inserts

MOLDINO Tool Engineering, Ltd.

New Product News | No. H2003A-1 | 2020-4

Radius End Mill for High-Precision Finishing.

Additional lineup of helical cutting edge inserts which offer both cutting edge strength and cutting performance

SG type

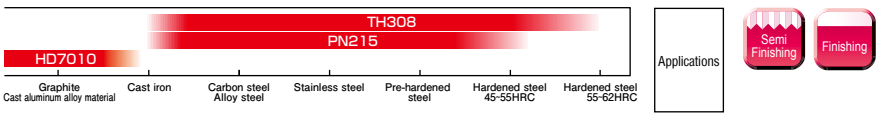
Excellent for semi-finishing and finishing of flat surfaces, angled surfaces, or 3-dimensional shapes

SW type

Excellent for high-accuracy finishing of vertical walls.

SQ type

Excellent for removing corner radius from previous operation.



Applications

Semi Finishing

Finishing

Features 01 Mounting runout accuracy of 0.02mm (.0008”) or less

・Unique clamp mechanism complete with a high-accuracy body and mounting screw allows inserts to be attached firmly with high accuracy.

Features 02 R accuracy of insert is ±0.01mm (.0004”) or less

・SG and SW types with a helical cutting edge use the tool axis center as a reference for the radius accuracy.

Features 03 Blade diameter tolerance for inserts is 0 to -0.02mm (.0008")

Features 04 Sharp cutting edge allows for smooth surface finishes.

・SG and SW types with helical cutting edges reduce vibrations and enable smooth cutting performance.

Features 05 New coating material for longer tool life.

・Multi-layer coating provides long life.
  ・TH308: Excellent for high-speed, high-performance machining of hardened steel or pre-hardened steel.
  ・PN215: Reduces material sticking to coating to achieve good machining surfaces when machining carbon, alloy, and stainless steels.

※For details regarding cutting performance, see p.18 and 19.

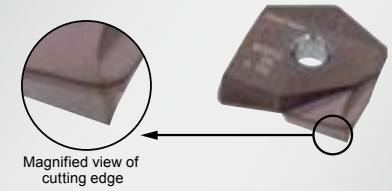
Proper use of helical cutting edge inserts

How to select helical cutting edge inserts

SG type

High-efficiency machining.

Application : semi-finishing to finishing

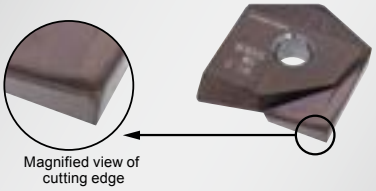


Suitable for machining of 3-dimensional shapes including flat surfaces and angled surfaces.

SW type

High-accuracy machining of vertical walls

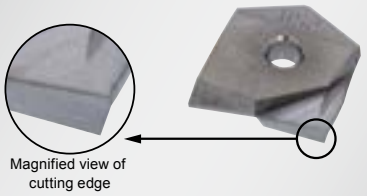
Application : Finishing



Suitable for high-accuracy finishing of vertical side surfaces (Vertical walls) which will be used as reference surfaces.

SQ type

Application : Corner R removal



Suitable for removing remaining corner material after rough machining.

An effect by helix edge shape

Typical conventional problem

When machining with a long tool overhang, the increased chances of chattering occurs. The tool would vibrate due to the increased cutting resistance. As a result, chatter marks would be prevalent on the machined surface.

Reduce cutting force

Helix edge shape reduces rapid increase in cutting force.
This reduces chattering when cutting and improves surface finish.

- Improved cutting surface finish.
- Chattering is unlikely even when machining with long overhang.

Merit

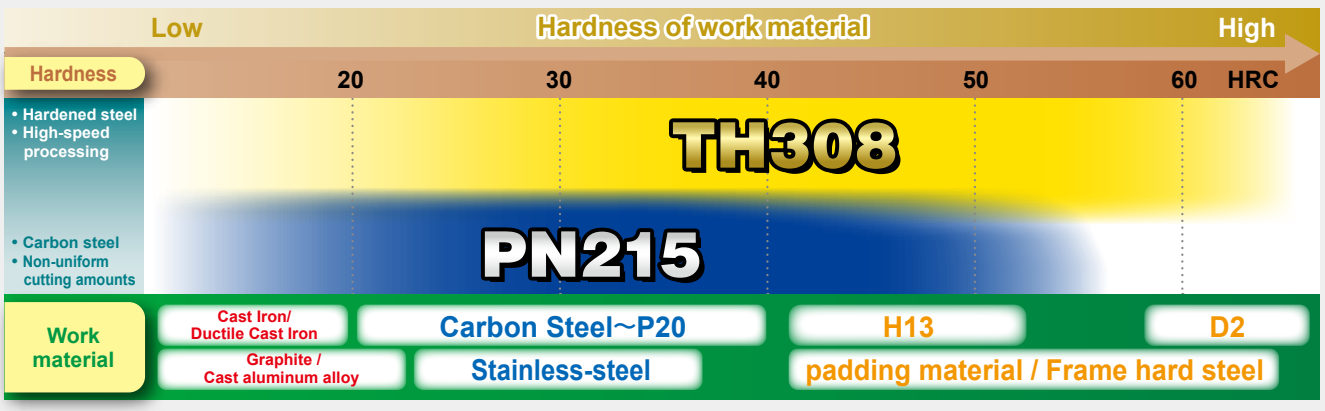
Improved machining performance and accuracy which reduces the workload for future processes.

Improved quality | **Cost reduction** | **Time savings**

Improved tool life

Lower cutting force reduces wear and chipping which leads to improved tool life.

How to select insert grades



PVD Technology TH3 Coating TH308

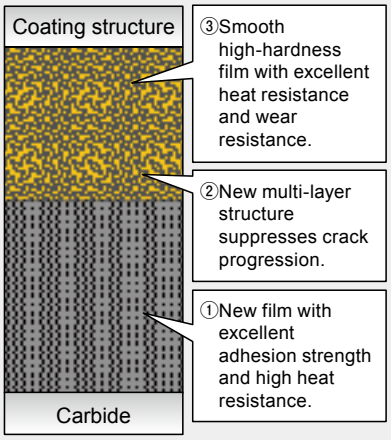
Features

- TH coating has further evolved to the new 3rd-generation TH coating.
- New film composition and structure that improves heat and wear resistance.
- New multi-layer structure increases durability and reduces cracks in the coating.

Strong fields

- High-speed finishing of hardened steel (45 to 65 HRC) such as D2, H13, 420 Stainless Steel types, etc.
- High-speed finishing of pre-hardened steel such as P20, P21, etc.
- TH308 uses ultra-fine carbide alloy with excellent wear resistance along with the new TH3 coating to increase performance, especially in high-hardness materials.

Characteristics



PVD Technology PN2 Coating PN215

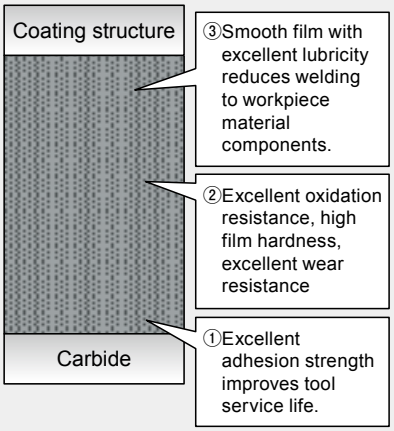
Features

- PN coating with excellent oxidation resistance, high film hardness, and excellent wear resistance.
- Low-friction, smooth film surface has excellent lubricity which reduces material sticking to the coating during machining.

Strong fields

- Carbon steel, general steel: High-speed finishing of 1049, A36, etc.
- Alloy steel: High-speed finishing of D2, H13, etc.
- Pre-hardened steel: High-speed finishing of P20, P21, etc.
- PN215 uses ultra-fine carbide alloy with excellent chipping resistance along with the PN2 coating to increase performance when finishing carbon or alloy steel.

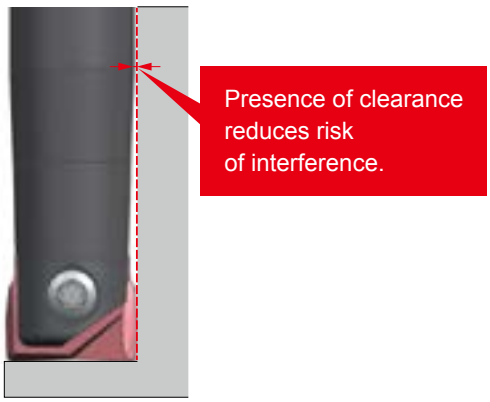
Characteristics



01 Mounting inserts with diameter of shank diameter +1mm

- A ϕ13 mm insert can be mounted on a ϕ12 mm body, a ϕ17 mm insert can be mounted on a ϕ16 mm body, a ϕ21 mm insert can be mounted on a ϕ20 mm body, or a ϕ26 mm insert can be mounted on a ϕ25 mm body.

When insert with same diameter as shank is mounted



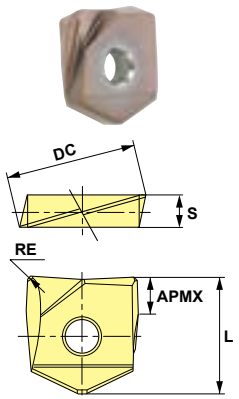
When insert with diameter +1mm larger than shank diameter is mounted.

Inch

SG・SW type (helical cutting edge inserts)

P	Carbon steel	⌐	■
K	Cast Iron・Ductile Cast Iron	■	⌐
	Graphite	⌐	
N	Aluminum Alloy		⌐
H	Hardened steel	■	⌐

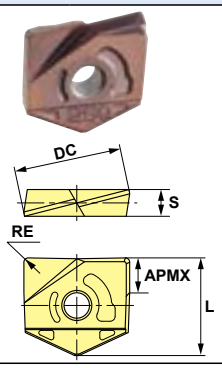
■ : General cutting, First recommendation
⌐ : General cutting, Second recommendation

Shape		Item Code	Tolerance Class	TH3 Coated	PN2 Coated	Size (Inch)				
				TH308	PN215	DC	RE	APMX	L	S
	SG type	IZCFG060SG-R0.8	F	●	●	.375	.031	.118	.492	.106
		IZCFG060SG-R1.6		●	●		.063			
		IZCFG060SG-R3.2		●	●		.126	.177		
		IZCFG080SG-R0.8		●	●	.5	.031	.157	.594	.126
		IZCFG080SG-R1.6		●	●		.063			
		IZCFG080SG-R3.2		●	●		.126	.177		
		IZCFG120SG-R0.8		●	●	.75	.031	.276	.823	.205
		IZCFG120SG-R1.6		●	●		.063			
		IZCFG120SG-R3.2		●	●		.126			
		IZCFG160SG-R0.8		●	●	1.0	.031	.315	.961	.244
		IZCFG160SG-R1.6		●	●		.063			
		IZCFG160SG-R3.2		●	●		.126			
	SW type	IZCFG080SW-R0.8	F	●	●	.5	.031	.157	.594	.126
		IZCFG120SW-R0.8		●	●	.75	.031	.276	.823	.205

General cutting edge shape inserts

P	Carbon steel	⌐	■
K	Cast Iron・Ductile Cast Iron	⌐	■
H	Hardened steel	⌐	■

■ : General cutting, First recommendation
⌐ : General cutting, Second recommendation

