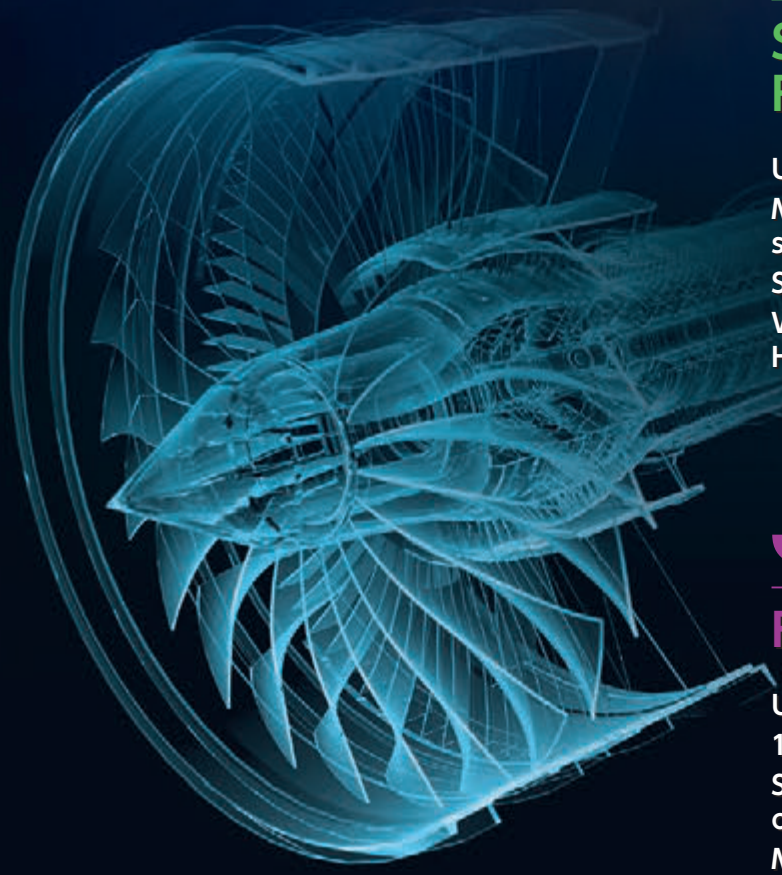
NTK CUTTING TOOLS
TOOL NEWS
No.050

New Era in Aerospace Machining

BIDEMICS



JX1 / JX3 NEW

Semi-finishing
Rough no scale

Up to V_c=480m/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=520m/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

NTK
CUTTING TOOLS

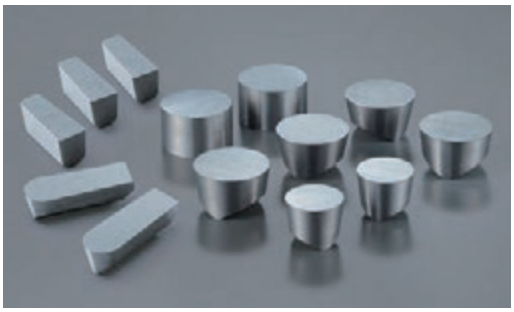
NEW

New Era in Aerospace Machining

BIDEMICS

New Composite Material for HRSA Machining

WATCH ON YouTube



JX1 / JX3 NEW

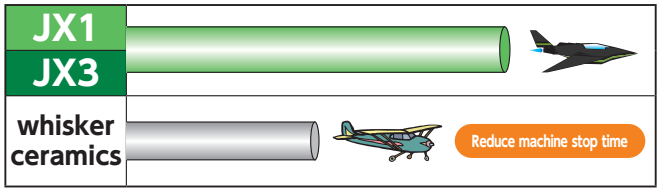
Features

- 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

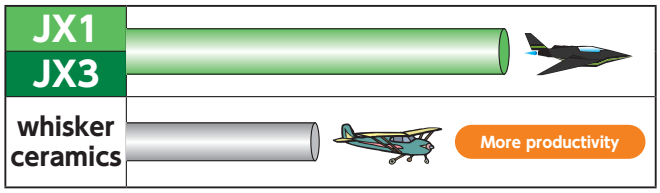
Productivity

vs. Whisker ceramics

① Imrove tool life at same cutting speed



② Higher speed



JP2

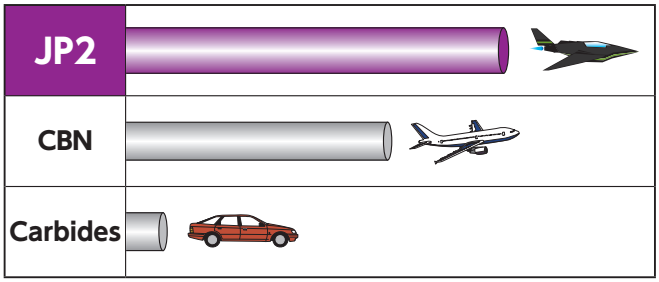
Features

- Finishing speed up to Vc=520m/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

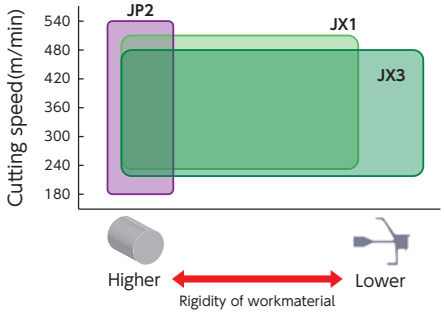
JX1

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

JX3

- Turning at the corner part, Grooving.
- Chipping occured 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

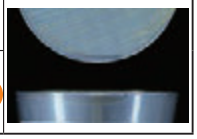
- 2 times higher speed than whisker ceramics
  Increasing productivty saves additional equipment

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	←

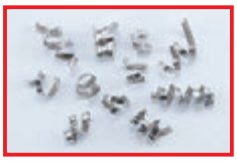
NTK : **JX1** — 120 cc/min

JX1



Competitor's whisker ceramic — 60 cc/min — High productivity

JX1



Whisker ceramic

Chip break easilly at higher cutting speed,
typically continuous chips are occured in HRSA turning.

