

# 2021-2022

www.nanoloy.co.kr

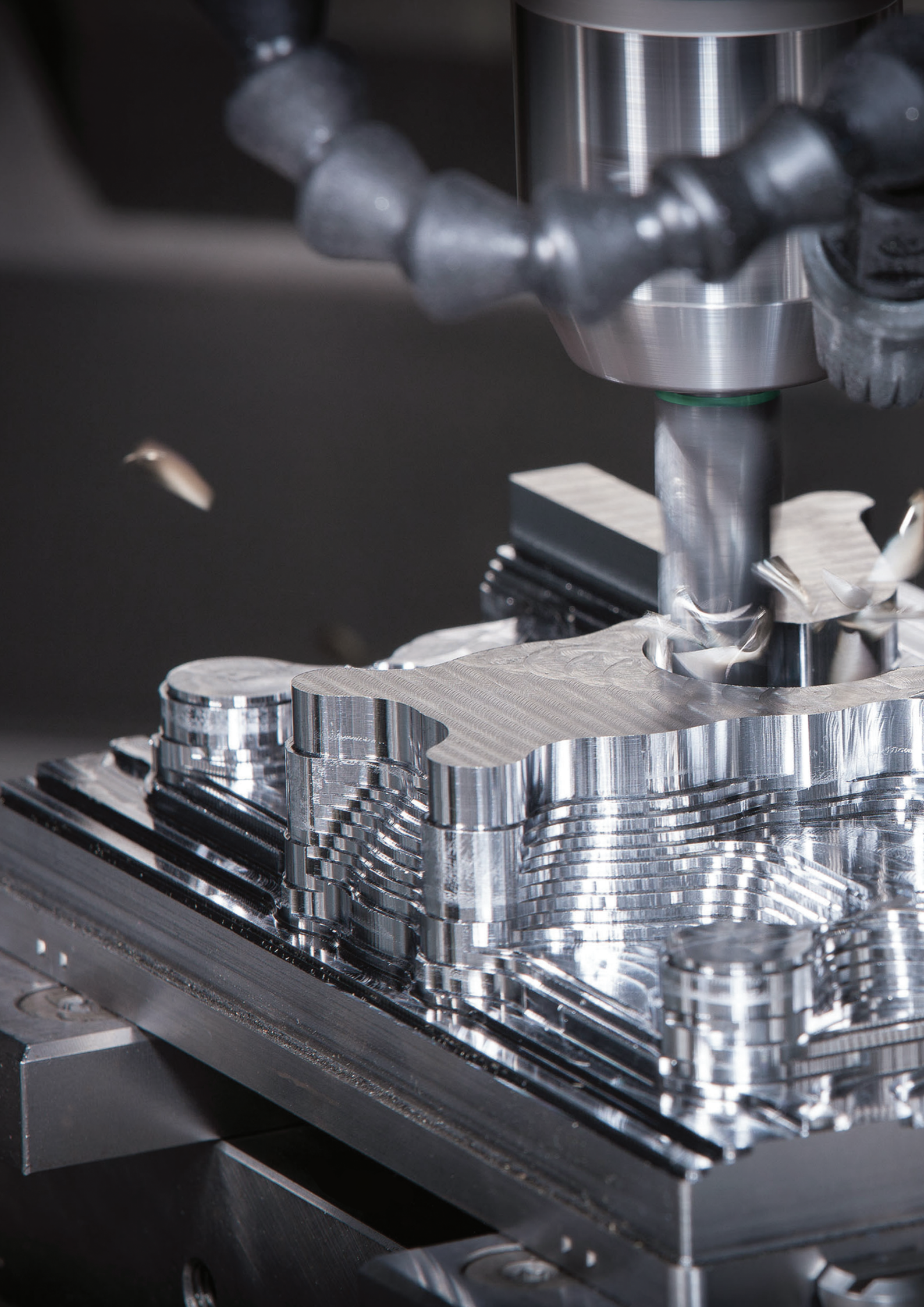


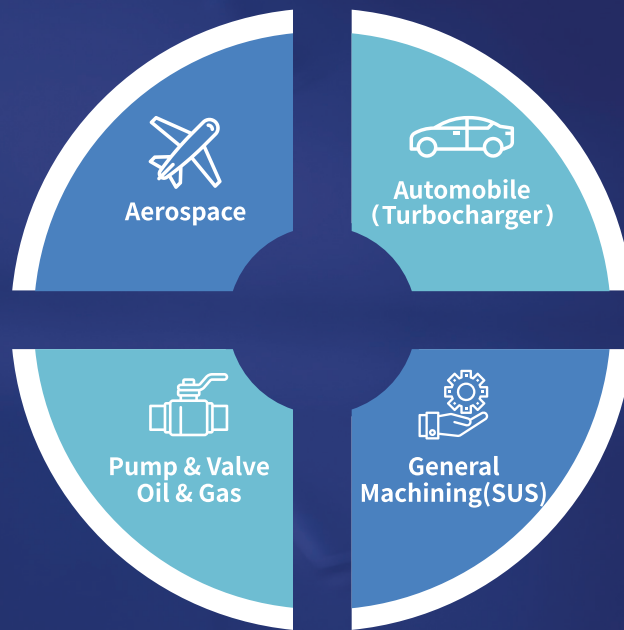
Global leader of tungsten carbide cutting tool for machining difficult-to-cut materials

# NANOLOY CUTTING TOOL

Meet the best NANOTECHNOLOGY

 **NANOLOY**





## The world's first ultrafine 0.2 $\mu$ m powder Difficult-to-cut materials cutting solution

Nanotech Co., Ltd. developed the world's first 0.2 $\mu$ m WC-Co composite powder and manufactures Inserts and End mills by Nano (Ultrafine) powder. Our products (Nanoloy) are specialized in machining difficult-to-cut materials in various industries. We are expanding global network by selling nanoloy cutting tools to all around of world.

N A N O T E C H

# TIME LINE

## 2016~2018

- 2018.02** Selected as a promising small and medium-sized enterprise in Cheongju (Cheongju City).
- 2016.09** Established NT Vina Factory.
- 2016.05** Designated as a global hidden champion (MSIT).
- 2016.05** Selected with material part technology development business - (W, Ti)C powder (MOCIE).

## 2012~2015

- 2015.01** NANOLOY inserts and end mills production. NANOLOY
- 2013.02** Selection of outstanding R&D performance utilization company (KEIT).
- 2012.09** Selected with material part technology development business - Cermet powder (MOCIE).

## 2006~2009

- 2009.08** Selected with material part technology development business - Difficult-to-cut materials (MOTIE).
- 2008.11** 300 Million Dollars of Exports Award - 45th Trade Day (President).
- 2008.01** ISO 9001 : ISO 14001 Certification (System Korea Certification).
- 2007.02** Selected with material part technology development business - Nano materials (MOTIE).
- 2006.05** Cemented carbide (WC-CO) material production.

## 2000~2004

- 2004.07** Selected as an excellent manufacturing technology research center-Nano powder (MOCIE).
- 2003.03** Selected as INNO-BIZ enterprise (MSIT Chungbuk).
- 2001.09** Manufactured Nano composite powder of tungsten carbide and cobalt.
- 2000.09** Selected as a venture enterprise (MSIT).
- 2000.04** Established the annex research institute of NANOTECH CO.,LTD.

## 1999

- 1999.12** The 20 century Korea Top 100 technologies selected (MK).
- 1999.09** Established NANOTECH Co., LTD.

# CONTENTS



06P INTRODUCTION OF NANOLOY TECHNOLOGIES

16P ISO TURNING INSERT

38P GROOVING TOOL

52P SOLID CARBIDE END MILLS

76P INDEXABLE END MILLS

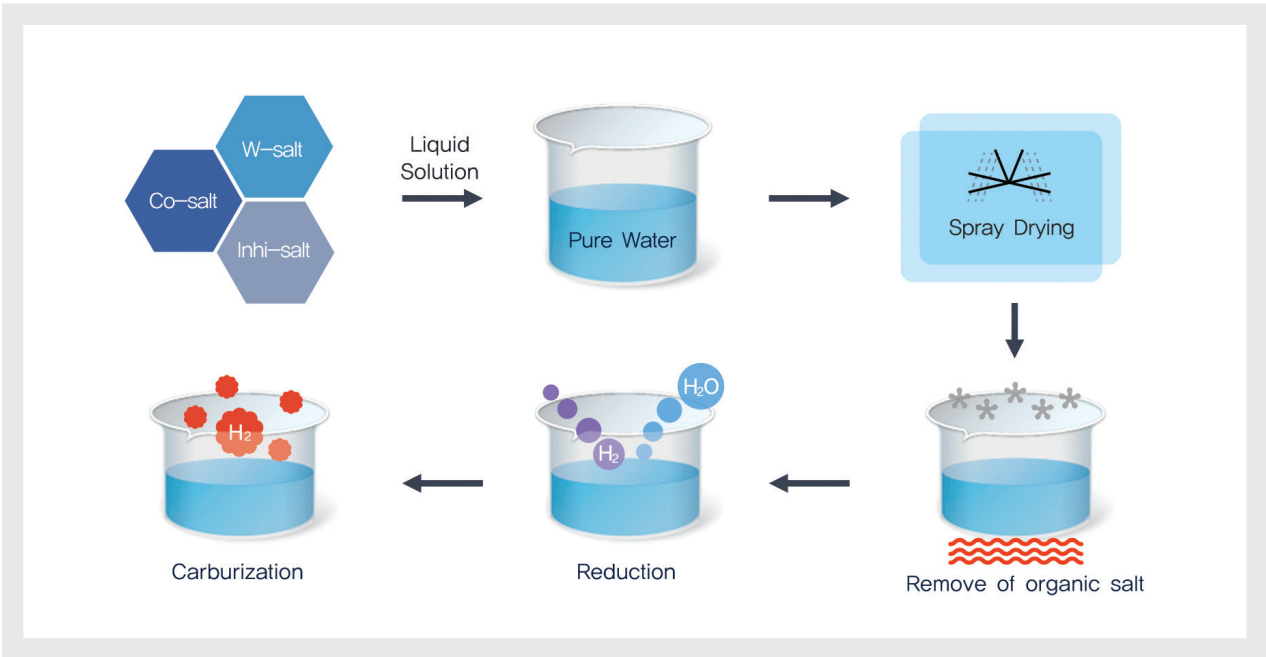
84P RESULTS OF USER TEST IN AEROSPACE INDUSTRY

96P RESULTS OF USER TEST IN AUTOMOBILE INDUSTRY

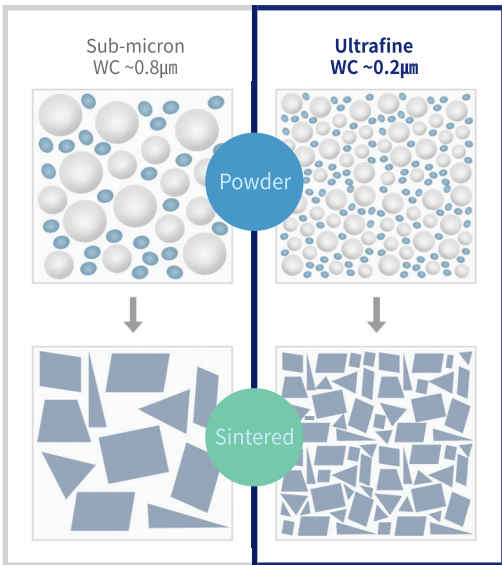
# CORE TECHNOLOGY

- Patent the original technology to manufacture the Nano composite powder.
- Specialized in difficult-to-cut material like aerospace and automobile industries.

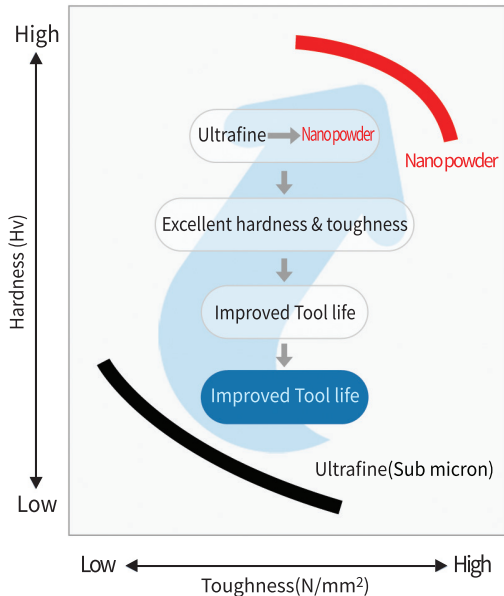
## NANOTECH original technology : Spray Conversion Method



## The strength of NANO(Ultrafine) powder



Manufacture the excellent hardness & wear-resistance materials by Nano (Ultrafine) powder



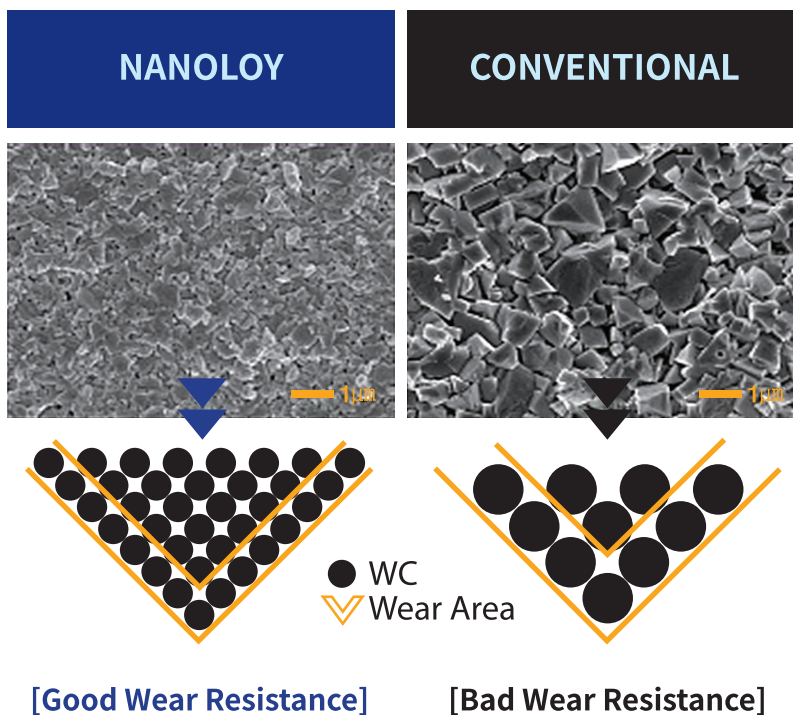
# INTRODUCTION OF NANOLOY TECHNOLOGY

## Specialized in difficult-to-cut materials

- Excellent hardness, toughness, wear resistance by nanoWC size
- Suitable for aerospace and automobile industries

### Features of difficult-to-cut materials machining

- HRSA : Tool temperature increases due to low thermal conductivity ▶ Surface, Internal, Mechanical defects.
- High hardened steel : Characteristic of material with high hardness and toughness
  - ▶ High cutting resistance & high cutting load.