Shape	Item Code	Tolerance Class	C Coated	ATH Coated	Size (Inch)				
			PCA12M	ATH08M	DC	RE	APMX	L	S
	IZCFW060-R0.8	F	●	●	.375	.031	.118	.474	.106
	IZCFW060-R1.6		●	●		.063			
	IZCFW060-R3.2		●	●		.126	.157		
	IZCFW080-R0.8		●	●	.5	.031	.157	.574	.126
	IZCFW080-R1.6		●	●		.063			
	IZCFW080-R3.2		●	●		.126			
	IZCFW120-R0.8		●	●	.75	.031	.236	.784	.205
	IZCFW120-R1.6		●	●		.063			
	IZCFW120-R3.2		●	●		.126			
	IZCFW160-R0.8		●	●	1.0	.031	.315	.889	.244
	IZCFW160-R1.6		●	●		.063			
	IZCFW160-R3.2		●	●		.126			

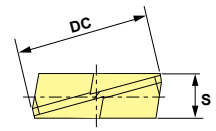
●: Inventory maintained in US

Metric

SG • SW • SQ type (helical cutting edge inserts)

		TH3 Coated	PN2 Coated
P	Carbon steel	▱	■
K	FC • FCD	■	▱
	Graphite	▱	
N	Aluminum Alloy		▱
H	Hardened steel	■	▱

■ : General cutting, First recommendation
▱ : General cutting, Second recommendation



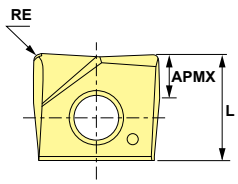
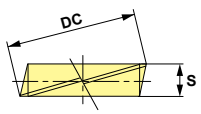


Fig.1



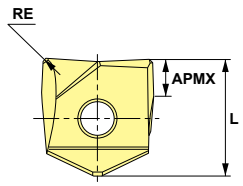


Fig.2

Shape		Item Code	Tolerance Class	TH3 Coated TH308	PN2 Coated PN215	Size (mm) DC	RE	APMX	L	S	Shape
	SG type	ZCFG06NSG-R0.3	F	★	★	6	0.3	2	5	2	Fig1
		ZCFG06NSG-R0.5		★	★		0.5				
		ZCFG06NSG-R1.0		★	★		1.0				
		ZCFG080SG-R0.3		●	●	8	0.3	2.5	9.9	2.1	Fig2
		ZCFG080SG-R0.5		●	●		0.5				
		ZCFG080SG-R1.0		●	●		1.0				
		ZCFG080SG-R1.5		●	●		1.5				
		ZCFG080SG-R2.0		●	●		2.0	3			
		ZCFG100SG-R0.3		●	●	10	0.3	3	12.5	2.7	
		ZCFG100SG-R0.5		●	●		0.5				
		ZCFG100SG-R1.0		●	●		1.0				
		ZCFG100SG-R1.5		●	●		1.5				
		ZCFG100SG-R2.0		●	●		2.0				
		ZCFG100SG-R3.0		●	●		3.0	4			
		ZCFG120SG-R0.3		●	●	12	0.3	4	15.1	3.2	
		ZCFG120SG-R0.5		●	●		0.5				
		ZCFG120SG-R1.0		●	●		1.0				
		ZCFG120SG-R1.5		●	●		1.5				
		ZCFG120SG-R2.0		●	●		2.0				
		ZCFG120SG-R3.0		●	●		3.0				
		ZCFG130SG-R0.3		★	★	13	0.3	4	15.1	3.2	
		ZCFG130SG-R0.5		★	★		0.5				
		ZCFG130SG-R1.0		★	★		1.0				
		ZCFG130SG-R1.5		★	★		1.5				
		ZCFG130SG-R2.0		★	★		2.0				
		ZCFG130SG-R3.0		★	★		3.0				
		ZCFG160SG-R0.3		●	●	16	0.3	5	17.2	4.2	
		ZCFG160SG-R0.5		●	●		0.5				
		ZCFG160SG-R1.0		●	●		1.0				
		ZCFG160SG-R1.5		●	●		1.5				
		ZCFG160SG-R2.0		●	●		2.0				
		ZCFG160SG-R3.0		●	●		3.0				
		ZCFG170SG-R0.3		★	★	17	0.3	5	17.2	4.2	
		ZCFG170SG-R0.5		★	★		0.5				
		ZCFG170SG-R1.0		★	★		1.0				
		ZCFG170SG-R1.5		★	★		1.5				
		ZCFG170SG-R2.0		★	★		2.0				
		ZCFG170SG-R3.0		★	★		3.0				
		ZCFG200SG-R0.3		●	●	20	0.3	7	20.9	5.2	
		ZCFG200SG-R0.5		●	●		0.5				
		ZCFG200SG-R1.0		●	●		1.0				
		ZCFG200SG-R1.5		●	●		1.5				
		ZCFG200SG-R2.0		●	●		2.0				
		ZCFG200SG-R3.0		●	●		3.0				
		ZCFG210SG-R0.3		★	★	21	0.3	7	20.9	5.2	
		ZCFG210SG-R0.5		★	★		0.5				
		ZCFG210SG-R1.0		★	★		1.0				
		ZCFG210SG-R1.5		★	★		1.5				
		ZCFG210SG-R2.0		★	★		2.0				
		ZCFG210SG-R3.0		★	★		3.0				
		ZCFG250SG-R0.3		●	●	25	0.3	8	24.4	6.2	
		ZCFG250SG-R0.5		●	●		0.5				
		ZCFG250SG-R1.0		●	●		1.0				
		ZCFG250SG-R1.5		●	●		1.5				
		ZCFG250SG-R2.0		●	●		2.0				
		ZCFG250SG-R3.0		●	●		3.0				

P	Carbon steel	⌐	■
K	FC • FCD	■	⌐
	Graphite	⌐	
N	Aluminum Alloy		⌐
H	Hardened steel	■	⌐

■ : General cutting, First recommendation
⌐ : General cutting, Second recommendation

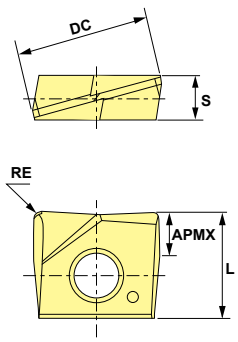
Shape		Item Code	Tolerance Class	TH3 Coated	PN2 Coated	Size (mm)					Shape
				TH308	PN215	DC	RE	APMX	L	S	
	SG type	ZCFG260SG-R0.3	F	★	★	26	0.3	8	24.4	6.2	Fig2
		ZCFG260SG-R0.5		★	★		0.5				
		ZCFG260SG-R1.0		★	★		1.0				
		ZCFG260SG-R1.5		★	★		1.5				
		ZCFG260SG-R2.0		★	★		2.0				
		ZCFG260SG-R3.0		★	★		3.0				
		ZCFG300SG-R0.3		★	★	30	0.3	10	29.4	7.2	
		ZCFG300SG-R0.5		★	★		0.5				
		ZCFG300SG-R1.0		★	★		1.0				
		ZCFG300SG-R1.5		★	★		1.5				
		ZCFG300SG-R2.0		★	★		2.0				
		ZCFG300SG-R3.0		★	★		3.0				
		ZCFG320SG-R0.3		★	★	32	0.3	10	30.4	7.2	
		ZCFG320SG-R0.5		★	★		0.5				
		ZCFG320SG-R1.0		★	★		1.0				
		ZCFG320SG-R1.5		★	★		1.5				
		ZCFG320SG-R2.0		★	★		2.0				
		ZCFG320SG-R3.0		★	★		3.0				
	SW type	ZCFG06NSW-R0.3	F	★	★	6	0.3	2	5	2	Fig1
		ZCFG06NSW-R0.5		★	★		0.5				
		ZCFG080SW-R0.3		★	★	8	0.3	2.5	9.9	2.1	Fig2
		ZCFG080SW-R0.5		★	★		0.5				
		ZCFG080SW-R1.0		★	★		1.0				
		ZCFG100SW-R0.3		★	★	10	0.3	3	12.5	2.7	
		ZCFG100SW-R0.5		★	★		0.5				
		ZCFG100SW-R1.0		★	★		1.0				
		ZCFG120SW-R0.3		★	★	12	0.3	4	15.1	3.2	
		ZCFG120SW-R0.5		●	●		0.5				
		ZCFG120SW-R1.0		●	●		1.0				
		ZCFG130SW-R0.3		★	★	13	0.3	4	15.1	3.2	
		ZCFG130SW-R0.5		★	★		0.5				
		ZCFG130SW-R1.0		★	★		1.0				
		ZCFG160SW-R0.3		★	★	16	0.3	5	17.2	4.2	
		ZCFG160SW-R0.5		●	●		0.5				
		ZCFG160SW-R1.0		●	●		1.0				
		ZCFG170SW-R0.3		★	★	17	0.3	5	17.2	4.2	
		ZCFG170SW-R0.5		★	★		0.5				
		ZCFG170SW-R1.0		★	★		1.0				
		ZCFG200SW-R0.3		★	★	20	0.3	7	20.9	5.2	
		ZCFG200SW-R0.5		●	●		0.5				
		ZCFG200SW-R1.0		●	●		1.0				
		ZCFG210SW-R0.3		★	★	21	0.3	7	20.9	5.2	
		ZCFG210SW-R0.5		★	★		0.5				
		ZCFG210SW-R1.0		★	★		1.0				
		ZCFG250SW-R0.3		★	★	25	0.3	8	24.4	6.2	
		ZCFG250SW-R0.5		●	●		0.5				
		ZCFG250SW-R1.0		●	●		1.0				
		ZCFG260SW-R0.3		★	★	26	0.3	8	24.4	6.2	
		ZCFG260SW-R0.5		★	★		0.5				
		ZCFG260SW-R1.0		★	★		1.0				
		ZCFG300SW-R0.3		★	★	30	0.3	10	29.4	7.2	
		ZCFG300SW-R0.5		★	★		0.5				
		ZCFG300SW-R1.0		★	★		1.0				
		ZCFG320SW-R0.3		★	★	32	0.3	10	30.4	7.2	
		ZCFG320SW-R0.5		★	★		0.5				
		ZCFG320SW-R1.0		★	★		1.0				

Fig.1

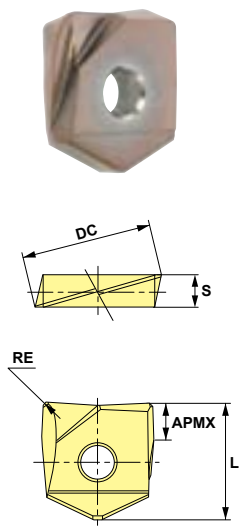


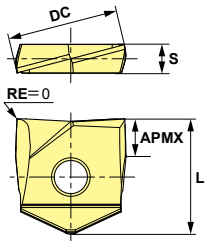
Fig.2

●: Inventory maintained in US ★: Inventory maintained in Japan

Line Up

P	Carbon steel	■
K	FC・FCD	⌐
	Graphite	⌐
N	Aluminum Alloy	⌐
H	Hardened steel	⌐

■ : General cutting, First recommendation
⌐ : General cutting, Second recommendation

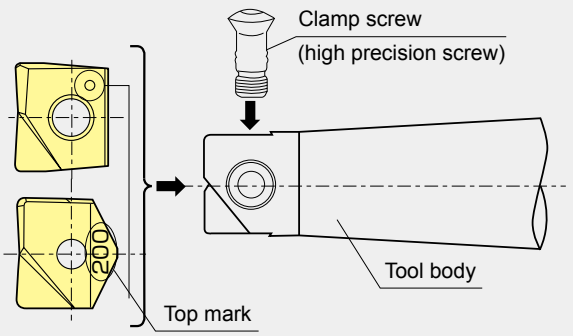
Shape		Item Code	Tolerance Class	PN2 Coated	Size (mm)				Shape
				PN215	DC	APMX	L	S	
 Fig.3	SQ type	ZCFG080SQ	F	★	8	2.5	9.9	2.1	Fig3
		ZCFG100SQ		★	10	3	12.5	2.7	
		ZCFG120SQ		★	12	4	15.1	3.2	
		ZCFG130SQ		★	13	4	15.1	3.2	
		ZCFG160SQ		★	16	5	17.2	4.2	
		ZCFG170SQ		★	17	5	17.2	4.2	
		ZCFG200SQ		★	20	7	20.9	5.2	
		ZCFG210SQ		★	21	7	20.9	5.2	
		ZCFG250SQ		★	25	8	24.4	6.2	
		ZCFG260SQ		★	26	8	24.4	6.2	

【Note】Inserts of SG, SW, SQ type can be installed on Ball Precision F "ABPF type" bodies.
Inserts(ϕ8 ~ ϕ32) of SG, SW, SQ type have a design with a longer A dimension than conventional products. Be careful of the dimension when installed on body.

