JRF Milling Cutter

For Heat-Resistant Alloys | Ceramics

Member IMC Group
NTK
CUTTING TOOLS

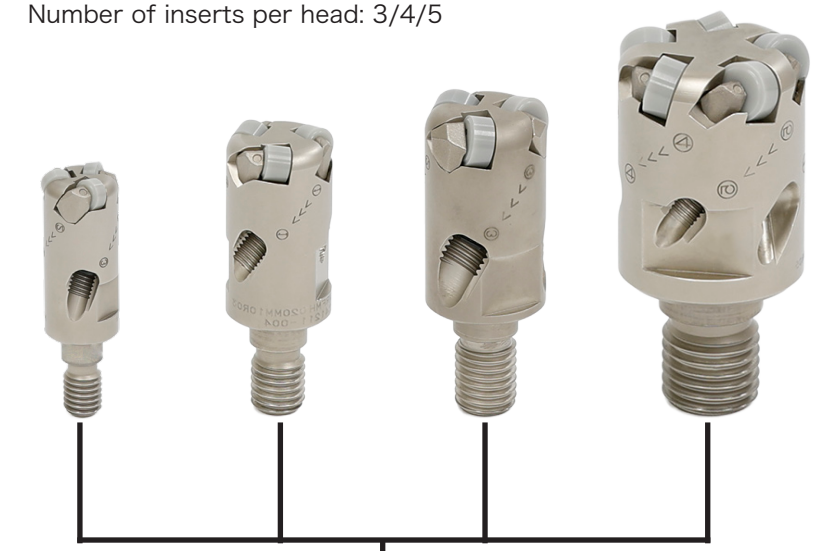
CERtainly | but not only | CERamics

Outstanding solutions for demanding applications

NTK’s JRF Cutter, available in small diameters (ϕ16–32), features a unique negative geometry that not only enables high-efficiency machining but also offers superior cost performance compared to competitors. A new addition to this product line is the modular-type JRF Cutter with an interchangeable head, which has now been released.

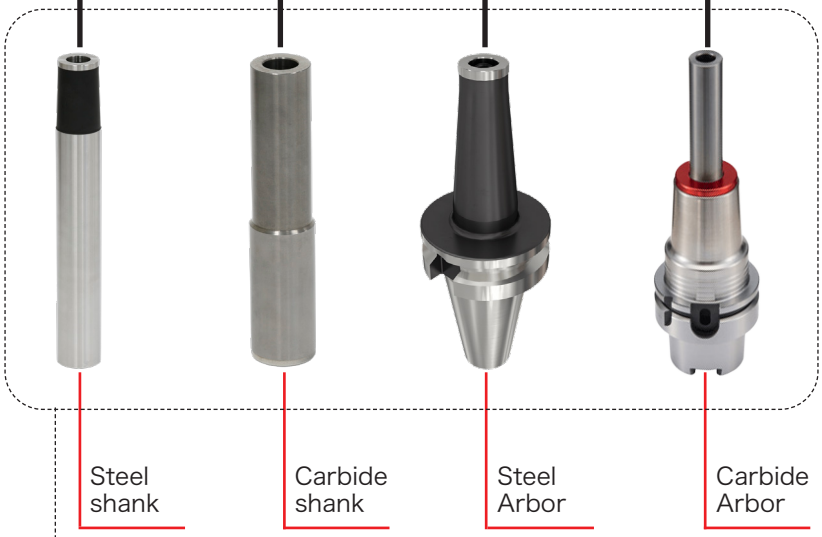
Introducing a New Era of High-Efficiency Machining: The Fusion of NTK's JRF Modular cutter and Tungaloy's TUNG-FLEX arbor and modular shank

Head Diameter: ϕ16/ϕ20/ϕ25/ϕ32
Number of inserts per head: 3/4/5



Features

- Higher number of inserts for even higher efficiency
- Negative inserts with higher cutting edge strength for more stable machining
- Economical negative insert that can be used on both sides



Features

Various types of modular heads can be combined with different shanks and holders for multiple application needs.

