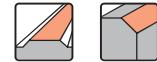
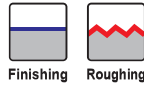


# INDEXABLE MILLING

## FACE MILLING <GENERAL CUTTING>

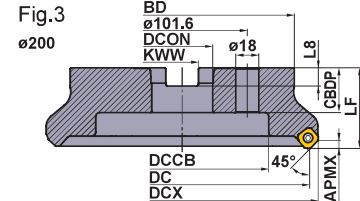
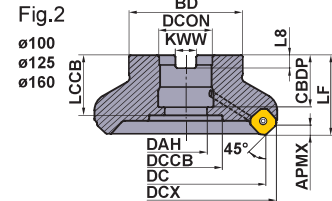
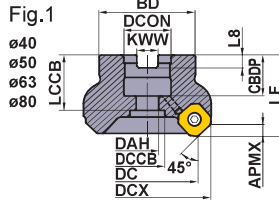


### WSX445 NEW

- P  
Steel
- M  
Stainless Steel
- K  
Cast Iron
- N  
Non-ferrous Metal
- S  
Heat Resistant Alloy
- H  
Hardened Steel



- Unique design both sides insert
- Sudden fracture & welding prevention function
- Highly efficient chip discharge



KAPR : 45°  
GAMP : +17° T : -7° ~ -2°  
GAMF : -6° ~ +1° I : +16° ~ +19°

Right hand tool holder only.

### ARBOR TYPE

Type	Order Number	Stock		Number of Teeth	Dimensions (mm)											WT* (kg)	APMX (mm)	Type (Fig.)
		R	Coolant Hole		DC	DCX	LF	DCON	CBDP	DAH	DCCB	LCCB	BD	KWW	L8			
Coarse Pitch	WSX445-040A03AR	●	○	3	40	52.8	40	16	18	9	14	25	37	8.4	5.6	0.3	5	1
	WSX445-050A03AR	●	○	3	50	62.9	40	22	20	11	17	27	47	10.4	6.3	0.5	5	1
	WSX445-063A04AR	●	○	4	63	75.9	40	22	20	11	17	27	50	10.4	6.3	0.6	5	1
	WSX445R08004CA	●	○	4	80	92.9	50	25.4	26	13	20	34	56	9.5	6	1.3	5	1
	WSX445R10005DA	●	○	5	100	112.9	50	31.75	32	26	45	37	70	12.7	8	1.8	5	2
	WSX445R12506EA	●	○	6	125	137.9	63	38.1	36	30	56	42	80	15.9	10	3.2	5	2
	WSX445R16007FA	●	○	7	160	172.9	63	50.8	38	40	72	45	100	19.14	11	4.9	5	2
	WSX445R20008KN	●	—	8	200	212.9	63	47.625	35	—	135	—	175	25.4	14.22	8.7	5	3
Fine Pitch	WSX445-040A04AR	●	○	4	40	52.8	40	16	18	9	14	25	37	8.4	5.6	0.3	5	1
	WSX445-050A04AR	●	○	4	50	62.9	40	22	20	11	17	27	47	10.4	6.3	0.4	5	1
	WSX445-063A05AR	●	○	5	63	75.9	40	22	20	11	17	27	50	10.4	6.3	0.6	5	1
	WSX445R08006CA	●	○	6	80	92.9	50	25.4	26	13	20	34	56	9.5	6	1.2	5	1
	WSX445R10007DA	●	○	7	100	112.9	50	31.75	32	26	45	37	70	12.7	8	1.7	5	2
	WSX445R12508EA	●	○	8	125	137.9	63	38.1	36	30	56	42	80	15.9	10	3.1	5	2
	WSX445R16010FA	●	○	10	160	172.9	63	50.8	38	40	72	45	100	19.1	11	4.8	5	2
	WSX445R20012KN	●	—	12	200	212.9	63	47.625	35	—	135	—	175	25.4	14.22	8.6	5	3
Extra Fine Pitch	WSX445-050A05AR	●	○	5	50	62.9	40	22	20	11	17	27	47	10.4	6.3	0.4	5	1
	WSX445-063A06AR	●	○	6	63	75.9	40	22	20	11	17	27	50	10.4	6.3	0.6	5	1
	WSX445R08008CA	●	○	8	80	92.9	50	25.4	26	13	20	34	56	9.5	6	1.1	5	1
	WSX445R10010DA	●	○	10	100	112.9	50	31.75	32	26	45	37	70	12.7	8	1.6	5	2
	WSX445R12512EA	●	○	12	125	137.9	63	38.1	36	30	56	42	80	15.9	10	3.0	5	2
	WSX445R16016FA	●	○	16	160	172.8	63	50.8	38	40	72	45	100	19.1	11	4.6	5	2
	WSX445R20020KN	●	—	20	200	212.8	63	47.625	35	—	135	—	175	25.4	14.22	8.4	5	3

