

New Era in Aerospace Machining

BIDEMICS

JX1 / JX3 NEW

Semi-finishing
Rough no scale

Up to $V_c=480\text{m/min}$ capability
Much longer tool life at Whisker ceramic's speed range
Superior surface finish vs. Whisker ceramics
Works well on wide range of High Temperature Alloys

JP2

Finishing

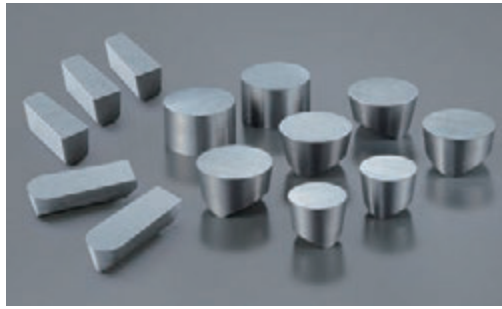
Up to $V_c=520\text{m/min}$ capability
10 to 15 times speed capability vs. carbides
Superior surface finish to coated carbides or CBN
Multi-edges, TiN coating,
Strong brazing insert

NEW

New Era in Aerospace Machining **BIDEMICS**

New Composite Material for HRSA Machining

WATCH ON
YouTube



JX1 / JX3 NEW

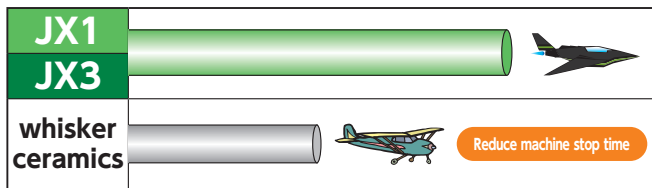
Features

- Newly added [JX3] provides toughness to BIDEMICS family
- Much longer tool life at Whisker ceramic's speed range
- Superior surface finish vs. Whisker ceramics
- Works well on wide range of High Temperature Alloys

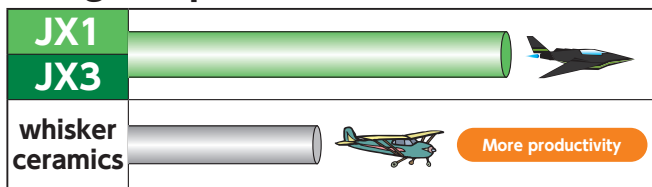
Productivity

vs. Whisker ceramics

① Improve tool life at same cutting speed



② Higher speed



JP2

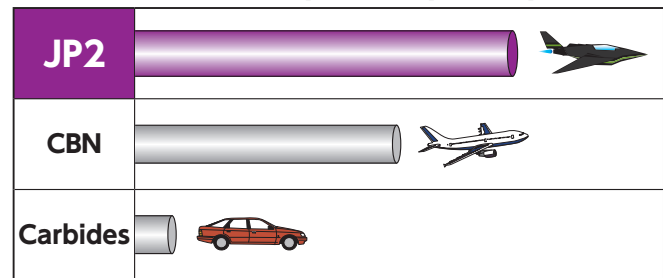
Features

- Finishing speed up to $V_c=520\text{m/min}$ capability
- Better wear and notch resistance than CBNs
- Superior surface finish to CBN or Carbides

Productivity

vs. Carbides

① 10 to 15 times speed capability



Application : JX1 & JX3

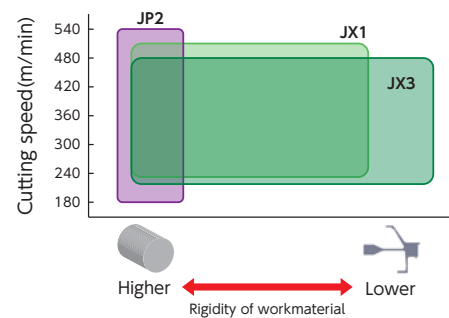
JX1

- Higher speed, more productivity than ceramics.
- Suitable for turning in high rigid situation (External/ endface tuening) Turning in using more toughness insert like RNGN type
- Offering excellent notch wear resistance

JX3

- Turning at the corner part, Grooving.
- Chipping occurred when use JX1 grade
- Turning in low rigidity situation

Grade

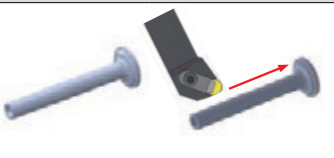
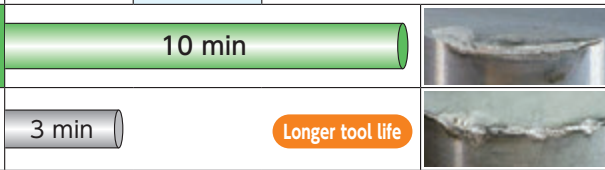


Grade	Workmaterial	Tooling	Applcations	Cutting speed (m/min)	Feed (mm/rev)	D.O.C (mm)	DRY	WET
JX1 JX3	Heat resistant alloy	Turning	Rough no scale	180- 480	0.15-0.30	1.00-2.50		●
			Semi-finish	180- 480	0.10-0.25	0.50-2.00		●
JP2	Heat resistant alloy	Turning	Finish	180- 520	0.10-0.25	0.20-1.00		●

1 Longer tool life

- Higher hardness, superior thermal conductivity.
- Improved strength than whisker ceramics
- Significantly longer tool life when applied at whisker ceramics cutting condition

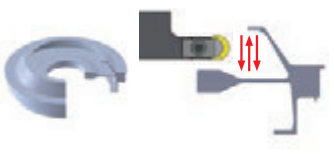
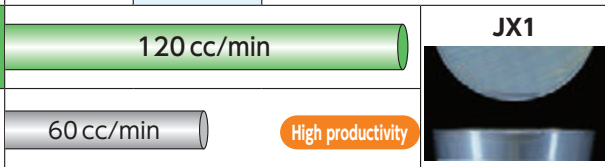
Turbine shaft(Inconel 718 with no scale)		
	Competitor's coated whisker ceramic	JX1
Insert shape	RNGN120700	←
Cutting speed (m/min)	240	←
Feed (mm/rev)	0.2	←
D.O.C (mm)	2.0	←
	WET	←
NTK : JX1	10 min	
Competitor's whisker ceramic	3 min	Longer tool life

2 Higher speeds, More Productivity

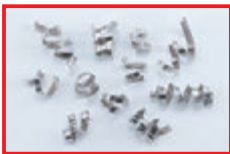
- 2 times higher speed than whisker ceramics
- Increasing productivity saves additional equipment

Turbine shaft(Inconel 718 rough with scale)		
	Competitor's coated whisker ceramic	JX1
Insert shape	RPGX120700	←
Cutting speed (m/min)	200	400
Feed (mm/rev)	0.15	←
D.O.C (mm)	2.0	←
	WET	←
NTK : JX1	120 cc/min	
Competitor's whisker ceramic	60 cc/min	High productivity

JX1

Whisker ceramic



Chip break easily at higher cutting speed, typically continuous chips are occurred in HRSA turning.

3 Works well on wide range of High Temperature Alloys

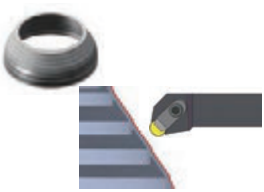

- Inconel 718, 718 Plus, 625
- Rene 41, 88, 104
- Waspaloy




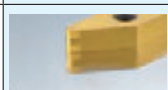


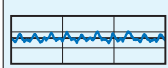
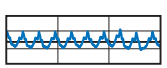
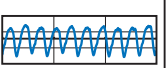
etc.