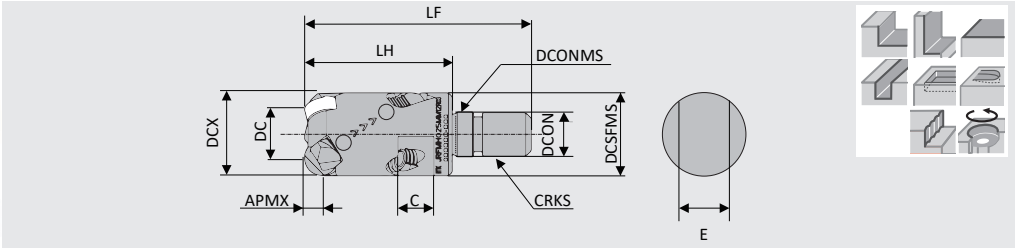
- Steel / Carbide shank series
- Arbors – BT, HSK type

TUNGFLEX
TUNGALOY

JRF Modular type

TUNGFLEX shank x Modular type JRF cutter, with RNGF negative insert

GAMP = -10° ~ -15°, GAMF = -20° ~ -28°



(mm)

Designation	APMX	DC	DCX	CICT	DCONMS	DCSFMS	LF	LH	C	E	CRKS	WT(kg)	Insert
JRFMH016MM08R03	1	9.65	16	3	8.5 (h7)	15	53	35	8	13	M8	0.04	RNGF0603..
JRFMH020MM10R03	1	13.65	20	3	10.5 (h7)	19	54	35	10	16	M10	0.07	RNGF0604..
JRFMH025MM12R03	1	15.475	25	3	12.5 (h7)	23	63	41	12	19	M12	0.11	RNGF0904..
JRFMH025MM12R04	1	18.65	25	4	12.5 (h7)	23	63	41	12	19	M12	0.13	RNGF0604..
JRFMH032MM16R03	1	19.3	32	3	17 (h7)	30	63	40.5	12	24	M16	0.2	RNGF1204..
JRFMH032MM16R04	1	22.475	32	4	17 (h7)	30	63	40.5	12	24	M16	0.19	RNGF0904..
JRFMH032MM16R05	1	22.475	32	5	17 (h7)	30	63	40.5	12	24	M16	0.21	RNGF0904..

SPARE PARTS

Designation	Cap screw	Wedge screw	Wrench	Wrench (sold separately)
JRFMH016MM08R03	HCS3P050	HWS3P050	LW-2.5	(DL-025-08-JRF)
JRFMH020MM10R03	HCS3P050	HWS3P050	LW-2.5	(DL-025-08-JRF)
JRFMH025MM12R03	HCS5P080	HWS5P080	LW-4.0	(DL-040-20-JRF)
JRFMH025MM12R04	HCS3P050	HWS3P050	LW-2.5	(DL-025-20-JRF)
JRFMH032MM16R03	HCS5P080	HWS5P080	LW-4.0	(DL-040-20-JRF)
JRFMH032MM16R04	HCS5P080	HWS5P080	LW-4.0	(DL-040-20-JRF)
JRFMH032MM16R05	HCS3P050	HWS3P050	LW-2.5	(DL-025-20-JRF)

Recommended Clamping Torque: CRKS / M8 = 23 N·m, M10 = 46 N·m, M12 = 80 N·m, M16 = 90 N·m

INSERT

RNGF-HNF

P	Steel		
M	Stainless		
K	Cast iron		
N	Non-ferrous		
S	Superalloy	★	☆
H	Hard materials		

★ : First choice
☆ : Second choice

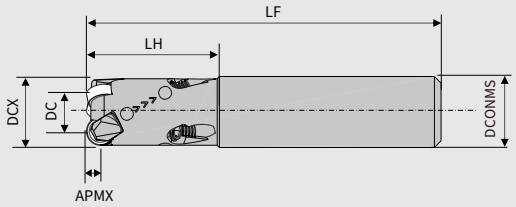
Designation	SiAlON SX3	SiAlON SX9	IC	S
RNGF060300E-HNF	●	●	6.35	3.18
RNGF060400E-HNF	●	●	6.35	4.76
RNGF090400E-HNF	●	●	9.525	4.76
RNGF120400E-HNF	●	●	12.7	4.76

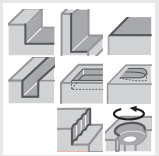
●: Line up

JRF Shank type – Metric size

For HRSA material with RNGF negative insert

GAMP = -10° ~ -15°, GAMF = -20° ~ -28°





Designation	APMX	DC	DCX	CICT	DCONMS	LF	LH	WT(kg)	Insert
JRFMH016E160R03	1	9.65	16	3	16	80	30	0.11	RNGF0603..
JRFMH020E200R03	1	13.65	20	3	20	100	40	0.22	RNGF0604..
JRFMH025E250R03	1	15.475	25	3	25	100	40	0.33	RNGF0904..
JRFMH025E250R04	1	18.65	25	4	25	100	40	0.34	RNGF0604..
JRFMH032E320R03	1	19.3	32	3	32	120	50	0.67	RNGF1204..
JRFMH032E320R04	1	22.475	32	4	32	120	50	0.67	RNGF0904..
JRFMH032E320R05	1	22.475	32	5	32	120	50	0.68	RNGF0904..