3 Works well on wide range of High Temperature Alloys

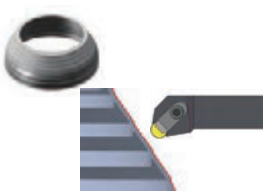
- Inconel 718, 718 Plus, 625
- Rene 41, 88, 104
- Waspaloy etc.

4 Superior surface finish

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

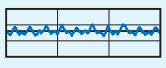
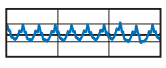
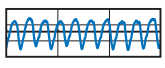
Turrbincase(Inconel718Plus)

	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 Materals with BIDEMICS and Ceramics

JX1 / JX3 NEW BIDEMICS- Game Changer

WATCH ON YouTube

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

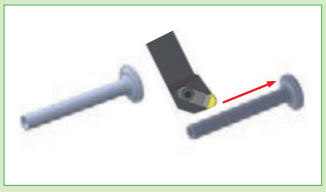
Work Materials
- Inconel 718, 718 Plus
- Rene
- MAR-M247

Applications
- Semi-finishing
- Profiling

Profiling Inconel718

Competitor's whisker ceramics
Tool life : 3min.

JX1
Turbine shaft



Turbine shaft
RNGN120700, v_c = 240m/min, f = 0.2mm/rev, a_p = 2.0mm, 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

WATCH ON YouTube

Features
- Extreme toughness makes hiogher 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

WATCH ON YouTube

Features

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

Work Materials

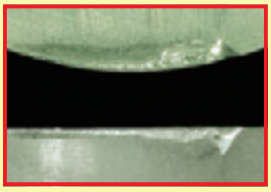
- Inconel 718
- Inconel 625

Applications

- Semi-finishing
- Profiling
- Grroving

Profiling Inconel718

Competitor's whisker ceramics



WA1

Turbine case

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

SX7 SiAlON ceramics

WATCH ON YouTube

Features

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

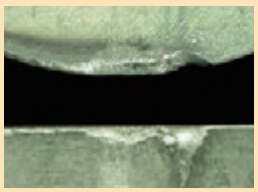
Work Materials

- Inconel 718
- Inconel 625
- Waspaloy
- Udimit720

Applications

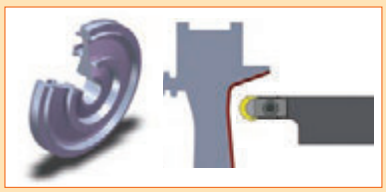
- Semi-finishing
- Profiling
- Miilling
- Grooving

Profiling Inconel718



Competitor's whisker ceramics

SX7



Turbine Disc

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

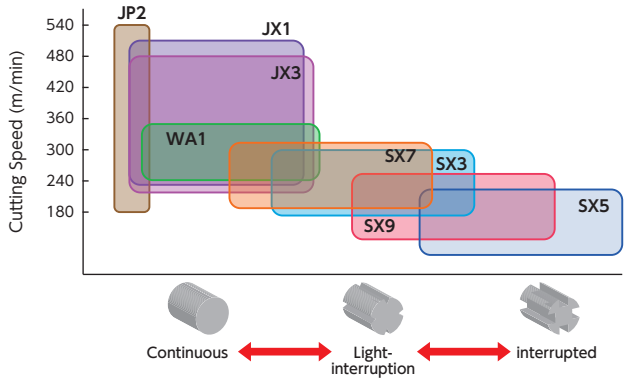
Guidelines for Machining HRSA Materials

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 fi nish 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	●	○	○			○	●

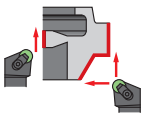
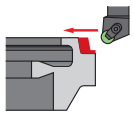
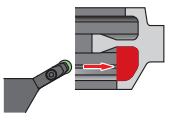
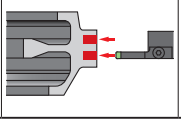
● 1st Choice　○ 2nd Choice

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

	Rough with scale	Rough&semi-finish	Profiling	Grooving	Milling	End milling
						

Applications

Application	Grade	Work material	Cutting speed (m/min) 180 240 300 360 420 480	Feed (mm/rev) 0.1 0.2 0.3 0.4 0.5	Depth of cut (mm) 0.5 1.0 1.5 2.0 2.5	Coolant
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)	When using SX7/SX3/SX5, increase feed rates 100% vs. Whisker Ceramics	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)		

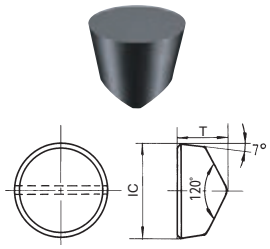
Application	Grade	Work material	Cutting speed (m/min) 450 600 750 900 1000 1200	Feed (mm/t) 0.05 0.07 1.0 0.12 0.15	Depth of cut (mm) 0.5 1.0 1.5 2.0 2.5	Coolant
Milling 	SX3 SX7	Overall	810(600-1200)	0.1(0.07-0.12)	1.7(1.0-2.5)	DRY
	SX9	Overall	750(450-1000)	0.12(0.1-0.15)	2.0(1.0-2.5)	
End milling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