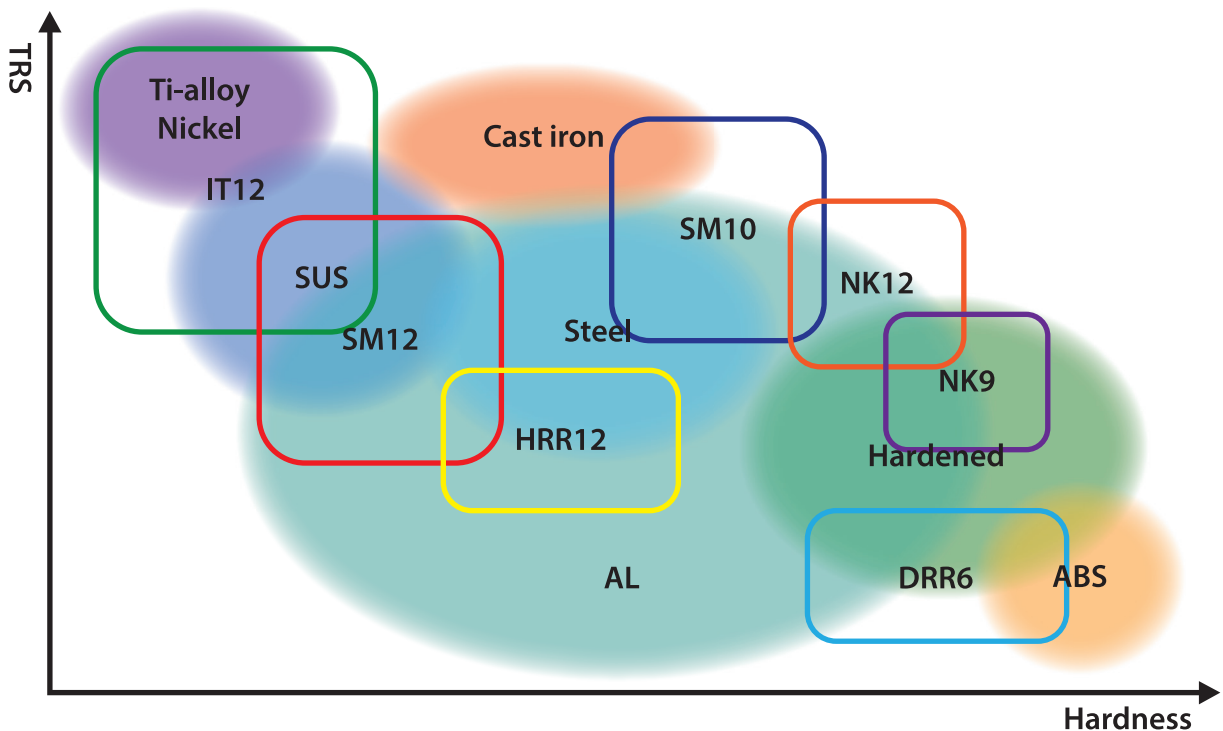
# INTRODUCTION GRADE – TUNGSTEN CARBIDE ROD

Grade	ISO Range	Cobalt	Density	Hv30	HRA	TRS
DRR06	K05~10	6%	14.75	1950	93.8	3850
SM08	K10~20	8%	14.55	1740	92.7	4250
SM10	K20~40	10%	14.30	1580	91.8	
SM12	K30~40	12%	14.20	1520	91.4	4300
NK09	K05~10	9%	14.35	1910	93.6	4000
NK12	K20~40	12%	14.10	1750	92.8	4050
IT12	K30~40	12%	14.10	1550	91.6	4400
HRR12	K05~10	12%	14.10	1530	91.5	4000

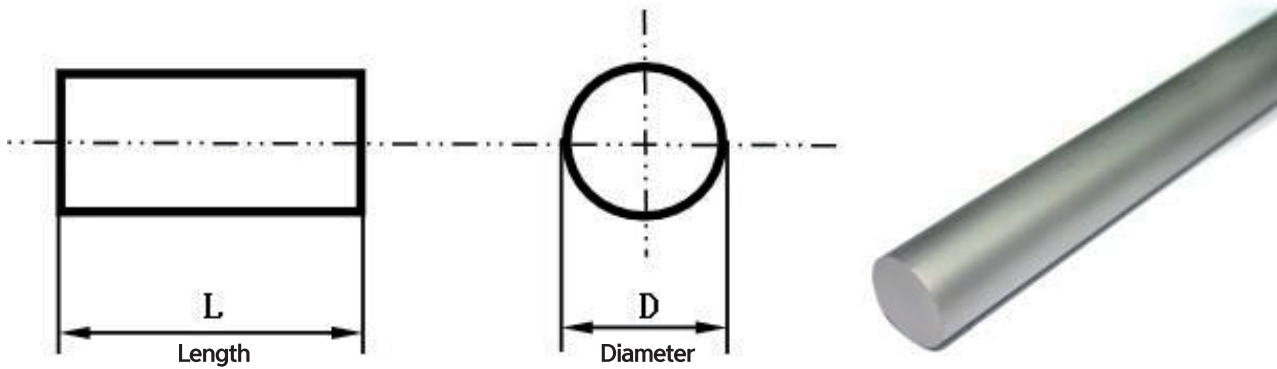
★ Material Application

- DRR/NK Series : High speed/High Hardened Steel(Over HRC52), 7000Series Al (Aerospace), Bronze
- SM Series : Low speed/High Hardened Steel(Over HRC52), Steel(Below HRC45), 6000Series Al, SUS (Small components)
- IT Series : Ti alloy, HRSA, SUS(Large components)
- The material can be recommended according to the diameter and proper working condition

▪ Recommended Grade of Cutting Area







## Unground Rods

Grade	Diameter	Tolerance	Length	Tolerance	Ground Service
DRR6 SM08 SM10 SM12 NK9 NK12 IT12 HRR12	3.2	-0/+0.20	310/330	-0/+6%	Possible
	4.2	-0/+0.30	310/330	-0/+6%	Possible
	6.2	-0/+0.30	310/330	-0/+6%	Possible
	8.3	-0/+0.30	310/330	-0/+6%	Possible
	10.3	-0/+0.30	310/330	-0/+6%	Possible
	12.3	-0/+0.30	310/330	-0/+6%	Possible
	14.3	-0/+0.30	310/330	-0/+6%	Possible
	16.3	-0/+0.30	310/330	-0/+6%	Possible
	18.3	-0/+0.30	310/330	-0/+6%	Possible
	20.3	-0/+0.30	310/330	-0/+6%	Possible
	22.3	-0/+0.30	310/330	-0/+6%	Possible
	24.3	-0/+0.30	310/330	-0/+6%	Possible
	25.3	-0/+0.30	310/330	-0/+6%	Possible
	26.3	-0/+0.30	310/330	-0/+6%	Possible
	28.3	-0/+0.30	310/330	-0/+6%	Possible
30.3	-0/+0.30	310/330	-0/+6%	Possible	

- \* Ground rod will be changed according to the requirement of length and (run-out) tolerance
- \* Ground rod includes chamfering
- \* The Delivery time is 3 ~ 21days



# ISO TURNING INSERT – NV Series

## NV3005 / NV3025 / NV3065

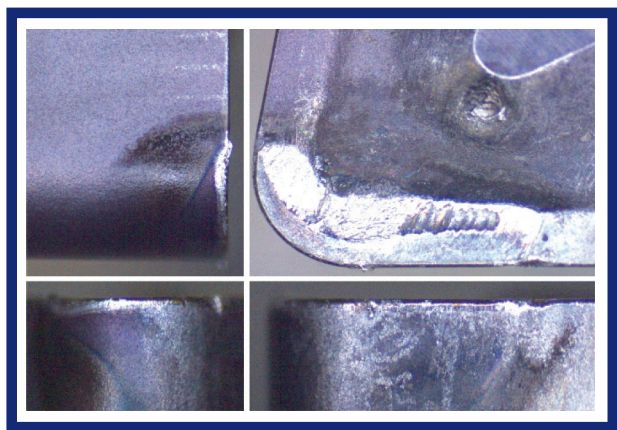
- Applied to difficult to cut materials high speed, continuous machining like HRSA (Ti alloy, Inconel), Stainless steel increase tool life and prevent defects with NANO composite powder.

### Features

- Excellent wear resistance and toughness in high temperature with NANO composite powder
- High speed continuous machining available ▶ Increase productivity



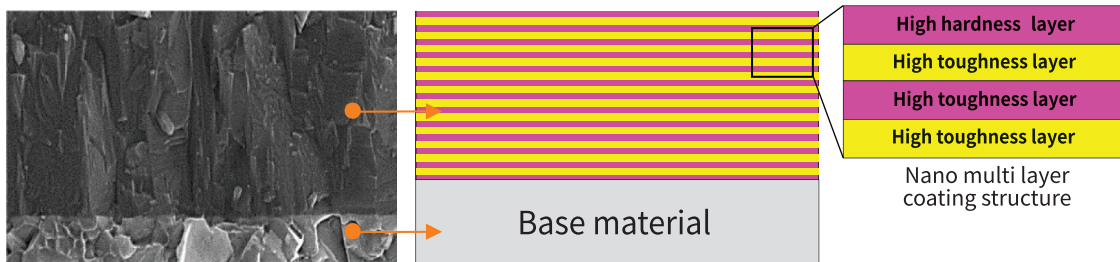
[ Competitor ]



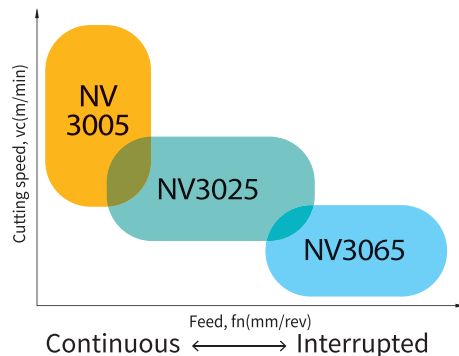
[NV3025]

### NV coating

- Lower coefficient of friction ▶ Better surface roughness and decrease machining stress
- Nano multi coating layer ▶ High hardness and toughness



### Applying area



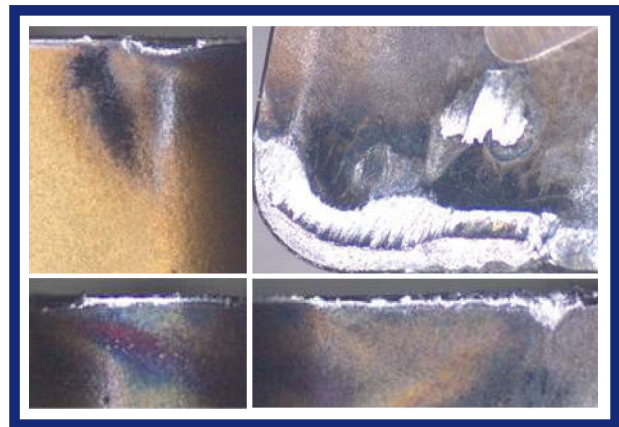
# ISO TURNING INSERT – NS Series

## NS4005 / NS4025 / NS4045

- Suitable for high speed, continuous machining of Stainless steel and Steel (Carbon, Alloy, Mold steel etc.)
- Superior wear resistance with Nano composite powder



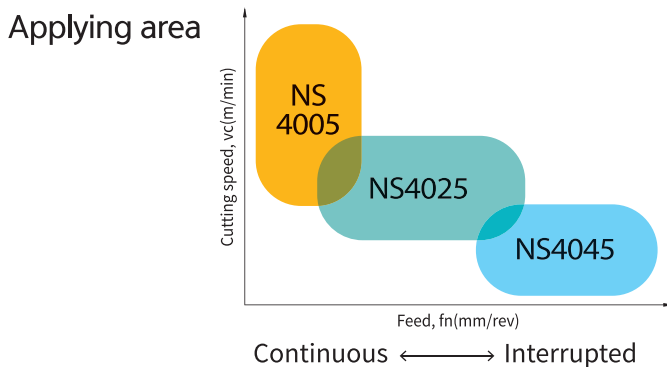
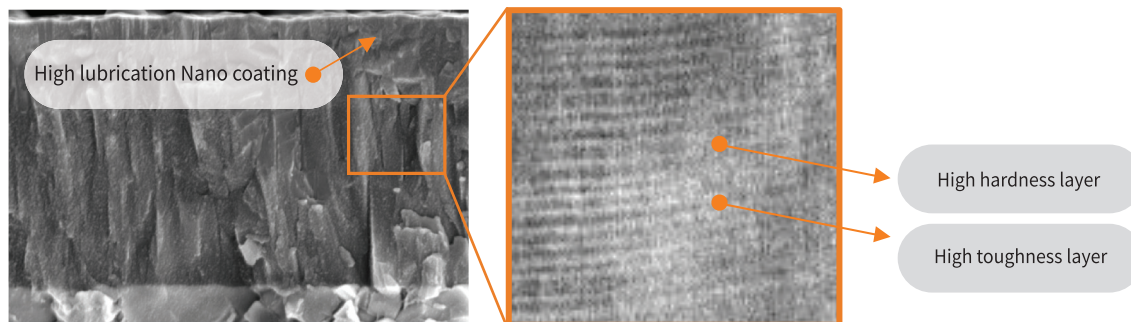
[Competitor]