(Note) A set bolt to the arbor is not supplied with the body. Please refer to page L012, when ordering.

\* WT : Tool Weight

### SPARE PARTS

Tool Holder Number	Clamp Screw	Wrench (Insert)
WSX445	TPS4R	TIP15W

\* Clamp Torque (N · m) : TPS4R=3.5

● : Inventory maintained in Japan.

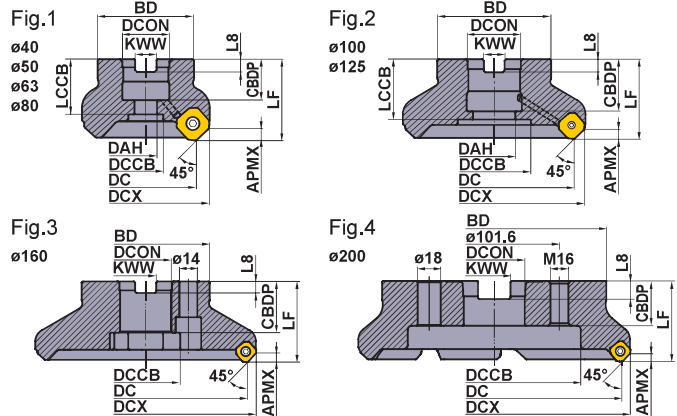
**For metric arbors**

The cutter bore diameter DCON is indicated in millimetre.



KAPR :45°  
GAMP :+17° T : -7° - -2°  
GAMF : -6° - +1° I : +16° - +19°

**ARBOR TYPE**



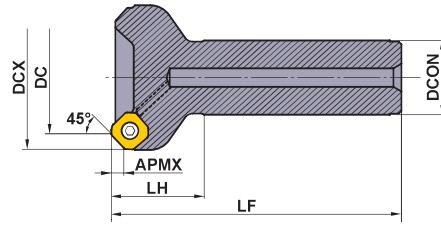
Right hand tool holder only.