Set-up Procedures of Inserts

1. Clean the insert seat: Using air-blow or alike, clean the seat.
2. Put in the insert with its top positioned to the screw-tightening side of the tool body.
3. Tighten the clamp screw with the special wrench.
   Please do not press down the insert during this tightening process.
4. This is the end of insert set-up.

In order to satisfy runout of 0.02mm (.0008") or less, follow the procedure at above.



●: Inventory maintained in US ★: Inventory maintained in Japan

General cutting edge shape inserts

Fig.1

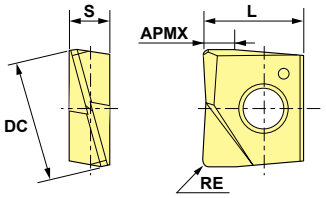
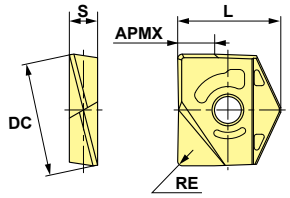


Fig.2



P	Carbon steel	⌐	■		
K	FC・FCD	⌐	■		
	Graphite			■	
N	Aluminum Alloy			■	
H	Hardened steel	⌐	■		

■ : General cutting, First recommendation

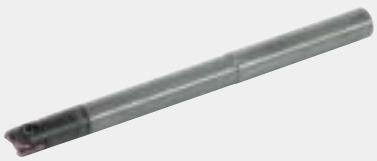
⌐ : General cutting, Second recommendation

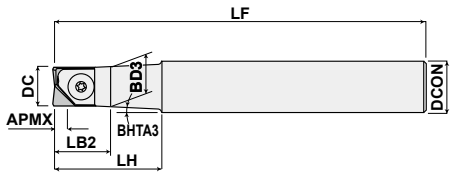
Item Code	Tolerance Class	C Coated	TH Coated	HD Coated	CBN	Size (mm)					Shape
		PCA12M	PTH08M	HD7010	BH250	DC	RE	APMX	L	S	
ZCFW060-R0.3	F		★	★	–	6	0.3	2	5.0	2.0	Fig.1
ZCFW060-R0.5			★		–		0.5				
ZCFW060-R1.0			★		–		1.0				
ZCFW080-R0.3		●	●	★	–	8	0.3	2.5	9.7	2.1	Fig.2
ZCFW080-R0.5		●	●		–		0.5				
ZCFW080-R1.0		●	●		–		1.0				
ZCFW100-R0.3		●	●	★	–	10	0.3	3	12.0	2.7	
ZCFW100-R0.5		●	●		–		0.5				
ZCFW100-R1.0		●	●		–		1.0				
ZCFW100-R1.5		●	●		–		1.5				
ZCFW100-R2.0		●	●		–		2.0				
ZCFW100-R3.0		●	●		–		3.0	4			
ZCFW120-R0.3		●	●	★	–	12	0.3	4	14.6	3.2	
ZCFW120-R0.5		●	●		–		0.5				
ZCFW120-R1.0		●	●		–		1.0				
ZCFW120-R1.5		●	●		–		1.5				
ZCFW120-R2.0		●	●		–		2.0				
ZCFW120-R3.0		●	●		–		3.0				
ZCFW160-R0.3		●	●	★		16	0.3	5	16.6	4.2	
ZCFW160-R0.5		●	●				0.5				
ZCFW160-R1.0		●	●		★		1.0				
ZCFW160-R1.5		●	●				1.5				
ZCFW160-R2.0		●	●		★		2.0				
ZCFW160-R3.0		●	●				3.0				
ZCFW200-R0.3		●	●	★		20	0.3	6	19.9	5.2	
ZCFW200-R0.5		●	●				0.5				
ZCFW200-R1.0		●	●		★		1.0				
ZCFW200-R1.5		●	●				1.5				
ZCFW200-R2.0		●	●		★		2.0				
ZCFW200-R3.0		●	●				3.0				
ZCFW250-R0.3		●	●			25	0.3	8	22.6	6.2	
ZCFW250-R0.5		●	●				0.5				
ZCFW250-R1.0		●	●		★		1.0				
ZCFW250-R2.0		●	●		★		2.0				
ZCFW250-R3.0		●	●				3.0				
ZCFW300-R0.3		★	★			30	0.3	10	27.2	7.2	
ZCFW300-R0.5		★	★				0.5				
ZCFW300-R1.0		★	★		★		1.0				
ZCFW300-R2.0		★	★		★		2.0				
ZCFW300-R3.0		★	★				3.0				
ZCFW320-R0.3		★	★			32	0.3	10	28.2	7.2	
ZCFW320-R0.5		★	★				0.5				
ZCFW320-R1.0		★	★				1.0				
ZCFW320-R2.0		★	★				2.0				
ZCFW320-R3.0		★	★				3.0				

Inch

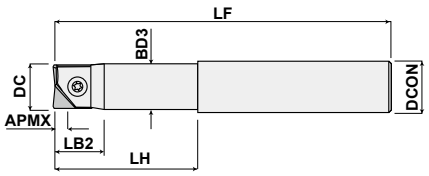
Numeric figure in a circle ◌ and alphabetical character comes in a square ⬚.

Steel shank・Carbide shank IARPF ◌◌S◌◌ (⬚/⬚⬚)





Type A (Taper Neck)



Type B (Straight Neck)

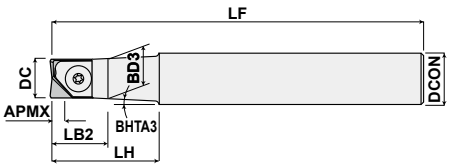
Type		Item Code	Stock	# of Inserts	Size (Inch)								Type	Inserts
					DC	LF	DCON	APMX	LB2	LH	BHTA3	BD3		
Steel Shank	Regular	IARPF06S08	●	1	.375	3.937(3.955)	.5	.118	.512(.53)	.984 (1.002)	3°	.354	A	IZCFG060SG-R◌.◌ IZCFW060-R◌.◌
		IARPF08S08	●	1	.5	4.331(4.351)	.5	.157	.591(.611)	1.181(1.201)	–	.48	B	IZCFG080S⬚-R◌.◌ IZCFW080-R◌.◌
		IARPF12S12	●	1	.75	5.512(5.551)	.75	.236	.827(.866)	2.362(2.401)	–	.728	B	IZCFG120S⬚-R◌.◌ IZCFW120-R◌.◌
		IARPF16S16	●	1	1.0	5.906(5.978)	1.0	.315	.945(1.017)	2.756(2.828)	–	.98	B	IZCFG160SG-R◌.◌ IZCFW160-R◌.◌
	Long Length	IARPF06S08L	●	1	.375	5.906(5.924)	.5	.118	.512(.53)	1.969(1.987)	4.5°	.354	A	IZCFG060SG-R◌.◌ IZCFW060-R◌.◌
		IARPF08S10L	●	1	.5	6.299(6.319)	.625	.157	.591(.611)	2.362(2.382)	2°	.48	A	IZCFG080S⬚-R◌.◌ IZCFW080-R◌.◌
		IARPF12S16L	●	1	.75	7.087(7.126)	1.0	.236	.827(.866)	3.15(3.189)	–	.728	B	IZCFG120S⬚-R◌.◌ IZCFW120-R◌.◌
		IARPF16S20L	●	1	1.0	7.874(7.946)	1.25	.315	.945(1.017)	3.543(3.615)	–	.98	B	IZCFG160SG-R◌.◌ IZCFW160-R◌.◌
Carbide Shank	Regular	IARPF06S06W	●	1	.375	3.937(3.955)	.375	.118	.906(.924)	1.378(1.396)	–	.366	B	IZCFG060SG-R◌.◌ IZCFW060-R◌.◌
		IARPF08S08W	●	1	.5	4.331(4.351)	.5	.157	1.024(1.044)	1.772(1.792)	–	.492	B	IZCFG080S⬚-R◌.◌ IZCFW080-R◌.◌
		IARPF12S12W	●	1	.75	6.299(6.338)	.75	.236	.866(.905)	2.165(2.204)	–	.728	B	IZCFG120S⬚-R◌.◌ IZCFW120-R◌.◌
		IARPF16S16W	●	1	1.0	7.087(7.159)	1.0	.315	.984(1.056)	2.5(2.572)	–	.98	B	IZCFG160SG-R◌.◌ IZCFW160-R◌.◌
	Medium	IARPF06S06WR	●	1	.375	5.512(5.530)	.375	.118	.906(.924)	2.935(2.953)	–	.366	B	IZCFG060SG-R◌.◌ IZCFW060-R◌.◌
		IARPF08S08WR	●	1	.5	5.906(5.926)	.5	.157	1.024(1.044)	3.346(3.366)	–	.492	B	IZCFG080S⬚-R◌.◌ IZCFW080-R◌.◌
	Long Length	IARPF06S06WL	●	1	.375	7.087(7.105)	.375	.118	.512(.53)	1.378(1.396)	–	.366	B	IZCFG060SG-R◌.◌ IZCFW060-R◌.◌
		IARPF08S08WL	●	1	.5	7.087(7.107)	.5	.157	.591(.611)	1.772(1.792)	–	.492	B	IZCFG080S⬚-R◌.◌ IZCFW080-R◌.◌
		IARPF12S12WL	●	1	.75	9.843(9.522)	.75	.236	.827(.866)	3.15(3.189)	–	.728	B	IZCFG120S⬚-R◌.◌ IZCFW120-R◌.◌
		IARPF16S16WL	●	1	1.0	9.843(9.915)	1.0	.315	.945(1.017)	3.15(3.222)	–	.98	B	IZCFG160SG-R◌.◌ IZCFW160-R◌.◌
		IARPF16S20WL	●	1	1.0	11.811(11.883)	1.0	.315	.945(1.017)	7.48(7.552)	–	.98	B	

●:Inventory maintained in US 【Note】( )dimension indicates when IZCFG type insert is installed.