4 Superior surface finish

- Outstanding wear resistance and nptching resistance results in superior surface finish

Turbine case(Inconel718Plus)		
	Competitor's coated whisker ceramic	JX1
Insert shape	RNGN120700	←
Cutting speed (m/min)	240	←
Feed (mm/rev)	0.25	←
D.O.C (mm)	0.5	←
	WET	←
NTK : JX1	3pass	
Competitor's coated whisker ceramic	1pass	3 times longer tool life

	JP2	CBN	Carbide
			
Machined surface			
Roughness			
	Ra 0.64 μm	1.18 μm	2.75 μm
	Rz 3.36 μm	5.56 μm	9.64 μm
Cutting speed	240 m/min	←	35 m/min
Feed	0.15 mm/rev	←	←
Cycle time	3.3 分	←	14.7 min
Removed chip	48 cc	←	←

Maching HRSA Materials with BIDE MICS and Ceramics

JX1 / JX3 NEW

BIDE MICS- Game Changer



■ Features

- Added toughness grade [JX3]
- Much longer tool life , higher cutting speed, superior surface finish vs. whisker ceramics
- Works well on wide range of Heat resistant alloys

■ Work Materials

- Inconel 718, 718 Plus
- Rene
- MAR-M247

■ Applications

- Semi-finishing
- Profiling

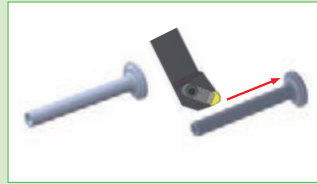
■ Profiling Inconel718



Competitor's whisker ceramics
Tool life : 3min.



JX1
Turbine shaft



Turbine shaft
RNGN120700, $v_c = 240\text{m/min}$,
 $f = 0.2\text{mm/rev}$, $a_p = 2.0\text{mm}$,
WET, Inconel 718(no scale)



SX5

SiALON ceramics ✖ Not stocked

■ Features

- Best grade for scale and interruptions
- Best grade for machining high-cobalt alloys

■ Work Materials

- Waspaloy
- Inconel 718Plus
- Udimet 720
- Rene 41

■ Applications

- Scale and interruptions

SX9

SiALON grade



■ Features

- Extreme toughness makes higher feed and heavier DOC machining possible
- Best grade for machining Inconel 718 with scale

■ Work Materials

- Inconel 718
- Inconel 713
- Inconel 706

■ Applications

- Rough with scale
- Milling

■ Features

- Best balance of toughness and hardness

■ Work Materials

- Inconel 718
- Inconel 718 Plus
- Inconel 625
- Rene
- Hastelloy
- Waspaloy

■ Applications

- Rough turning with scale
- Semi-finishing Milling

SX3 NEW

SiALON grade

WA5 / WA1 whisker ceramics



■ Features

- Better flank wear resistance compared to SiAlON ceramics
- Better notching wear resistance compared to competitor's whisker ceramics

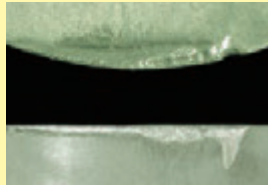
■ Work Materials

- Inconel 718
- Inconel 625

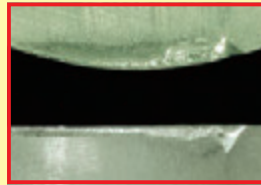
■ Applications

- Semi-finishing
- Profiling
- Grooving

■ Profiling Inconel718



Competitor's whisker ceramics

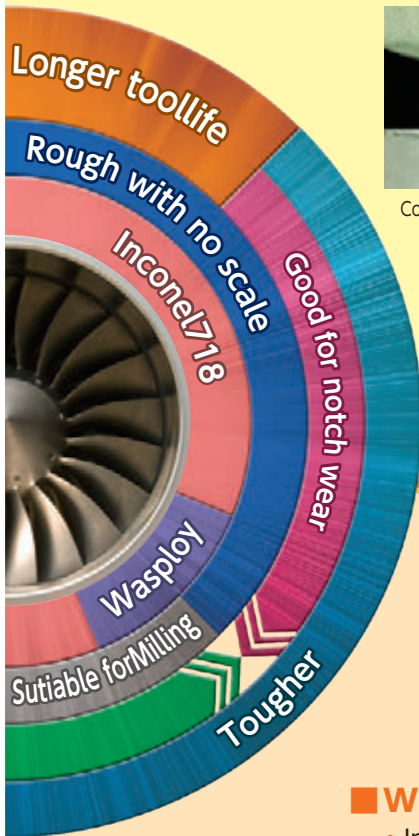


WA1



Turbine case

Machining time 5min.
RPGX120700, $v_c = 240\text{m/min}$, $f = 0.15\text{mm/rev}$, $a_p = 1.0\text{mm}$, Wet Inconel718(no scale)



SX7 SiAlON ceramics



■ Features

- Can run at same cutting condition as whisker ceramics
- Best grade for high-speed milling, good for Waspaloy, Inconel.

■ Work Materials

- Inconel 718
- Inconel 625
- Waspaloy
- Udimit720

■ Applications

- Semi-finishing
- Profiling
- Milling
- Grooving

■ Profiling Inconel718



Competitor's whisker ceramics



SX7



Turbine Disc

Machining time 4.5min.
RCGX120700, $v_c = 240\text{m/min}$, $f = 0.15\text{mm/rev}$, $a_p = 1.0\text{mm}$, Wet Inconel718(no scale)

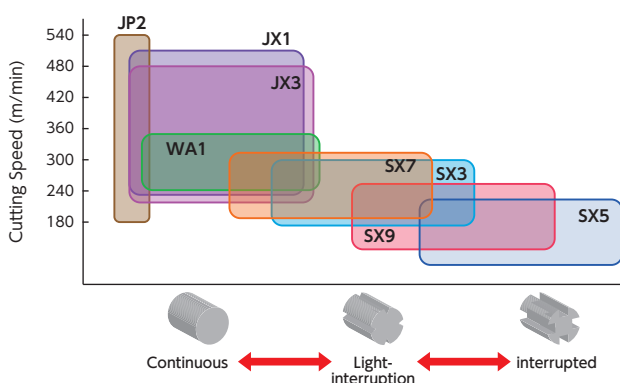
Guidelines for Machining HRSA Materials

Insert Grade

Category	Grade	Attributes	Applications						
			Scale	No scale	Profi ling	Finishing	Grooving	Grooving	End milling
BIDEMICS	JX1	Special grade with higher speed and longer tool life potential		●	●	●	●		
	JP2	Special grade for finish turning				●			
	JX3	Added toughness in BIDEMICS		●	●	●	●		
Whisker	WA1	General versatile grade for turning		●	●		●		
SIALON	SX3	Best balance of toughness and hardness	●	●	●		●	●	
	SX5	Best grade for Waspaloy with scale	●				●		
	SX7	Versatile grade for turning and milling	●	●	●		●	●	
	SX9	Best grade for scale of Inco718	●	●	●			●	●

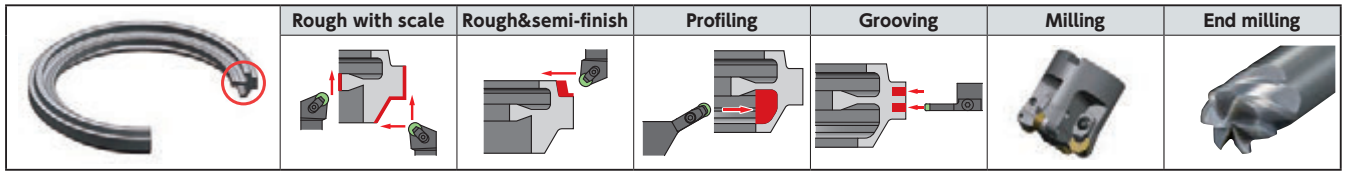
● 1st Choice ● 2nd Choice

材質マップ



	Grade	Rough with Scale	Rough	Semi-Finishing	Finishing
BIDEMICS	JP2			■	■
	JX1		■	■	■
	JX3		■	■	■
Whisker	WA1		■	■	■
SIALON	SX7		■	■	■
	SX3		■	■	■
	SX9		■	■	■
	SX5		■	■	■