[NS4025]

### NS Coating

- Applying Nano Multi layer coating ► Heat resistance, wear resistance and high toughness available
- High lubrication coating layer apply to prevent built up edge





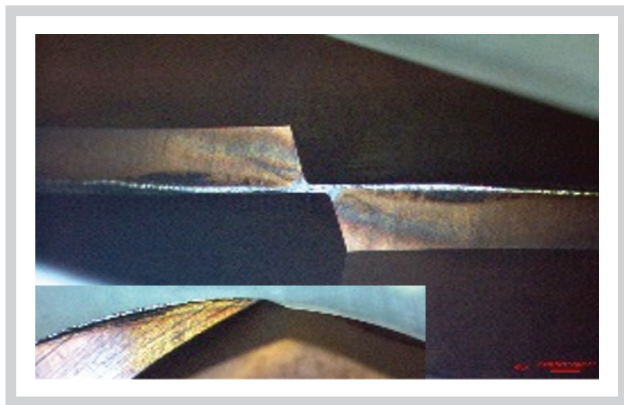
# ISO TURNING INSERT – TS Series

## TS1125 / TS1145

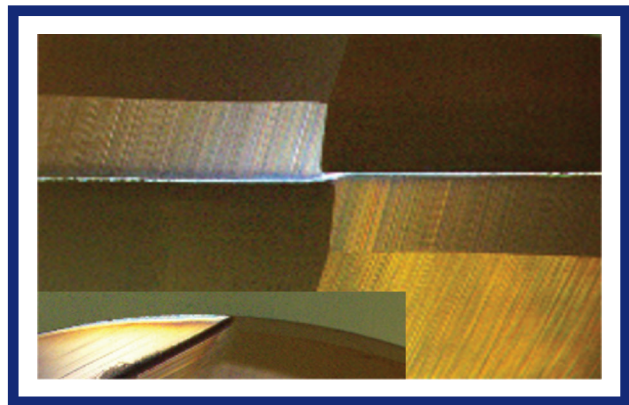
- Applied to over HRC 55 materials (mold, press steel) high speed, continuous machining
- Specially designed coating for prevent defects and increase tool life

### Features

- Excellent wear resistance and prevent chipping with NANO Ultra-fine powder
- Applying specially PVD coating for superior high temperature properties



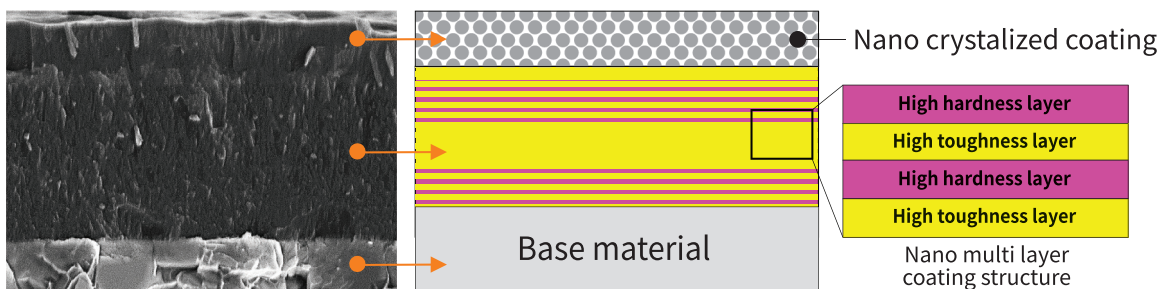
[Competitor]



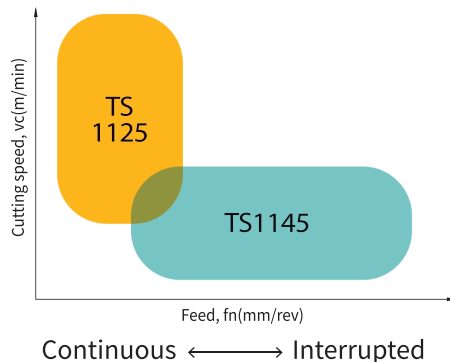
[TS1145]

### TS coating





- Surface : Nano crystallized coating ► Excellent wear resistance and high temperature properties
- Under layer : High hardness bumper layer coating ► Prevent rapid breakage and reduce machining stress



### Applying area



CVD Coated Grades 

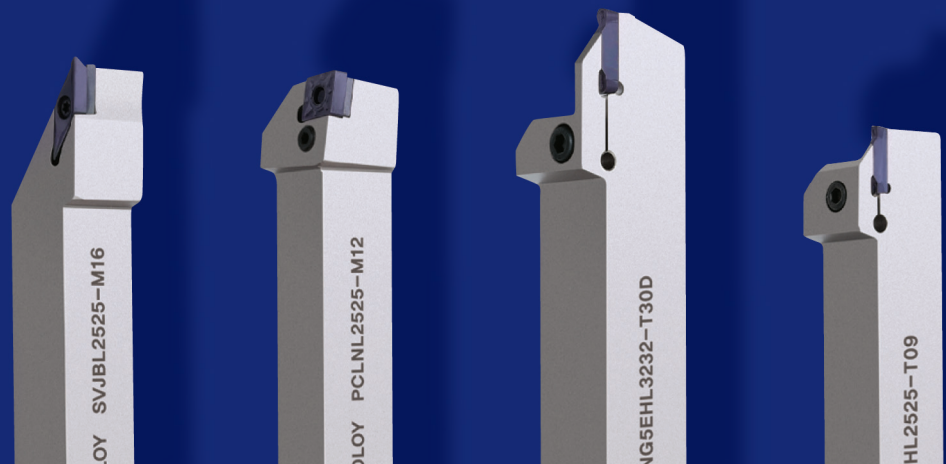
Application	Work Material	Classification Code	NANOLOY	Sumitomo	Mitsubishi	Tungaloy	Kyocera	Sandvik	Kennametal	SECO	WALTER	ISCAR	TaeguTec	
For Turning		P05		AC8015P AC810P	UE6105	T9105 T9215	CA510 CA5505	GC4305 GC4205	KCP05 KCP05B KCPK05	TP0501 TP0500	WPP05S WPP05 WPP01	IC8005 IC8150 IC428	TT8105	
		P10	AO4025	AC8015P AC810P	MC6015 UE6110	T9105 T9115 T9215	CA510 CA515 CA5515	GC4305 GC4315 GC4215	KCP10 KCP10B	TP1501 TP1500	WPP10S WPP10	IC5100 IC8150 IC8250 IC9015	TT8115	
		P20	AO4025	AC8025P AC820P	MC6025 UE6020	T9115 T9125 T9225	CA025P CA525	GC4315 GC4325 GC4225 GC1515	KCP25 KCP25B	TP2501 TP2500	WPP20S WPP20	IC8150 IC8250 IC8350 IC9015	TT5100 TT8125	
		P30	AO4025	AC8035P AC830P AC6030M AC630M	MC6035 UE6035	T9125 T9135 T6130	CA025P CA525 CA530	GC2025 GC4325 GC4335 GC4235	KCP30 KCP30B	TP3500	WPP30S WPP30	IC8350 IC8025	TT7100 TT8135	
		P40		AC8035P AC830P AC6030M AC630M	UH6400	T9135 T6130	CA530 CA5535	GC4335 GC4235 GC30	KCP40 KCP40B	TP3500		IC8350 IC8025	TT7100	
	 	M10 S10	KO4025	AC6020M AC610M	MC7015 US7020 US905	T9115	CA6515	GC2015 GC1515 S05F	KCM15				IC6015 IC8025 IC8150 IC8250 IC5820	TT9215
		M20 S20	KO4025	AC6020M AC6030M AC610M AC630M	MC7025 US7020	T6120 T9125	CA6525	GC2025 GC1515	KCM25	TP2501 TP2500 TM2000			IC6015 IC6025 IC8350	TT5100 TT9225
		M30	KO4025	AC6030M AC630M AC8035P AC830P	MC7025 US735	T6130	CA6535	GC2035 GC235	KCM35 KC9240	TP3500 TM4000			IC6025	TT9235
		M40		AC6030M AC630M	US735			GC235 GC2035		TM4000				TT7800
		K05		AC4010K AC405K	MC5005 UC5105 UC5115	T5105	CA310 CA4505 CA4010	GC3005 GC3205 GC3210	KCK05	TK1001 TK1000	WKK10S WKK10	IC5005	TT7005 TT7505	
		K10	AO4025	AC4010K AC4015K AC405K AC415K	MC5005 MC5015 MC5020 UC5105 UC5115	T515 T5105 T5115 T5125	CA315 CA4505 CA4515 CA4115	GC3005 GC3210 GC4305	KCK15	TK1001 TK1000	WKK10S WKK20S WAK10 WAK20	IC5005 IC5010 IC5100	TT7015	
		K20	AO4025	AC4010K AC415K AC420K AC425K AC8025P	MC5015 UC5115 UE6110	T5125 T9115	CA320 CA4515 CA4120 CA4115	GC3215 GC4325	KCK15 KCK20	TK2001 TK2000	WKK20S WAK20 WAK30	IC5010 IC8150	TT7015	

## PVD Coated Grades

Application	Work Material	Classification Code	NANOLOY	Sumitomo	Mitsubishi	Tungaloy	Kyocera	Sandvik	Kennametal	SECO	WALTER	ISCAR	TaeguTec		
For Turning	<b>P</b> Steel	P05	NS4005	ACZ150		AH710 AH110	PR915 PR1005								
		P10	NS4005 NS4025	AC1030U ACZ150 AC5025S AC520U	VP15TF MS6015	AH120 AH725	PR930 PR1215 PR1225					IC807			
		P20	NS4025	AC1030U AC5025S AC520U AC530U	VP15TF VP20RT	AH120 AH725 AH3135	PR1225 PR1425	GC15 GC1125	KCU25			IC807 IC808 IC810	TT9080		
		P30	NS4025 NS4045	AC1030U AC530U	VP15TF VP20RT	AH120 AH725 SH730	PR1425 PR1525 PR1535	GC1125				IC328 IC330 IC830 IC928	TT8020 TT8080 TT9080		
		P40	NS4045 NS5045	AC1030U			PR660	GC4335 GC4235				IC830	TT8020 TT8080		
	<b>M</b> Stainless Steel	M10 S10		NV3005 NV3025 NS4005 NS4025	AC5015S AC5025S AC510U AC520U ACZ150	MP9005 MP9015 VP15TF VP05RT VP10RT	AH110 AH710 AH725 AH905 AH8005	PR005S PR015S PR915 PR1025 PR1215 PR1225 PR1305 PR1310	GC1105 GC1115	KC5510 KCU10	TS2000	WSM01 WSM10 WSM10S	IC807 IC808 IC907 IC908	TT5080 TT3010	
			M20 S20	NV3025 NS4025	AC5015S AC5025S AC1030U AC520U	MP9015 MP9025 VP15TF VP20RT VP20MF UP20M	AH630 AH120 AH725 AH8015	PR015S PR915 PR930 PR1025 PR1125 PR1215 PR1225 PR1325	GC15 GC1115 GC1125	KC5525 KCU25 KC5025	TS2500	WSM20 WSM20S	IC330 IC806 IC808 IC830 IC908 IC928	TT9080 TT9020 TT3020	
			M30	NS4025 NS4045	AC5025S AC6040M AC1030U AC520U AC530U	MP7035 VP15TF VP20MF	AH630 AH645 AH725	PR1125 PR1525 PR1535	GC1125				WSM30 WSM30S	IC328 IC330 IC830 IC840 IC882	TT8020 TT8080 TT9080
			M40	NV3065 NS4045 NS5045	AC6040M AC1030U AC530U	MP7035 VP15TF MS6015	AH645	PR1125 PR1535						IC830 IC928	TT8020 TT8080
	<b>S</b> Exotic Alloy	K10		NH4025	AC1030U AC510U ACZ150	VP10RT	AH110 AH120	PR905	GC15				IC810	TT6080	
			K20	NH4025 NH4045	AC1030U AC510U AC530U ACZ150	VP10RT VP20RT VP15TF	AH120	PR905						TT6080	
			K30	NH4045 NH5045	AC1030U AC530U	VP15TF VP20RT	AH110 AH120 AH725						IC830 IC908 IC910 IC928		

# NANOLOY CUTTING TOOL

Meet the best NANOTECHNOLOGY







**NANOLOY** ●●●●

ISO

# TURNING INSERT

Turning insert for ISO S,M group

## “N-IT” SERIES

Nano ultrafine powder technology & optimal geometry  
for aerospace and automobile parts machining

### Turning insert for ISO S,M group

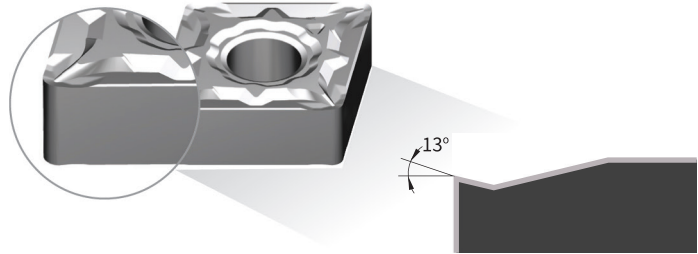
1. Excellent hardness and wear resistance
2. Designed for ISO S,M group (Prevent built up edge and burrs)
3. Various geometries from finishing to roughing

# GEOMETRY FEATURE

## F11 Chip Breaker

### Features

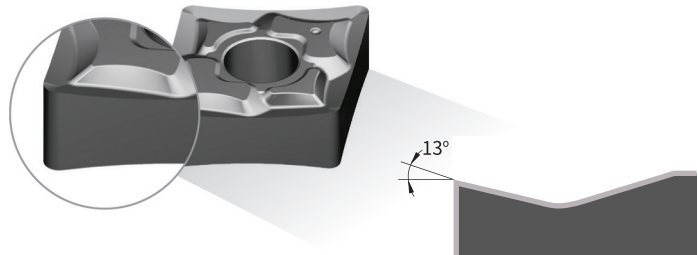
- Prevents B.U.E with sharp edge.
- High rake angle applied in side cutting edge.
- Optimized in finishing ISO S,M group.



