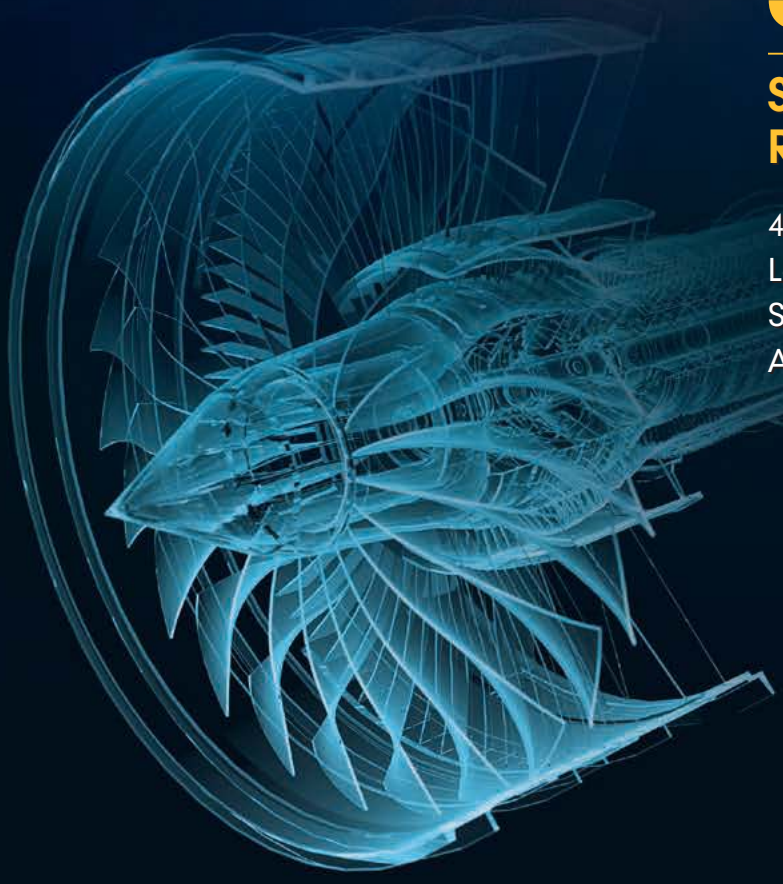
New Era in Aerospace Machining

BIDEMICS

Patents Pending



JX1

Semi-finishing & Finishing
Rough no scale

480 m/min Speed Capability
Longer Tool Life vs. Whisker
Superior Surface Finishes vs. Whisker
Able To Cut New Aerospace Materials

JP2

Finishing

510 m/min Speed Capability
10 to 15 x Speed vs. Carbide
Superior Surface Finishes vs. Carbide & CBN
Coated Multi-tipped Brazed Inserts

NTK
CUTTING TOOLS

NEW BIDEMICS New Era in Aerospace Machining

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JX1

Features Patents Pending

- *Significantly extended tool life compared to whisker ceramics*
- *Double cutting speed potential compared to whisker ceramics*
- *Superior surface finish compared to whisker ceramics*
- *Applicable to powder-metallurgical heat resistant alloys*

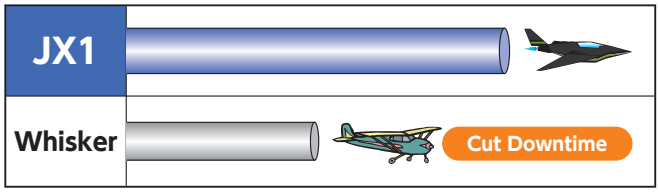
JP2

Features Patents Pending

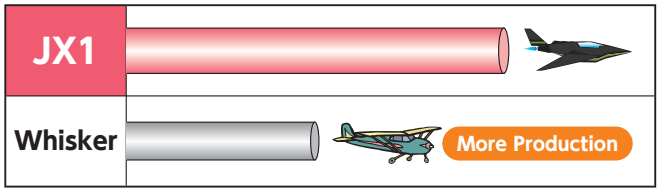
- *High speed finish turning can be performed at 240m/min or higher*
- *Superior wear resistance compared to CBN's*
- *Superior notching resistance vs CBN or carbides*
- *Superior surface finishes vs CBNs and coated carbides*