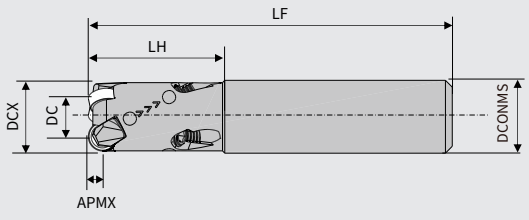
SPARE PARTS

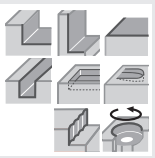
Designation	Cap screw	Wedge screw	Wrench	Wrench (sold separately)
JRFMH016E160R03	HCS3P050	HWS3P050	LW-2.5S	(DL-025-08-JRF)
JRFMH020E200R03	HCS3P050	HWS3P050	LW-2.5S	(DL-025-08-JRF)
JRFMH025E250R03	HCS5P080	HWS5P080	LW-4.0	(DL-040-20-JRF)
JRFMH025E250R04	HCS3P050	HWS3P050	LW-2.5	(DL-025-20-JRF)
JRFMH032E320R03	HCS5P080	HWS5P080	LW-4.0	(DL-040-20-JRF)
JRFMH032E320R04	HCS5P080	HWS5P080	LW-4.0	(DL-040-20-JRF)
JRFMH032E320R05	HCS3P050	HWS3P050	LW-2.5	(DL-025-20-JRF)

JRF Shank type – Inch size

For HRSA material with RNGF negative insert

GAMP = -10° ~ -15°, GAMF = -20° ~ -28°





Designation	APMX	DC	DCX	CICT	DCONMS	LF	LH	WT(lbs)	Insert
JRFIH0625E0625R03	0.039	0.375	0.625	3	0.625	3.16	1.191	0.243	RNGF22..
JRFIH075E075R03	0.039	0.5	0.75	3	0.75	4	1.638	0.485	RNGF23..
JRFIH100E100R03	0.039	0.625	1	3	1	4	1.638	0.728	RNGF33..
JRFIH100E100R04	0.039	0.75	1	4	1	4	1.638	0.750	RNGF23..
JRFIH125E125R03	0.039	0.75	1.25	3	1.25	4.725	1.969	1.477	RNGF43..
JRFIH125E125R04	0.039	0.875	1.25	4	1.25	4.725	1.969	1.477	RNGF33..
JRFIH125E125R05	0.039	0.875	1.25	5	1.25	4.725	1.969	1.499	RNGF33..

SPARE PARTS

Designation	Cap screw	Wedge screw	Wrench	Wrench (sold separately)
JRFIH0625E0625R03	HCS3P050	HWS3P050	LW-2.5S	(DL-025-08-JRF)
JRFIH075E075R03	HCS3P050	HWS3P050	LW-2.5S	(DL-025-08-JRF)
JRFIH100E100R03	HCS5P080	HWS5P080	LW-4.0	(DL-040-20-JRF)
JRFIH100E100R04	HCS3P050	HWS3P050	LW-2.5	(DL-025-20-JRF)
JRFIH125E125R03	HCS5P080	HWS5P080	LW-4.0	(DL-040-20-JRF)
JRFIH125E125R04	HCS5P080	HWS5P080	LW-4.0	(DL-040-20-JRF)
JRFIH125E125R05	HCS3P050	HWS3P050	LW-2.5	(DL-025-20-JRF)

INSERT
RNGF-HNF

P	Steel		
M	Stainless		
K	Cast iron		
N	Non-ferrous		
S	Superalloy	★	☆
H	Hard materials		

★ : First choice
☆ : Second choice

Designation		SiAlON		IC		S	
Metric	Inch	SX3	SX9	Metric	Inch	Metric	Inch
RNGF 060300 E -HNF	RNGF 220 E02 -HNF	●	●	6.35	1/4	3.18	1/8
RNGF 060400 E -HNF	RNGF 230 E02 -HNF	●	●	6.35	1/4	4.76	3/16
RNGF 090400 E -HNF	RNGF 330 E02 -HNF	●	●	9.525	3/8	4.76	3/16
RNGF 120400 E -HNF	RNGF 430 E02 -HNF	●	●	12.7	1/2	4.76	3/16