## 7FM Chip Breaker

### Features

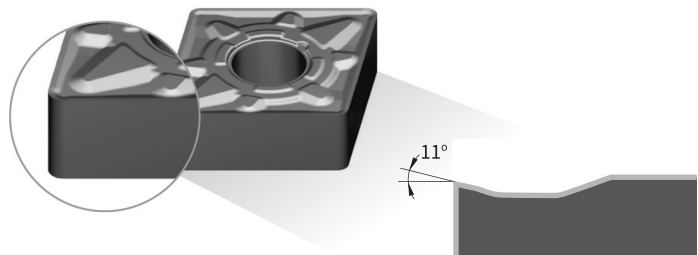
- Waved cutting edge.
- Guaranteed high quality surface roughness.
- Optimized in semi – finishing ISO S,M group.



## M11 Chip Breaker

### Features

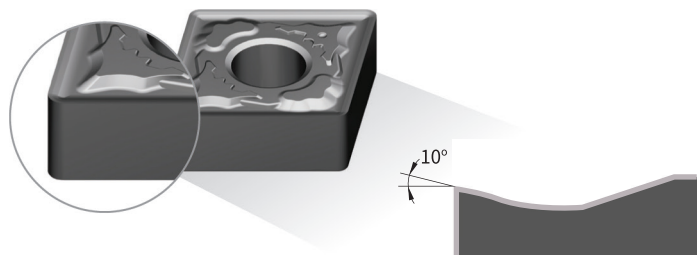
- Stable chip evacuation.
- Applied variable land for crater wear resistance.
- Prevents B.U.E with sharp edge.
- Optimized in medium machining ISO S,M group.



## M22 Chip Breaker

### Features

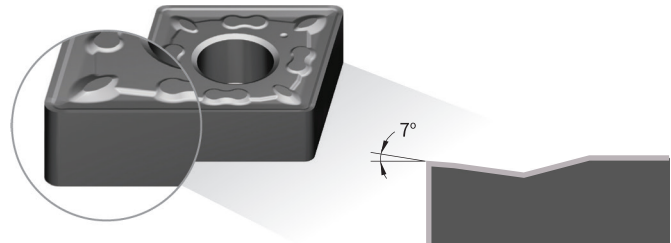
- Sharp cutting edge & low cutting force.
- Stable chip evacuation.
- Guaranteed high quality surface roughness.
- Optimized in medium machining ISO S,M group.



## R11 Chip Breaker

### Features

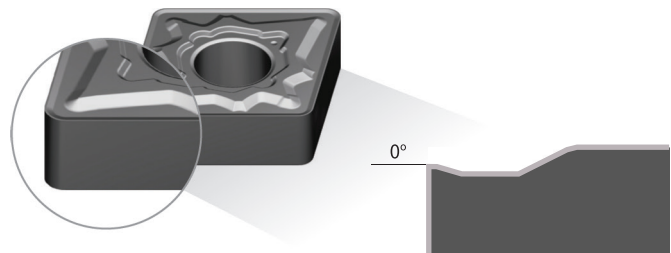
- Excellent for cutting edge strength.
- Designed for deep depth of cut.
- Optimized in roughing ISO S,M group.



## R21 Chip Breaker

### Features

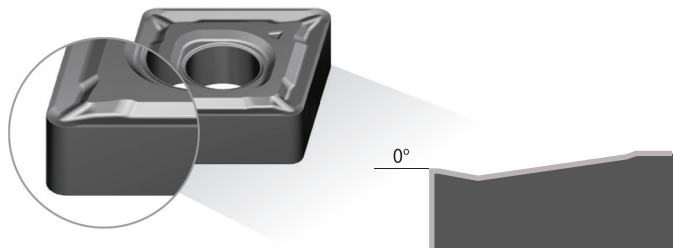
- Excellent for cutting edge strength.
- Designed for deep depth of cut.
- Optimized in universal roughing machining.



## M51 Chip Breaker

### Features

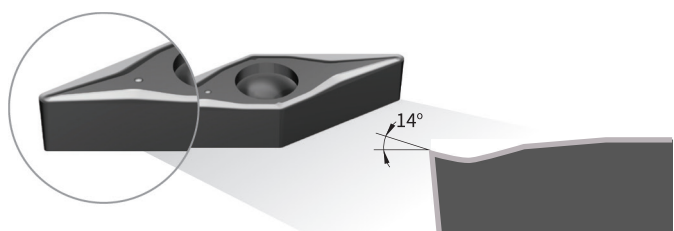
- Low cutting force.
- Excellent chip evacuation at low feed, depth of cut.
- Optimized in universal medium machining.





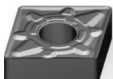



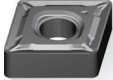



## 2FM Chip Breaker

### Features


- Prevents B.U.E with sharp edge.
- Guaranteed high quality surface roughness at finishing.
- Optimized in finishing ISO S,M group.





# TYPE OF APPLICATION AREA

Chip Breaker	Corner section	Recommended cutting condition										Features		
		ap (mm)												
		0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3				
feed (mm/rev)														
0.07	0.14	0.21	0.28	0.35	0.42	0.49	0.56	0.63						
 F11 Finishing		0.1 ~ 1.5												<ul style="list-style-type: none"> <li>Prevents B.U.E with sharp edge</li> <li>Stable chip evacuation</li> </ul>
 M11 Medium					1.2 ~ 4.5									<ul style="list-style-type: none"> <li>Stable chip evacuation</li> <li>Applied variable land for crater wear resistance</li> </ul>
 M22 Medium				0.5 ~ 3.0										<ul style="list-style-type: none"> <li>Sharp cutting edge &amp; low cutting force</li> <li>Guaranteed high quality surface roughness</li> </ul>
 M51 Medium					0.7 ~ 3.5									<ul style="list-style-type: none"> <li>Low cutting force</li> <li>Excellent chip evacuation at low feed, depth of cut</li> </ul>
 R11 Roughing										2.4 ~ 6.0				<ul style="list-style-type: none"> <li>Excellent for cutting edge strength</li> <li>Designed for deep depth of cut</li> </ul>


**M** Stainless steel


Roughing: 


Medium: 

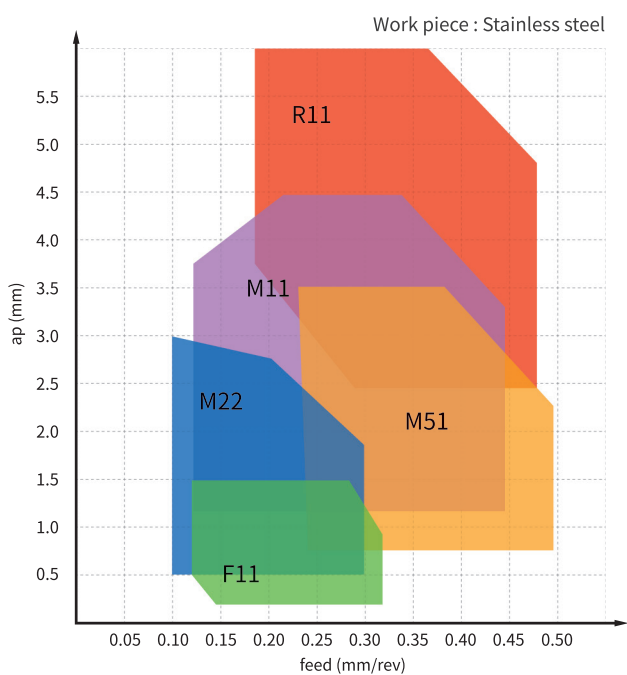
Finishing: 

**S** HRSA

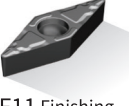


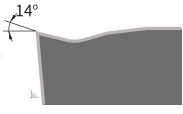


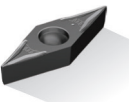
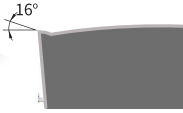


Roughing: 

Medium: 


Finishing: 





# TYPE OF APPLICATION AREA

Chip Breaker	Corner section	Recommended cutting condition									Features
		ap (mm)									
		0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	
feed (mm/rev)											
0.04	0.08	0.12	0.16	0.20	0.24	0.28	0.32	0.36			
 F11 Finishing		0.13 ~ 1.8			0.10 ~ 0.20						<ul style="list-style-type: none"> <li>Prevents B.U.E with sharp edge</li> <li>Stable chip evacuation</li> </ul>
 2FM Semi finishing		0.5 ~ 2.0			0.08 ~ 0.20						<ul style="list-style-type: none"> <li>Prevents B.U.E with sharp edge</li> <li>Guaranteed high quality surface roughness at finishing</li> </ul>
 M11 Medium		0.35 ~ 2.2			0.12 ~ 0.24						<ul style="list-style-type: none"> <li>Stable chip evacuation</li> <li>Applied variable land for crater wear resistance</li> </ul>
 M51 Medium		0.4 ~ 2.5			0.10 ~ 0.22						<ul style="list-style-type: none"> <li>Low cutting force</li> <li>Excellent chip evacuation at low feed, depth of cut</li> </ul>
 R11 Roughing		1.2 ~ 3.0			0.14 ~ 0.28						<ul style="list-style-type: none"> <li>Excellent for cutting edge strength</li> <li>Designed for deep depth of cut</li> </ul>


**M** Stainless steel

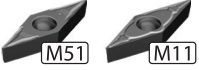
Roughing 


Medium 

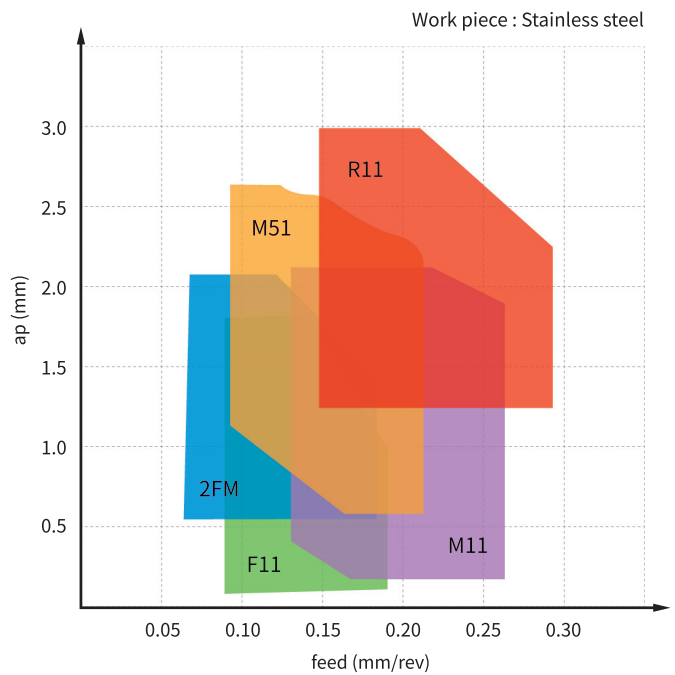
Finishing 

**S** HRSA

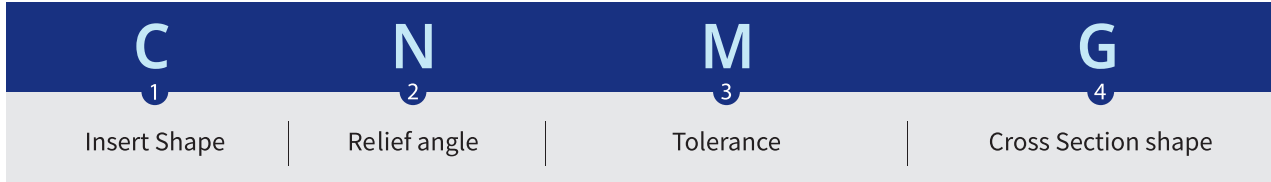
Roughing 

Medium 

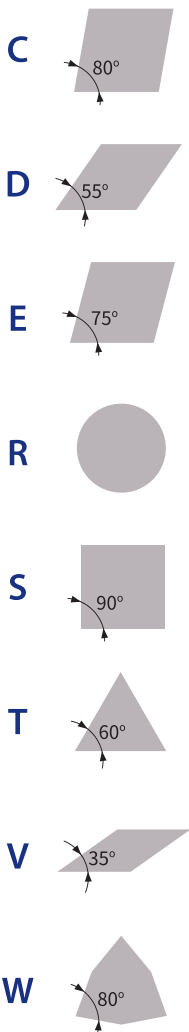
Finishing 



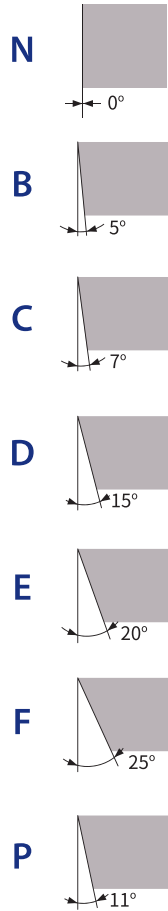
# ISO TURNING INSERT NUMBERING SYSTEM



1 Insert Shape



2 Relief angle

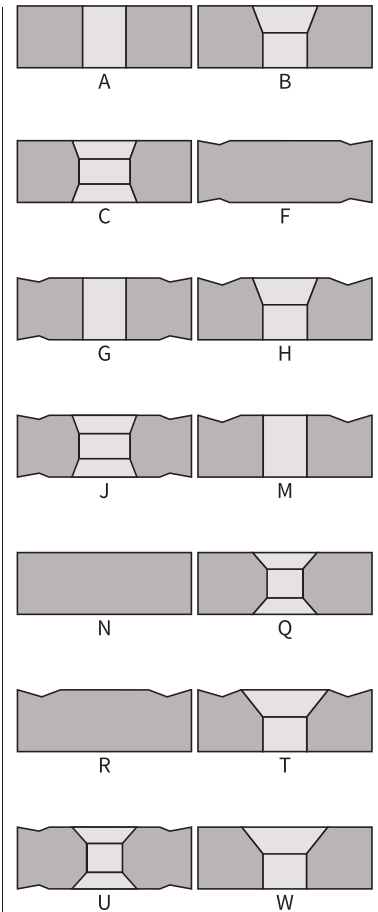


3 Tolerance

Unit (mm)

	d	m	t
A	±0.025	±0.005	±0.025
C	±0.025	±0.013	±0.025
E	±0.025	±0.025	±0.025
F	±0.013	±0.005	±0.025
G	±0.025	±0.025	±0.130
H	±0.013	±0.013	±0.025
J	±0.05~0.15	±0.005	±0.025
K	±0.05~0.15	±0.013	±0.025
L	±0.05~0.15	±0.025	±0.025
M	±0.05~0.15	±0.130	±0.127
N	±0.05~0.15	±0.025	±0.025
U	±0.08~0.25	±0.130	±0.127