Increase Productivity vs. Whisker Ceramics

① Significantly extended tool life at same speed

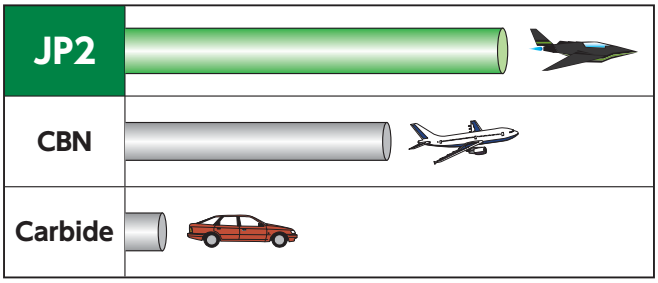


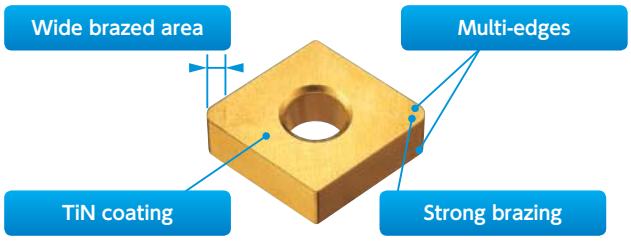
② Double speed capability



Increase Productivity vs. Carbide

① 10 to 15 times higher speed capability





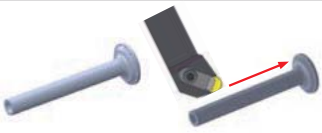
Grade	Work material	Application	Purpose	Cutting speed (m/min)	Feed (mm/rev)	Depth of cut (mm)	DRY	WET
JX1	Heat Resistant Alloy	Turning	Rough no scale	180-**480**	0.125-0.275	1.0-2.5		●
			Semi finishing	180-**480**	0.10-0.25	0.5-2.0		●
JP2	Heat Resistant Alloy	Turning	Finishing	180-**510**	0.10-0.25	0.25-1.0		●

1 Longer tool life

JX1's combination of High Hardness, Superior Thermal Conductivity and Improved Strength compared to whisker ceramics results in significantly longer tool life when applied at typical whisker ceramic speeds / feeds and depth of cut.

Turbine shaft (Inco718 Pre-machined)

	Comp. whisker	JX1
Shape	RNGN120700	←
Cutting speed (m/min)	240	←
Feed (mm/rev)	0.2	←
Depth of cut (mm)	2.0	←
	WET	←



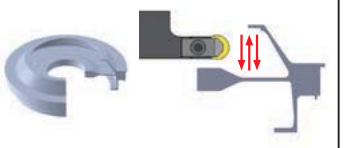
NTK : JX1	10 min	
Competitor's whisker ceramic	3 min	

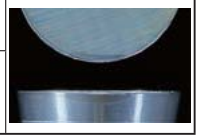
2 Higher speeds

JX1's Superior Physical Properties compared to whisker ceramic enable you to increase speeds; potentially as much as 2X whisker ceramic speeds; increasing productivity and potentially offsetting needs for additional equipment to meet increasing demands.

Turbine disk (Inco718 rough)

	Comp. whisker	JX1
Shape	RPGX120700	←
Cutting speed (m/min)	195	390
Feed (mm/rev)	0.15	←
Depth of cut (mm)	2.0	←
	WET	←



NTK : JX1	120 cc/min	JX1 
Competitor's whisker ceramic	60 cc/min	

JX1

Whisker Ceramic

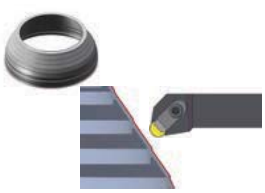
Chips easily break at higher cutting speed vs typically continuous chips of Super Alloy materials. This makes more efficient chip removal.