●: Line up

TUNGFLEX
TUNGALOY

Line up introduction

Steel shank

Steel shank series

Modular – ER collet
Modular – TungFit
Modular – Straight shank

Carbide shank

Carbide shank series

- Increased cutting parameters can be applied to carbide modular shank over steel modular shank
- Enhanced chatter control for long tool overhang
- Coolant-through design suited for ramping for cavity and pockets

Steel Arbor

Carbide Arbor

Arbor type series

Modular – BT taper
Modular – HSK

- Cutter heads can be directly connected to holders, increasing rigidity
- Reduces tool changing time
- DIN 69871 or CAT tapers are available

BT type

HSK type

Recommended Machining Parameters

Grade	Workpiece Material	Machining process	Cutting conditions			DRY	WET
			Cutting Speed (m/min) ※ (sfm)	Feed (mm/rev) (ipt)	D.O.C. (mm) (inch)		
SX3 SX9	HRSA	Milling	400 - **700** – 1000 (1300 - **2300** – 3280)	0.08 - **0.10** - 0.12 (.0032 - **.0039** - .0047)	- **1.0** (- **0.394**)	●	×

※Value calculated with the outermost diameter of the cutter

Exceeding the recommended cutting conditions may damage the insert. Please machine within the recommended cutting conditions

Insert grade characteristics

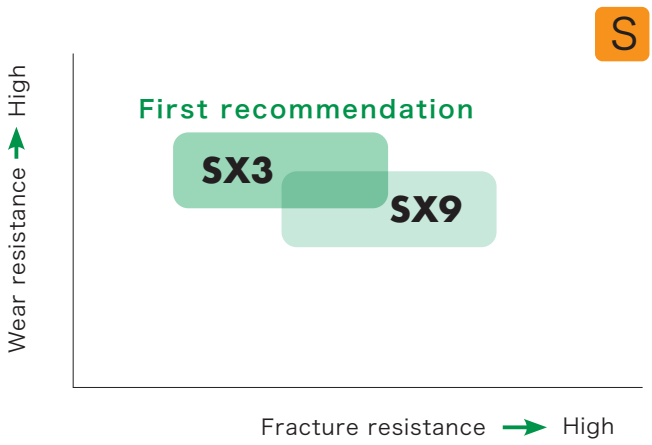
S

SX3

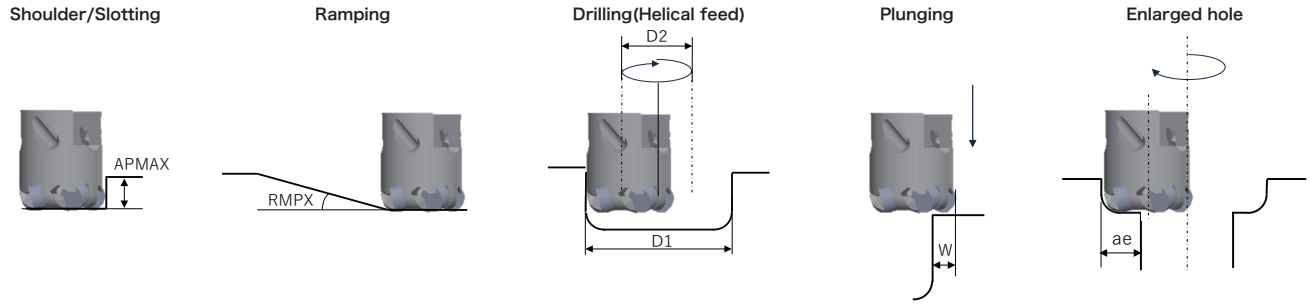
The First Recommended Grade for Machining Heat-Resistant Alloys with Ceramics: Balancing Wear Resistance and Fracture Resistance.

SX9

Grade with emphasis on fracture resistance



Processing form



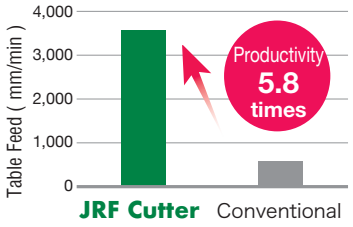
Machinable range (mm)