Type	Order Number	Stock		Coolant Hole	Number of Teeth	Dimensions (mm)										WT* (kg)	APMX (mm)	Type (Fig.)	
		R				DC	DCX	LF	DCON	CGBP	DAH	DCCB	LCCB	BD	KWW				L8
Coarse Pitch	WSX445-040A03AR	●	○		3	40	52.8	40	16	18	9	14	25	37	8.4	5.6	0.3	5	1
	WSX445-050A03AR	●	○		3	50	62.9	40	22	20	11	17	27	47	10.4	6.3	0.5	5	1
	WSX445-063A04AR	●	○		4	63	75.9	40	22	20	11	17	27	50	10.4	6.3	0.6	5	1
	WSX445-080A04AR	●	○		4	80	92.9	50	27	23	13	20	34	56	12.4	7	1.3	5	1
	WSX445-100B05AR	●	○		5	100	112.9	50	32	26	26	45	32	78	14.4	8	1.9	5	2
	WSX445-125B06AR	●	○		6	125	137.9	63	40	28	30	56	40	89	16.4	9	3.4	5	2
	WSX445-160C07NR	●	—		7	160	172.9	63	40	40	—	56	—	100	16.4	9	4.9	5	3
	WSX445-200C08NR	●	—		8	200	212.9	63	60	32	—	135	—	160	25.7	14.22	7.5	5	4
Fine Pitch	WSX445-040A04AR	●	○		4	40	52.8	40	16	18	9	14	25	37	8.4	5.6	0.3	5	1
	WSX445-050A04AR	●	○		4	50	62.9	40	22	20	11	17	27	47	10.4	6.3	0.4	5	1
	WSX445-063A05AR	●	○		5	63	75.9	40	22	20	11	17	27	50	10.4	6.3	0.6	5	1
	WSX445-080A06AR	●	○		6	80	92.9	50	27	23	13	20	34	56	12.4	7	1.2	5	1
	WSX445-100B07AR	●	○		7	100	112.9	50	32	26	26	45	32	78	14.4	8	1.9	5	2
	WSX445-125B08AR	●	○		8	125	137.9	63	40	28	30	56	40	89	16.4	9	3.4	5	2
	WSX445-160C10NR	●	—		10	160	172.9	63	40	40	—	56	—	100	16.4	9	4.8	5	3
	WSX445-200C12NR	●	—		12	200	212.9	63	60	32	—	135	—	160	25.7	14.22	7.4	5	4
Extra Fine Pitch	WSX445-050A05AR	●	○		5	50	62.9	40	22	20	11	17	27	47	10.4	6.3	0.4	5	1
	WSX445-063A06AR	●	○		6	63	75.9	40	22	20	11	17	27	50	10.4	6.3	0.6	5	1
	WSX445-080A08AR	●	○		8	80	92.9	50	27	23	13	20	34	56	12.4	7	1.1	5	1
	WSX445-100B10AR	●	○		10	100	112.9	50	32	26	26	45	32	78	14.4	8	1.8	5	2
	WSX445-125B12AR	●	○		12	125	137.9	63	40	28	30	56	40	89	16.4	9	3.2	5	2
	WSX445-160C16NR	●	—		16	160	172.8	63	40	40	—	56	—	100	16.4	9	4.6	5	3
WSX445-200C20NR	●	—		20	200	212.8	63	60	32	—	135	—	160	25.7	14.22	7.2	5	4	

(Note) A set bolt to the arbor is not supplied with the body. Please refer to page L012, when ordering.

\* WT : Tool Weight

# INDEXABLE MILLING



Right hand tool holder only.

## SHANK TYPE

Type	Order Number	Stock R	Coolant Hole	Number of Teeth	Dimensions (mm)					WT* (kg)	APMX (mm)
					DC	DCX	LF	DCON	LH		
Coarse Pitch	WSX445R4003SA32M	●	○	3	40	52.8	125	32	40	0.8	5
	WSX445R5003SA32M	●	○	3	50	62.9	125	32	40	1.0	5
	WSX445R6304SA32M	●	○	4	63	75.9	125	32	40	1.2	5
	WSX445R8004SA32M	●	○	4	80	92.9	125	32	40	1.6	5
Fine Pitch	WSX445R4004SA32M	●	○	4	40	52.8	125	32	40	0.8	5
	WSX445R5004SA32M	●	○	4	50	62.9	125	32	40	1.0	5
	WSX445R6305SA32M	●	○	5	63	75.9	125	32	40	1.2	5
	WSX445R8006SA32M	●	○	6	80	92.9	125	32	40	1.5	5