Insert Item List

● : 1st Choice ● : 2nd Choice

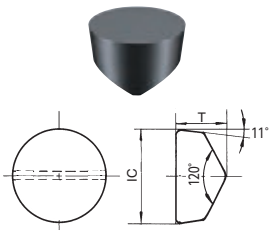
		JX1	JX3	SX7	SX3	SX9	WA1	WA5
Steel	P							
Stainless Steel	M							
Cast Iron	K			●	●	●	●	●
Non-Ferrous Material	N							
Heat Resistant Alloy	S	●	●	●	●	●	●	●
Hardened Material	H						●	●

RCGX [CRDCN Insert]



P/N	IC	T	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					●		

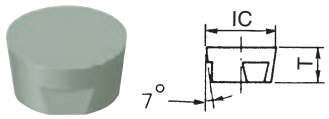
RPGX [CRDCN Insert]



P/N	IC	T	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

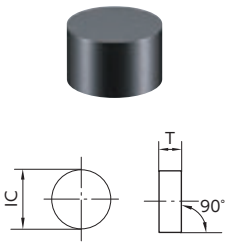
RCGY [CRXC Insert]



P/N	IC	T	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



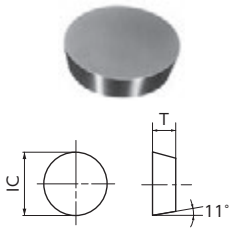
P/N	IC	T	JX1	JX3	SX7	SX3	SX9	WA1	WA5
RNGN 120400 T00520	12.70	4.76				●		●	
120400 T00820	12.70	4.76							●
120400 T00525	12.70	4.76					●	●	
120400 T01020	12.70	4.76					●	●	
120400 T02025	12.70	4.76					●		
120700 E002	12.70	7.94					●		
120700 E004	12.70	7.94	●	●	●	●			
120700 T00520	12.70	7.94					●	●	
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

		JX1	JX3	JP2	SX7	SX3	SX9	WA1	WA5
Steel	P								
Stainless Steel	M								
Cast Iron	K				●	●	●	●	●
Non-Ferrous Material	N								
Heat Resistant Alloy	S	●	●	●	●	●	●	●	●
Hardened Material	H							●	●

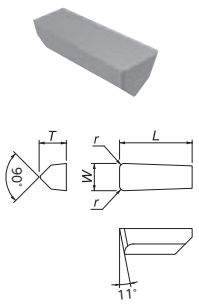
RPGN



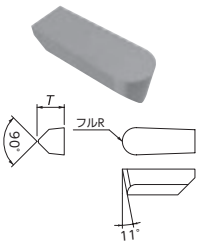
P/N	Dimension(mm) IC	T	JX1	JX3	JP2	SX7	SX3	SX9	WA1	WA5
RPGN 060200 T00520	6.35	2.38							●	
090300 T00520	9.525	3.18							●	
120400 E004	12.70	4.76				●				
120400 EX0004	12.70	4.76						●		
120400 T00520	12.70	4.76							●	
120400 T00525	12.70	4.76						●		
120400 T00820	12.70	4.76				●				
120400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

●Toolholder→ O34-35 2019-2020 GeneralCatalogue

VGW



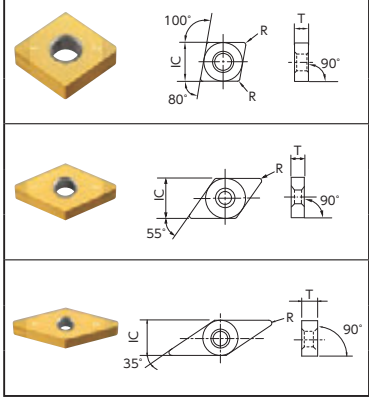
P/N	Dimension(mm) W	r	T	L	JX1	JX3	JP2	SX7	SX3	SX9	WA1	WA5
VGW 4125-1 E004	3.18	0.4	6.35	12.7	●	●						
4125-2 E004	3.18	0.8	6.35	12.7	●	●						
4125-2 EX0001	3.18	0.8	6.35	12.7							●	●
4156-1 E004	3.96	0.4	6.35	12.7	●	●						
4156-2 E004	3.96	0.8	6.35	12.7	●	●						
4156-2 EX0001	3.96	0.8	6.35	12.7							●	●
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 EX001	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) IC	T	Corner radius	Edge prep.	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			●					

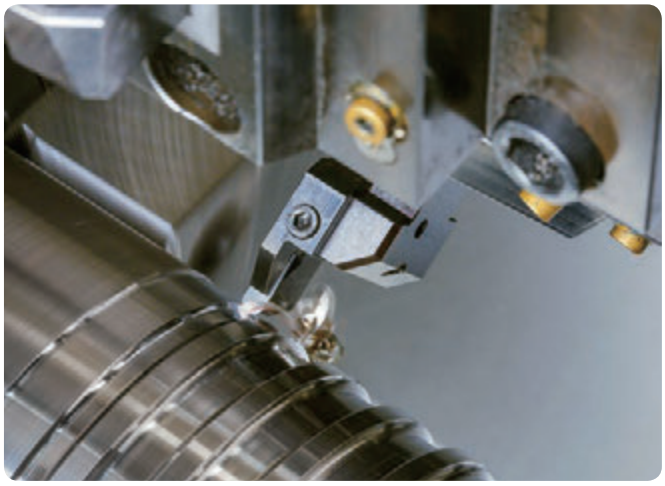


※ NOTE : JP2 : 1pc/Case

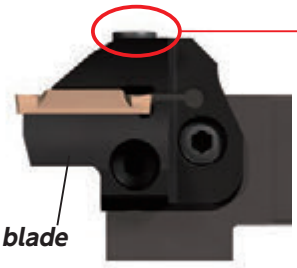
●Toolholder→ F11-13・15-17・31, G42-43・K36-37, 2019-2020 GeneralCatalogue, 12-13

New Modular Tooling !