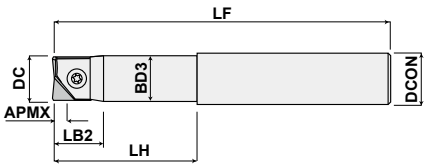
Metric

Numeric figure in a circle ◌ and alphabetical character comes in a square □.

Steel shank ARPF○○S○○(□○○○/□□○○)



Type A (Taper Neck)



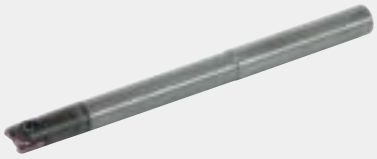
Type B (Straight Neck)

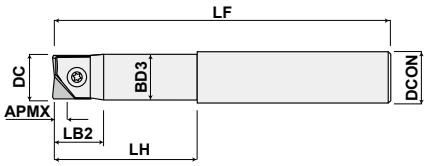
Type	Item Code	Stock	# of Inserts	Size (mm)								Type	Inserts	
				DC	LF	DCON	APMX	LB2	LH	BHTA3	BD3			
Regular	ARPF06S10	★	1	6	80	10	2	15	30	8.25°	5.4	A	ZCFG06NS□-R○.○	ZCFW060-R○.○
	ARPF08S12	●	1	8	100(100.2)	12	2.5	10(10.2)	22(22.2)	9.5°	7.5	A	ZCFG080S□-R○.○	ZCFW080-R○.○
	ARPF10S12	●	1	10	100(100.5)	12	3	13(13.5)	25(25.5)	3°	9.5	A	ZCFG100S□-R○.○	ZCFW100-R○.○
	ARPF12S12	●	1	12	110(110.5)	12	4	21(21.5)	30(30.5)	–	11.5	B	ZCFG120S□-R○.○ ZCFG130S□-R○.○	ZCFW120-R○.○
	ARPF16S16	●	1	16	130(130.6)	16	5	27(27.6)	50(50.6)	–	15.5	B	ZCFG160S□-R○.○ ZCFG170S□-R○.○	ZCFW160-R○.○
	ARPF20S20	●	1	20	140(141)	20	6	35(36)	60(61)	–	19.5	B	ZCFG200S□-R○.○ ZCFG210S□-R○.○	ZCFW200-R○.○
	ARPF25S25	●	1	25	150(151.8)	25	8	43(44.8)	70(71.8)	–	24.5	B	ZCFG250S□-R○.○ ZCFG260S□-R○.○	ZCFW250-R○.○
	ARPF30S32	★	1	30	160(162.2)	32	10	55(57.2)	80(82.2)	–	29.5	B	ZCFG300S□-R○.○	ZCFW300-R○.○
	ARPF32S32	★	1	32	160(162.2)	32	10	58(60.2)	80(82.2)	–	31.5	B	ZCFG320S□-R○.○	ZCFW320-R○.○
Long Length	ARPF08S12L	●	1	8	130(130.2)	12	2.5	10(10.2)	50(50.2)	3°	7.5	A	ZCFG080S□-R○.○	ZCFW080-R○.○
	ARPF10S16L	●	1	10	150(150.5)	16	3	13(13.5)	50(50.5)	4.5°	9.5	A	ZCFG100S□-R○.○	ZCFW100-R○.○
	ARPF12S16L	●	1	12	160(160.5)	16	4	21(21.5)	60(60.5)	2°	11.5	A	ZCFG120S□-R○.○ ZCFG130S□-R○.○	ZCFW120-R○.○
	ARPF16S16L	●	1	16	165(165.6)	16	5	27(27.6)	65(65.6)	–	15.5	B	ZCFG160S□-R○.○ ZCFG170S□-R○.○	ZCFW160-R○.○
	ARPF20S20L	●	1	20	180(181)	20	6	35(36)	80(81)	–	19.5	B	ZCFG200S□-R○.○	ZCFW200-R○.○
	ARPF20S20L120	★	1	20	220(221)	20	6	35(36)	120(121)	–	19.5	B	ZCFG210S□-R○.○	
	ARPF20S20L150	★	1	20	250(251)	20	6	35(36)	150(151)	–	19.5	B		
	ARPF25S25L	●	1	25	200(201.8)	25	8	43(44.8)	90(91.8)	–	24.5	B	ZCFG250S□-R○.○	ZCFW250-R○.○
	ARPF25S32L150	★	1	25	250(251.8)	32	8	43(44.8)	150(151.8)	–	24.5	B	ZCFG260S□-R○.○	
	ARPF30S32L	★	1	30	220(222.2)	32	10	55(57.2)	100(102.2)	–	29.5	B		
	ARPF30S32L150	★	1	30	250(252.2)	32	10	55(57.2)	150(152.2)	–	29.5	B	ZCFG300S□-R○.○	ZCFW300-R○.○
	ARPF30S32L200	★	1	30	300(302.2)	32	10	55(57.2)	200(202.2)	–	29.5	B		
	ARPF32S32L	★	1	32	220(222.2)	32	10	58(60.2)	100(102.2)	–	31.5	B	ZCFG320S□-R○.○	ZCFW320-R○.○
Long Shank	ARPF16S16E	★	1	16	200(200.6)	16	5	27(27.6)	65(65.6)	–	15.5	B	ZCFG160S□-R○.○ ZCFG170S□-R○.○	ZCFW160-R○.○
	ARPF20S20E	★	1	20	250(251)	20	6	35(36)	80(81)	–	19.5	B	ZCFG200S□-R○.○ ZCFG210S□-R○.○	ZCFW200-R○.○
	ARPF25S25E	★	1	25	300(301.8)	25	8	43(44.8)	90(91.8)	–	24.5	B	ZCFG250S□-R○.○	ZCFW250-R○.○
	ARPF25S32E	★	1	25	300(301.8)	32	8	43(44.8)	100(101.8)	3.5°	24.5	A	ZCFG260S□-R○.○	
	ARPF30S32E	★	1	30	350(352.2)	32	10	55(57.2)	100(102.2)	–	29.5	B	ZCFG300S□-R○.○	ZCFW300-R○.○
	ARPF30S42E	★	1	30	350(352.2)	42	10	55(57.2)	120(122.2)	5.3°	29.5	A		
	ARPF32S32E	★	1	32	350(352.2)	32	10	58(60.2)	100(102.2)	–	31.5	B	ZCFG320S□-R○.○	ZCFW320-R○.○

【Note】( )dimension indicates when ZCFG type insert is installed.

Numeric figure in a circle ◌ and alphabetical character comes in a square □.

Carbide shank ARPF○○S○○ (□○○○/□□○○)

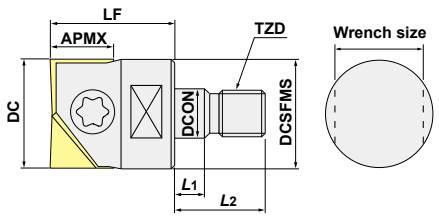




Type		Item Code	Stock	# of Inserts	Size (mm)							Inserts
					DC	LF	DCON	APMX	LB2	LH	BD3	
Carbide Shank	Regular	ARPF06S06W	★	1	6	90	6	2	10.3	25	5.8	ZCFG06NS□-R○.○ ZCFW060-R○.○
	Long Length	ARPF06S06WL65	★	1	6	120	6	2	10.3	65	5.8	ZCFG06NS□-R○.○ ZCFW060-R○.○
		ARPF08S08WL	●	1	8	130(130.2)	8	2.5	65(65.2)	65(65.2)	7.8	ZCFG080S□-R○.○ ZCFW080-R○.○
		ARPF10S10WL	●	1	10	140(140.5)	10	3	18(18.5)	75(75.5)	9.8	ZCFG100S□-R○.○ ZCFW100-R○.○
		ARPF12S12WL	●	1	12	150(150.5)	12	4	21(21.5)	85(85.5)	11.8	ZCFG120S□-R○.○ ZCFW120-R○.○ ZCFG130S□-R○.○ ZCFW160-R○.○
	Long Shank	ARPF16S16WE	●	1	16	200(200.6)	16	5	27(27.6)	120(120.6)	15.5	ZCFG160S□-R○.○ ZCFW200-R○.○ ZCFG170S□-R○.○ ZCFW250-R○.○
		ARPF20S20WE	●	1	20	250(251)	20	6	35(36)	150(151)	19.5	ZCFG200S□-R○.○ ZCFW300-R○.○ ZCFG210S□-R○.○ ZCFW320-R○.○
		ARPF25S25WE	●	1	25	300(301.8)	25	8	43(44.8)	190(191.8)	24.5	ZCFG250S□-R○.○ ZCFG260S□-R○.○
		ARPF30S32WE	★	1	30	350(352.2)	32	10	55(57.2)	230(232.2)	29.5	ZCFG300S□-R○.○
		ARPF32S32WE	★	1	32	350(352.2)	32	10	58(60.2)	230(232.2)	31.5	ZCFG320S□-R○.○

Modular Mill Type ARPFM○○

Numeric figure in a circle ◌ and alphabetical character comes in a square □.

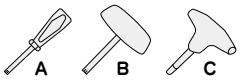


Item Code	Stock	# of Inserts	Size (mm)									Inserts
			DC	LF	APMX	DCON	TZD	DCSFMS	L_1	L_2	Wrench size	
ARPFM10	★	1	10	26(26.5)	3	6.5	M6	9.8	5.5	14.5	7	ZCFG100S□-R○.○ ZCFW100-R○.○
ARPFM12	★	1	12	26(26.5)	4	6.5	M6	9.8	5.5	14.5	7	ZCFG120S□-R○.○ ZCFW120-R○.○ ZCFG130S□-R○.○
ARPFM16	★	1	16	32(32.6)	5	8.5	M8	12.8	5.5	17	10	ZCFG160S□-R○.○ ZCFW160-R○.○ ZCFG170S□-R○.○
ARPFM20	●	1	20	38(39)	6	10.5	M10	17.8	5.5	19	15	ZCFG200S□-R○.○ ZCFW200-R○.○ ZCFG210S□-R○.○
ARPFM25	●	1	25	38(39.8)	8	12.5	M12	20.8	5.5	22	17	ZCFG250S□-R○.○ ZCFW250-R○.○ ZCFG260S□-R○.○
ARPFM30	★	1	30	43(45.2)	10	17	M16	28.8	6	23	22	ZCFG300S□-R○.○ ZCFW300-R○.○
ARPFM32	★	1	32	43(45.2)	10	17	M16	28.8	6	23	22	ZCFG320S□-R○.○ ZCFW320-R○.○

【Note】Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "special shanks" and "special arbor".

●:Inventory maintained in US ★:Inventory maintained in Japan 【Note】( )dimension indicates when ZCFG type insert is installed.