Modular type	Shank	ϕDc	Max. Depth of cut APMAX	Max. ramping angle RMPX(°)	Min. machinable hole dia. ϕD1	Max. machinable hole dia. ϕD1	Min. machinable hole dia. ϕD2	Max. machinable hole dia. ϕD2	Max. Cutting width in plunging W	Max. cutting width in enlarged hole ae	MAX RPM (min⁻¹)
JRFMH016MM08R03	JRFMH016E160R03	16	1.0	1.0	25.7	30.0	9.7	14.0	3.1	12.9	20.000
JRFMH020MM10R03	JRFMH020E200R03	20	1.0	0.9	33.7	38.0	13.7	18.0	3.2	16.8	17.500
JRFMH025MM12R03	JRFMH025E250R03	25	1.0	1.0	40.7	48.0	15.7	23.0	4.7	20.3	15,000
JRFMH025MM12R04	JRFMH025E250R04	25	1.0	0.5	43.8	48.0	18.8	23.0	3.1	21.9	15,000
JRFMH032MM16R03	JRFMH032E320R03	32	1.0	0.9	51.6	62.0	19.6	30.0	6.2	25.8	12,500
JRFMH032MM16R04	JRFMH032E320R04	32	1.0	0.9	54.5	62.0	22.5	30.0	4.7	27.3	12,500
JRFMH032MM16R05	JRFMH032E320R05	32	1.0	1.1	54.4	62.0	22.4	30.0	4.8	27.2	12,500

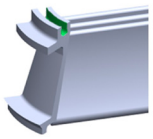
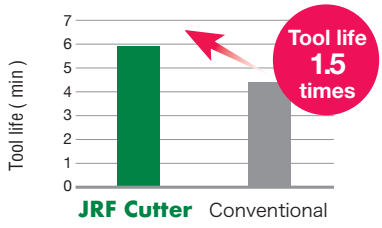
Machinable range (in)

Shank type	ϕDc	Max. Depth of cut APMAX	Max. ramping angle RMPX(°)	Min. machinable hole dia. ϕD1	Max. machinable hole dia. ϕD1	Min. machinable hole dia. ϕD2	Max. machinable hole dia. ϕD2	Max. Cutting width in plunging W	Max. cutting width in enlarged hole ae	MAX RPM (min⁻¹)
JRFIH0625E0625R03	0.625	0.039	1.0	1.003	1.171	0.378	0.546	0.124	0.501	20.000
JRFIH075E075R03	0.75	0.039	0.9	1.252	1.421	0.502	0.671	0.124	0.626	17.500
JRFIH100E100R03	1.00	0.039	1.0	1.633	1.921	0.633	0.921	0.184	0.816	15,000
JRFIH100E100R04	1.00	0.039	0.5	1.758	1.921	0.758	0.921	0.121	0.879	15,000
JRFIH125E125R03	1.25	0.039	1.1	2.012	2.421	0.762	1.171	0.244	1.006	12,500
JRFIH125E125R04	1.25	0.039	1.0	2.127	2.421	0.877	1.171	0.186	1.064	12,500
JRFIH125E125R05	1.25	0.039	1.2	2.121	2.421	0.871	1.171	0.189	1.061	12,500

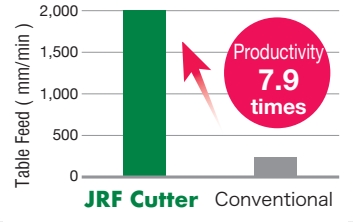
Machining Examples

	NTK	Conventional
Component	Combustion case	
Toolholder	JRFIH0625E0625R03	Solid Endmill
Grade	SX3	Coated Carbide
Workpiece	Waspaloy	
Workpiece: S HRSA		
Cutting conditions: Cutting speed (m/min)	600	120
Cutting conditions: Feed per tooth (mm/t)	0.1	0.03
Cutting conditions: Table feed (mm/min)	3,609	610
Cutting conditions: a_p (mm)	1	6.35
Cutting conditions: a_e (mm)	5.1	1.6
Cutting conditions: Coolant	DRY	WET
Results		

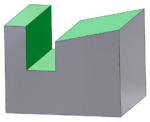
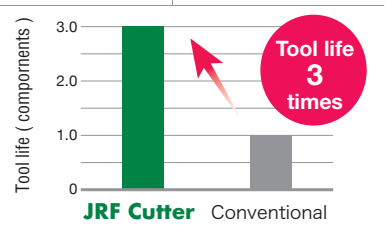
By using JRF, cutting edge chipping was improved, and productivity increased by 5.8 times.

	NTK	Conventional
Component	Gas Turbine Component	
Toolholder	JRFMH032E320R05	ϕ32
Grade	SX3	Ceramic
Workpiece	Inconel 718	
Workpiece: S HRSA		
Cutting conditions: Cutting speed (m/min)	1200	1000
Cutting conditions: Feed per tooth (mm/t)	0.1	0.15
Cutting conditions: Table feed (mm/min)	5,968	4,476
Cutting conditions: a_p (mm)	0.8	0.8
Cutting conditions: a_e (mm)	5	5
Cutting conditions: Coolant	DRY	DRY
Results		

Leading to a 1.5times increase in tool life and a 1.3 times boost in productivity compared to competitors, resulting in improved overall efficiency.