Available in 3 different styles



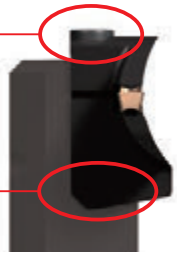
Most rigid blade type system



Position clamp bolt to the front side
Strong clamping prevents movement of insert

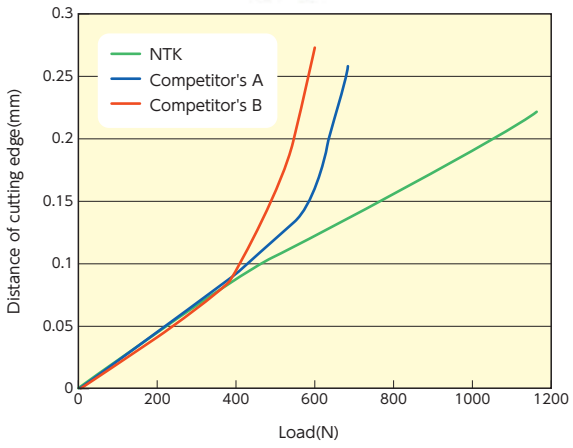
blade

Strong clamping by directly fastening the blades



Wedge style design

Tool rigidity comparision



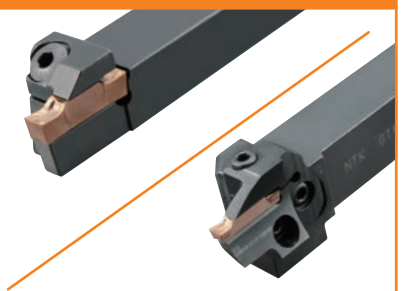
RCGX Style
RPGX Style
for BIDEMICS, ceramics insert

➡14-15

VGW Style(Grooving)
for BIDEMICS, ceramics insert

➡12-13

Grooving/Face grooving
for PVD coated carbide insert

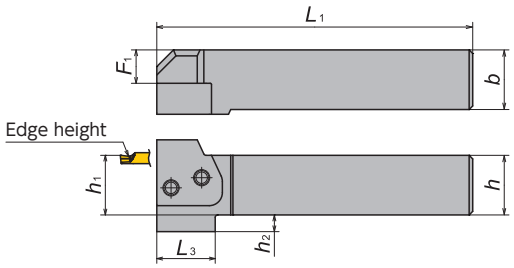


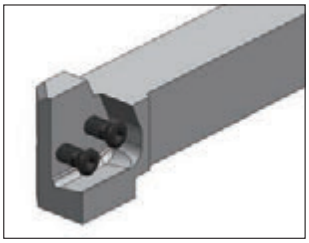
➡ H40, 2019-2020GeneralCatalogue

■Toolholder for blade

Straight style＝0°

GTWP-H





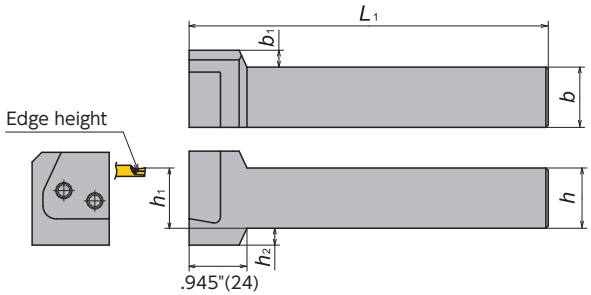
Right-Hand style shown

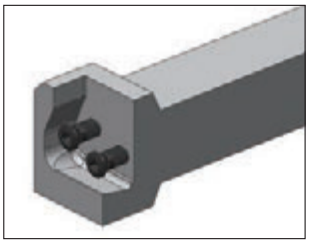
Toolholder	Stock		Dimension (mm)							Parts	
	R	L	h	b	h_1	L_1	F_1	h_2	L_3	Screw	Wrench
GTWP[R/L] 2020-H	●	●	20.0	20.0	20.0	107.5	9	8	28.5	FSI28-6.0×18	LW-4
2525-H	●	●	25.0	25.0	25.0	132.5	14	7	24.5	FSI28-6.0×18	LW-4
3232-H	●	●	32.0	32.0	32.0	152.5	21	—	—	FSI28-6.0×18	LW-4

■ブレード用ホルダ

L-style＝90°

GKWP-H





Right-Hand style shown
＊Use oppsoite hand blade

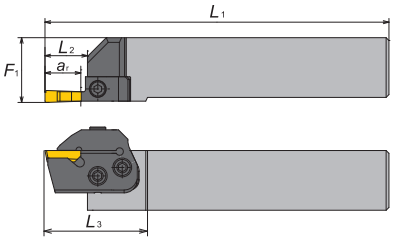
Toolholder	Stock		Dimension (mm)						Parts	
	R	L	h	b	h_1	L_1	b_1	h_2	Screw	Wrench
GKWP[R/L] 2020-H	●	●	20.0	20.0	20.0	124	12	8	FSI28-6.0×18	LW-4
2525-H	●	●	25.0	25.0	25.0	149	7	7	FSI28-6.0×18	LW-4
3232-H	●	●	32.0	32.0	32.0	169	—	—	FSI28-6.0×18	LW-4