3 Works well on wide range of High Temperature Alloys

JX1's Unique Physical Properties enables machining of newer compositions of difficult to machine High Nickel Alloys, High Nickel/Cobalt alloys, or powdered metallurgy alloys that are becoming more common in the market .

Turbine case (718Plus semi finish)

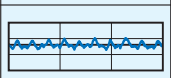
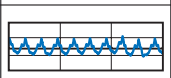
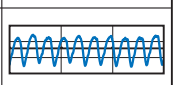
	Comp. coated whisker	JX1
Shape	RNGN120700	←
Cutting speed (m/min)	240	←
Feed (mm/rev)	0.25	←
Depth of cut (mm)	0.5	←
	WET	←



NTK : JX1	3 pass	
Competitor's whisker ceramic	1 pass	

4 Superior Surface Finish

JP2's Outstanding Wear resistance and notching resistance results in workpiece surface finishes consistently superior to either CBN or Carbide

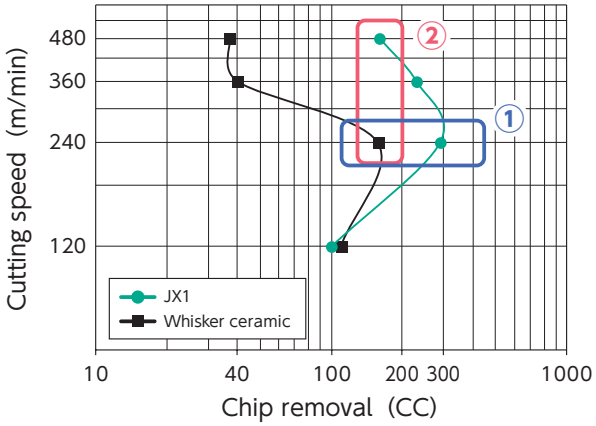
		JP2	CBN	Carbide
				
Machined surface				
Roughness				
	Ra	0.64 μm	1.18 μm	2.75 μm
	Rz	3.36 μm	5.56 μm	9.64 μm
Cutting speed		240 m/min	←	36 m/min
Feed rate		0.15 mm/rev	←	←
Cycle time		3.3 min	←	14.7 min
Removed chip		48 cc	←	←

JX1 New Composite Material for Super Alloy Machining

Features

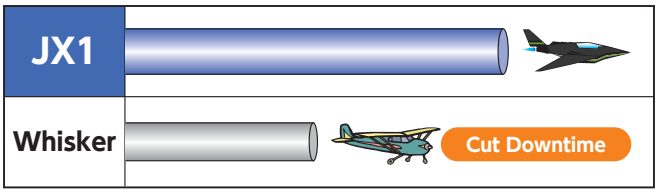
Patents Pending

- *Significantly extended tool life compared to whisker ceramics*
- *Double cutting speed potential compared to whisker ceramics*
- *Superior surface finish compared to whisker ceramics*
- *Applicable to powder-metallurgical heat resistant alloys*

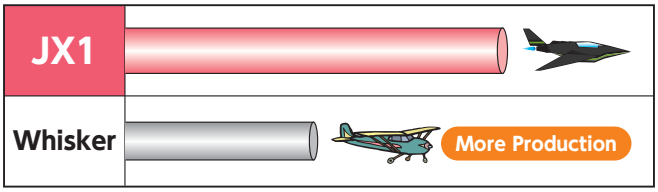


Increase Productivity vs. Whisker Ceramics

① Significantly extended tool life at same speed



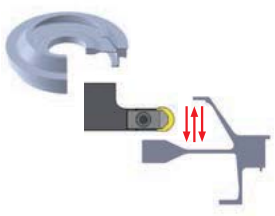
② Double speed capability



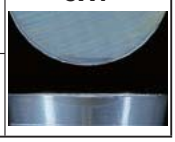
Grade	Work material	Application	Purpose	Cutting speed (m/min)	Feed (mm/rev)	Depth of cut (mm)	DRY	WET
JX1	Heat Resistant Alloy	Turning	Rough no scale	180-**480**	0.125-0.275	1.0-2.5		●
			Semi finishing	180-**480**	0.1-0.25	0.5-2.0		●