Applications



Applications

Application	Grade	Work material	Cutting speed (m/min)					Feed (mm/rev)					Depth of cut (mm)					Coolant
			180	240	300	360	420	480	0.1	0.2	0.3	0.4	0.5	0.5	1.0	1.5	2.0	
Rough with Scale 	SX5	Waspaloy	200(180-240)					0.3(0.2-0.35)					2.0(1.0-5.0)					WET
	SX9	Inco718	200(180-240)					0.3(0.2-0.35)					2.0(1.0-5.0)					
	SX3	Overall	240(180-270)					0.2(0.1-0.22)					2.0(1.0-5.0)					
Rough no Scale 	JX1 JX3	Overall	210-390					0.1(0.12-0.27)					1.7(1.0-2.5)					WET
	SX9 SX3 SX7	Overall	210(180-270)					0.2(0.15-0.3)					2.0(1.0-0.2)					
	WA1	Overall	240(180-300)					0.2(0.12-0.25)					1.7(1.0-2.5)					
Profiling & Semi-Finish 	JX1 JX3	Overall	210-450					0.2(0.1-0.25)					1.5(1.0-2.0)					WET
	SX3 SX7	Overall	240(180-270)					0.2(0.12-0.25)					1.5(1.0-2.0)					
	WA1	Overall	240(180-330)					0.2(0.1-0.25)					1.5(1.0-2.0)					
Finishing 	JP2	Overall	210-480					0.1(0.05-0.17)					0.2(0.12-0.76)					WET
Grooving 	JX1 JX3	Overall	360(180-480)					0.07(0.05-0.1)					<div style="background-color: orange; padding: 5px; border: 1px solid black;"> When using SX7/SX3/SX5, increase feed rates 100% vs. Whisker Ceramics </div>					WET
	SX5	Waspaloy	210(180-240)					0.15(0.07-0.17)										
	SX3 SX7	Overall	230(180-270)					1.1(0.07-0.15)										
	WA1	Overall	240(180-330)					0.07(0.05-0.1)										

Application	Grade	Work material	Cutting speed (m/min)					Feed (mm/t)					Depth of cut (mm)					Coolant
			450	600	750	900	1000	1200	0.05	0.07	1.0	0.12	0.15	0.5	1.0	1.5	2.0	
Milling 	SX3 SX7	Overall	810(600-1200)					0.1(0.07-0.12)					1.7(1.0-2.5)					DRY
	SX9	Overall	750(450-1000)					0.12(0.1-0.15)					2.0(1.0-2.5)					
End milling 	SX9	Overall	600(300-1000)					0.02-0.03										DRY

Insert Item List

● : 1st Choice ● : 2nd Choice

Steel	P								
Stainless Steel	M								
Cast Iron	K				●	●	●	●	●
Non-Ferrous Material	N								
Heat Resistant Alloy	S	●	●	●	●	●	●	●	●
Hardened Material	H							●	●

RCGX [CRDCN Insert]	P/N	Dimension(mm)		Stock						
		IC	T	BIDEMICS		SiAlON ceramics			Whisker ceramics	
				JX1	JX3	SX7	SX3	SX9	WA1	WA5
	RCGX 060400 T00520	6.35	4.76						●	●
	060700 T00520	6.35	7.94						●	
	090700 E004	9.525	7.94	●	●					
	090700 T00520	9.525	7.94				●		●	
	090700 T01020	9.525	7.94						●	
	090700 T00820	9.525	7.94	●	●				●	●
	0908 TNB	9.525	7.86						●	
	120700 E004	9.525	7.94	●	●					
	120700 T00520	12.70	7.94				●		●	
	120700 T00820	12.70	7.94	●	●					●
	120700 T01020	12.70	7.94						●	
	120700 Z01520	12.70	7.94						●	
	1208 TNB	12.70	7.86						●	

RPGX [CRDCN Insert]	P/N	Dimension(mm)		Stock						
		IC	T	BIDEMICS		SiAlON ceramics			Whisker ceramics	
				JX1	JX3	SX7	SX3	SX9	WA1	WA5
	RPGX 060400 T00520	6.35	4.76						●	
	090700 E004	6.35	7.94	●	●					
	090700 T00520	9.525	7.94				●		●	
	090700 T00820	9.525	7.94	●	●	●				●
	0908 TNB	9.525	7.86						●	
	120700 E004	9.525	7.94	●	●					
	120700 T00520	12.70	7.94				●		●	
	120700 T01020	12.70	7.94						●	
	120700 T00820	12.70	7.94	●	●	●				●
	1208 TNB	12.70	7.86						●	

● Toolholder → F33, L4 · L14-15 2019-2020 GeneralCatalogue, 14-15

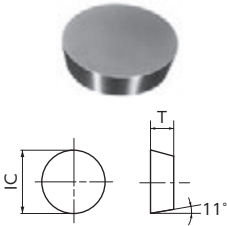
RCGY [CRXC Insert]	P/N	Dimension(mm)		Stock						
		IC	T	BIDEMICS		SiAlON ceramics			Whisker ceramics	
				JX1	JX3	SX7	SX3	SX9	WA1	WA5
	RCGY 090603 TNB	6.35	4.76						●	
	120603 TNB	6.35	7.94						●	

● Toolholder → F33, L4 · L14-15 2019-2020 GeneralCatalogue

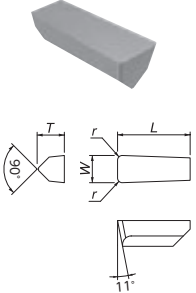
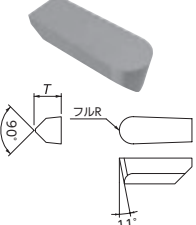
RNGN	P/N	Dimension(mm)		Stock						
		IC	T	BIDEMICS		SiAlON ceramics			Whisker ceramics	
				JX1	JX3	SX7	SX3	SX9	WA1	WA5
	RNGN 120400 T00520	12.70	4.76						●	
	120400 T00820	12.70	4.76						●	●
	120400 T00525	12.70	4.76						●	
	120400 T01020	12.70	4.76						●	
	120400 T02025	12.70	4.76						●	
	120700 E002	12.70	7.94						●	
	120700 E004	12.70	7.94	●	●	●	●			
	120700 T00520	12.70	7.94						●	
	120700 T00525	12.70	7.94						●	
	120700 T00820	12.70	7.94	●	●	●				●
	120700 T01020	12.70	7.94						●	
	120700 Z01520	12.70	7.94						●	
	150700 T00520	15.875	7.94						●	
	150700 T00525	15.875	7.94						●	
	150700 T00820	15.875	7.94						●	●
	190700 T00520	19.05	7.94						●	
	190700 T00525	19.05	7.94						●	
	190700 T00820	19.05	7.94						●	●
190700 T01020	19.05	7.94						●		
250700 T00520	25.4	7.94						●	●	
250700 T00820	25.4	7.94						●	●	

● Toolholder → F18, O34 2019-2020 GeneralCatalogue

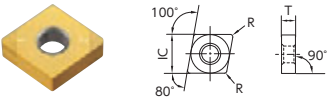
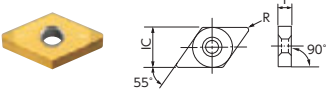
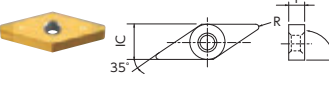
● : 1st Choice ● : 2nd Choice

RPGN	P/N	Dimension(mm)		Stock								
		IC	T	BIDEMICS			SiAlON ceramics			Whisker ceramics		
				JX1	JX3	JP2	SX7	SX3	SX9	WA1	WA5	
	RPGN 060200 T00520	6.35	2.38								●	
	090300 T00520	9.525	3.18								●	
	120400 E004	12.70	4.76				●					
	120400 EX0004	12.70	4.76							●		
	120400 T00520	12.70	4.76								●	
	120400 T00525	12.70	4.76								●	
	120400 T00820	12.70	4.76				●					
	120400 T01020	12.70	4.76								●	