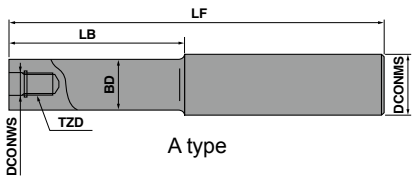
Parts

Parts / Shape / Cutter body	Clamp screw	Fastening torque (N·m)	Screw Driver / Wrench	Type	Screw anti-seizure agent
			 A B C		
ARPF06S○○(W/WL○○)	581-140	0.5	104-T6	A	P-37
ARPF08S○○(L/WL)	581-141	1.1	104-T8	A	
ARPF10S○○(L/WL) ARPFM10 IARPF06S○○(L/WL)	581-142	2.2	104-T10	A	
ARPF12S○○(L/WL) ARPFM12 IARPF08S○○(L/WL)	581-143	4.9	105-T20	B	
ARPF16S○○(L/E/WE) ARPFM16	581-144	4.9			
ARPF20S○○(L○○○/E/WE) ARPFM20 IARPF12S○○(L○○○/E/WE)	581-145	6.9	101-T25S	B	
ARPF25S○○(L○○○/E/WE) ARPFM25 IARPF16S○○(L○○○/E/WE)	581-146	9.8	105-T30A	C	
ARPF30S○○(L○○○/E/WE) ARPFM30	581-147	9.8			
ARPF32S○○(L/E/WE) ARPFM32					

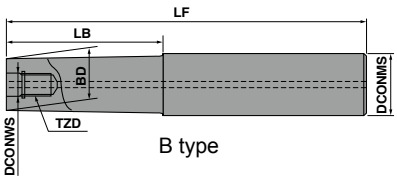
【Note】①One clamp screw is attached to the body. Spare screws are not included (sold separately).
②The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.

Inch

The Shanks for Modular Mill



A type



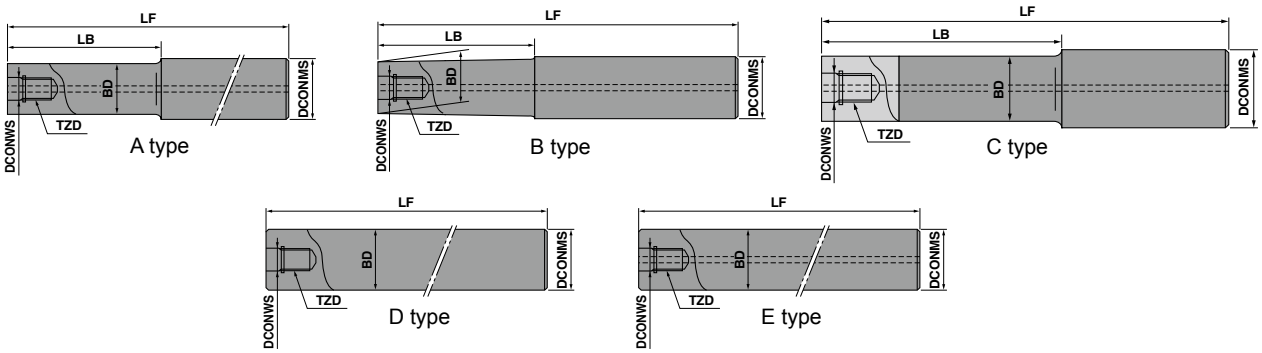
B type

Order No.	Stock	Dimensions (Inch) DCONWS	TZD	LF	LB	BD	DCONMS	Type	Cutter body	Coolant hole
IASC0.375-M6-3-1	●	6.5mm	M6	3	1	.3661	.375	A	ϕ1/2″ ϕ8mm※1 ϕ10mm※1 ϕ12mm※1	—
IASC0.5-M6-4-2	●		M6	4	2	.453	.5	A		—
IASC0.5-M6-6-3	●		M6	6	3	.453	.5	A		—
IASC0.625-M8-4-2	●	8.5mm	M8	4	2	.571	.625	B	ϕ16mm	○
IASC0.625-M8-6-3	●		M8	6	3	.571	.625	B		○
IASC0.75-M10-5-2.5Z	●	10.5mm	M10	5	2.5	.689	.75	B	ϕ3/4″※1 ϕ20mm	○
IASC0.75-M10-8-4Z	●		M10	8	4	.689	.75	B		○
IASC1-M12-6-3Z	●	12.5mm	M12	6	3	.906	1	B	ϕ1″※1 ϕ25mm※1	○
IASC1-M12-8-4Z	●		M12	8	4	.906	1	B		○

●= Inventory Maintained in US ○= Tool with coolant hole
※1 Cutter Dia. is same or smaller than the shank dia.. Interference may occures.

Metric

The Shanks for Modular Mill

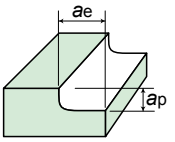


Order No.	Stock	Dimensions (mm)						Type	Cutter body	Coolant hole
		DCONWS	TZD	LF	LB	BD	DCONMS			
NEW ASC10-6.5-74-24Z	●	6.5	M6	74	24	9.3	10	A	ϕ8※1 ϕ10※1 ϕ12 ϕ1/2″※1	○
NEW ASC10-6.5-84-34Z	●			84	34			A		○
NEW ASC10-6.5-114-49Z	★			114	49			A		○
NEW ASC10-6.5-114-24Z	★				24			A		○
NEW ASC12-6.5-74-24Z	●	6.5	M6	74	24	11	12	B		○
NEW ASC12-6.5-94-44Z	●			94	44			B		○
ASC12-M6-100-0	●			100	-	12		D		—
NEW ASC12-6.5-129-64Z	★			129	64	11		B		○
NEW ASC12-6.5-129-24Z	★				24			B		○
ASC16-8.5-95-30Z	●	8.5	M8	95	30	14.5	16	B	ϕ16※1	○
ASC16-8.5-120-55Z	●			120	55					
ASC16-8.5-140-75Z	●			140	75					
ASC16-8.5-160-95Z	★			160	95					
ASC16-8.5-160-30Z	★			160	30					
ASC18-M10-125-0Z	●	10.5	M10	125	-	18	18	E	ϕ20※1 ϕ3/4″※1	○
ASC20-10.5-120-50Z	★			120	50	18.5	20	B		○
ASC20-10.5-170-90Z	●			170	90					
ASC20-10.5-220-120Z	●			220	120					
ASC20-10.5-270-150Z	★			270	150					
ASC20-10.5-220-50Z	★	10.5	M10	220	50	18.5	20	B		○
ASC20-10.5-270-50Z	★			270						
ASC25-12.5-145-65	★	12.5	M12	145	65	23	25	C	ϕ25※1 ϕ1″	○
ASC25-M12-150-0Z	●			150	-	25		E		
ASC25-12.5-215-115	●			215	115	23		C		
ASC25-12.5-265-145	●			265	145					
ASC25-12.5-315-195	★			315	195					
ASC25-12.5-265-65	★	12.5	M12	265	65	23	25	C		○
ASC25-12.5-315-65	★			315						
ASC32-17-160-80	★	17	M16	160	80	28	32	C	ϕ30※1 ϕ32※1 ϕ1.25″※1	○
ASC32-17-210-110	●			210	110					
ASC32-17-260-140	●			260	140					
ASC32-17-310-190	★			310	190					
ASC32-17-360-240	★			360	240					
ASC32-17-260-80	★	17	M16	260	80	28	32	C		○
ASC32-17-310-80	★			310						
ASC32-17-360-80	★			360						

●= Inventory Maintained in US ★= Inventory Maintained in Japan ○= Tool with coolant hole

※1 Cutter Dia. is same or smaller than the shank dia.. Interference may occures.

Recommended Cutting Conditions (Inch)



※Red indicates primary recommended insert grade.

Work material	Insert Grade		Cutting Conditions	ϕ.375			ϕ.5			ϕ.75			ϕ1		
	SG・SW (helical cutting edge inserts)	General Edge Shape		Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing
				General purpose	High-speed		General purpose	High-speed		General purpose	High-speed		General purpose	High-speed	
Carbon steel Alloy steel (30HRC or less)	※ PN215 TH308	ATH08M (PCA12M)	*n* (min⁻¹)	5,348	10,028	10,028	4,011	7,521	7,521	2,550	5,014	5,014	2,006	3,820	3,820
			SFM	525	984	984	525	984	984	525	984	984	525	984	984
			IPM	84.2	118.4	118.4	63.2	88.8	88.8	52.6	79.0	79.0	39.5	59.2	59.2
			IPT	.0079	.0059	.0059	.0079	.0059	.0059	.0098	.0079	.0079	.0098	.0079	.0079
			*a*p (inch)	.0098	.0098	.0039	.0118	.0118	.0039	.0394	.0394	.0079	.0492	.0492	.0079
			*a*e (inch)	.0394	.0197	.0079	.0472	.0236	.0079	.0787	.0787	.0079	.0984	.0492	.0079
Carbon steel Alloy steel (30～45HRC)	TH308 PN215	ATH08M (PCA12M)	*n* (min⁻¹)	3,820	9,359	9,359	3,008	7,020	7,020	2,006	4,680	4,680	1,530	3,510	3,510
			SFM	397	918	918	397	918	918	397	918	918	397	918	918
			IPM	63.2	110.5	110.5	47.4	82.9	82.9	39.5	73.7	73.7	29.6	55.3	55.3
			IPT	.0079	.0059	.0059	.0079	.0059	.0059	.0098	.0079	.0079	.0098	.0079	.0079
			*a*p (inch)	.0098	.0098	.0039	.0118	.0118	.0039	.0394	.0394	.0079	.0492	.0492	.0079
			*a*e (inch)	.0394	.0197	.0079	.0472	.0236	.0079	.0787	.0787	.0079	.0984	.0492	.0079
Cast Iron	TH308 PN215	ATH08M (PCA12M)	*n* (min⁻¹)	5,090	12,100	12,100	4,011	10,080	10,080	2,674	6,351	6,351	2,006	4,763	4,763
			SFM	525	1,246	1,246	525	1,246	1,246	525	1,246	1,246	525	1,246	1,246
			IPM	126.3	200.0	200.0	94.8	150.0	150.0	73.7	150.0	150.0	55.3	112.5	112.5
			IPT	.0118	.0079	.0079	.0118	.0079	.0079	.0138	.0118	.0118	.0138	.0118	.0118
			*a*p (inch)	.0098	.0079	.0039	.0098	.0079	.0039	.0394	.0394	.0079	.0492	.049	.0079
			*a*e (inch)	.0394	.0154	.0079	.0472	.0236	.0079	.0787	.787	.0079	.0984	.0984	.0079
Graphite	TH308		*n* (min⁻¹)	10,028	13,371	13,371	7,521	10,028	10,028	5,014	6,685	6,685	3,760	5,012	5,012
			SFM	984	1,312	1,312	984	1,312	1,312	984	1,312	1,312	984	1,312	1,312
			IPM	157.9	315.8	210.6	118.4	236.9	157.9	98.7	157.9	131.6	73.7	118.3	98.2
			IPT	.0079	.0118	.0079	.0079	.0118	.0079	.0098	.0118	.0098	.0098	.0118	.0098
			*a*p (inch)	.0197	.0118	.0079	.0236	.0157	.0079	.0394	.0276	.0079	.0492	.0492	.0079
			*a*e (inch)	.0394	.0315	.0098	.0472	.0354	.0118	.0787	.0591	.0157	.0984	.0984	.0157
Cast aluminum alloy AC4A, ADC12 etc	PN215		*n* (min⁻¹)	10,028	15,920	15,920	7,521	13,270	13,270	5,014	7,960	7,960	3,760	6,265	6,265
			SFM	984	1,640	1,640	984	1,640	1,640	984	1,640	1,640	984	1,640	1,640
			IPM	157.9	526.4	263.2	118.4	394.8	197.4	98.7	263.2	131.6	73.7	147.8	122.8
			IPT	.0079	.0157	.0079	.0079	.0157	.0079	.0098	.0157	.0098	.0098	.0157	.0098
			*a*p (inch)	.0197	.0118	.0079	.0236	.0157	.0079	.0394	.0276	.0079	.0492	.0492	.0079
			*a*e (inch)	.0394	.0315	.0098	.0472	.0354	.0118	.0787	.0591	.0157	.0984	.0984	.0157
Hardened Steel 45～55HRC	TH308 PN215	ATH08M (PCA12M)	*n* (min⁻¹)	3,343	9,359	9,359	2,507	7,020	7,020	1,590	4,680	4,680	1,254	3,510	3,510
			SFM	328	918	918	328	918	918	328	918	918	328	918	918
			IPM	26.3	36.8	36.8	19.7	27.6	27.6	15.8	22.1	22.1	11.8	16.6	16.6
			IPT	.0039	.002	.002	.0039	.002	.002	.0047	.0024	.0024	.0047	.0024	.0024
			*a*p (inch)	.0098	.0098	.0039	.0118	.0118	.0039	.0394	.0394	.0787	.0492	.0492	.0079
			*a*e (inch)	.0394	.0098	.0078	.0472	.0118	.0078	.0787	.0394	.0079	.0984	.0492	.0079
Hardened Steel 55～62HRC	TH308	ATH08M	*n* (min⁻¹)	2,674	7,354	7,354	2,006	5,515	5,515	1,337	3,677	3,677	1,003	2,758	2,758
			SFM	262	721	721	262	721	721	262	721	721	262	721	721
			IPM	21.1	29.0	29.0	15.8	21.7	21.7	12.6	17.4	17.4	9.5	13.0	13.0
			IPT	.0039	.002	.002	.0039	.002	.002	.0047	.0024	.0024	.0047	.0024	.0024
			*a*p (inch)	.0098	.0098	.0039	.0118	.0118	.0039	.0394	.0394	.0787	.0492	.0492	.0079
			*a*e (inch)	.0394	.0098	.0078	.0472	.0118	.0078	.0787	.0394	.0079	.0984	.0492	.0079
Maximum *fz* (inch/t)				<0.0197			<0.0197			<0.0236			<0.0236		
Maximum *a*p (inch)				<0.118			<0.1575			<0.236			<0.236		