Turbine disk (Inco718 rough)

	Comp. whisker	JX1
Shape	RPGX120700	←
Cutting speed (m/min)	195	390
Feed (mm/rev)	0.15	←
Depth of cut (mm)	2.0	←
	WET	←

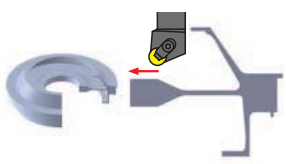


NTK : JX1	120 cc/min	JX1
Competitor's whisker ceramic	60 cc/min	



Turbine disk (Rene104 rough)

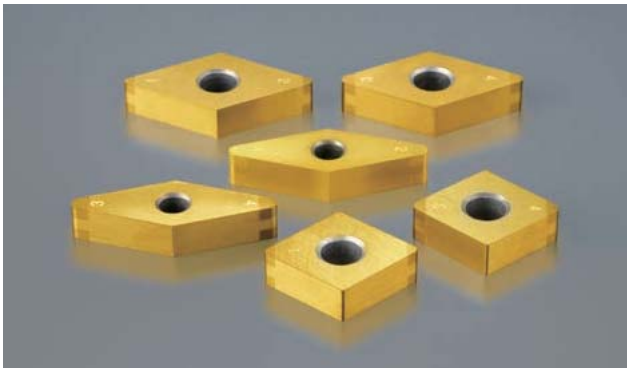
	Comp. whisker	JX1
Shape	RNGN120700	←
Cutting speed (m/min)	210	←
Feed (mm/rev)	0.175	←
Depth of cut (mm)	1.0	←
	WET	←



NTK : JX1	4 pass	
Competitor's whisker ceramic	1 pass	

JP2

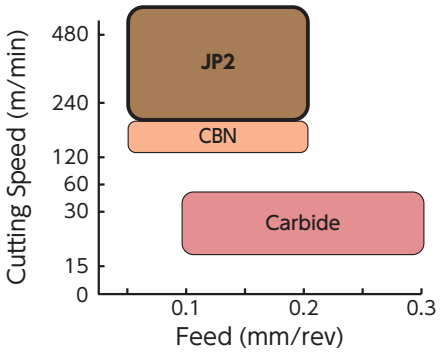
Ultra High-Speed Finishing of Super Alloys

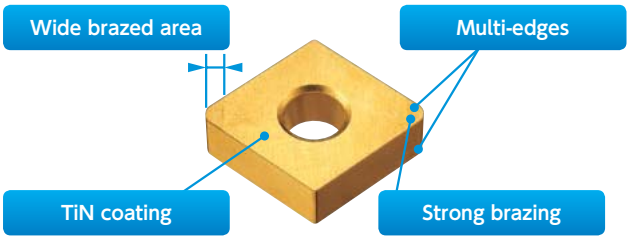


Features

Patents Pending

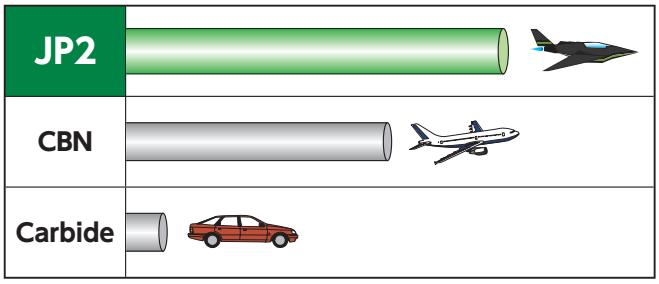
- *High speed finish turning can be performed at 240m/min or higher*
- *Superior wear resistance compared to CBN's*
- *Superior notching resistance vs CBN or carbides*
- *Superior surface finishes vs CBNs and coated carbides*