● Toolholder → O34-35 2019-2020 GeneralCatalogue

VGW	P/N	Dimension(mm)				Stock							
		W	r	T	L	BIDEMICS			SiAlON ceramics			Whisker ceramics	
						JX1	JX3	JP2	SX7	SX3	SX9	WA1	WA5
	VGW 4125-1 E004	3.18	0.4	6.35	12.7	●	●						
	4125-2 E004	3.18	0.8	6.35	12.7	●	●						
	4125-2 EX0001	3.18	0.8	6.35	12.7							●	●
	4156-1 E004	3.96	0.4	6.35	12.7	●	●						
	4156-2 E004	3.96	0.8	6.35	12.7	●	●						
	4156-2 EX0001	3.96	0.8	6.35	12.7							●	●
	4187-1 E004	4.75	0.4	6.35	12.7	●	●						
	4187-2 E004	4.75	0.8	6.35	12.7	●	●						
	4187-2 EX0001	4.75	0.8	6.35	12.7							●	●
	6250-1 E004	6.35	0.4	6.35	19.05	●	●						
6250-2 E004	6.35	0.8	6.35	19.05	●	●							
6250-2 EX0001	6.35	0.8	6.35	19.05							●	●	
6250-3 E004	6.35	1.2	6.35	19.05	●	●							
8375-2 EX0001	9.525	0.8	8.56	25.4							●	●	
	VGW 4125-R E004	3.18	フルR	6.35	12.7	●	●						
	4125-R EX0001	3.18	フルR	6.35	12.7						●	●	
	4156-R E004	3.96	フルR	6.35	12.7	●	●						
	4156-R EX0001	3.96	フルR	6.35	12.7						●	●	
	4187-R E004	4.75	フルR	6.35	12.7	●	●						
	4187-R EX0001	4.75	フルR	6.35	12.7						●	●	
	6250-R EX0001	6.35	フルR	6.35	19.05						●	●	
	8375-R EX0001	9.525	フルR	8.56	25.4						●	●	

● Toolholder → L12-13 2019-2020 GeneralCatalogue, 12-13

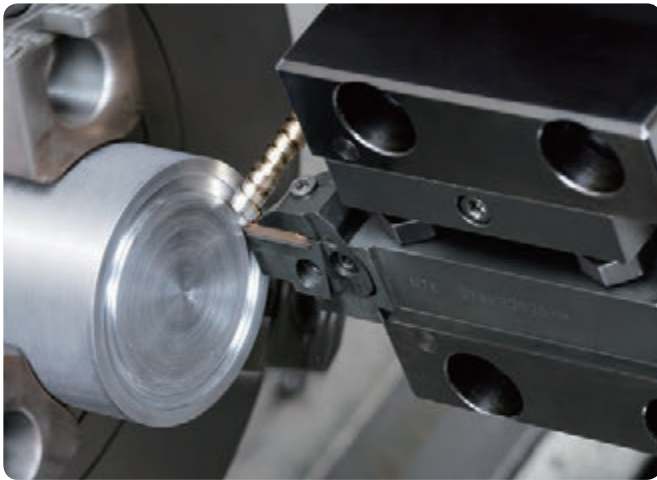
BIDEMICS : JP2	P/N	Dimension (mm)		Corner radius	Edge prep.	Stock							
		IC	T			BIDEMICS			SiAlON ceramics			Whisker ceramics	
						JX1	JX3	JP2	SX7	SX3	SX9	WA1	WA5
	CNGA 120404 BQ	12.70	4.76	0.4	T00520			●					
	120408 BQ	12.70	4.76	0.8	T00520			●					
	120412 BQ	12.70	4.76	1.2	T00520			●					
	DNGA 150404 BQ	12.70	4.76	0.4	T00520			●					
	150408 BQ	12.70	4.76	0.8	T00520			●					
	150412 BQ	12.70	4.76	1.2	T00520			●					
	VNGA 160404 BQ	9.525	4.76	0.4	T00520			●					
	160408 BQ	9.525	4.76	0.8	T00520			●					
	160412 BQ	9.525	4.76	1.2	T00520			●					

※ NOTE : JP2 : 1pc/Case

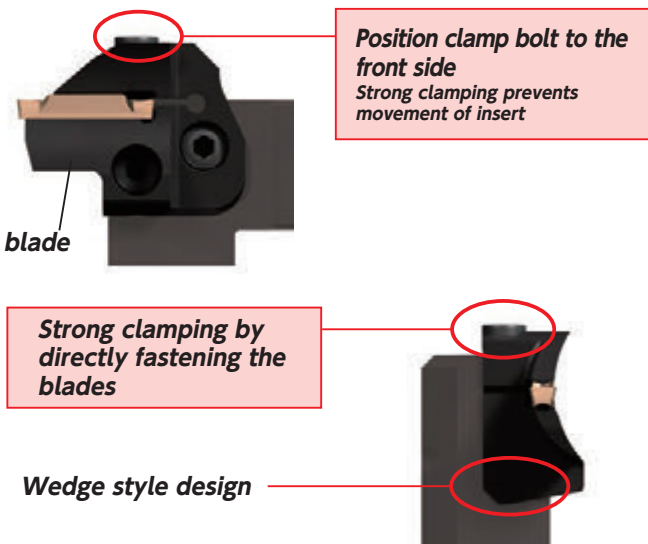
● Toolholder → F11-13・15-17・31, G42-43・K36-37, 2019-2020 GeneralCatalogue, 12-13

New Modular Tooling !

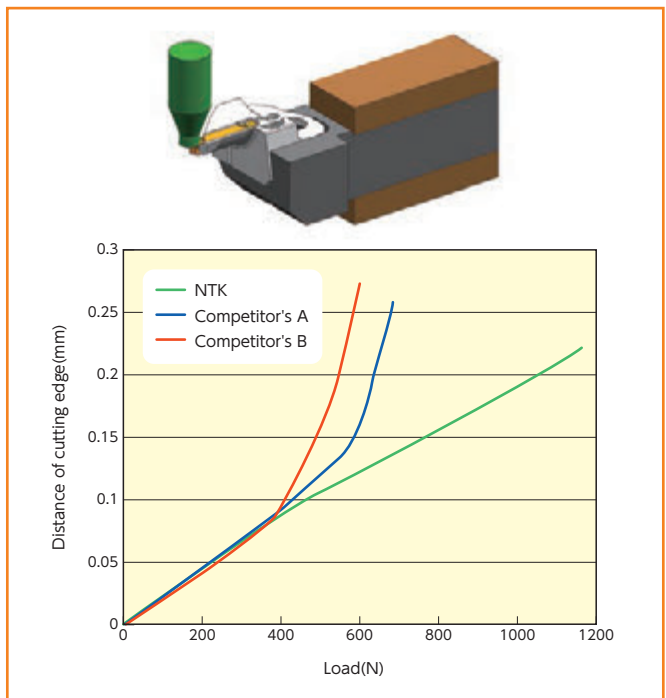
Available in 3 different styles



Most rigid blade type system



Tool rigidity comparison



→14-15



→12-13

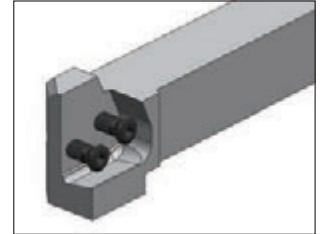
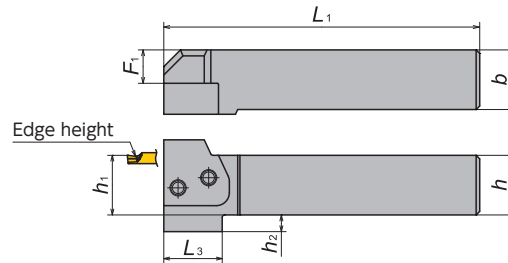


→ H40, 2019-2020 General Catalogue

Toolholder for blade

Straight style=0°

GTWP-H



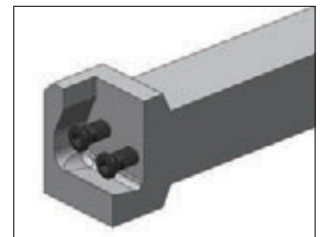
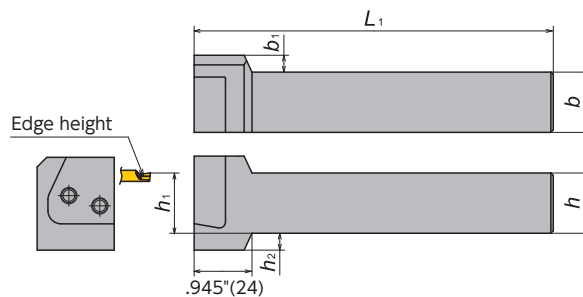
Right-Hand style shown