Blade for external grooving

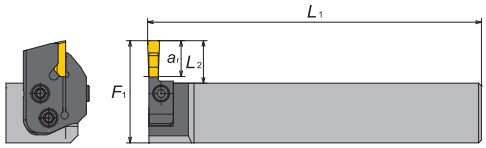
VGW

Toolholder

For GTWP



For GKWP



Right hand

Hand	Blade number	Stock	Insert	Dimension (mm)		Holder	Insert	Dimension (mm)				
								GTWPR-H			GKWPL-H	
				a_r	L_2			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	36.1
						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	42.4
						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	42.4
						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	47.5
						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	52.6
						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	55.1
						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	

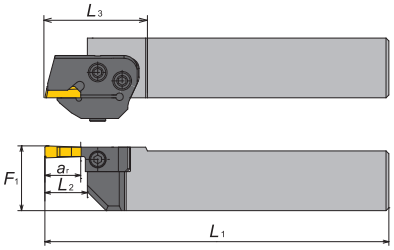
●Insert➡9

Blade for external grooving

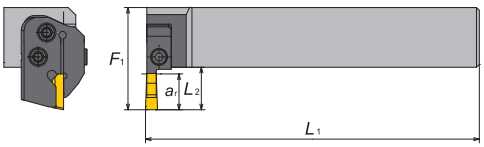
VGW

Toolholder

For GTWP



For GKWP



Left hand

Hand	Blade number	Stock	Insert	Dimension (mm)		Holder	Insert	Dimension (mm)				
								GTWPL-H			GKWPR-H	
				a_r	L_2			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
						GKWPR3232-H	VGW4156			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
						GKWPR3232-H	VGW4187			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
						GKWPR3232-H	VGW6250			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
						GKWPR3232-H	VGW6281			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
						GKWPR3232-H	VGW8344			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
						GKWPR3232-H	VGW8375			35.7	170.7	

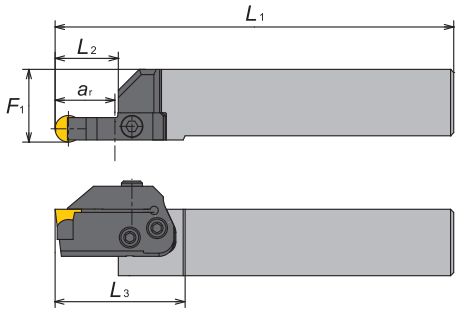
●Insert➡9

Blade for external grooving(RCGX/RPGX insert)

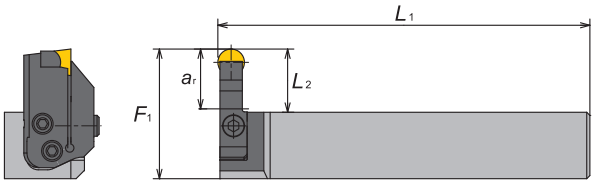
GBR

Toolholder

For GTWP-H



For GKWP-H



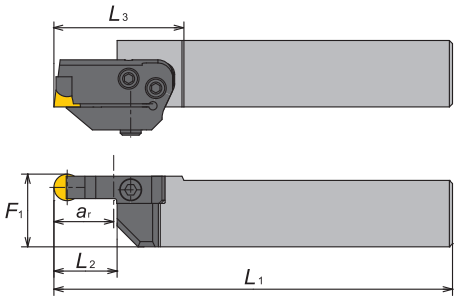
Right hand

Hand	Blade number	Stock	Insert	Dimension (mm)		Holder	Dimension (mm)				
							GTWPR-H			GKWPL-H	
				a_r	L_2		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					

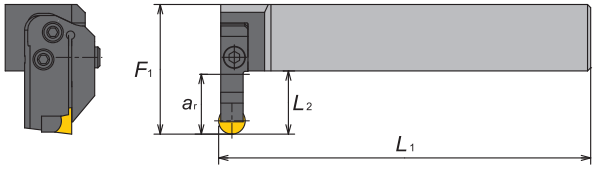
●Insert➡8

Toolholder

For GTWP-H



For GKWP-H



Left hand

Hand	Blade number	Stock	Insert	Dimension (mm)		Holder	Dimension (mm)				
							GTWPL-H			GKWPL-H	
				a_r	L_2		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

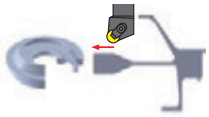
● BIDEMICS

JX1 — 4 times longer tool life

Turbin disc (Rene104 rough/semi-finish)

RNGN120700T00820,
v_c=210m/min, f =0.18mm/rev, a_p=1.00mm, Wet

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



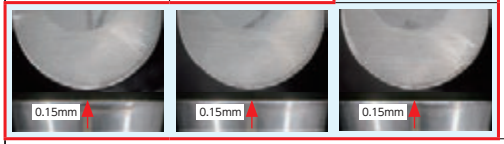
- Rene 104 is a difficult material to cut.
- JX1 cut 4 times longer tool life than whisker ceramics.

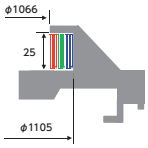
JX1 — 1.7 times higer speed

Turbin disc (Inconel718 rough/semi-finish)

RPGX120700T00820,
v_c=210m/min, f =0.16mm/rev, a_p= ~ 1.50mm, 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

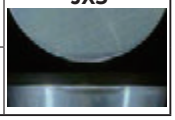
JX3

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 productivty

Turbine disc (Inconel718 finishing)

CNGA120408,
v_c=240m/min, f =0.08mm/rev, a_p=0.25mm, Wet

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



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

JP2 — 4 times higher productivty

Turbine disc (Inconel718 no scale, semi-finishing)

CNGA120408,
v_c=180m/min, f =0.10mm/rev, a_p=0.4mm, Wet

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

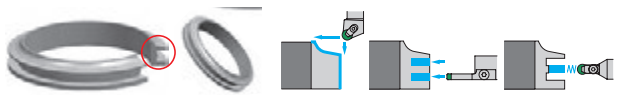
Competitor's whisker ceramic

SX7

● Whisker ceramics

Turbine disc

Inconel718



	External turning	Grroving	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.