4 Cross Section shape



SPECIAL  
X

<b>12</b> 5	<b>04</b> 6	<b>08</b> 7	<b>M11</b> 8
I.C, cutting edge length	Height of cutting edge	Nose R	Chip Breaker

5 I.C, cutting edge length

IC*d" (mm)	C	D	R	S	T	V	W
3.97	S4	4	3	3	6	-	-
4.76	4	5	4	4	8	8	S3
5.56	5	6	5	5	9	9	3
6	-	-	6	-	-	-	-
6.35	6	7	6	6	11	11	4
7.94	8	9	7	7	13	13	5
8	-	-	8	-	-	-	-
9.525	9	11	9	9	16	16	6
10	-	-	10	-	-	-	-
11.11	11	13	11	11	19	19	7
12	-	-	12	-	-	-	-
12.7	12	15	12	12	22	22	8
14.29	14	17	14	14	24	24	9
15.875	16	19	15	15	27	27	10
16	-	-	16	-	-	-	-
17.46	17	21	17	17	30	30	11
19.05	19	23	19	19	33	33	13
20	-	-	20	-	-	-	-
22.225	22	27	22	22	38	38	15
25	-	-	25	-	-	-	-
25.4	25	31	25	25	44	44	17
31.75	32	38	31	31	54	54	21
32	-	-	32	-	-	-	-

6 Height of cutting edge

1	1.59		
T1	1.98		
2	2.38		
T2	2.76		
3	3.18		
T3	3.97		
4	4.76		
5	5.56		
6	6.35		
7	7.94		
9	9.52		

7 Nose R

01	0.1
02	0.2
04	0.4
08	0.8
12	1.2
16	1.6
20	2.0
24	2.4
32	3.2

8 Chip breaker


▼ Negative type

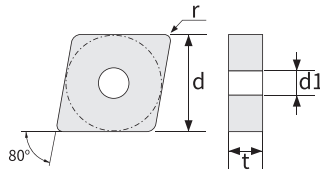


▼ Positive type

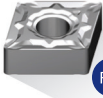

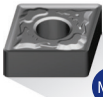


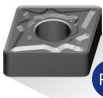
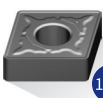



# ISO TURNING INSERT SERIES

80° Rhombic (C) Negative 



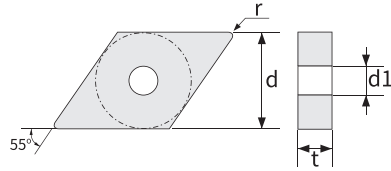
Size	Dimension (mm)		
	d	t	d1
09	9.525	3.18	3.81
12	12.7	4.76	5.16
16	15.875	6.35	6.35
19	19.05	6.35	7.93

Insert shape		Designation	Feed (mm/rev)	Ap (mm)	NV3005	NV3025	NV3045	NV3065
Finishing								
		120404-F11	0.06~0.24	0.12~1.20	○	●	○	○
		120408-F11	0.12~0.32	0.12~1.20	○	●	○	○
Medium		120408-M11	0.12~0.36	0.6~4.5	○	●	○	○
		120412-M11	0.12~0.45	0.6~4.5	○	●	○	○
		120416-M11	0.12~0.50	0.6~4.5	○	●	○	○
		160612-M11	0.10~0.40	2.3~4.5	○	●	○	○
Medium		120404-M22	0.10~0.22	0.5~3.0	○	●	○	○
		120408-M22	0.12~0.30	0.5~3.0	○	●	○	○
		120412-M22	0.12~0.40	0.5~3.5	○	●	○	○
		160612-M22	0.15~0.40	2.5~5.0	○	●	○	○
		190608-M22	0.20~0.50	3.0~5.5	○	●	○	○
		190612-M22	0.20~0.50	3.0~6.0	○	●	○	○
		190616-M22	0.20~0.50	3.0~6.5	○	●	○	○
Semi Finishing		090308-M51	0.25~0.40	1.2~4.0	○	●	○	○
Roughing		120408-R11	0.18~0.48	2.4~6.0	○	●	○	○
		120412-R11	0.18~0.48	2.4~6.0	○	●	○	○
		120416-R11	0.18~0.50	2.4~6.0	○	●	○	○
		190612-R11	0.18~0.45	2.4~8.0	○	●	○	○
		190616-R11	0.18~0.55	2.4~8.0	○	●	○	○
Roughing		120408-R21	0.12~0.35	0.7~3.8	○	●	○	○
		120412-R21	0.18~0.45	0.7~3.8	○	●	○	○
		190616-R21	0.30~0.60	1.0~9.0	○	●	○	○
Roughing		120408-1RM	0.18~0.48	2.4~6.0	○	●	○	○
		190612-1RM	0.18~0.45	2.4~8.0	○	●	○	○
Finishing		120402-7FM	0.08~0.14	0.3~3.0	○	●	○	○
		120404-7FM	0.08~0.20	0.3~3.0	○	●	○	○
		120408-7FM	0.08~0.40	0.3~3.0	○	●	○	○

● Stock item



### 55° Rhombic (D) Negative




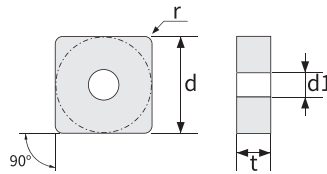
Size	Dimension (mm)		
	d	t	d1
11	9.525	3.18~4.76	3.81
15	12.7	4.76~6.35	5.16

Insert Shape		Designation	Feed (mm/rev)	Ap (mm)	NV3005	NV3025	NV3045	NV3065	
Finishing					DNMG	110404-F11	0.06~0.24	0.12~1.0	○
		150404-F11	0.06~0.24	0.12~1.2		○	●	○	○
		150408-F11	0.12~0.32	0.12~1.2		○	●	○	○
		150604-F11	0.06~0.24	0.12~1.2		○	●	○	○
		150608-F11	0.12~0.32	0.12~1.2		○	●	○	○
Finishing		DNMG	150404-9FN	0.10~0.25	0.5~2.5	○	●	○	○
			150408-9FN	0.15~0.30	0.5~2.5	○	●	○	○
			150604-9FN	0.10~0.25	0.5~2.5	○	●	○	○
			150608-9FN	0.15~0.30	0.5~2.5	○	●	○	○
Medium		DNMG	110408-M11	0.12~0.40	0.6~3.0	○	●	○	○
			150408-M11	0.18~0.30	0.3~2.0	○	●	○	○
			150412-M11	0.12~0.45	0.6~4.0	○	●	○	○
			150608-M11	0.12~0.40	0.6~4.0	○	●	○	○
			150612-M11	0.12~0.45	0.6~4.0	○	●	○	○
Medium		DNMG	150404-M22	0.12~0.25	0.3~2.0	○	●	○	○
			150408-M22	0.18~0.30	0.3~2.0	○	●	○	○
			150412-M22	0.25~0.40	0.3~2.0	○	●	○	○
			150416-M22	0.30~0.45	0.3~2.5	○	●	○	○
			150604-M22	0.12~0.25	0.3~2.2	○	●	○	○
			150608-M22	0.18~0.30	0.3~2.2	○	●	○	○
			150612-M22	0.25~0.40	0.3~2.2	○	●	○	○
			150416-M22	0.30~0.45	0.3~2.5	○	●	○	○
Roughing		DNMG	150412-R11	0.18~0.45	2.4~4.5	○	●	○	○
			150416-R11	0.18~0.45	2.4~4.5	○	●	○	○
			150608-R11	0.15~0.60	2.0~6.0	○	●	○	○
			150612-R11	0.18~0.45	2.4~4.5	○	●	○	○
			150616-R11	0.18~0.45	2.4~4.5	○	●	○	○
				0.15~0.60	2.0~6.0	○	●	○	○

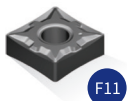
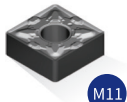
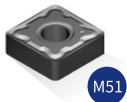
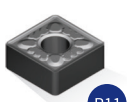
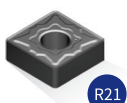
● Stock item

# ISO TURNING INSERT SERIES

90° Square (S) Negative 

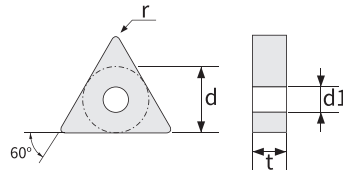


Size	Dimension (mm)		
	d	t	d1
09	9.525	3.18	3.81
12	12.7	3.18~4.76	5.16
15	15.875	4.76~6.35	6.35
19	19.05	4.76~6.35	7.93

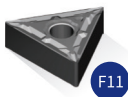
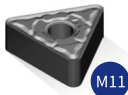
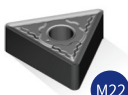
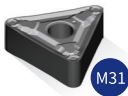
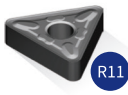
Insert shape		Designation	Feed (mm/rev)	Ap (mm)	NV3005	NV3025	NV3045	NV3065
Finishing		090304-F11	0.06~0.20	0.10~1.0	○	●	○	○
		120404-F11	0.06~0.24	0.12~1.2	○	●	○	○
		120408-F11	0.12~0.32	0.12~1.2	○	●	○	○
Medium		120408-M11	0.12~0.36	0.6~5.0	○	●	○	○
		120412-M11	0.12~0.45	0.6~5.0	○	●	○	○
		120416-M11	0.12~0.48	0.6~5.0	○	●	○	○
		190612-M11	0.15~0.60	0.5~8.0	○	●	○	○
		190616-M11	0.15~0.63	0.5~8.0	○	●	○	○
Semi Finishing		090308-M51	0.25~0.40	1.2~4.0	○	●	○	○
Roughing		120408-R11	0.18~0.44	2.4~6.0	○	●	○	○
		120412-R11	0.40~0.60	2.5~5.5	○	●	○	○
		150612-R11	0.15~0.60	2.0~8.0	○	●	○	○
		150616-R11	0.15~0.70	2.0~8.0	○	●	○	○
		190612-R11	0.18~0.48	2.4~5.5	○	●	○	○
		190616-R11	0.25~0.55	2.4~8.0	○	●	○	○
Roughing		190624-R11	0.30~0.90	2.5~9.0	○	●	○	○
		190616-R21	0.30~0.50	1.0~9.0	○	●	○	○

● Stock item

# 60° Triangular (T) Negative




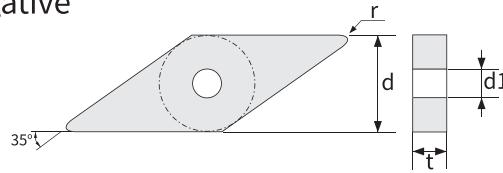
Size	Dimension (mm)		
	d	t	d1
16	9.525	3.18~4.76	3.81
22	12.7	4.76	5.16

Insert shape		Designation	Feed (mm/rev)	Ap (mm)	NV3005	NV3025	NV3045	NV3065
Finishing								
			160408-F11 0.12~0.32	0.12~1.2	○	●	○	○
Medium		TNMG	160408-M11 0.14~0.35	0.5~3.0	○	●	○	○
			160412-M11 0.16~0.50	0.6~4.0	○	●	○	○
			220412-M11 0.1~0.5	0.5~6.0	○	●	○	○
			220416-M11 0.1~0.55	0.5~6.0	○	●	○	○
Medium		TNMG	160404-M22 0.10~0.22	0.3~2.5	○	●	○	○
			160408-M22 0.15~0.30	0.3~2.5	○	●	○	○
			160412-M22 0.20~0.40	0.3~2.5	○	●	○	○
			220408-M22 0.2~0.5	0.3~4.0	○	●	○	○
			220412-M22 0.2~0.5	0.3~4.0	○	●	○	○
Medium		TNMG	160412-M31 0.22~0.50	1.0~4.5	○	●	○	○
Roughing		TNMG	160408-R11 0.18~0.44	2.4~4.3	○	●	○	○
			160412-R11 0.18~0.45	2.4~4.3	○	●	○	○
			220412-R11 0.15~0.50	2.0~7.0	○	●	○	○
			220416-R11 0.15~0.60	2.0~7.0	○	●	○	○

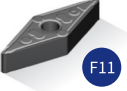

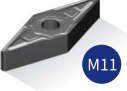

● Stock item

# ISO TURNING INSERT SERIES

35° Rhombic (V) Negative 

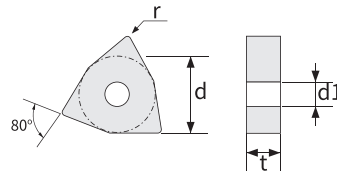


Size	Dimension (mm)		
	d	t	d1
16	9.525	4.76	3.81

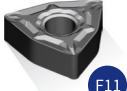
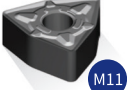
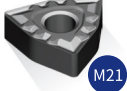
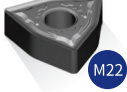


Insert shape		Designation	Feed (mm/rev)	Ap (mm)	NV3005	NV3025	NV3045	NV3065	
Finishing					160404-F11	0.06~0.24	0.12~1.2	○	●
		160408-F11	0.18~0.40	0.40~3.5	○	●	○	○	
Finishing		160412-F21	0.12~0.25	0.40~2.0	○	●	○	○	
Medium		160404-M11	0.12~0.32	0.48~3.2	○	●	○	○	
		160408-M11	0.12~0.36	0.60~3.2	○	●	○	○	
Medium		160404-M22	0.10~0.20	0.10~1.7	○	●	○	○	
		160408-M22	0.10~0.20	0.30~1.5	○	●	○	○	
		160412-M22	0.10~0.25	0.50~2.0	○	●	○	○	