Toolholder	Stock		Dimension (mm)							Parts	
	R	L	h	b	h_1	L_1	F_1	h_2	L_3	Screw	Wrench
GTWP [®] / 2020-H	●	●	20.0	20.0	20.0	107.5	9	8	28.5	FSI28-6.0×18	LW-4
2525-H	●	●	25.0	25.0	25.0	132.5	14	7	24.5	FSI28-6.0×18	LW-4
3232-H	●	●	32.0	32.0	32.0	152.5	21	—	—	FSI28-6.0×18	LW-4

ブレード用ホルダ

L-style=90°

GKWP-H



Right-Hand style shown
* Use oppoite hand blade

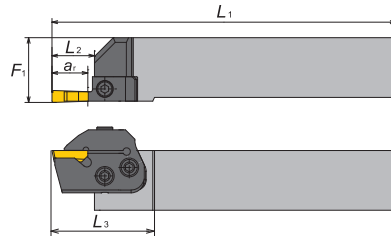
Toolholder	Stock		Dimension (mm)						Parts	
	R	L	h	b	h_1	L_1	b_1	h_2	Screw	Wrench
GKWP [®] / 2020-H	●	●	20.0	20.0	20.0	124	12	8	FSI28-6.0×18	LW-4
2525-H	●	●	25.0	25.0	25.0	149	7	7	FSI28-6.0×18	LW-4
3232-H	●	●	32.0	32.0	32.0	169	—	—	FSI28-6.0×18	LW-4

Blade for external grooving

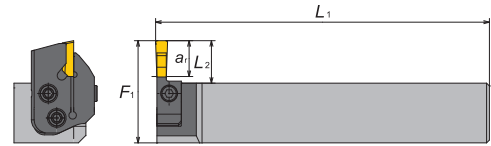
VGW

Toolholder

For GTWP



For GKWP



Right hand

Hand	Blade number	Stock	Insert	Dimension (mm)		Holder	Insert	Dimension (mm)						
				a_r	L_2			GTWPR-H			GKWPL-H			
								L_1	L_3	F_1	L_1	F_1		
Right	GBVR-VGW4-3T09	●	VGW4125 VGW4156	9.5	11.2	GTWPR2020-H	VGW4125	118.6	39.6	22.3	124.2	31.1		
						GKWPL2020-H	VGW4156			22.6	124.6			
						GTWPR2525-H	VGW4125			143.6	35.6		27.2	149.3
						GKWPL2525-H	VGW4156						27.6	149.6
	GTWPR3232-H	VGW4125	163.6	—	34.2	169.2	43.1							
	GKWPL3232-H	VGW4156			34.6	169.6								
	GBVR-VGW4-4T14	●	VGW4156 VGW4187	14.2	17.5	GTWPR2020-H	VGW4156	124.9	45.9	22.3	124.3	37.4		
						GKWPL2020-H	VGW4187			22.7	124.7			
						GTWPR2525-H	VGW4156			150.0	42.0		27.3	149.3
						GKWPL2525-H	VGW4187						27.7	149.7
	GTWPR3232-H	VGW4156	170.0	—	34.3	169.3	49.5							
	GKWPL3232-H	VGW4187			34.7	169.7								
	GBVR-VGW6-6T14	●	VGW6218 VGW6250	14.2	17.5	GTWPR2020-H	VGW6218	124.9	45.9	22.7	124.7	37.4		
						GKWPL2020-H	VGW6250			23.1	125.1			
						GTWPR2525-H	VGW6218			150.0	42.0		27.7	149.7
						GKWPL2525-H	VGW6250						28.1	150.1
	GTWPR3232-H	VGW6218	170.0	—	34.7	169.7	49.5							
	GKWPL3232-H	VGW6250			35.1	170.1								
	GBVR-VGW6-6T19	●	VGW6250 VGW6281	19.0	22.6	GTWPR2020-H	VGW6250	130.0	51.0	22.6	124.6	42.5		
						GKWPL2020-H	VGW6281			23.0	125.0			
						GTWPR2525-H	VGW6250			155.0	47.0		27.6	149.6
						GKWPL2525-H	VGW6281						28.0	150.0
	GTWPR3232-H	VGW6250	175.0	—	34.6	169.6	54.5							
	GKWPL3232-H	VGW6281			35.0	170.0								
GBVR-VGW8-8T19	●	VGW8312 VGW8344	19.0	27.6	GTWPR2020-H	VGW8312	135.1	56.1	23.5	125.5	47.6			
					GKWPL2020-H	VGW8344			23.9	125.9				
					GTWPR2525-H	VGW8312			160.1	52.1		28.4	150.5	
					GKWPL2525-H	VGW8344						28.9	150.9	
GTWPR3232-H	VGW8312	180.1	—	35.5	170.5	59.6								
GKWPL3232-H	VGW8344			35.9	170.9									
GBVR-VGW8-8T28	●	VGW8344 VGW8375	28.5	30.2	GTWPR2020-H	VGW8344	137.6	58.6	23.3	125.3	50.1			
					GKWPL2020-H	VGW8375			23.7	125.7				
					GTWPR2525-H	VGW8344			162.7	54.7		28.3	150.3	
					GKWPL2525-H	VGW8375						28.7	150.7	
GTWPR3232-H	VGW8344	182.7	—	35.3	170.3	62.2								
GKWPL3232-H	VGW8375			35.7	170.7									