\* WT : Tool Weight

## SPARE PARTS

Tool Holder Number	*	
WSX445	TPS4R	TIP15W

\* Clamp Torque (N · m) : TPS4R=3.5

## SET BOLT (SOLD SEPARATELY)

Arbor Type	Set Bolt		Type	Reference Dimensions (mm)							Geometry
	With coolant hole	Without coolant hole		a	b	c	d	e	f	g	
	Order Number	Order Number									
WSX445-040A $\odot$ AR	HSC08025H	HSC08040	1	13	M8×1.25	33	8	5	-	-	Fig.1 Fig.2
WSX445-050A $\odot$ AR	HSC10030H	HSC10035	1	16	M10×1.5	40	10	6	-	-	
WSX445-063A $\odot$ AR	HSC10030H	HSC10035	1	16	M10×1.5	40	10	6	-	-	
WSX445-080A $\odot$ AR	HSC12035H	HSC12035 HSC12045	1	18	M12×1.75	47 57	12	10	-	-	
WSX445-100B $\odot$ AR	MBA16033H	-	2	40	M16×2	43	10	14	6	23	
WSX445-125B $\odot$ AR	MBA20040H	-	2	50	M20×2.5	54	14	17	6	27	
WSX445-160C $\odot$ NR	No coolant hole	-	2	50	M20×2.5	54	14	17	6	27	
WSX445-200C $\odot$ NR	No coolant hole	-	1	24	M16×2	43	16	14	6	23	
WSX445R080 $\odot$ CA	HSC12035H	HSC12035 HSC12045	1	18	M12×1.75	47 57	12	10	-	-	
WSX445R100 $\odot$ DA	MBA16033H	-	2	40	M16×2	43	10	14	6	23	
WSX445R125 $\odot$ EA	MBA20040H	-	2	50	M20×2.5	54	14	17	6	27	
WSX445R160 $\odot$ FA	MBA24045H	-	2	65	M24×3	59	14	17	10	37	
WSX445R200 $\odot$ KN	No coolant hole	-	2	24	M16×2	43	16	14	-	-	

(Note 1) Internal coolant is necessary with the set bolt.

"Confirmation method" (See the figure at the right.)

- ① Cutting dimensions "DAH" and "DCCB" shall be larger than bore diameters " $\phi$ a" and " $\phi$ g".
- ② Cutting dimension "LF-LCCB" shall be larger than bolt dimension "d".

● : Inventory maintained in Japan. (10 inserts in one case)

## INSERTS WITH BREAKER

Work Material	P	Steel												<b>Cutting Conditions :</b> ● : Stable Cutting ● : General Cutting ✦ : Unstable Cutting  <b>Honing :</b> E : Round F : Sharp				
	M	Stainless Steel																
	K	Cast Iron																
Shape	Order Number	Class	Honing	Coated							Carbide	Dimensions (mm)				Geometry		
				MC5020	MP6120	MP6130	MP7130	MP9120	VP15TF	VP20RT	TF15	IC	S	BS	RE			
 	SNGU140812ANFR-L	G	F									●	14	8.4	1.5	1.2		
	SNGU140812ANER-L	G	E	●	●	●	●	●	●					14	8.4	1.5		1.2
	SNGU140812ANER-M	G	E	●	●	●	●	●	●					14	8.4	1.5		1.2
	SNMU140812ANER-M	M	E	●	●	●	●	●	●					14	8.4	1.5		1.2
	SNMU140812ANER-R	M	E	●	●	●	●	●	●					14	8.4	1.5		1.2
	SNMU140812ANER-H	M	E	●	●	●	●	●	●					14	8.4	1.5		1.2



## WIPER INSERTS

Shape	Order Number	Class	Honing	Coated		Dimensions (mm)					Geometry
				MP6120	VP15TF	L	W1	S	BS	RE	
 	WNGU1406ANEN8C-M	G	E	●	●	18.1	14	6	8	1.0	