	NTK	Conventional
Component	Fan Blade	
Toolholder	JRFMH020E200R03	Solid Endmill
Grade	SX3	Coated Carbide
Workpiece	Inconel 718	
Workpiece: S HRSA		
Cutting conditions: Cutting speed (m/min)	600	20
Cutting conditions: Feed per tooth (mm/t)	0.07	0.4
Cutting conditions: Table feed (mm/min)	2,005	255
Cutting conditions: a_p (mm)	0.5	0.6
Cutting conditions: Coolant	DRY	WET
Results		

Cutting speed increased by about 30 times and table feed by 7.9 times compared to conventional tools. This resulted in a significant boost in productivity and machining efficiency.

	NTK	Conventional
Component	Aerospace Component	
Toolholder	JRFIH075E075R03	Solid Endmill
Grade	SX9	Coated Carbide
Workpiece	Stellite 6B	
Workpiece: S HRSA		
Cutting conditions: Cutting speed (m/min)	627	61
Cutting conditions: Feed per tooth (mm/t)	0.08	0.025
Cutting conditions: Table feed (mm/min)	2,514	191
Cutting conditions: a_p (mm)	0.5	1
Cutting conditions: a_e (mm)	9.525	0.38
Cutting conditions: Coolant	DRY	WET
Results		

SX9 is toughest ceramic grade. Excellent thermal shock and fracture resistance. As a result, SX9 achieved 3 times toollife and 13 times productivity.

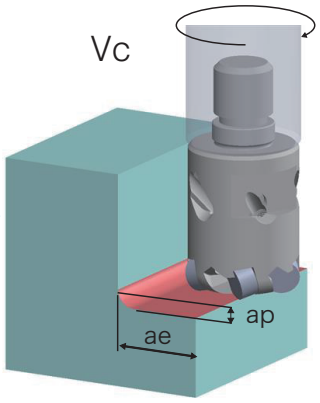
Trouble shooting ~ How to eliminate chattering

Please try in the order from ① to ⑤.

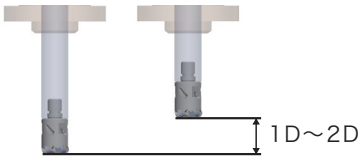
①Speed Vc：20～30% UP

②Depth of cut ap：20～50% DOWN

③ae：20～50% DOWN

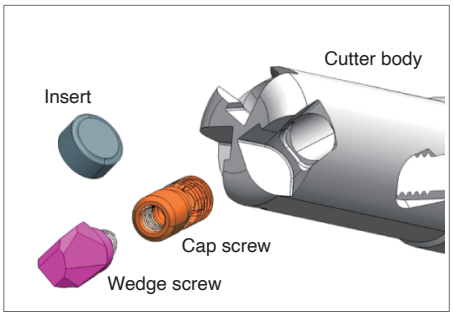


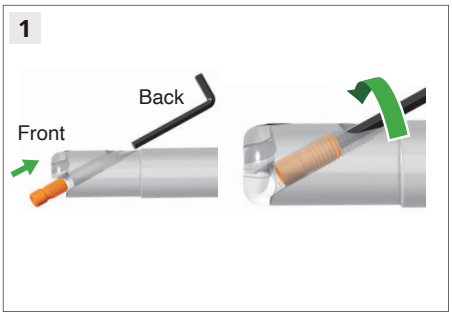
④Overhang amount：1D～2D DOWN



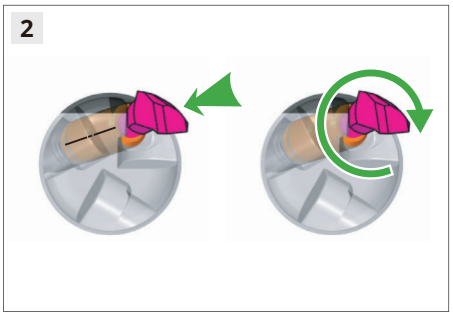
⑤Modular shank changed to carbide shank

JRF cutter parts installation manual

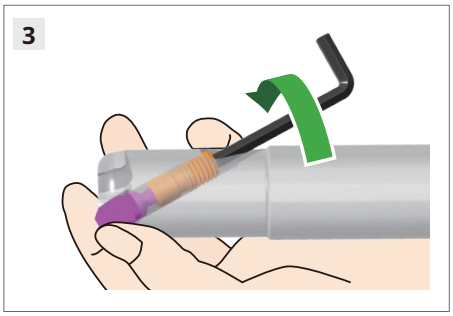




Insert the cap screw from the front, insert a hex wrench from the back side, and rotate it 360 degrees (1 turn).