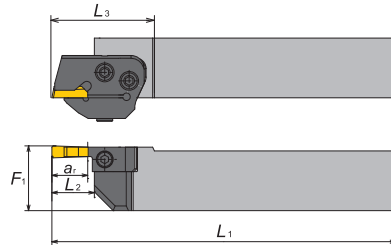
● Insert → 9

Blade for external grooving

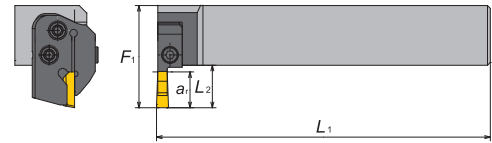
VGW

Toolholder

For GTWP



For GKWP



Left hand

Hand	Blade number	Stock	Insert	Dimension (mm)		Holder	Insert	Dimension (mm)				
				a_r	L_2			GTWPL-H			GKWPR-H	
								L_1	L_3	F_1	L_1	F_1
Left	GBVL-VGW4-3T09	●	VGW4125 VGW4156	9.5	11.2	GTWPL2020-H	VGW4125	118.6	39.6	22.3	124.2	31.1
						GKWPR2020-H	VGW4156			22.6	124.6	
						GTWPL2525-H	VGW4125	143.6	35.6	27.2	149.3	36.1
						GKWPR2525-H	VGW4156			27.6	149.6	
						GTWPL3232-H	VGW4125	163.6	—	34.2	169.2	43.1
									34.6	169.6		
	GBVL-VGW4-4T14	●	VGW4156 VGW4187	14.2	17.5	GTWPL2020-H	VGW4156	124.9	45.9	22.3	124.3	37.4
						GKWPR2020-H	VGW4187			22.7	124.7	
						GTWPL2525-H	VGW4156	150.0	42.0	27.3	149.3	42.4
						GKWPR2525-H	VGW4187			27.7	149.7	
						GTWPL3232-H	VGW4156	170.0	—	34.3	169.3	49.5
									34.7	169.7		
	GBVL-VGW6-6T14	●	VGW6218 VGW6250	14.2	17.5	GTWPL2020-H	VGW6218	124.9	45.9	22.7	124.7	37.4
						GKWPR2020-H	VGW6250			23.1	125.1	
						GTWPL2525-H	VGW6218	150.0	42.0	27.7	149.7	42.4
						GKWPR2525-H	VGW6250			28.1	150.1	
						GTWPL3232-H	VGW6218	170.0	—	34.7	169.7	49.5
									35.1	170.1		
	GBVL-VGW6-6T19	●	VGW6250 VGW6281	19.0	22.6	GTWPL2020-H	VGW6250	130.0	51.0	22.6	124.6	42.5
						GKWPR2020-H	VGW6281			23.0	125.0	
GTWPL2525-H						VGW6250	155.0	47.0	27.6	149.6	47.5	
GKWPR2525-H						VGW6281			28.0	150.0		
GTWPL3232-H						VGW6250	175.0	—	34.6	169.6	54.5	
								35.0	170.0			
GBVL-VGW8-8T19	●	VGW8312 VGW8344	19.0	27.6	GTWPL2020-H	VGW8312	135.1	56.1	23.5	125.5	47.6	
					GKWPR2020-H	VGW8344			23.9	125.9		
					GTWPL2525-H	VGW8312	160.1	52.1	28.4	150.5	52.6	
					GKWPR2525-H	VGW8344			28.9	150.9		
					GTWPL3232-H	VGW8312	180.1	—	35.5	170.5	59.6	
								35.9	170.9			
GBVL-VGW8-8T28	●	VGW8344 VGW8375	28.5	30.2	GTWPL2020-H	VGW8344	137.6	58.6	23.3	125.3	50.1	
					GKWPR2020-H	VGW8375			23.7	125.7		
					GTWPL2525-H	VGW8344	162.7	54.7	28.3	150.3	55.1	
					GKWPR2525-H	VGW8375			28.7	150.7		
					GTWPL3232-H	VGW8344	182.7	—	35.3	170.3	62.2	
								35.7	170.7			

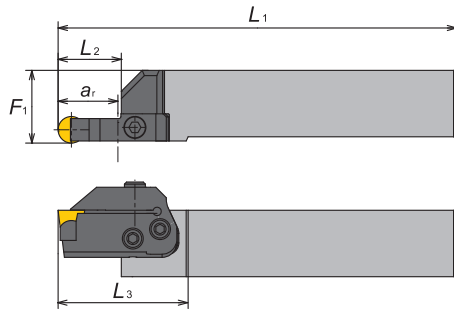
Insert → 9

Blade for external grooving(RCGX/RPGX insert)

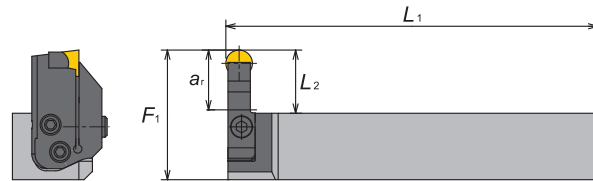
GBR

Toolholder

For GTWP-H



For GKWP-H



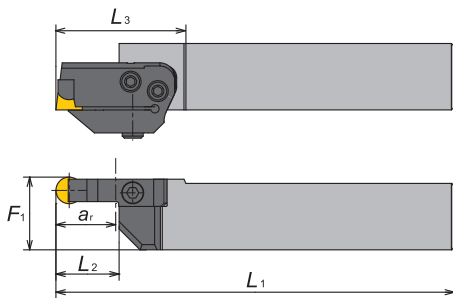
Right hand

Hand	Blade number	Stock	Insert	Dimension (mm)		Holder	Dimension (mm)				
				ar	L ₂		GTWPR-H			GKWPL-H	
							L ₁	L ₃	F ₁	L ₁	F ₁
Right	GBRR-R23-19	●	RCGX0604 RPGX0604	19.0	22.5	GTWPR2020-H	130.0	51.0	23.0	124.9	42.5
						GKWPL2020-H					
						GTWPR2525-H	155.0	47.0	27.9	150.0	47.5
						GKWPL2525-H					
						GTWPR3232-H	175.0	—	35.0	170.0	54.5
						GKWPL3232-H					
	GBRR-R35-25	●	RCGX0907 RPGX0907 RCGX0908	25.4	27.6	GTWPR2020-H	135.1	56.1	23.0	124.9	47.6
						GKWPL2020-H					
						GTWPR2525-H	160.1	52.1	27.9	150.0	52.6
						GKWPL2525-H					
						GTWPR3232-H	180.1	—	35.0	170.0	59.6
						GKWPL3232-H					
GBRR-R45-28	●	RCGX1207 RPGX1207 RCGX1208	28.5	30.2	GTWPR2020-H	137.6	58.6	23.0	124.9	50.1	
					GKWPL2020-H						
					GTWPR2525-H	162.7	54.7	27.9	150.0	55.1	
					GKWPL2525-H						
					GTWPR3232-H	182.7	—	35.0	170.0	62.2	
					GKWPL3232-H						

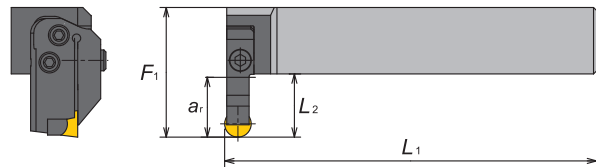
● Insert → 8

Toolholder

For GTWP-H



For GKWP-H



● Left hand

Hand	Blade number	Stock	Insert	Dimension (mm)		Holder	Dimension (mm)				
				a_r	L_2		GTWPL-H			GKWPL-H	
							L_1	L_3	F_1	L_1	F_1
Left	GBRL-R23-19	●	RCGX0604 RPGX0604	19.0	22.5	GTWPL2020-H	130.0	51.0	23.0	124.9	42.5
						GKWPR2020-H					
						GTWPL2525-H	155.0	47.0	27.9	150.0	47.5
						GKWPR2525-H					
						GTWPL3232-H	175.0	—	35.0	170.0	54.5
						GKWPR3232-H					
	GBRL-R35-25	●	RCGX0907 RPGX0907 RCGX0908	25.4	27.6	GTWPL2020-H	135.1	56.1	23.0	124.9	47.6
						GKWPR2020-H					
						GTWPL2525-H	160.1	52.1	27.9	150.0	52.6
						GKWPR2525-H					
						GTWPL3232-H	180.1	—	35.0	170.0	59.6
						GKWPR3232-H					
GBRL-R45-28	●	RCGX1207 RPGX1207 RCGX1208	28.5	30.2	GTWPL2020-H	137.6	58.6	23.0	124.9	50.1	
					GKWPR2020-H						
					GTWPL2525-H	162.7	54.7	27.9	150.0	55.1	
					GKWPR2525-H						
					GTWPL3232-H	182.7	—	35.0	170.0	62.2	
					GKWPR3232-H						

● Insert → 8

Case study

● BIDE MICS

JX1 4 times longer tool life

Turbin disc (Rene104 rough/semi-finish)
RNGN120700T00820,
 $v_c=210\text{m/min}$, $f=0.18\text{mm/rev}$, $a_p=1.00\text{mm}$, Wet

	Rene104	Competitor's whisker ceramic	JX1
Cutting speed (m/min)	210	210	←
Tool life (pass)	1	1	4

- Rene 104 is a difficult material to cut.
- JX1 cut 4 times longer tool life than whisker ceramics.

JX1 1.7 times higher speed

Turbin disc (Inconel718 rough/semi-finish)
RPGX120700T00820,
 $v_c=210\text{m/min}$, $f=0.16\text{mm/rev}$, $a_p \sim 1.50\text{mm}$, Wet

	Competitor's whisker ceramic	JX1
Cutting speed (m/min)	210	350
Chip removal (cc/min)	50	84
Cycle time (min)	15	9

- JX1 cut 1.7 times faster than Competitor's Whisker and kept good edge.
- Reducing cycle time dramatically.