# INDEXABLE MILLING

## RECOMMENDED CUTTING CONDITIONS

### Dry cutting

Work Material	Hardness	Grade	vc (m/min)	Finish—Light Cutting		Light—Rough Cutting		Medium—Heavy Cutting	
				L, M Breaker		M, R Breaker		R, H Breaker	
				fz (mm/t.)	ap (mm)	fz (mm/t.)	ap (mm)	fz (mm/t.)	ap (mm)
<b>P</b> Mild Steel (ASTM A36, AISI 1010)	≤180HB	MP6120 VP15TF	250 (200—300)	0.15 (0.1—0.2)	≤3.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0
		MP6130 VP20RT	240 (190—290)	0.15 (0.1—0.2)	≤3.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0
	180—350HB	MP6120 VP15TF	220 (170—270)	0.15 (0.1—0.2)	≤3.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0
		MP6130 VP20RT	200 (150—250)	0.15 (0.1—0.2)	≤3.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0
	35—45HRC	MP6120 VP15TF	140 (100—180)	0.15 (0.1—0.2)	≤2.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0
		MP6130 VP20RT	120 (90—150)	0.15 (0.1—0.2)	≤2.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0
<b>M</b> Austenitic Stainless Steel Ferritic and Martensitic Stainless Steel (AISI 304, AISI 316) (AISI 410, AISI 430, AISI 431, AISI 420)	—	MP7130 VP15TF VP20RT	200 (150—250)	0.15 (0.1—0.2)	≤2.0	0.2 (0.15—0.25)	≤3.0	—	—
	>200HB	MP7130 VP15TF VP20RT	170 (120—220)	0.15 (0.1—0.2)	≤2.0	0.2 (0.15—0.25)	≤3.0	—	—
	≤280MPa	MP7130 VP15TF VP20RT	160 (110—210)	0.15 (0.1—0.2)	≤2.0	0.2 (0.15—0.25)	≤3.0	—	—
	<450HB	MP7130 VP15TF VP20RT	150 (100—200)	0.15 (0.1—0.2)	≤2.0	0.2 (0.15—0.25)	≤3.0	—	—
<b>K</b> Gray Cast Iron (FC300)	Tensile Strength ≤350MPa	MC5020	220 (200—270)	0.15 (0.1—0.2)	≤3.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0
		VP15TF VP20RT	180 (130—250)	0.15 (0.1—0.2)	≤3.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0
	Tensile Strength ≤800MPa	MC5020	200 (180—250)	0.15 (0.1—0.2)	≤3.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0
		VP15TF VP20RT	160 (110—240)	0.15 (0.1—0.2)	≤3.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0
<b>H</b> Hardened Steel (AISI H13, JIS SKT4)	40—55HRC	VP15TF	50 (30—70)	0.05 (0.05—0.1)	≤1.5	0.1 (0.05—0.15)	≤2.0	—	—

\* Refer to the table above and set the cutting conditions to match the application.

\* Wet cutting is recommended, when focusing on the surface finish. (Life is lower than dry cutting.)

## Wet cutting

Work Material	Hardness	Grade	vc (m/min)	Finish—Light Cutting		Light—Rough Cutting		Medium—Heavy Cutting		
				L, M Breaker		M, R Breaker		R, H Breaker		
				fz (mm/t.)	ap(mm)	fz (mm/t.)	ap(mm)	fz (mm/t.)	ap(mm)	
<b>P</b> Mild Steel (ASTM A36, AISI 1010)	≤180HB	MP6120 VP15TF	150 (100—200)	0.15 (0.1—0.2)	≤3.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0	
		MP6130 VP20RT								
	180—350HB	MP6120 VP15TF	120 (80—160)	0.15 (0.1—0.2)	≤3.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0	
		MP6130 VP20RT								
	Alloy Steel Pre-Hardened Steel (AISI D2, SKD61, SKT4, AISI P21, AISI P20)	35—45HRC	MP6120 VP15TF	100 (80—120)	0.15 (0.1—0.2)	≤2.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0
			MP6130 VP20RT							
<b>M</b> Austenitic Stainless Steel Ferritic and Martensitic Stainless Steel (AISI 304, AISI 316) (AISI 410, AISI 430, AISI 431, AISI 420)	—	MP7130 VP15TF VP20RT	130 (80—180)	0.15 (0.1—0.2)	≤2.0	0.2 (0.15—0.25)	≤3.0	—	—	
	>200HB	MP7130 VP15TF VP20RT	100 (80—150)	0.15 (0.1—0.2)	≤2.0	0.2 (0.15—0.25)	≤3.0	—	—	
	≤280MPa	MP7130 VP15TF VP20RT	100 (80—150)	0.15 (0.1—0.2)	≤2.0	0.2 (0.15—0.25)	≤3.0	—	—	
	<450HB	MP7130 VP15TF VP20RT	90 (50—140)	0.15 (0.1—0.2)	≤2.0	0.2 (0.15—0.25)	≤3.0	—	—	
<b>K</b> Gray Cast Iron (FC300)	≤350MPa	MC5020	180 (160—200)	0.15 (0.1—0.2)	≤3.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0	
		VP15TF VP20RT	130 (100—160)	0.15 (0.1—0.2)	≤3.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0	
	≤800MPa	MC5020	180 (160—200)	0.15 (0.1—0.2)	≤3.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0	
		VP15TF VP20RT	110 (80—140)	0.15 (0.1—0.2)	≤3.0	0.2 (0.15—0.25)	≤4.0	0.25 (0.2—0.3)	≤5.0	
<b>N</b> Aluminium Alloy	—	TF15	300—	0.2 (0.1—0.3)	≤5.0	—	—	—	—	
<b>S</b> Titanium Alloy (Ti-6Al-4V)	—	MP9120 VP15TF VP20RT	50 (40—60)	0.05 (0.05—0.1)	≤1.5	0.1 (0.05—0.15)	≤2.0	—	—	
	—	MP9120 VP15TF VP20RT	40 (20—50)	0.05 (0.05—0.1)	≤1.5	0.1 (0.05—0.15)	≤2.0	—	—	
<b>H</b> Hardened Steel (AISI H13, JIS SKT4)	40—55HRC	VP15TF	50 (30—70)	0.05 (0.05—0.1)	≤1.5	0.1 (0.05—0.15)	≤2.0	—	—	