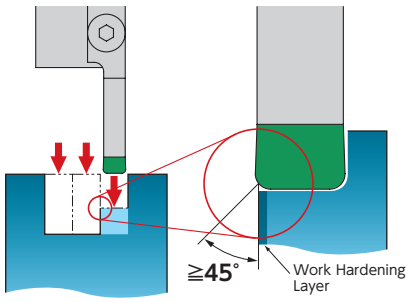
	JX1 / JX3	SX3 / SX7	SX5	WA1 / WA5
				
Speed	●	●	●	●
Feed		●	●	
Versatility	●	●		●
Toughness		●	●	
	Can run at up to 1500 SFM. Double the speed of whisker	Double the feed of whisker	Best for Scale and interruption	Versatile grade

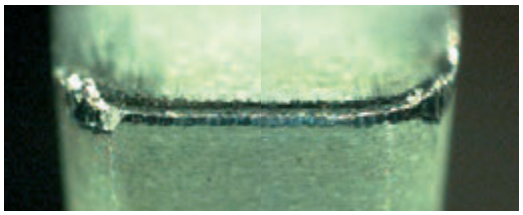
● : 1st choice ● : 2nd choice

Application	Grade	Work material	Cutting speed (m/min) 180 240 300 360 420 480	Feed (mm/rev) 0.1 0.2 0.3 0.4 0.5	Depth of cut (mm) 0.5 1.0 1.5 2.0 2.5	Coolant
Grooving 	JX1 JX3	Overall	360(180-480)	0.07(0.05-0.1)	When using SX7 / SX5, increase feed rates 100% vs. Whisker Ceramics	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 applying JX1 / JX3, increase speed to over 1000 SFM
When applying SX3 / SX7 / SX5, increase feed rates 100% vs. Whisker Ceramics

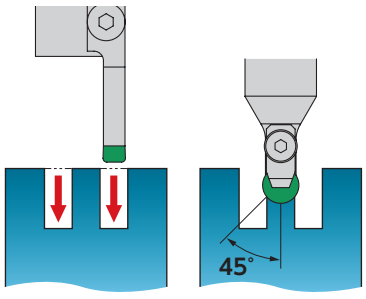
Application Information

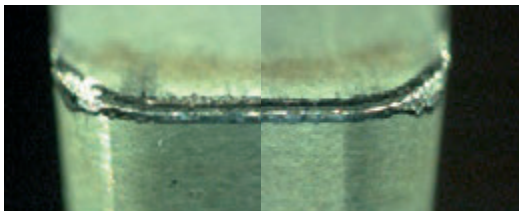




When machining a grooved area with multiple passes, the insert radius engages a potentially work hardened area during the last remaining plunge. This programming procedure sets up the potential of corner radius chipping or notching.

Change to



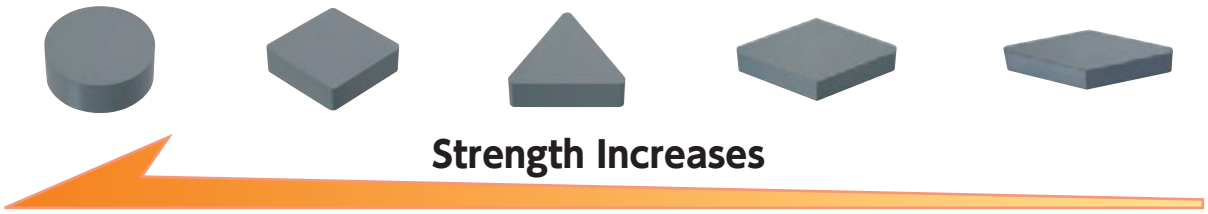


The grooving insert is plunged down both outside walls thus maintaining a good finish. The remaining material can be removed by using a stronger insert shape such as a RCGX style.

Keys to successful machining of HRSA Materials

1) Use strong insert shapes

Maximize geometry for strength productivity

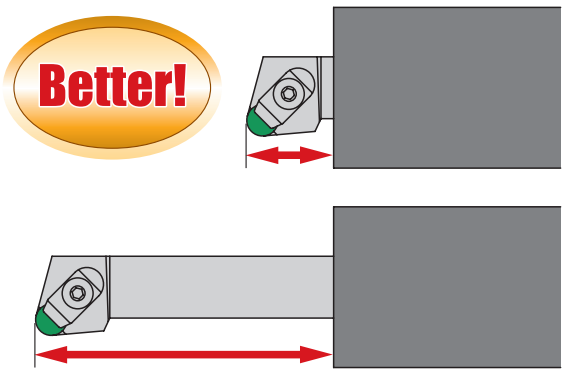


2) Use largest nose radius

Maximize insert nose radius for strength and longer tool life
Take into account that the larger the nose radius the greater the tool pressure
Typical application machining heat resistant alloys use a RNGN1207 insert for roughing and CNGA1204 style for finishing

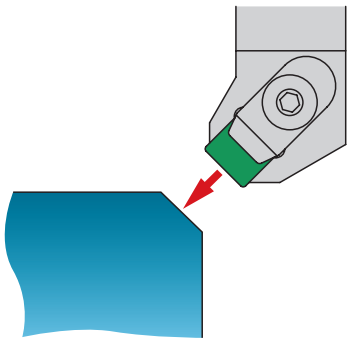
3) Minimize overhang

Too much overhang may cause chatter or insert breakage



4) Pre-chamfering

Pre-chamferring the part reduces the potential for insert chipping or breaking upon the entry or exit point of work material



5) No dwelling

Inserts wear out when rubbing the part instead of cutting

6) Coolant

- Turning : WET conditon should be used.
  ※DRY condition may be best in a high interruption is encountered
- Milling : DRY condition should be used.