JX3

Turbin disc (Inconel718)

Grade	Competitor's whisker ceramic	JX3
Insert Shape	RPGX120700	←
Cutting speed (m/min)	210	350
Feed (mm/rev)	0.15	←
D.O.C (mm)	1.5	←
	WET	←

NTK : JX3 82 cc/min

Competitor's whisker ceramic 48 cc/min

JX3

Turbin disc (Inconel718)

Grade	Competitor's whisker ceramic	JX3
Insert Shape	RPGX120700	←
Cutting speed (m/min)	210	360
Feed (mm/rev)	0.15	←
D.O.C (mm)	1.8	←
	WET	←

NTK : JX3 100 cc/min

Competitor's whisker ceramic 60 cc/min

JP2 12 times higher productivity

Turbine disc (Inconel718 finishing)
CNGA120408,
 $v_c=240\text{m/min}$, $f=0.08\text{mm/rev}$, $a_p=0.25\text{mm}$, Wet

	Inco718	Competitor's coated carbide	JP2
Cutting speed (m/min)	20	20	240
Chip removal per minutes (cc/min)	0.4	0.4	4.8
Tool life (pass)	1	1	1

- JP2 cut 12 times faster than carbide insert, reducing cycle time dramatically

JP2 4 times higher productivity

Turbine disc (Inconel718 no scale, semi-finishing)
CNGA120408,
 $v_c=180\text{m/min}$, $f=0.10\text{mm/rev}$, $a_p=0.4\text{mm}$, Wet

	Inco718	Competitor's coated carbide	JP2
Cutting speed (m/min)	45	45	180
Chip removal per minutes (cc/min)	1.8	1.8	7.2
Tool life (pass)	1	1	4

- JP2 cut 4 times faster than carbide insert, reducing cycle time dramatically

● SiAlON ceramics

Turning(semi-finishing) : Turbine disc ● Inconel718

	current tool	NTK
Grade	Whisker ceramic	SX7
Insert Shape	RPGX120700	←
Cutting speed (m/min)	240	←
Feed (mm/rev)	0.15	←
D.O.C (mm)	1.50	←
Coolant	WET	←
Tool life (min)	7.0	←

● Whisker ceramics

Turbine disc
Inconel718

	External turning	Grooving	Ramping
	WA1	WA1	WA1
Cutting speed (m/min)	300	300	300
Feed (mm/rev)	0.15	0.1	0.06
D.O.C (mm)	3 - 4	-	2 - 3
Coolant	WET	WET	WET
Tool life (min)	20	20	20

Whisker ceramics WA1 achieved stable machining.

Guideline for grooving HRSA materials

BIDEMICS / Ceramic grooving inserts provide high speed capability to your process. Whisker ceramic is the most versatile option in this category. NTK also offers BIDEMICS and SiAlON grades for more productivity and stability.

	JX1	JX3	SX3	SX7	SX5	WA1/WA5	
Speed		●		●	●	●	
Feed			●	●	●		
Versatility	●			●		●	
Toughness			●	●	●		
	Can run at up to 1500 SFM. Double the speed of whisker		Double the feed of whisker		Best for Scale and interruption		Versatile grade

● : 1st choice ● : 2nd choice

Application	Grade	Work material	Cutting speed (m/min)						Feed (mm/rev)					Depth of cut (mm)					Coolant
			180	240	300	360	420	480	0.1	0.2	0.3	0.4	0.5	0.5	1.0	1.5	2.0	2.5	
Grooving 	JX1 JX3	Overall	360(180-480)						0.07(0.05-0.1)										WET
	SX5	Waspaloy	210(180-240)						0.15(0.07-0.17)										
	SX3 SX7	Overall	230(180-270)						1.1(0.07-0.15)										
	WA1	Overall	240(180-330)						0.07(0.05-0.1)										

When using SX7/SX5, increase feed rates 100% vs. Whisker Ceramics

When applying JX1 / JX3, increase speed to over 1000 SFM
 When applying SX3 / SX7 / SX5, increase feed rates 100% vs. Whisker Ceramics

Application Information

Work Hardening Layer
 $\geq 45^\circ$

When machining a grooved area with multiple passes, the insert radius engages a potentially work hardened area during the last remaining plunge. This programming procedure sets up the potential of corner radius chipping or notching.

Change to

45°

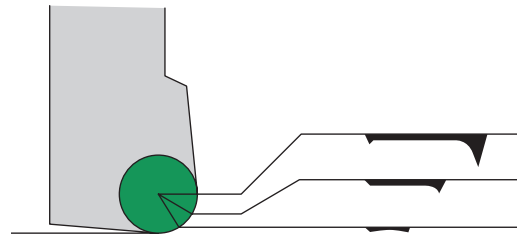
The grooving insert is plunged down both outside walls thus maintaining a good finish. The remaining material can be removed by using a stronger insert shape such as a RCGX style.

Keys to successful machining with ceramics, BIDEMICS insert

1) Depth of Cut

Depth of Cut Notching

This mode of insert failure is typical when machining heat resistant alloys. It must be controlled to prevent a catastrophic failure of the insert's cutting edge. The following information should help to minimize this problem.



Depth of Cut

Prime consideration should be given to the effect of depth of cut upon insert tool life. There is a direct relationship between the insert radius size and the maximum depth of cut which should be taken. See the chart below for recommendations.

Recommended Depth of Cut Range (mm)

Round insert	Maximum DOC	*Insert radius	Maximum DOC
φ 6.35	1.5mm...Less	0.8	0.2
φ 9.525	2.3mm...Less	1.2	0.3
φ 12.7	3.2mm...Less	1.6	0.4
φ 25.4	6.4mm...Less	2.4	0.6

*OPTIMUM DOC. IS 5-15% OF THE INSERT DIAMETER *BASED ON 0° LEAD ANGLE

2) Lead Angle

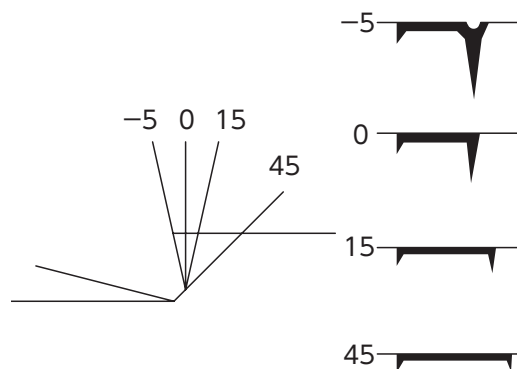
Lead Angles

When cutting heat resistant alloys consideration should be given to using the largest lead angle possible. When using large lead angles, the cutting forces are spread over a larger surface area of the insert. This will also improve tool life and surface finish while reducing notching. As the lead angle increases the chip will flow more easily.

- Typical insert wear pattern showing the effect of various lead angle changes and the resulting increase of depth of cut notching

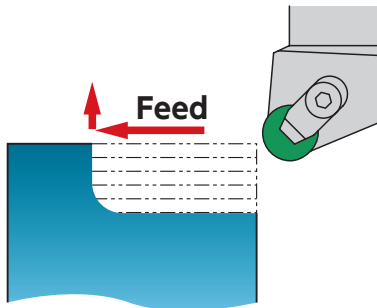
Feeds

Utilize the superior strength characteristic of SX7, SX3, SX9, SX5 SiAlON ceramics. If excessive wear is encountered while machining heat resistant alloys, increase the feed rate thus minimizing the cutting time.



3) Roughing

Same Depth of Cut

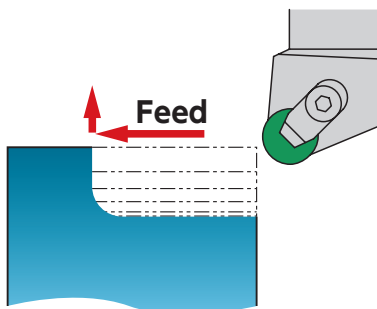


Note)

Notch wear on the insert cutting edge as shown in is the result of multiple passes being taken at the same depth of cut. This type of wear will minimize tool life.

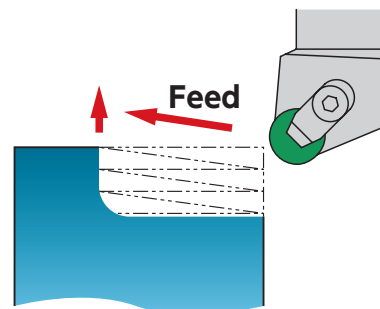
The following programming examples will help to minimize this mode of failure.