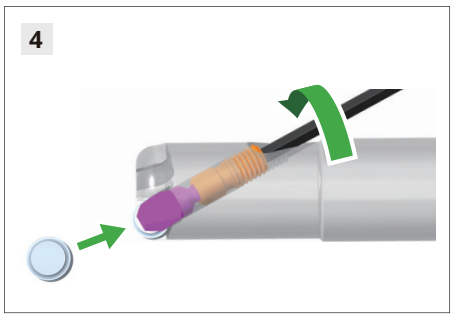


Insert the wedge screw into the cap screw and rotate it 360 degrees (1 turn) by hand.



Hold the wedge screw and tighten the cap screw with the hex wrench until it stops, then loosen it 360 degrees (1 turn) *.

*Loosen 360° for insert space



First, insert the insert.
Then, insert the torque wrench from the back side and tighten to the specified torque value.

Video explanation

Shank type Designation	Modular type Designation	Recommended tightening torque※	Cap screw	Wedge screw
JRFMH016E160R03	JRFMH016MM08R03	2N·m	HCS3P050	HWS3P050
JRFIH0625E0625R03				
JRFMH020E200R03	JRFMH020MM10R03			
JRFIH075E075R03				
JRFMH025E250R04	JRFMH025MM12R04			
JRFIH100E100R04				
JRFMH032E320R05	JRFMH032MM16R05			
JRFIH125E125R05				
JRFMH025E250R03	JRFMH025MM12R03	4N·m	HCS5P080	HWS5P080
JRFIH100E100R03				
JRFMH032E320R03	JRFMH032MM16R03			
JRFIH125E125R03				
JRFMH032E320R04	JRFMH032MM16R04			
JRFIH125E125R04				

※If the recommended cutting conditions or tightening torque are exceeded, the insert, cutter body, cap screw, or wedge screw may be damaged. Please ensure machining is performed within the specified recommended range.

Worldwide Network

Tungaloy-NTK America, Inc.
3726 N. Ventura Drive
Arlington Heights
IL 60004, U.S.A.
Phone: +1-888-554-8394
Fax: +1-888-554-8392
www.tungaloy.com/us
https://www.ntkcuttingtools.com/us/

Tungaloy Canada
432 Elgin St. Unit 3, Brantford
Ontario N3S 7P7, Canada
Phone: +1-519-758-5779
Fax: +1-519-758-5791
www.tungaloy.com/ca

Tungaloy-NTK de Mexico S.A.
C/ Los Arellano 113
Parque Industrial Siglo XXI
Aguascalientes, AGS
Mexico 20290
Phone: +52-449-929-5410
Fax: +52-449-929-5411
www.tungaloy.com/mx
https://www.ntkcuttingtools.com/mx/

Tungaloy-NTK do Brasil Ltda.
Avd. Independencia N4158
Residencial Flora
13280-000 Vinhedo
São Paulo, Brazil
Phone: +55-19-38262757
Fax: +55-19-38262757
www.tungaloy.com/br
https://www.ntkcuttingtools.com/br/

Tungaloy Hungary Kft
Erzsébet királyné útja 125
H-1142 Budapest, Hungary
Phone: +36 1 781-6846
Fax: +36 1 781-6866
www.tungaloy.com/hu

Tungaloy Turkey
Serifali Mah.bayraktar
Bulvari Kule Sk. No:26
34775 Umraniye / Istanbul / Turkey
Phone: +90 216 540 04 67
Fax: +90 216 540 04 87
www.tungaloy.com/tr

Tungaloy Benelux b.v.
Tjalk 70
NL-2411 NZ Bodegraven Netherlands
Phone: +31 172 630 420
Fax: +31 172 630 429
www.tungaloy.com/nl

Tungaloy Croatia
Ulica bana Josipa Jelačića 87,
10430 Samobor, Croatia
Phone: +385 1 3326 604
Fax: +385 1 3327 683
www.tungaloy.com/hr

NTK Cutting Tools (Shanghai) Co., Ltd
Room 103, Building C, No. 7666 Zhong-chun Road, Minhang District, Shanghai, 200131, China
Phone: +86-21-64788878
Fax: +86-21-64788879
www.ntkcuttingtools.com/zh-hans/