7) Edge preparations

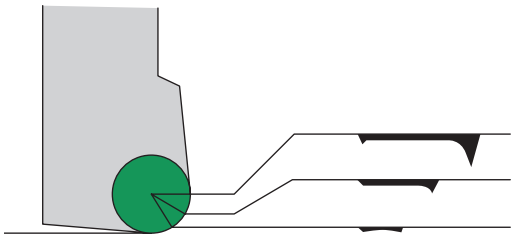
Typical HRSA machining requires the insert cutting edge to be sharp. Using a slight T-land or honed edge is also effective to reduce notching, flaking and built up edge

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 probrem.



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
ϕ6.35	1.5mm...Less
ϕ9.525	2.3mm...Less
ϕ12.7	3.2mm...Less
ϕ25.4	6.4mm...Less

*Insert radius	Maximum DOC
0.8	0.2
1.2	0.3
1.6	0.4
2.4	0.6

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

2) Lead Angle

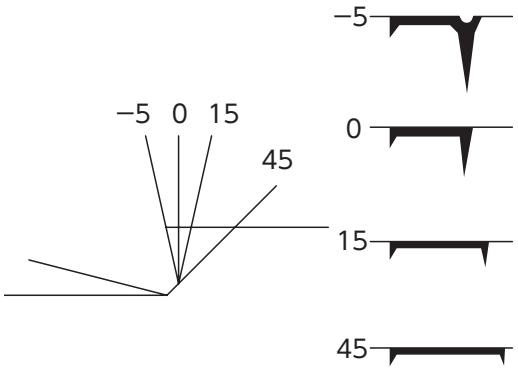
Lead Angles

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.

Feeds

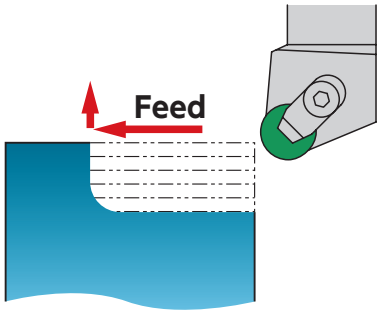
Utilize the superior strength characteristic of SX7, SX3, SX9, SX5 SiAlON ceramics. If excessive wear is encountered while machining heat resistant alloys, increase the feed rate thus minimizing the cutting time.

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



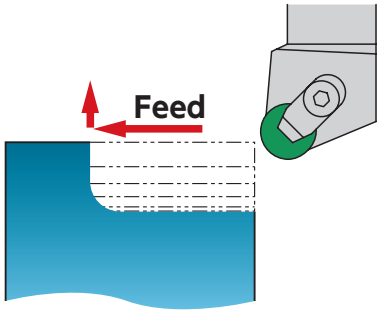
3) Roughing

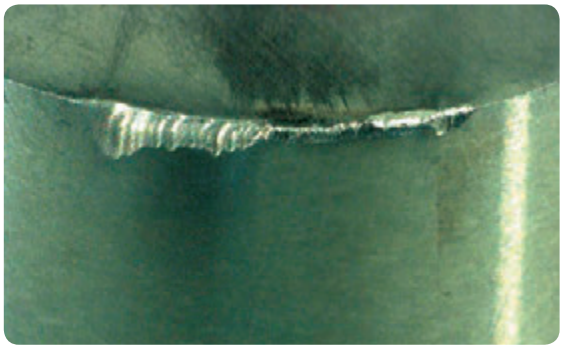
Same Depth of Cut



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.

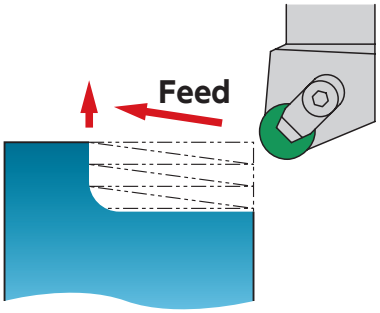
Varying Depth of Cut





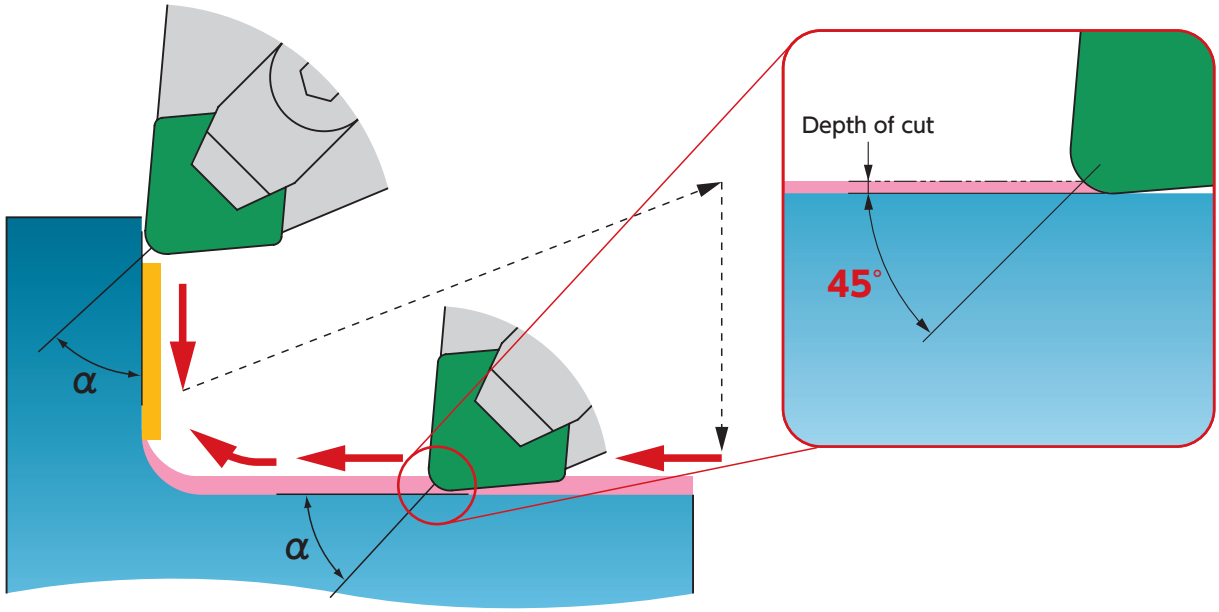
Note) Another programming change that may help to reduce notching is by varying the depth of cut. Again, the same principle applies, notching takes place at various points on the cutting edge rather than concentrated at one point.