\* Refer to the table above and set the cutting conditions to match the application.

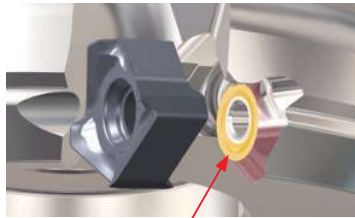
\* Wet cutting is recommended, when focusing on the surface finish. (Life is lower than dry cutting.)

# INDEXABLE MILLING

## FEATURES

### Conical seating surface prevents insert breakage

Anti Fly Insert (AFI) and conical insert seat hold the insert securely and prevent damage to the seat and body even if sudden fracture occurred. The thick insert eliminates the need of shim.



Anti Fly Insert mechanism (AFI)

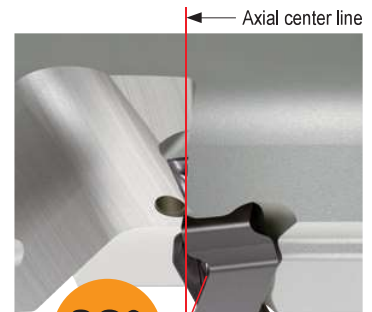
### Extremely quiet, fly-free insert



Double sided, Z Geometry

Mitsubishi Materials' proprietary "Double sided, Z Geometry" insert features a low resistance and sharp cutting edge while being a negative (double sided) insert.

### WSX445



26°\*

Excellent cutting edge sharpness

Unique double sided finished (4 corners X 2)

\*Rake angle when insert installed

### Coolant holes

Improves chip discharge and prevents chip welding

- \*Not applicable to some carbides
- \*Purchase the set bolt separately when using internal coolant.

## BREAKER SYSTEM

Breaker series capable of various cutting

Focus on cutting edge sharpness

Thin sheet, low rigidity

Interrupted cutting, with scale

Focus on cutting edge strength



### L Breaker

Focus on cutting edge sharpness

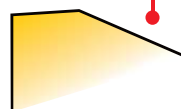
- Low resistance type
- Precision grinding



### M Breaker

1st Recommendation All-around

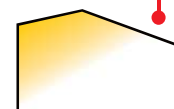
- General ungrounded precision
- Precision grinding (improved cutting surface)



### R Breaker

Rough Cutting Reinforced edge type

- General ungrounded precision



### H Breaker

Heavy cutting and forced interrupted cutting Reinforced edge type

- General ungrounded precision

## ■ Instructions for use of wiper inserts



Fig.1



Fig.2

- These wiper inserts have 2 corners.
- Install the insert so that the cutting edge is located as shown in Fig.1.  
Do not install the wiper insert as shown in Fig.2. (The insert may be damaged by a too heavy cutting load.)
- Excellent finished surface can be obtained with one wiper insert.
- When the feed per revolution is larger than the width of the wiper edge, install 2 or more wiper inserts equally inside the cutting body.