● Stock item

# 80° Trigon (W) Negative ○



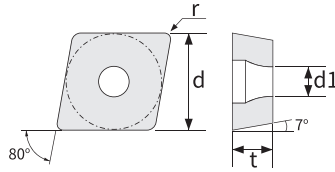
Size	Dimension (mm)		
	d	t	d1
06	9.525	4.76	3.81
08	12.7	4.76	5.16

Insert shape		Designation	Feed (mm/rev)	Ap (mm)	NV3005	NV3025	NV3045	NV3065
Finishing					060404-F11	0.12~0.25	0.60~2.0	○
		060408-F11	0.18~0.40	0.60~2.0	○	●	○	○
		080404-F11	0.12~0.25	0.60~1.6	○	●	○	○
		080408-F11	0.12~0.32	0.12~1.2	○	●	○	○
		080412-F11	0.12~0.45	0.12~1.2	○	●	○	○
Medium		060408-M11	0.12~0.36	0.60~2.5	○	●	○	○
		080404-M11	0.10~0.30	0.12~1.2	○	●	○	○
		080408-M11	0.10~0.33	0.12~1.2	○	●	○	○
		080412-M11	0.12~0.45	0.60~3.2	○	●	○	○
Medium		080408-M21	0.15~0.30	0.30~2.5	○	●	○	○
Medium		080408-M22	0.12~0.30	0.50~3.0	○	●	○	○
		080412-M22	0.15~0.40	0.50~3.0	○	●	○	○
Roughing		080408-R11	0.18~0.35	2.40~3.2	○	●	○	○
		080412-R11	0.18~0.48	2.40~3.2	○	●	○	○
Roughing		080408-R21	0.12~0.35	0.60~3.5	○	●	○	○
		080412-R21	0.12~0.40	0.60~3.5	○	●	○	○


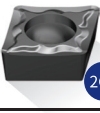


● Stock item

# ISO TURNING INSERT SERIES

80° Rhombic (C) Positive  
Relief angle 7°

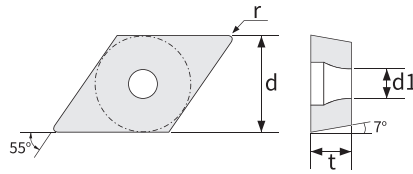


Size	Dimension (mm)		
	d	t	d1
06	6.35	2.38	2.8
09	9.525	3.97	4.4
12	12.7	4.76	5.5

Insert shape		Designation	Feed (mm/rev)	Ap (mm)	NV3005	NV3025	NV3045	NV3065
Finishing								
		060204-F11	0.06~0.15	0.12~1.35	○	●	○	○
		060208-F11	0.08~0.18	0.16~1.35	○	●	○	○
		09T302-F11	0.05~0.12	0.10~1.60	○	●	○	○
		09T304-F11	0.07~0.18	0.13~1.60	○	●	○	○
		09T308-F11	0.10~0.24	0.18~1.60	○	●	○	○
		120402-F11	0.06~0.20	0.17~1.92	○	●	○	○
		120404-F11	0.08~0.22	0.17~1.92	○	●	○	○
Semi Finishing		09T308-2GF	0.08~0.25	0.20~1.20	○	●	○	○
Medium		060204-M11	0.07~0.15	0.24~1.92	○	●	○	○
		060208-M11	0.10~0.18	0.28~1.92	○	●	○	○
		09T304-M11	0.10~0.20	0.30~2.50	○	●	○	○
		09T308-M11	0.12~0.25	0.60~2.50	○	●	○	○
		120402-M11	0.11~0.22	0.35~3.00	○	●	○	○
		120404-M11	0.11~0.22	0.35~3.00	○	●	○	○
		120408-M11	0.15~0.30	0.50~3.00	○	●	○	○
Semi Finishing		060202-M51	0.02~0.10	0.12~1.30	○	●	○	○
		060204-M51	0.10~0.25	0.40~1.60	○	●	○	○
		09T302-M51	0.03~0.10	0.08~1.30	○	●	○	○
		09T304-M51	0.10~0.20	0.40~2.00	○	●	○	○
		09T308-M51	0.14~0.30	0.60~2.40	○	●	○	○
		120404-M51	0.10~0.20	0.40~3.50	○	●	○	○

● Stock item

55° Rhombic (D) Positive  
Relief angle 7°



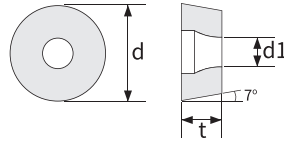
Size	Dimension (mm)		
	d	t	d1
07	6.35	2.38	2.8
11	9.525	3.97	4.4

Insert shape		Designation	Feed (mm/rev)	Ap (mm)	NV3005	NV3025	NV3045	NV3065	
Finishing									DCMT
		070204-F11	0.06~0.15	0.10~1.2	○	●	○	○	
		11T302-F11	0.05~0.12	0.10~1.6	○	●	○	○	
		11T304-F11	0.10~0.20	0.13~1.8	○	●	○	○	
		11T308-F11	0.10~0.24	0.18~1.8	○	●	○	○	
Medium		DCMT	070204-M11	0.07~0.15	0.23~1.2	○	●	○	○
			070208-M11	0.10~0.20	0.40~1.2	○	●	○	○
			11T304-M11	0.10~0.20	0.35~2.2	○	●	○	○
			11T308-M11	0.12~0.25	0.60~2.5	○	●	○	○
			11T312-M11	0.14~0.32	0.72~2.2	○	●	○	○
Roughing		DCMT	11T308-R11	0.14~0.28	1.20~3.0	○	●	○	○
			11T312-R11	0.17~0.35	1.40~3.0	○	●	○	○
Roughing		DCGT	11T304-F11	0.10~0.20	0.40~2.5	○	●	○	○
Semi Finishing		DCGT	070202-M51	0.02~0.10	0.12~1.3	○	●	○	○
			070204-M51	0.10~0.22	0.60~2.2	○	●	○	○
			11T301-M51	0.02~0.05	0.12~0.8	○	●	○	○
			11T302-M51	0.02~0.05	0.12~1.3	○	●	○	○
			11T304-M51	0.10~0.22	0.40~2.5	○	●	○	○
			11T308-M51	0.14~0.30	0.40~2.5	○	●	○	○

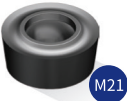
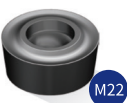
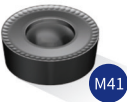
● Stock item

# ISO TURNING INSERT SERIES

Round (R) Positive  
Relief angle  $7^\circ$

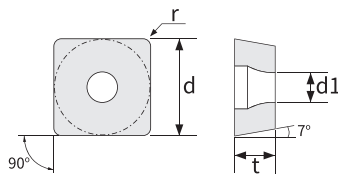


Size	Dimension (mm)		
	d	t	d1
08	8	3.18	3.35
10	10	3.18	3.6
12	12	4.76	4.2
16	16	6.35	5.2
19	19	6.35	6.5

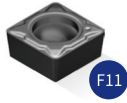
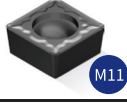
Insert shape		Designation	Feed (mm/rev)	Ap (mm)	NV3005	NV3025	NV3045	NV3065
Medium					RCMT	1204M0-M21	0.20~0.40	0.5~4.0
Medium		RCMT	0803M0-M22	0.06~0.08	0.3~2.0	○	●	○
			10T3M0-M22	0.08~0.10	0.3~2.2	○	●	○
			1204M0-M22	0.10~0.16	0.5~3.0	○	●	○
			1606M0-M22	0.12~0.16	0.8~4.0	○	●	○
Medium		RCMT	190600-M41	0.15~0.65	2.0~8.0	○	●	○

● Stock item

Square (S) Positive  
Relief angle  $7^\circ$



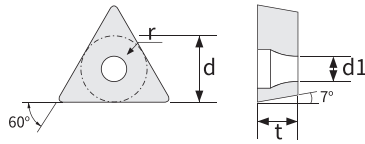
Size	Dimension (mm)		
	d	t	d1
09	9.525	3.97	4.4

Insert shape		Designation	Feed (mm/rev)	Ap (mm)	NV3005	NV3025	NV3045	NV3065
Finishing					SCMT	09T304-F11	0.07~0.18	0.13~1.6
		09T308-F11	0.10~0.24	0.18~1.6		○	●	○
Medium		SCMT	09T304-M11	0.10~0.20	0.28~2.4	○	●	○
			09T308-M11	0.12~0.24	0.60~2.4	○	●	○




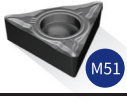
● Stock item



### 60° Triangular (T) Positive Relief angle 7°



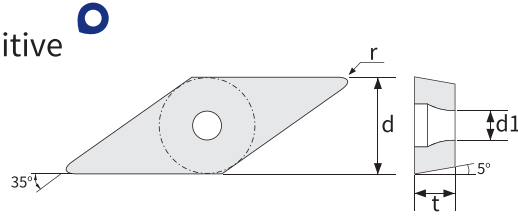
Size	Dimension (mm)		
	d	t	d1
06	3.97	1.98	2.2
09	5.56	2.38	2.5
11	6.35	2.38	2.8
16	9.525	3.97	4.4

Insert shape		Designation	Feed (mm/rev)	Ap (mm)	NV3005	NV3025	NV3045	NV3065	
Finishing		TCMT	06T101-F11	0.05~0.09	0.07~1.20	○	●	○	○
			06T104-F11	0.06~0.15	0.10~1.20	○	●	○	○
			06T108-F11	0.07~0.18	0.13~1.20	○	●	○	○
			090202-F11	0.05~0.10	0.07~1.35	○	●	○	○
			090204-F11	0.06~0.15	0.12~1.35	○	●	○	○
			110204-F11	0.06~0.15	0.12~1.35	○	●	○	○
			110302-F11	0.05~0.10	0.07~1.35	○	●	○	○
			110304-F11	0.06~0.15	0.12~1.35	○	●	○	○
			110308-F11	0.08~0.21	0.16~1.35	○	●	○	○
			16T302-F11	0.05~0.20	0.10~1.80	○	●	○	○
			16T304-F11	0.08~0.18	0.15~1.60	○	●	○	○
16T308-F11	0.10~0.25	0.50~2.50	○	●	○	○			
Finishing		TCMT	16T308-F51	0.07~0.20	0.25~1.80	○	●	○	○
Medium		TCMT	090204-M11	0.07~0.15	0.23~1.80	○	●	○	○
			090208-M11	0.10~0.18	0.46~1.80	○	●	○	○
			110308-M11	0.11~0.21	0.50~2.00	○	●	○	○
			16T304-M11	0.10~0.18	0.30~2.50	○	●	○	○
			16T312-M11	0.14~0.32	0.80~2.50	○	●	○	○
Semi Finishing		TCMT	16T308-M51	0.14~0.35	0.60~3.50	○	●	○	○

● Stock item

# ISO TURNING INSERT SERIES

35° Rhombic (V) Positive  
Relief angle 5°

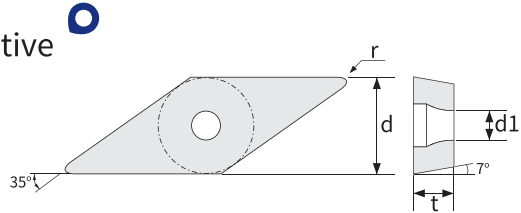


Size	Dimension (mm)		
	d	t	d1
11	6.35	3.18	2.8
12	7.5	3.18	2.8
16	9.525	4.76	4.4


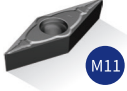




Insert shape		Designation	Feed (mm/rev)	Ap (mm)	NV3005	NV3025	NV3045	NV3065
Finishing		VBMT	110302-F11	0.05~0.10	0.07~1.35	○	●	○
			110304-F11	0.06~0.15	0.12~1.35	○	●	○
			110308-F11	0.08~0.21	0.16~1.35	○	●	○
			160404-F11	0.06~0.16	0.12~1.45	○	●	○
			160408-F11	0.08~0.22	0.17~1.45	○	●	○
Medium		VBMT	110304-M11	0.12~0.20	0.35~2.00	○	●	○
			110308-M11	0.15~0.30	0.50~2.00	○	●	○
			160404-M11	0.08~0.16	0.28~2.20	○	●	○
			160408-M11	0.11~0.22	0.54~2.20	○	●	○
			160412-M11	0.13~0.26	0.65~2.20	○	●	○
Roughing		VBMT	160412-R11	0.16~0.30	1.30~2.70	○	●	○
Finishing		VBGT	160404-F11	0.06~0.16	0.12~1.45	○	●	○
Finishing		VBGT	160404-2FM	0.05~0.12	0.20~1.60	○	●	○
			160408-2FM	0.08~0.25	0.20~1.60	○	●	○
			160412-2FM	0.10~0.30	0.20~1.60	○	●	○
Finishing		VBGT	120302S-9NF	0.01~0.08	0.05~0.50	○	●	○
			120304S-9NF	0.01~0.08	0.05~0.50	○	●	○
			120302K-9NF	0.01~0.08	0.05~0.50	○	●	○
			120304K-9NF	0.01~0.08	0.05~0.50	○	●	○
Semi Finishing		VBGT	110302-M51	0.10~0.20	0.40~2.50	○	●	○
			110304-M51	0.10~0.20	0.40~2.50	○	●	○
			160408-M51	0.14~0.30	0.40~3.20	○	●	○