Varying Depth of Cut



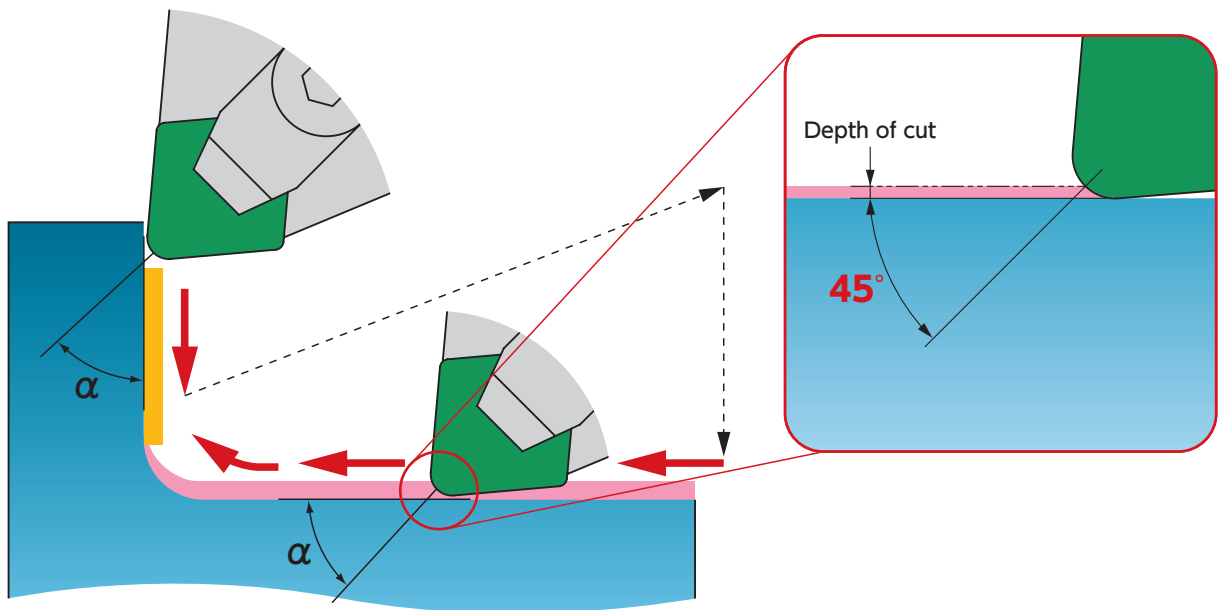
Note) Another programming change that may help to reduce notching is by varying the depth of cut. Again, the same principle applies, notching takes place at various points on the cutting edge rather than concentrated at one point.

Ramping



Note) Programming " Ramping " cuts in the same cutting direction is one of the best procedures to use to minimize notching. By varying the DOC, wear is distributed over the entire cutting edge not on one point.

4) Roughing



Depth of cut



Better

Note) The correct procedure is to take more material off during the previous roughing application. Then remove the amount of stock suitable for the nose radius of the insert by staying **below the 45° mark of the corner radius**. This will minimize notching and allow a cut from both directions.

$\alpha=45^\circ$

Insert radius		DOC	
(mm)	(Inch)	(mm)	(Inch)
0.4	0.0157	0.12	0.0047
0.8	0.0315	0.23	0.0091
1.2	0.0472	0.35	0.0138
1.6	0.0630	0.47	0.0185
2.0	0.0787	0.59	0.0232
2.4	0.0945	0.70	0.0276
3.2	0.1260	0.94	0.0370

Cutting Conditions & Parameters Adjustment

● Whisker ceramics(WA1/WA5), BIDEMICS(JX1/JX3/JP2)

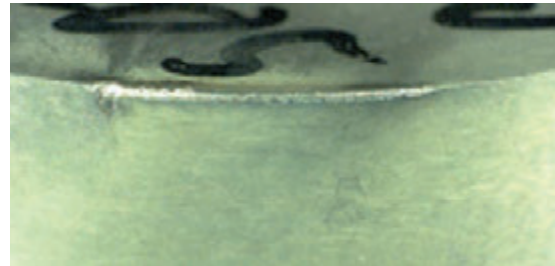
Cutting speed

Increasing cutting speed reduce nothing wear

100m/min



500m/min



● SiALON ceramics(SX7/SX3/SX9/SX5)

1) Cutting speed

Decreasing cutting speed increase the wear resistance

400m/min



100m/min



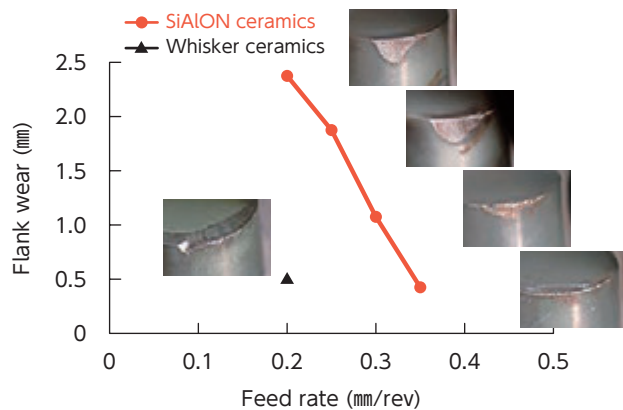
2) Feed rate

In some cases, in order to increase the wear resistance of **SiALON ceramics**, the feed must be increased. By increasing the feed and utilizing the toughness of **SiALON ceramics**, the inserts are off the part sooner causing less wear. Increasing the feed also decreases cycle time and improves productivity and profitability.

Note : Speed and feed rates shown are recorded test data and should not be thought of as recommended cutting conditions.

Note : Be careful to reduce the feed rate by 25%, when going into a corner.

Feed rate increased decreases wear amount



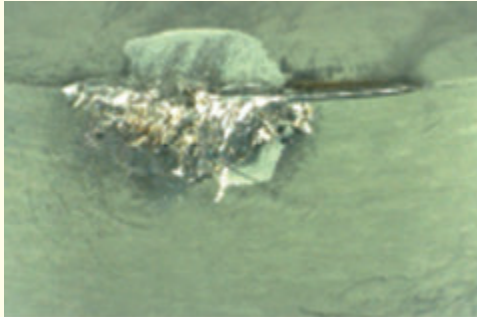
Cutting condition

Work material : Inco718
Insert shape : RNGN120700

Cutting Speed : 250m/min
Depth of Cut : 2.0mm
WET

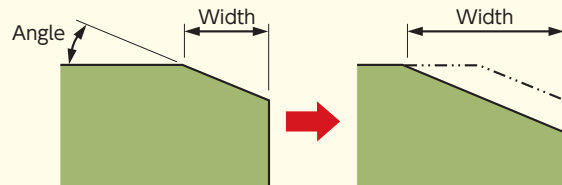
Troubleshooting

Flaking



Measures

- Decrease feed rate
- Use slightly larger T-land on the edge preparation

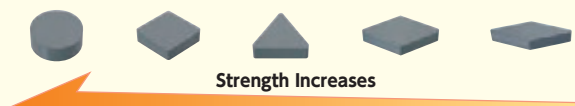


Breakage



Measures

- Increase cutting speed and feed rate
- Use strong insert shapes



It takes time to set the suitable cutting condition if work material hardness is unknown. Generally decreasing cutting speed is effective when machining harder work material.

Eliminate chatter

Chatter problem is often caused by too much cutting pressure when machining heat resistant alloys especially in profiling or grooving. A non-rigid machine may cause excessive insert wear or insert breakage.

- Increase speeds and decrease feeds
- Use harder grade with higher speed
- Use smaller I.C round insert, or smaller nose radius
- Reduce insert nose radius
- Use positive insert
- Reduce lead angle
- Reduce edge preparation or use sharp edge
- Minimize overhang
- Try a heavy metal boring bar