Tungaloy-NTK Germany GmbH
Katzbergstr. 3a
D-40764 Langenfeld, Germany
Phone: +49-2173-90420-0
Fax: +49-2173-90420-19
www.tungaloy.com/de
https://www.ntkcuttingtools.com/de/

Tungaloy France S.A.S.
Les Fjords
19 avenue de Norvège
91140 Villebon Sur Yvette, France
Phone: +33-1-6486-4300
Fax: +33-1-6907-7817
www.tungaloy.com/fr

Tungaloy Italia S.r.l.
Viale Sarca 336/Edificio 13
20126 Milano, Italy
Phone: +39-02-252012-1
Fax: +39-02-252012-65
www.tungaloy.com/it

Tungaloy Czech s.r.o
Turanka 1583/115g,
627 00 Brno, Czech Republic
Phone: +420-532 123 391
www.tungaloy.com/cz

Tungaloy Ibérica S.L.
C/Miquel Servet, 43B, Nau 7
Pol. Ind. Bufalvent
ES-08243 Manresa (BCN), Spain
Phone: +34 93 113 1360
Fax: +34 93 876 2798
www.tungaloy.com/es

Tungaloy-NTK Cutting Tools (Thailand) Co.,Ltd.
Interlink tower 4th Fl.
1858/5-7 Bangna-Trad Road
km.5 Bangna, Bangna, Bangkok 10260
Thailand
Phone: +66-2-751-5711
Fax: +66-2-751-5715
www.tungaloy.com/th
https://www.ntkcuttingtools.com/th/

Tungaloy Cutting Tools (Taiwan) Co.,Ltd.
9F. No.293, Zhongyang Rd,
Xinzhuang Dist, New Taipei City,
24251 Taiwan
Phone: +886-2-8521-9986
Fax: +886-2-8521-8935
www.tungaloy.com/tw

Tungaloy Singapore (Pte.), Ltd.
62 Ubi Road 1,
#08-09 Oxley BizHub 2
Singapore 408734
Phone: +65-6391-1833
Fax: +65-6299-4557
www.tungaloy.com/sg

Tungaloy-NTK Vietnam LLC
3rd Floor, Licogi 13 Tower,
164 Khuat Duy Tien, Nhan Chinh, Thanh Xuan District,
Hanoi, Vietnam
Phone: +84 24 63282086
www.tungaloy.com/vn

Tungaloy Scandinavia AB
Bultgatan 38, 442 40
Kungälv, Sweden
Phone: +46-462119200
Fax: +46-462119207
www.tungaloy.com/se

Tungaloy Rus, LLC
Andropova avenue, h.18/7,
11 floor, office 3, 115432,
Moscow, Russia
Phone: +7-499-683-01-80
Fax: +7-499-683-01-81
www.tungaloy.com/ru

Tungaloy Polska Sp. z o.o.
Ul. Irysowa 1, 55-040 Bielany
Wrocławskie, Poland
Phone: +48 607 907 237
www.tungaloy.com/pl

Tungaloy-NTK U.K. Ltd
Suite 3, Pioneer House, Mill Street,
Cannock, WS11 0EF, UK
Phone: +44 121 4000 231
Fax: +44 121 270 9694
www.tungaloy.com/uk
https://www.ntkcuttingtools.com/uk/

Tungaloy India Pvt. Ltd.
One International Center,
Unit # 902-A, 9th Floor,
Tower 1, Senapati Bapat Marg,
Elphinstone Road (West),
Mumbai -400013, India
Phone: +91-22-6124-8804
Fax: +91-22-6124-8899
www.tungaloy.com/in

Tungaloy-NTK Korea Ltd
1040 Gachang-ro, Gachang-myeon,
Dalseong-gun, Daegu, 42936, Korea
Phone: +82-53-760-7698
Fax: +82-53-768-9912
www.tungaloy.com/kr

Tungaloy Malaysia Sdn Bhd
50 K-2, Kelana Mall, Jalan
SS6/14, Kelana Jaya, 47301
Petaling Jaya, Selangor Darul Ehsan
Malaysia
Phone: +603-7805-3222
Fax: +603-7804-8563
www.tungaloy.com/my

Tungaloy Australia Pty Ltd
Unit 68 1470 Ferntree Gully Road
Knoxfield 3180 Victoria, Australia
Phone: +61-3-9755-8147
Fax: +61-3-9755-6070
www.tungaloy.com/au

PT. Tungaloy Indonesia
Kompleks Grand Wisata Block AA-10
No.3-5 Cibitung
Bekasi 17510, Indonesia
Phone: +62-21-8261-5808
Fax: +62-21-8261-5809
www.tungaloy.com/id

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