● Stock item

35° Rhombic (V) Positive  
Relief angle 7°



Size	Dimension (mm)		
	d	t	d1
11	6.35	3.18	2.8
12	7.5	3.18	2.8
16	9.525	4.76	4.4

Insert shape		Designation	Feed (mm/rev)	Ap (mm)	NV3005	NV3025	NV3045	NV3065	
Finishing									VCMT
			160404-F11	0.06~0.16	0.12~1.5	○	●	○	○
			160408-F11	0.10~0.22	0.16~1.6	○	●	○	○
Medium		VCMT	110304-M11	0.12~0.20	0.35~2.4	○	●	○	○
Semi Finishing		VCMT	160404-M51	0.10~0.25	0.60~3.2	○	●	○	○
			160408-M51	0.14~0.35	0.60~3.2	○	●	○	○
Finishing		VCGT	1203005-9NF	0.01~0.03	0.05~0.5	○	●	○	○
			1203008-9NF	0.01~0.04	0.05~0.5	○	●	○	○
			120301-9NF	0.01~0.05	0.05~0.5	○	●	○	○
			120302S-9NF	0.01~0.08	0.05~0.5	○	●	○	○
			120304S-9NF	0.01~0.08	0.05~0.5	○	●	○	○
			120302K-9NF	0.01~0.08	0.05~0.5	○	●	○	○
			120304K-9NF	0.01~0.08	0.05~0.5	○	●	○	○
1203CF-9NF	0.10~0.08	0.05~0.5	○	●	○	○			
Finishing		VCGT	160404-2FM	0.05~0.12	0.20~1.6	○	●	○	○
			160408-2FM	0.08~0.25	0.20~1.6	○	●	○	○
			160412-2FM	0.10~0.30	0.20~1.6	○	●	○	○
Semi Finishing		VCGT	110302-M51	0.02~0.10	0.12~1.3	○	●	○	○
			110304-M51	0.10~0.20	0.40~2.5	○	●	○	○
			160402-M51	0.03~0.10	0.12~1.3	○	●	○	○
			160404-M51	0.10~0.25	0.40~3.2	○	●	○	○
			160408-M51	0.14~0.30	0.40~3.2	○	●	○	○

● Stock item

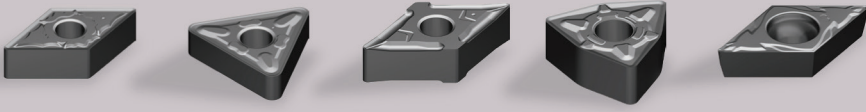
# TURNING INSERT CHIP BREAKER COMPARISON TABLE

NEGATIVE		NANOLOY	SANDVIK	TAEGUTEC	WALTER	KORLOY	KYOCERA	SECO	SUMITOMO	KENNAMETAL	mitsubishi
<b>M</b>	Finishing	F11	MF	EA	NF4	VP2	MQ	FF1	SU	FP	LM
	Medium	M11	MM	EM MP	NM4	MM	MS	MF3	EX GU	MP	MM
	Roughing	R11	MR	ET	NR4	RM	MU	MR3 R6	MU	RP	RM

POSITIVE		NANOLOY	SANDVIK	TAEGUTEC	WALTER	KORLOY	KYOCERA	SECO	SUMITOMO	KENNAMETAL	mitsubishi
<b>M</b>	Finishing	F11	MF	FA	FM4	VP1	CF	F1	FC	LF,UF	FM
	Medium	M11	MM UM	FM	MM4	VL	MQ	MF2 M3	SI	MP	LM MM
	Roughing	R11	MR	MT	RM4	-	-	-	-	-	-

NEGATIVE		NANOLOY	SANDVIK	TAEGUTEC	WALTER	KORLOY	KYOCERA	SECO	SUMITOMO	KENNAMETAL	mitsubishi
<b>S</b>	Finishing	F21	SF	EA	NF4	VP2	MQ	MF1	EF	FS	LS
	Medium	M22	SM	ML EM	NMS	VP3	MS	M1	EG	MS	MS
	Roughing	R11	SMR	ET	NRS	VP4	MU	MR4	MU	RP	RS

POSITIVE		NANOLOY	SANDVIK	TAEGUTEC	WALTER	KORLOY	KYOCERA	SECO	SUMITOMO	KENNAMETAL	mitsubishi
<b>S</b>	Finishing	F21	MF	FG	FM4	VP1	CF	MF2	FC	LF,UF	FS
	Medium	M22 R11	MM MR	FM MT	MM4 RM4	VL	MQ	M3	SI	FP	LS
	Roughing	-	-	-	-	-	-	-	-	-	-



# ISO TURNING INSERT

Meet the best NANOTECHNOLOGY

ISO TURNING INSERT



**NANOLOY** ● ● ● ●

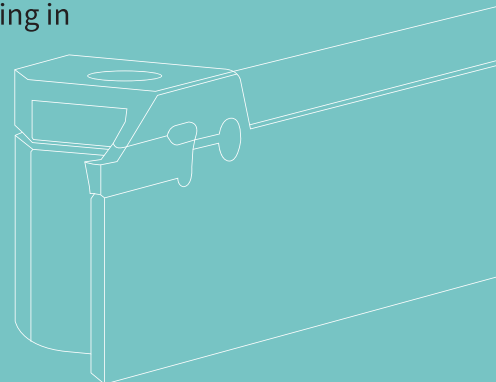
# GROOVING TOOL

## “N-MT” SERIES

Applying stable clamping system,  
guaranteed high quality and efficiency machining

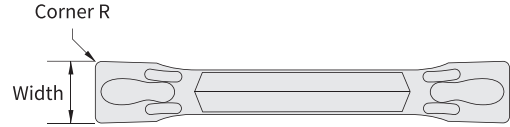
### Grooving inserts & holders

1. Stable clamping system for specially designed grooving machining
2. Various machining available (grooving, parting off, turning)
3. High quality and high efficiency machining in aerospace and automobile industry

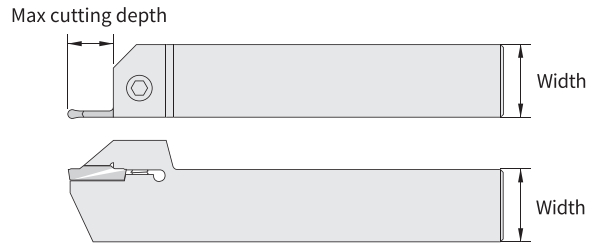


# NUMBERING SYSTEM

Numbering system (Insert & holder)



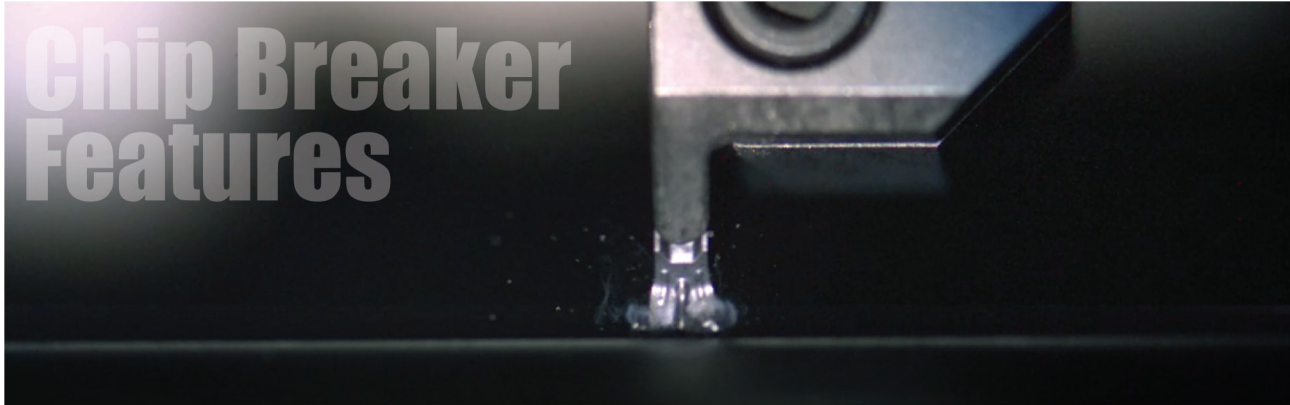
INSERT								
<b>2</b>	<b>NG</b>	<b>30</b>	<b>N</b>	<b>-</b>	<b>04</b>	<b>M</b>	<b>-</b>	<b>M1</b>
Number of corner	Nano grooving	Width (3.0mm)	Edge shape		Corner R (0.4mm)	Tolerance (M class)		C/B



HOLDER							
<b>NG</b>	<b>3</b>	<b>E</b>	<b>H</b>	<b>R</b>	<b>2525</b>	<b>-</b>	<b>T11</b>
Nano grooving	Insert width	Application E : External I : Internal	Holder type H : Horizontal V : Vertical U : Under cut	Hand L : Left R : Right	Shank size (Height / Width 25mm)		Max cutting depth(11mm)  9~30mm

※Right hand shown

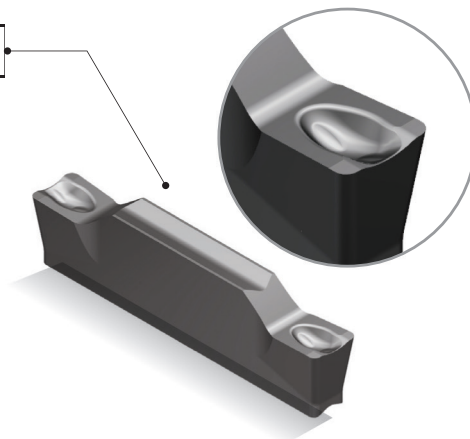




## NANOLOY Chip breaker features

### M1 Chip Breaker

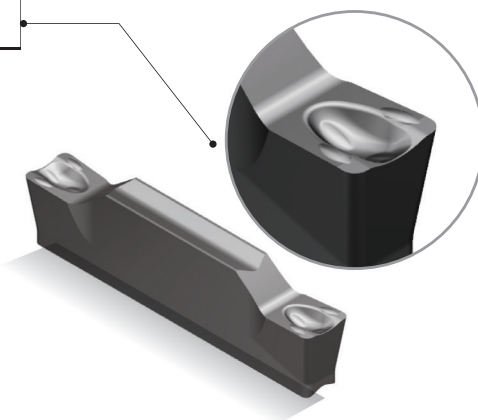
- Machining type
  - Grooving / Parting off
  - Work piece
  - P,M,S group
- M(Mold), G(Grind)



- Features : • Sharp edge
- Low cutting force
- Prevent built up edge

### M1 Chip Breaker

- Machining type
  - Grooving / Turning Parting off
  - Work piece
  - P,M,S group
- M(Mold), G(Grind)



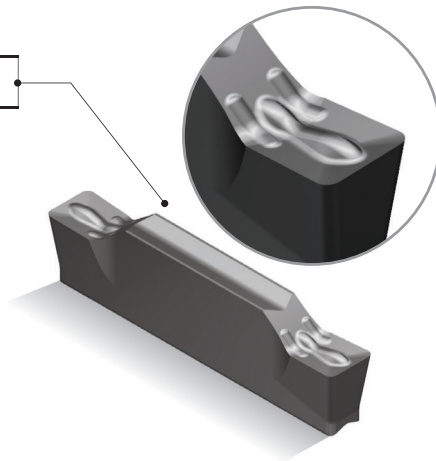
- Features : • Sharp edge
- Low cutting force
- Prevent built up edge



## NANOLOY Chip breaker features

### M1 Chip Breaker

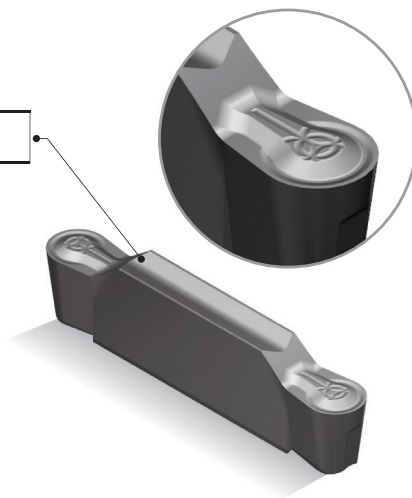
- Machining type
- Grooving / Turning  
Parting off
- Work piece
- P,M,S group
- M(Mold), G(Grind)



- Features : • Various machining type
- Excellent tool life
- Enhanced chip control

### M1(R) Chip Breaker

- Machining type
- Profiling / Undercut
- Work piece
- P,M,S group
- M(Mold), G(Grind)



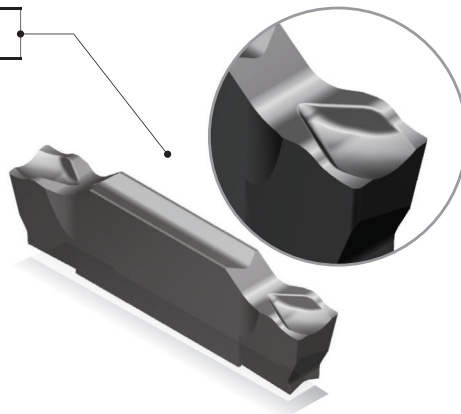
- Features : • Various machining type
- Excellent tool life
- Enhanced chip control
- Full Radius for profiling



## NANOLOY Chip breaker features

### C1 Chip Breaker

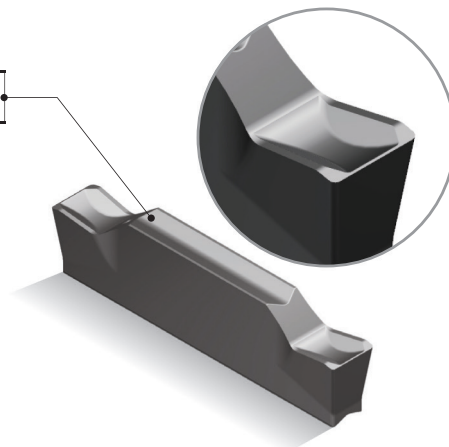
- Machining type
- Parting off
- Work piece
- P,M,S group
- G(Grind)



- Features : • Sharp edge
- Low cutting force
- Enhanced chip control

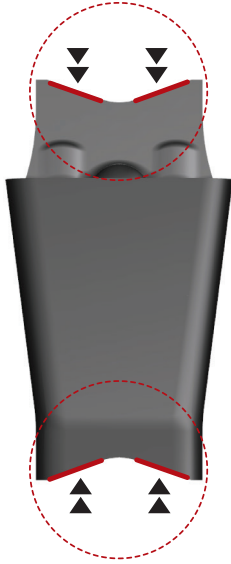
### R1 Chip Breaker

- Machining type
- Grooving / Turning
- Parting off
- P,M,S group
- Work piece
- P,M,K,S group
- M(Mold)