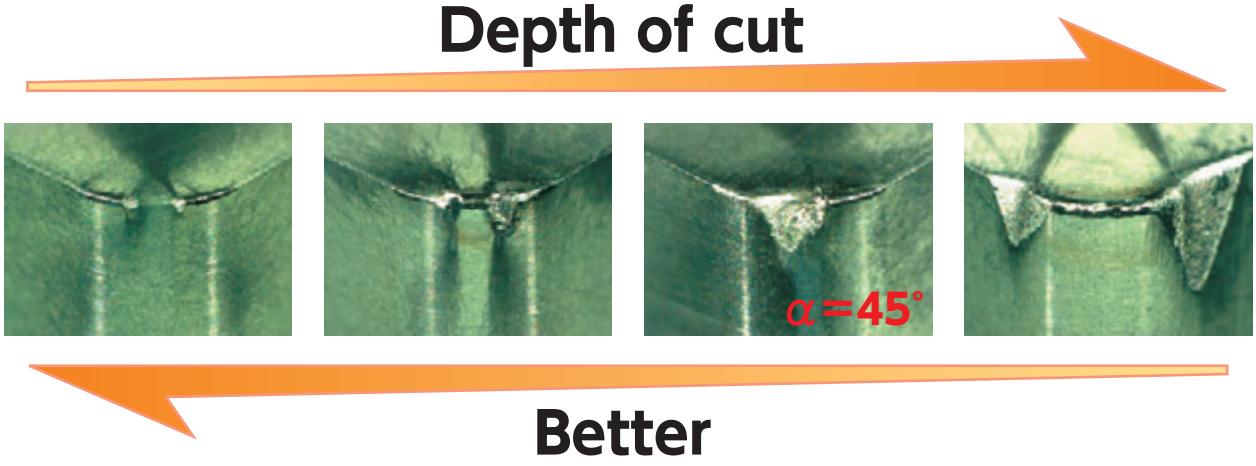
Ramping



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





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 frow both directions.

α=45°

Insert radius		DOC	
(㎜)	(Inch)	(㎜)	(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 & Parametrs 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

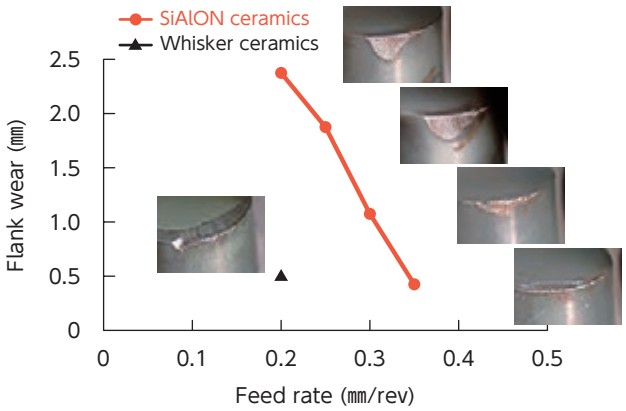
2) Feed rate

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



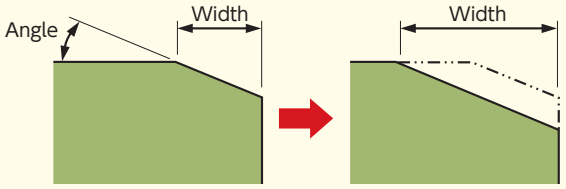
Cutting condition
Work material : Inco718
Insert shape : RNGN120700
Cutting Speed : 250m/min
Depth of Cut : 2.0mm
WET

Troubleshooting

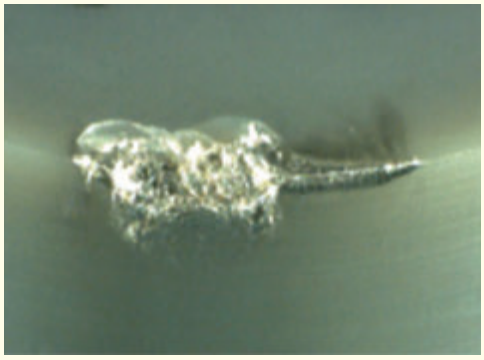
Flaking

Measures

- Decrease feed rate
- Use slightly larger T-land on the edgepreparation



Breakage



Measures

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

It takes time to set the suitableb cutting condition if work material hardeness is unknown.
Generally decreasing cutting speed is effective when mashining 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