Increase Productivity vs. Carbide

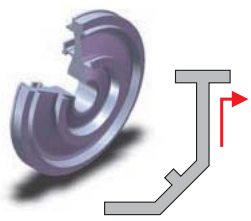
① 10 to 15 times higher speed capability



Grade	Work material	Application	Purpose	Cutting speed (m/min)	Feed (mm/rev)	Depth of cut (mm)	DRY	WET
JP2	Heat Resistant Alloy	Turning	Finishing	180-**510**	0.1-0.25	0.25-1.0		●

Disk (Inco718 Finishing)

	Competitor's Coated Carbide	JP2
Shape	CNGG120408	CNGA120408
Cutting speed (m/min)	21	240
Feed (mm/rev)	0.08	←
Depth of cut (mm)	0.25	←
	WET	←
Tool life	1pc	←

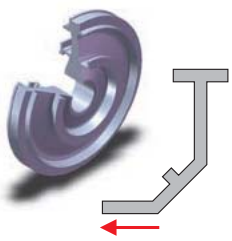


NTK : JP2 — 525 cc/min

Competitor's Coated Carbide — 45 cc/min

Disc (Inco718 Semi-finishing / Finishing)

	Competitor's Coated Carbide	JP2
Shape	CNGP120408	CNGA120408
Cutting speed (m/min)	45	180
Feed (mm/rev)	0.09	←
Depth of cut (mm)	0.375+0.125	←
	WET	←
Tool life	1pc	4pcs



NTK : JP2 — 4 pcs with 4 times higher productivity

Competitor's Coated Carbide — 1 pc

Solutions for the Aerospace Industry

JX1 BIDEMICS

NEW

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Features

- Significantly extended tool life compared to whisker ceramics
- Double cutting speed potential compared to whisker ceramics
- Superior surface finish compared to whisker ceramics
- Applicable to powder-metallurgical heat resistant alloys

	JX1	WA1
Notching	◎	
Flank Wear	◎	◎
Toughness	○	
Heat Shock		

Recommended Work Materials

- Inco 718
- 718 Plus
- MAR-M247
- Rene

Recommended Applications

- Semi-Finish
- Profiling

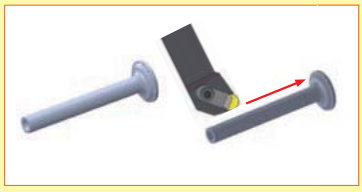
Profiling of Inco 718

Competitor's Whisker Ceramic

Tool Life : 3min

JX1

Tool Life : 10min



Turbine Shaft

RNGN120700, 240m/min, 0.20mm/rev, 2.0mmDOC, WET, Inco 718 (pre-machined)

SX5 SiAlON Ceramic

Features

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

Recommended Work Materials

- Waspaloy
- 718Plus
- Udimet 720
- Rene 41

Recommended Applications

- Rough Turning with scale and interruptions

SX9 SiAlON Ceramic

WATCH ON YouTube

Features

- Tougher when compared to whisker ceramics
- Extreme toughness makes higher feed and heavier DOC machining possible
- Best grade for machining Inco 718 with scale

Recommended Work Materials

- Inco 718
- Inco 706
- Inco 713

Recommended Applications

- Rough turning with scale
- Milling

WA1 Whisker-Reinforced Ceramic

SX7	SX9	SX5
◎	◎	○
○		
	◎	○
◎	◎	

Features

- Versatile grade for machining of high temperature alloys
- Better flank wear resistance compared to SiAlON ceramics
- Better notching resistance compared to competitor's whisker ceramics

Recommended Work Materials

- Inco 718
- Inco 625

Recommended Applications

- Semi-Finish
- Profiling
- Grooving

Profiling of Inco 718

Competitor's Whisker Ceramic

WA1

Turbine Case

Tool Life : 5.0min
RPGX120700, 240m/min, 0.15mm/rev, 1.0mmDOC, WET
Inco 718 (pre-machined)