【Note】

1. Use the appropriate coolant for the work material and machining shape.
2. These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
3. Be sure to practice safety instructions and precautions such as wearing glasses and safety shoes, and placing safety covers when you use this tool. Because this tool can be broken during machining so failure to follow these instructions may cause personal injury.
4. Never attempt to modify the carbide shank holder. Use the value for the depth of cut (*a*p) when the carbide shank holder is used.
   Mill diameters *D*c≦.5" :*a*p≦.008". Mill diameters *D*c≧.75 ":*a*p≦0.012".

※with overhang of more than 3*D*c, please modify parameter using the chart below

Overhang ratio	SFM	IPM
<3DC	100%	100%
3DC～5DC	70%	70%
5DC～8DC	60%	60%
8DC～10DC	50%	50%

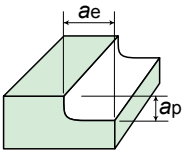
Recommended Cutting Conditions (Metric)

※Red indicates primary recommended insert grade.

Work material	Insert Grade		Cutting Conditions	φ6			φ8			φ10			φ12		
	SG・SW (helical cutting edge inserts)	General edge shape		Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing
				General purpose	High-speed		General purpose	High-speed		General purpose	High-speed		General purpose	High-speed	
Carbon steel Alloy steel (30HRC or less)	※ PN215 TH308	PTH08M (PCA12M)	*n* (min⁻¹)	8,490	16,450	16,450	6,370	11,940	11,940	5,090	9,550	9,550	4,240	7,960	7,960
			Vc (m/min)	160	310	310	160	300	300	160	300	300	160	300	300
			Vf (mm/min)	1,700	2,300	2,300	2,550	3,580	3,580	2,040	2,870	2,870	1,700	2,390	2,390
			fz (mm/t)	0.1	0.07	0.07	0.2	0.15	0.15	0.2	0.15	0.15	0.2	0.15	0.15
			*a*p (mm)	0.1	0.1	0.05	0.2	0.2	0.1	0.25	0.25	0.1	0.3	0.3	0.1
			*a*e (mm)	0.6	0.3	0.2	0.8	0.4	0.2	1	0.5	0.2	1.2	0.6	0.2
Carbon steel Alloy steel (30～45HRC)	TH308 PN215	PTH08M (PCA12M)	*n* (min⁻¹)	6,370	14,850	14,850	4,770	11,150	11,150	3,820	8,920	8,920	3,180	7,430	7,430
			Vc (m/min)	120	280	280	120	280	280	120	280	280	120	280	280
			Vf (mm/min)	1,270	2,080	2,080	1,910	3,350	3,350	1,530	2,680	2,680	1,270	2,230	2,230
			fz (mm/t)	0.1	0.07	0.07	0.2	0.15	0.15	0.2	0.15	0.15	0.2	0.15	0.15
			*a*p (mm)	0.1	0.1	0.05	0.2	0.2	0.1	0.25	0.25	0.1	0.3	0.3	0.1
			*a*e (mm)	0.6	0.3	0.2	0.8	0.4	0.2	1	0.5	0.2	1.2	0.6	0.2
Cast Iron	TH308 PN215	PTH08M (PCA12M)	*n* (min⁻¹)	8,490	20,160	20,160	6,370	15,120	15,120	5,090	12,100	12,100	4,240	10,080	10,080
			Vc (m/min)	160	380	380	160	380	380	160	380	380	160	380	380
			Vf (mm/min)	2,550	4,030	4,030	3,820	6,050	6,050	3,050	4,840	4,840	2,550	4,030	4,030
			fz (mm/t)	0.15	0.1	0.1	0.3	0.2	0.2	0.3	0.2	0.2	0.3	0.2	0.2
			*a*p (mm)	0.1	0.1	0.05	0.2	0.2	0.1	0.25	0.2	0.1	0.3	0.3	0.1
			*a*e (mm)	0.6	0.3	0.2	0.8	0.4	0.2	1	0.4	0.2	1.2	0.6	0.2
Graphite	TH308	HD7010	*n* (min⁻¹)	15,920	21,220	21,220	11,940	15,920	15,920	9,550	12,740	12,740	7,960	10,620	10,620
			Vc (m/min)	300	400	400	300	400	400	300	400	400	300	400	400
			Vf (mm/min)	3,180	6,370	4,240	4,780	9,550	6,370	3,820	7,640	5,100	3,190	6,370	4,240
			fz (mm/t)	0.1	0.15	0.1	0.2	0.3	0.2	0.2	0.3	0.2	0.2	0.3	0.2
			*a*p (mm)	0.3	0.15	0.15	0.4	0.2	0.2	0.5	0.3	0.2	0.6	0.4	0.2
			*a*e (mm)	0.6	0.6	0.2	0.8	0.8	0.25	1.0	0.8	0.25	1.2	0.9	0.3
Cast aluminum alloy AC4A, ADC12 etc	PN215	HD7010	*n* (min⁻¹)	15,920	26,530	26,530	11,940	19,900	19,900	9,550	15,920	15,920	7,960	13,270	13,270
			Vc (m/min)	300	500	500	300	500	500	300	500	500	300	500	500
			Vf (mm/min)	3,180	10,610	5,310	4,780	15,920	7,960	3,820	12,740	6,370	3,190	10,620	5,310
			fz (mm/t)	0.1	0.2	0.1	0.2	0.4	0.2	0.2	0.4	0.2	0.2	0.4	0.2
			*a*p (mm)	0.3	0.15	0.15	0.4	0.2	0.2	0.5	0.3	0.2	0.6	0.4	0.2
			*a*e (mm)	0.6	0.6	0.2	0.8	0.8	0.25	1.0	0.8	0.25	1.2	0.9	0.3
Hardened Steel 45～55HRC	TH308 PN215	PTH08M (PCA12M)	*n* (min⁻¹)	5,310	14,850	14,850	3,980	11,150	11,150	3,180	8,920	8,920	2,650	7,430	7,430
			Vc (m/min)	100	280	280	100	280	280	100	280	280	100	280	280
			Vf (mm/min)	850	1,190	1,190	800	1,120	1,120	640	890	890	530	740	740
			fz (mm/t)	0.08	0.04	0.04	0.1	0.05	0.05	0.1	0.05	0.05	0.1	0.05	0.05
			*a*p (mm)	0.1	0.1	0.05	0.2	0.2	0.1	0.25	0.25	0.1	0.3	0.3	0.1
			*a*e (mm)	0.6	0.2	0.2	0.8	0.2	0.2	1	0.25	0.2	1.2	0.3	0.2
Hardened Steel 55～62HRC	TH308	PTH08M	*n* (min⁻¹)	4,240	11,670	11,670	3,180	8,760	8,760	2,550	7,000	7,000	2,120	5,840	5,840
			Vc (m/min)	80	220	220	80	220	220	80	220	220	80	220	220
			Vf (mm/min)	680	930	930	640	880	880	510	700	700	420	580	580
			fz (mm/t)	0.08	0.04	0.04	0.1	0.05	0.05	0.1	0.05	0.05	0.1	0.05	0.05
			*a*p (mm)	0.1	0.1	0.05	0.2	0.2	0.1	0.25	0.25	0.1	0.3	0.3	0.1
			*a*e (mm)	0.6	0.2	0.2	0.8	0.2	0.2	1	0.25	0.2	1.2	0.3	0.2
Maximum *fz* (mm/t)				<0.2			<0.5			<0.5			<0.5		
Maximum *a*p (mm)				<0.6			<2.5			<3.0			<4.0		

【Note】

1. Use the appropriate coolant for the work material and machining shape.
2. These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
3. Be sure to practice safety instructions and precautions such as wearing glasses and safety shoes, and placing safety covers when you use this tool. Because this tool can be broken during machining so failure to follow these instructions may cause personal injury.
4. Never attempt to modify the carbide shank holder. Use the value for the depth of cut (*a*p) when the carbide shank holder is used.
   Mill diameters *D*c≦12mm:*a*p≦0.2mm. Mill diameters *D*c≧16mm:*a*p≦0.3mm.



※Red indicates primary recommended insert grade.

Work material	Insert Grade		Cutting Conditions	ϕ16			ϕ20			ϕ25			ϕ30			ϕ32		
	SG・SW (helical cutting edge inserts)	General edge shape		Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing
				General purpose	High-speed		General purpose	High-speed		General purpose	High-speed		General purpose	High-speed		General purpose	High-speed	
Carbon steel Alloy steel (30HRC or less)	※ PN215 TH308	PTH08M (PCA12M)	n (min^{-1})	3,190	5,970	5,970	2,550	4,780	4,780	2,040	3,820	3,820	1,700	3,180	3,180	1,590	2,990	2,990
			Vc (m/min)	160	300	300	160	300	300	160	300	300	160	300	300	160	300	300
			Vf (mm/min)	1,600	2,390	2,390	1,280	1,910	1,910	1,020	1,530	1,530	850	1,270	1,270	800	1,200	1,200
			fz (mm/t)	0.25	0.2	0.2	0.25	0.2	0.2	0.25	0.2	0.2	0.25	0.2	0.2	0.25	0.2	0.2
			ap (mm)	0.8	0.8	0.2	1	1	0.2	1.25	1.25	0.2	1.6	1.6	0.2	1.6	1.6	0.2
			ae (mm)	1.6	1.6	0.2	2	2	0.2	2.5	1.25	0.2	3.2	3.2	0.2	3.2	3.2	0.2
Carbon steel Alloy steel (30～45HRC)	TH308 PN215	PTH08M (PCA12M)	n (min^{-1})	2,390	5,570	5,570	1,910	4,460	4,460	1,530	3,570	3,570	1,270	2,970	2,970	1,190	2,790	2,790
			Vc (m/min)	120	280	280	120	280	280	120	280	280	120	280	280	120	280	280
			Vf (mm/min)	1,200	2,230	2,230	960	1,780	1,780	760	1,430	1,430	640	1,190	1,190	600	1,120	1,120
			fz (mm/t)	0.25	0.2	0.2	0.25	0.2	0.2	0.25	0.2	0.2	0.25	0.2	0.2	0.25	0.2	0.2
			ap (mm)	0.8	0.8	0.2	1	1	0.2	1.25	1.25	0.2	1.6	1.6	0.2	1.6	1.6	0.2
			ae (mm)	1.6	1.6	0.2	2	2	0.2	2.5	2.5	0.2	3.2	3.2	0.2	3.2	3.2	0.2
Cast Iron	TH308 PN215	PTH08M (PCA12M)	n (min^{-1})	3,190	7,560	7,560	2,550	6,050	6,050	2,040	4,840	4,840	1,700	4,030	4,030	1,590	3,780	3,780
			Vc (m/min)	160	380	380	160	380	380	160	380	380	160	380	380	160	380	380
			Vf (mm/min)	2,240	4,540	4,540	1,790	3,630	3,630	1,430	2,900	2,900	1,190	2,420	2,420	1,110	2,270	2,270
			fz (mm/t)	0.35	0.3	0.3	0.35	0.3	0.3	0.35	0.3	0.3	0.35	0.3	0.3	0.35	0.3	0.3
			ap (mm)	0.8	0.8	0.2	1	1	0.2	1.25	1.25	0.2	1.6	1.6	0.2	1.6	1.6	0.2
			ae (mm)	1.6	1.6	0.2	2	2	0.2	2.5	2.5	0.2	3.2	3.2	0.2	3.2	3.2	0.2
Graphite	TH308	HD7010	n (min^{-1})	5,970	7,960	7,960	4,780	6,370	6,370	3,830	5,100	5,100	3,190	4,250	4,250	3,190	4,250	4,250
			Vc (m/min)	300	400	400	300	400	400	300	400	400	300	400	400	300	400	400
			Vf (mm/min)	2,990	4,780	3,980	2,390	3,820	3,190	1,920	3,060	2,550	1,600	2,550	2,130	1,600	2,550	2,130
			fz (mm/t)	0.25	0.3	0.25	0.25	0.3	0.25	0.25	0.3	0.25	0.25	0.3	0.25	0.25	0.3	0.25
			ap (mm)	0.8	0.6	0.2	1	0.7	0.2	1.25	1.25	0.2	1.6	1.6	0.2	1.6	1.6	0.2
			ae (mm)	1.6	1.1	0.3	2	1.5	0.4	2.5	2.5	0.4	3.2	3.2	0.4	3.2	3.2	0.4
Cast aluminum alloy AC4A, ADC12 etc	PN215	HD7010	n (min^{-1})	5,970	9,950	9,950	4,780	7,960	7,960	3,830	6,370	6,370	3,190	5,310	5,310	3,190	5,310	5,310
			Vc (m/min)	300	500	500	300	500	500	300	500	500	300	500	500	300	500	500
			Vf (mm/min)	2,990	7,960	4,980	2,390	6,370	3,980	1,920	5,100	3,190	1,600	4,250	2,660	1,600	4,250	2,660
			fz (mm/t)	0.25	0.4	0.25	0.25	0.4	0.25	0.25	0.4	0.25	0.25	0.4	0.25	0.25	0.4	0.25
			ap (mm)	0.8	0.6	0.2	1	0.7	0.2	1.25	1.25	0.2	1.6	1.6	0.2	1.6	1.6	0.2
			ae (mm)	1.6	1.1	0.3	2	1.5	0.4	2.5	2.5	0.4	3.2	3.2	0.4	3.2	3.2	0.4
Hardened Steel 45～55HRC	TH308 PN215	PTH08M (PCA12M)	n (min^{-1})	1,990	5,570	5,570	1,590	4,460	4,460	1,270	3,570	3,570	1,060	2,970	2,970	1,000	2,790	2,790
			Vc (m/min)	100	280	280	100	280	280	100	280	280	100	280	280	100	280	280
			Vf (mm/min)	480	670	670	380	530	530	310	430	430	250	360	360	240	330	330
			fz (mm/t)	0.12	0.06	0.06	0.12	0.06	0.06	0.12	0.06	0.06	0.12	0.06	0.06	0.12	0.06	0.06
			ap (mm)	0.8	0.8	0.2	1	1	0.2	1.25	1.25	0.2	1.6	1.6	0.2	1.6	1.6	0.2
			ae (mm)	1.6	0.8	0.2	2	1	0.2	2.5	1.25	0.2	3.2	1.6	0.2	3.2	1.6	0.2
Hardened Steel 55～62HRC	TH308	PTH08M	n (min^{-1})	1,590	4,380	4,380	1,270	3,500	3,500	1,020	2,800	2,800	850	2,330	2,330	800	2,190	2,190
			Vc (m/min)	80	220	220	80	220	220	80	220	220	80	220	220	80	220	220
			Vf (mm/min)	380	530	530	300	420	420	240	340	340	200	280	280	190	260	260
			fz (mm/t)	0.12	0.06	0.06	0.12	0.06	0.06	0.12	0.06	0.06	0.12	0.06	0.06	0.12	0.06	0.06
			ap (mm)	0.8	0.8	0.2	1	1	0.2	1.25	1.25	0.2	1.6	1.6	0.2	1.6	1.6	0.2
			ae (mm)	1.6	0.8	0.2	2	1	0.2	2.5	1.25	0.2	3.2	1.6	0.2	3.2	1.6	0.2
Maximum fz (mm/t)				<0.6			<0.6			<0.6			<0.6			<0.6		
Maximum ap (mm)				<5.0			<6.0			<8.0			<10.0			<10.0		

※with overhang of more than 3*D*c, please modify parameter using the chart below

Overhang ratio	v_c (m/min)	v_f (mm/min)
<3DC	100%	100%
3DC～5DC	70%	70%
5DC～8DC	60%	60%
8DC～10DC	50%	50%

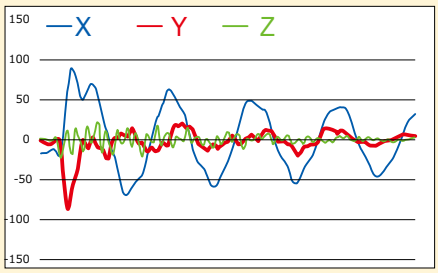
Cutting performance

SG type

01 Cutting force comparison between conventional edge shape and high helix one.

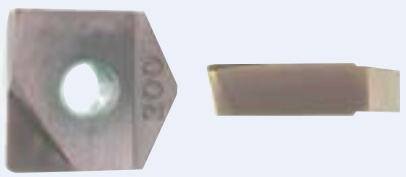
ZCFG-SG(helical cutting edge inserts)

Insert : ZCFG200SG-R1.0

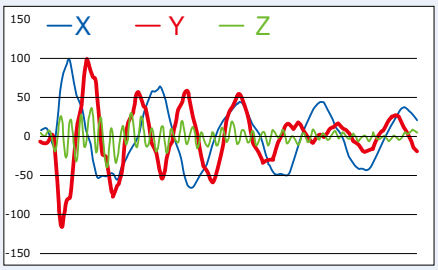


Compared to conventional tools, the cutting resistance (Y part force) received from the wall surface is low and the variation is also small so machining stability is good.

Conventional



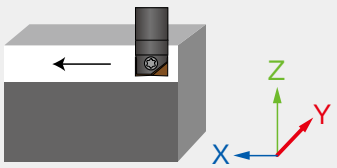
Insert : ZCFW200



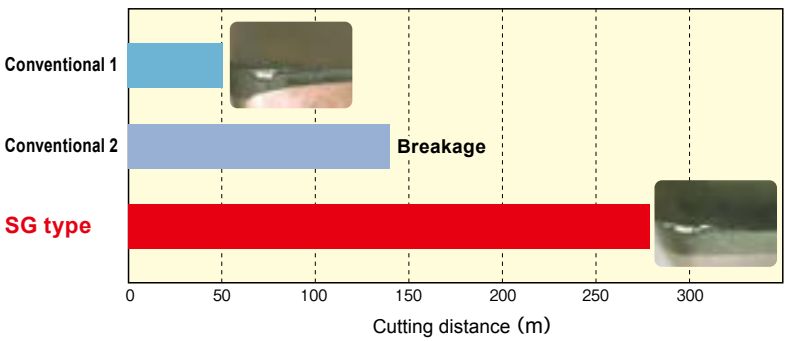
Cutting resistance variation is large.

Cutting conditions

Work material : 1050 (220HB)
Cutter : ARPFM20(Tool dia. ϕ20-R1.0)
Shank : ASC20-10.5-170-90Z
(Overhang : 140mm)
Machine : Vertical type(BT50)
Cutting speed : *Vc*=200m/min
Feed rate : *fz*=0.15mm/t
Cutting depth(*ap*)=1.0mm
Radial depth of cut(*ae*)=0.1mm
Cutting shape : Vertical wall
Coolant : Air



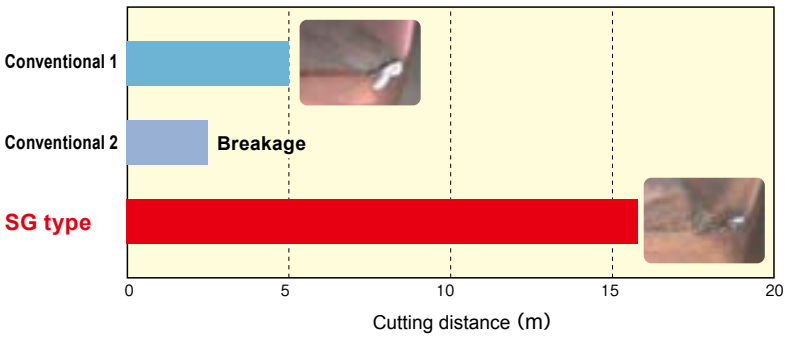
02 Tool life when performing semi-finishing of vertical walls.