SX7 SiAlON Ceramic

WATCH ON YouTube

Features

- Can run at same cutting condition vs whisker ceramics
- Better notching resistance compared to whisker ceramics
- No need to program ramping when compared to whisker ceramics
- Better flank wear resistance compared to competitor's SiAlON ceramics
- Best grade for pre-machined Waspaloy
- Best grade for high-speed milling

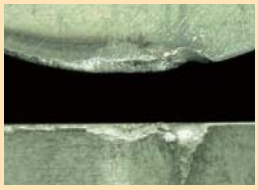
Recommended Work Materials

- Inco 718
- Inco 625
- Waspaloy
- Udimet 720

Recommended Applications

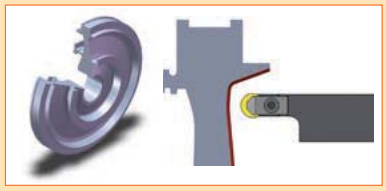
- Semi-Finish
- Profiling
- Milling
- Grooving

Profiling of Inco 718



Competitor's Whisker Ceramic

SX7



Turbine Disk

Tool Life : 4.5min
RCGX120700, 240m/min, 0.15mm/rev, 1.0mmDOC, WET
Inco 718 (pre-machined)

Applications

Application	Grade	Work material	Cutting speed	Feed	Depth of cut	Coolant
			180 240 300 360 420 480	0.10 0.20 0.30 0.40 0.50	0.5 1.0 1.5 2.0 2.5	
Rough with Scale 	SX5	Waspalloy	195 (180-240) m/min	0.30 (0.20-0.35) mm/rev	2.0 (1.0-5.0) mm	WET
	SX9	Inco718	195 (180-240) m/min	0.30 (0.20-0.35) mm/rev	2.0 (1.0-5.0) mm	
	SX7	Overall	240 (180-270) m/min	0.20 (0.10-0.23) mm/rev	2.0 (1.0-5.0) mm	
Rough no Scale 	JX1	Overall	210-390 (180-480) m/min	0.20 (0.13-0.28) mm/rev	1.8 (1.0-2.5) mm	WET
	SX7	Waspalloy	210 (180-270) m/min	0.23 (0.15-0.30) mm/rev	2.0 (1.0-2.5) mm	
	WA1	Inco718	240 (180-300) m/min	0.20 (0.13-0.25) mm/rev	1.8 (1.0-2.5) mm	
Profiling & Semi-Finish 	JX1	Overall	210-450 (180-480) m/min	0.20 (0.10-0.25) mm/rev	1.5 (1.0-2.0) mm	WET
	SX7	Waspalloy	240 (180-270) m/min	0.20 (0.13-0.25) mm/rev	1.5 (1.0-2.0) mm	
	WA1	Inco718	240 (180-330) m/min	0.20 (0.10-0.25) mm/rev	1.5 (1.0-2.0) mm	
Finishing 	JP2	Overall	210-480 (180-510) m/min	0.18 (0.10-0.25) mm/rev	0.75 (0.25-1.0) mm	WET
Grooving 	SX5	Waspalloy	210 (180-240) m/min	0.15 (0.08-0.18) mm/rev	When using SX7 / SX5, increase feed rates 100% vs. Whisker Ceramics	WET
	SX7	Inco718	225 (180-270) m/min	0.11 (0.08-0.15) mm/rev		
	WA1	Overall	240 (180-330) m/min	0.08 (0.05-0.10) mm/rev		

Application	Grade	Work material	Cutting speed	Feed	Depth of cut	Coolant
			450 600 750 900 1050 1200	0.05 0.075 0.10 0.125 0.15	0.5 1.0 1.5 2.0 2.5	
Milling 	SX7	Overall	810 (600-1200) m/min	0.10 (0.08-0.13) mm/rev	1.75 (1.0-2.5) mm	DRY
	SX9	Overall	750 (450-1050) m/min	0.13 (0.10-0.15) mm/rev	2.0 (1.0-2.5) mm	

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