Cutting conditions

Work material : stainless materials (52HRC)
Cutter : ARPFM20 (Tool dia. ϕ20)
Shank : ASC20-10.5-120-50Z
(Overhang : 60mm)
Machine : Vertical type (BT50)
Cutting speed : *Vc*=120m/min
Feed rate : *fz*=0.25mm/t
Cutting depth (*ap*) =1.0mm
Radial depth of cut (*ae*) =0.5mm
Cutting shape : Vertical wall
Coolant : Air

03 Tool life when performing semi-finishing of flat surfaces.



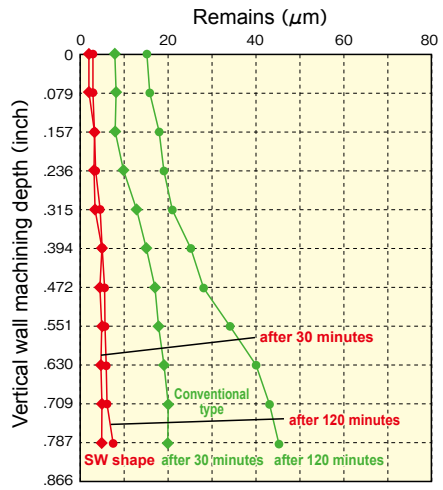
Cutting conditions

Work material : stainless materials (52HRC)
Cutter : ARPFM20 (Tool dia. ϕ20)
Shank : ASC20-10.5-120-50Z
(Overhang : 60mm)
Machine : Vertical type (BT50)
Cutting speed : *Vc*=120m/min
Feed rate : *fz*=0.25mm/t
Cutting depth (*ap*) =0.5mm
Radial depth of cut (*ae*) =10mm
Cutting shape : Planing
Coolant : Air

SW type

Remaining stock when cutting vertical walls

※Comparison of remaining stock with conventional products when the vertical wall was machined for 120 minutes.

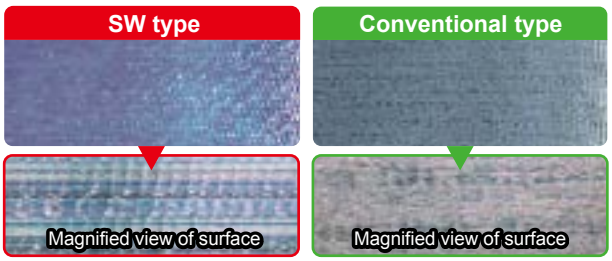


With SW type, even after machining for 120 minutes, the remaining stock was 10μm or less and cut surface quality is good.

Cutting conditions

Work material : Carbon steel (220HB)
Cutter : ARPFM20 (Tool dia. ϕ20)
Shank : ASC20-10.5-170-90Z (Overhang : 140mm)
Machine : Vertical type (BT50)
Cutting speed : *Vc*=200m/min
Feed rate : *fz*=0.15mm/t
Cutting depth (*ap*) =1.0mm
Radial depth of cut (*ae*) =0.1mm
Cutting shape : Vertical wall
Coolant : Air

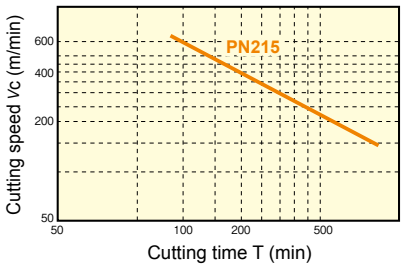
Magnified view of surface after 120 minutes of machining



Shiny surface　　Cloudy surface

Field data

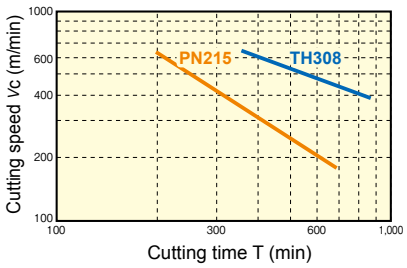
01 *Vc*-T chart for Carbon Steel【220HB】



Cutting conditions

Work material : Carbon steel (220HB)
Tool Cutter : ARPFM20(ϕ20)
Shank : ASC20-10.5-120-50Z
Insert : ZCFG200SG-R1.0(PN215)
Overhang : 80mm, Feed rate : *fz*=0.15mm/t
Radial depth of cut : *ap*×*ae*=1×0.1mm
Machine : Vertical type(BT50)
Cutting shape : vertical wall, Coolant : Air

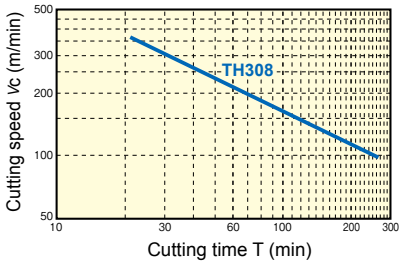
02 *Vc*-T chart for H13【45HRC】



Cutting conditions

Work material : H13 (45HRC)
Tool Cutter : ARPFM20(ϕ20)
Shank : ASC20-10.5-120-50Z
Insert : ZCFG200SG-R1.0(PN215), ZCFG200SG-R1.0(TH308)
Overhang : 80mm, Feed rate : *fz*=0.15mm/t
Radial depth of cut : *ap*×*ae*=1×0.1mm
Machine : Vertical type(BT50)
Cutting shape : vertical wall, Coolant : Air

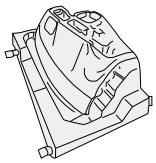
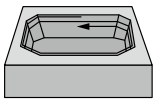
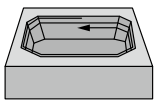
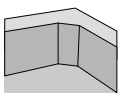
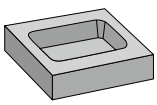
03 *Vc*-T chart for D2【60HRC】



Cutting conditions

Work material : D2 (60HRC)
Tool Cutter : ARPFM20(ϕ20)
Shank : ASC20-10.5-120-50Z
Insert : ZCFG200SG-R1.0(TH308)
Overhang : 80mm, Feed rate : *fz*=0.15mm/t
Radial depth of cut : *ap*×*ae*=1×0.1mm
Machine : Vertical type(BT50)
Cutting shape : vertical wall, Coolant : Air

Field data

Cutting examples	Cutting conditions		Result
Plastic mold 	Tool : ARPF20S20WE (OH=150mm) Work material : Carbon steel Insert: ZCFG200SG-R1.0 (PN215) Machine:Vertical type M/C(BT50) Cutting speed: *Vc*=220m/min Revolution: *n*=3500min^{-1}	Feed speed: *Vf*=1750mm/min Feed rate:*fz*=0.25mm/t Cutting depth: *a*p=0.2mm Radial depth of cut: *a*e=0.1mm Coolant: Dry(Air)	After 6 hours, the cutting edge is good with normal wear. The finished surface is also good compared with conventional products.
	Tool : ARPFM20 + ASC20-10.5-120-50Z(OH=90mm) Work material : Carbon steel Insert : ZCFG200SG-R1.0 (PN215) Machine : Vertical type M/C(BT50) Cutting speed : *Vc*=188m/min Revolution : *n*=3000min^{-1}	Feed speed : *Vf*=1500mm/min Feed rate : *fz*=0.25mm/t Cutting depth : *a*p=0.3mm Radial depth of cut : *a*e=0.4mm Coolant : Dry(Air)	Even after performing semi-finishing with non-uniform cutting for 7 hours, the cutting edge is good with no chipping.
Plastic mold (Carbon Steel) 	Tool : ARPFM20 + ASC20-10.5-220-120Z(OH=150mm) Work material : Carbon steel Insert : ZCFG200SG-R1.0 (PN215) Machine : Vertical type M/C(BT50) Cutting speed : *Vc*=176m/min Revolution : *n*=2800min^{-1}	Feed speed : *Vf*=1700mm/min Feed rate : *fz*=0.3mm/t Cutting depth : *a*p=0.3mm Radial depth of cut : *a*e=0.05mm Coolant : Water base	Even after 7 hours of machining, surface accuracy is good. (Surface is glossy.) With conventional products, surface accuracy became bad after approximately 3 hours of machining, which was judged as the tool life end.
Machining of die-casting mold (pocket area) 	Tool : ARPFM20+ASC20-10.5-220-120Z (OH=160mm) Work material : Equivalent to H13 (40 ～ 43HRC) Insert : ZCFG200SW-R1.0 (TH308) Machine : Vertical type M/C(BT50) ■side wall Cutting speed : *Vc*=182m/min Revolution : *n*=2900min^{-1} Feed speed : *Vf*=600mm/min Feed rate : *fz*=0.1mm/t Cutting depth : *a*p=0.1mm Radial depth of cut : *a*e=0.1mm	■planar section Cutting speed : *Vc*=70m/min Revolution : *n*=1100min^{-1} Feed speed : *Vf*=180mm/min Feed rate : *fz*=0.08mm/t Cutting depth : *a*p=0.1mm Radial depth of cut : *a*e=8mm Coolant : Dry(Air)	Machining accuracy for both side surface areas and flat surface areas is good. With conventional indexable tools, machining accuracy had been a problem.
Machining of die-casting mold 	Tool : ARPFM20+ASC20-10.5-170-90Z(OH=130mm) Work material : H13 Equivalent (45HRC) Insert : ZCFG200SG-R1.0 (PN215) Machine : Vertical type M/C(BT50) Cutting speed : *Vc*=88m/min Revolution : *n*=1400min^{-1}	Feed speed : *Vf*=280mm/min Feed rate : *fz*=0.1mm/t Cutting depth : *a*p=0.5mm Radial depth of cut : *a*e=1mm Coolant : Dry(Air)	Even when machining corner areas where cutting amount is non-uniform, the cutting edge is good with no chipping.
Machining of die-casting mold (structural area) 	Tool : ARPFM20+ASC20-10.5-170-90Z(OH=130mm) Work material : H13 (45HRC) Insert : ZCFG200SG-R1.0 (TH308) Machine : Vertical type M/C(BT50) Cutting speed : *Vc*=200m/min Revolution : *n*=3200min^{-1}	Feed speed : *Vf*=1600mm/min Feed rate : *fz*=0.25mm/t Cutting depth : *a*p=0.2mm Radial depth of cut : *a*e=0.1mm Coolant : Dry(Air)	Performing finishing once resulted in finishing that was within the specified dimensional tolerance. With conventional products, chattering often occurred and there were uncut areas so re-machining was necessary.

Safety Considerations

1. Handling

(1) When removing tool from packaging, be careful not to drop the tool on your foot or fingers.
(2) When actually setting the inserts, be careful not to touch the cutting flute directly with your bare hands.

2. Mounting

(1) When preparing to use, be sure that the insert is firmly screwed in the pocket and cutter is properly mounted on the tool holder.
(2) If abnormal chattering occurs during use, stop the machine immediately, identify the cause of the chatter and take corrective action.

3. Usage

(1) Before use confirm all dimensions, verify work material and programmed tool rotation.
(2) The numerical values in the standard cutting conditions table should be used as criteria when starting new work. The cutting conditions should be adjusted as appropriate when the cutting depth is large, the rigidity of the machine being used is low, or according to the conditions of the work material.
(3) Inserts are made of hard material and may break and be expelled from cutter at high speeds. Since there is a danger of injury to workers from chip evacuation, insert breakage or fire safety precautions must be observed at all times. Including, but not limited to: safety glasses, machine enclosures or other means to create a safe environment for work. If you have questions on safety, contact your supervisor.
- Do not use where there is a risk of fire or explosion.
- Do not use non-water-soluble cutting oils. Such oils may result in fire.

(4) Do not use the tool for any purpose other than that for which it is intended, and do not modify it.

Notes

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