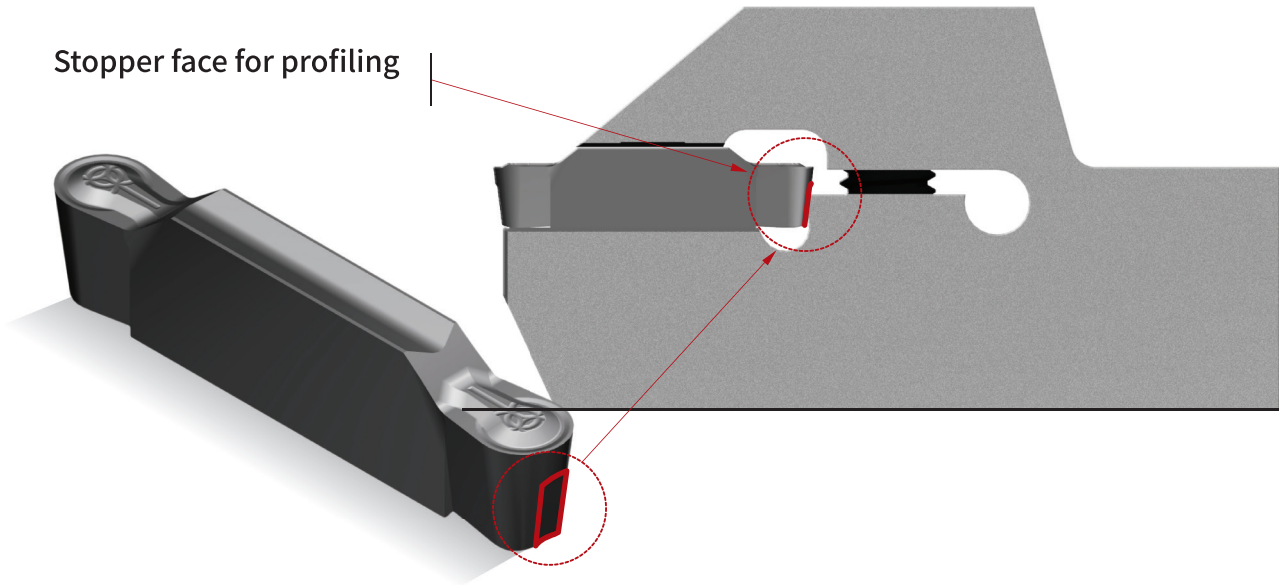
- Features : • High feed machining
- Strong cutting edge
- Enhanced productivity

# STABLE CLAMPING



- Applying self-centering system, excellent insert repeatability
- High precision machining with stable clamping

Stopper face for profiling



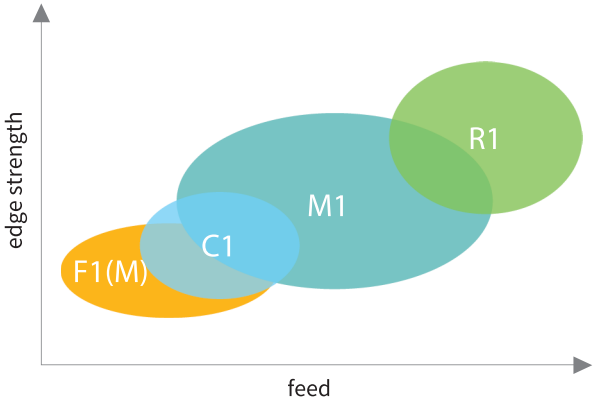
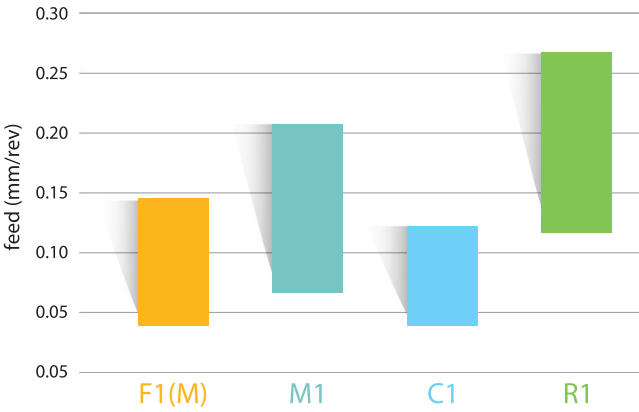
Enhanced contact force with increase contact area ► Stable machining available

# MACHINING TYPE BY GEOMETRY


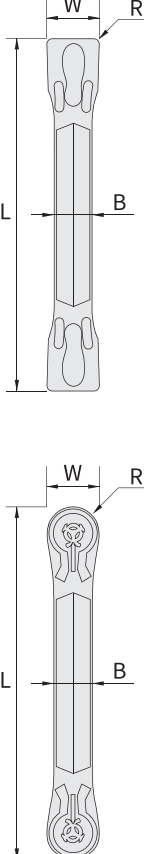
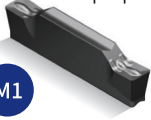



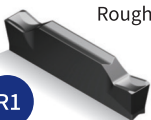
Insert shape	Application				
	Grooving	Turning	Parting off	Profiling	Under cut
 F1	✓		✓		
 F1M	✓	✓	✓		
 M1	✓	✓	✓		
 F1 (RADIUS)				✓	✓
 M1 (RADIUS)				✓	✓
 C1			✓		
 R1	✓	✓	✓		

GROOVING TOOL

## APPLYING AREA


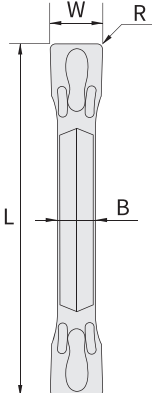

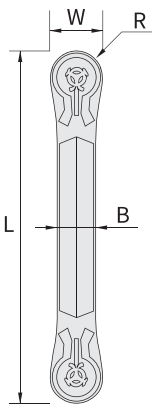


# GROOVING INSERT SERIES – M CLASS

Insert shape	Designation	Dimension (mm)				Coated			Feed (mm/rev)	Configuration
		W	L	B	R	NV3005	NV3025	NV3065		
 <p>F1</p>	2NG20N-02M-F1	2	20	1.7	0.2	○	●	○	0.03~0.12	
	2NG30N-02M-F1	3	20	2.2	0.2	○	●	○	0.05~0.18	
	2NG30N-03M-F1	3	20	2.2	0.3	○	●	○	0.05~0.18	
	2NG30N-04M-F1	3	20	2.2	0.4	○	●	○	0.05~0.20	
	2NG40N-04M-F1	4	20	3.2	0.4	○	●	○	0.05~0.20	
	2NG40N-08M-F1	4	20	3.2	0.8	○	●	○	0.05~0.25	
	2NG50N-02M-F1	5	25	4	0.2	○	●	○	0.05~0.15	
	2NG50N-04M-F1	5	25	4	0.4	○	●	○	0.05~0.20	
2NG50N-08M-F1	5	25	4	0.8	○	●	○	0.05~0.25		
 <p>M1</p> <p>General purpose</p>	2NG20N-02M-M1	2	20	1.7	0.2	○	●	○	0.03~0.12	
	2NG30N-02M-M1	3	20	2.2	0.2	○	●	○	0.05~0.20	
	2NG30N-04M-M1	3	20	2.2	0.4	○	●	○	0.05~0.25	
	2NG40N-02M-M1	4	20	3.2	0.2	○	●	○	0.05~0.20	
	2NG40N-04M-M1	4	20	3.2	0.4	○	●	○	0.05~0.25	
	2NG40N-08M-M1	4	20	3.2	0.8	○	●	○	0.05~0.27	
	2NG50N-02M-M1	5	25	4	0.2	○	●	○	0.05~0.20	
	2NG50N-04M-M1	5	25	4	0.4	○	●	○	0.05~0.25	
2NG50N-08M-M1	5	25	4	0.8	○	●	○	0.05~0.30		
2NG60N-08M-M1	6	25	5	0.8	○	●	○	0.05~0.22		
2NG80N-08M-M1	8	30.3	6	0.8	○	●	○	0.05~0.30		
 <p>F1M</p>	2NG30N-04M-F1M	3	20	2.2	0.4	○	●	○	0.05~0.20	
	2NG40N-03M-F1M	4	20	3.2	0.3	○	●	○	0.05~0.18	
	2NG40N-04M-F1M	4	20	3.2	0.4	○	●	○	0.05~0.20	
	2NG40N-08M-F1M	4	20	3.2	0.8	○	●	○	0.05~0.20	
	2NG50N-02M-F1M	5	25	4	0.2	○	●	○	0.05~0.15	
	2NG50N-04M-F1M	5	25	4	0.4	○	●	○	0.05~0.20	
	2NG50N-08M-F1M	5	25	4	0.8	○	●	○	0.05~0.25	
	2NG60N-03M-F1M	6	25	5	0.3	○	●	○	0.05~0.20	
 <p>M1 (Radius)</p> <p>Profiling</p>	2NG30R-15M-M1	3	20	2.2	1.5	○	●	○	0.05~0.20	
	2NG40R-20M-M1	4	20	3.2	2	○	●	○	0.05~0.22	
	2NG50R-25M-M1	5	25	4	2.5	○	●	○	0.05~0.25	
	2NG60R-30M-M1	6	25	5	0.3	○	●	○	0.05~0.27	
	2NG80R-40M-M1	8	30.3	6	0.4	○	●	○	0.05~0.30	
 <p>F1 (Radius)</p> <p>Profiling</p>	2NG30R-15M-F1	3	20	2.2	1.5	○	●	○	0.05~0.15	
	2NG40R-20M-F1	4	20	3.2	2	○	●	○	0.05~0.20	
	2NG50R-25M-F1	5	25	4	2.5	○	●	○	0.05~0.22	
 <p>R1</p> <p>Roughing</p>	2NG20N-02M-R1	2	20	1.7	0.2	○	●	○	0.08~0.15	
	2NG30N-02M-R1	3	20	2.2	0.2	○	●	○	0.08~0.20	
	2NG40N-03M-R1	4	20	3.2	0.3	○	●	○	0.08~0.22	
	2NG50N-03M-R1	5	25	4	0.3	○	●	○	0.08~0.25	
	2NG60N-03M-R1	6	25	5	0.3	○	●	○	0.08~0.27	
	2NG80N-04M-R1	8	30.3	6	0.4	○	●	○	0.08~0.30	

● Stock item

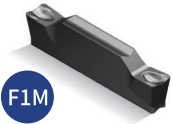
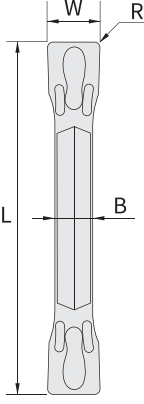
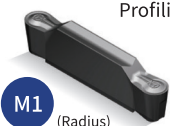
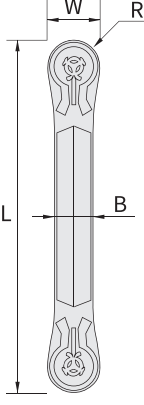
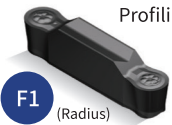
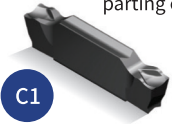
# GROOVING INSERT SERIES – G CLASS

Insert shape	Designation	Dimension (mm)				Coated			Feed (mm/rev)	Configuration
		W	L	B	R	NV3005	NV3025	NV3065		
 <p>General purpose</p> <p>M1</p>	2NG20N-02G-M1	3	20	2.2	0.2	○	●	○	0.05~0.20	
	2NG20N-03G-M1	3	20	2.2	0.3	○	●	○	0.05~0.20	
	2NG20N-04G-M1	3	20	2.2	0.4	○	●	○	0.05~0.20	
	2NG30N-02G-M1	3	20	3.2	0.2	○	●	○	0.05~0.25	
	2NG30N-03G-M1	3	20	3.2	0.3	○	●	○	0.05~0.25	
	2NG30N-04G-M1	3	20	3.2	0.4	○	●	○	0.05~0.25	
	2NG40N-02G-M1	4	20	3.2	0.2	○	●	○	0.05~0.25	
	2NG40N-03G-M1	4	20	3.2	0.3	○	●	○	0.05~0.25	
	2NG40N-04G-M1	4	20	3.2	0.4	○	●	○	0.05~0.25	
	2NG40N-06G-M1	4	20	3.2	0.6	○	●	○	0.05~0.25	
	2NG40N-08G-M1	4	20	3.2	0.8	○	●	○	0.05~0.30	
	2NG50N-02G-M1	5	25	4	0.2	○	●	○	0.05~0.22	
	2NG50N-03G-M1	5	25	4	0.3	○	●	○	0.05~0.25	
	2NG50N-04G-M1	5	25	4	0.4	○	●	○	0.05~0.25	
	2NG50N-06G-M1	5	25	4	0.6	○	●	○	0.05~0.30	
	2NG50N-08G-M1	5	25	4	0.8	○	●	○	0.05~0.30	
	2NG60N-02G-M1	6	25	5	0.2	○	●	○	0.05~0.25	
	2NG60N-03G-M1	6	25	5	0.3	○	●	○	0.05~0.25	
	2NG60N-04G-M1	6	25	5	0.4	○	●	○	0.05~0.25	
	2NG60N-06G-M1	6	25	5	0.6	○	●	○	0.05~0.30	
2NG60N-08G-M1	6	25	5	0.8	○	●	○	0.05~0.30		
2NG80N-04G-M1	8	30.3	6	0.4	○	●	○	0.05~0.30		
2NG80N-06G-M1	8	30.3	6	0.6	○	●	○	0.05~0.35		
2NG80N-08G-M1	8	30.3	6	0.8	○	●	○	0.05~0.35		
 <p>F1</p>	2NG20N-02G-F1	2	20	1.7	0.2	○	●	○	0.03~0.12	
	2NG20N-03G-F1	2	20	1.7	0.3	○	●	○	0.05~0.20	
	2NG20N-04G-F1	2	20	1.7	0.4	○	●	○	0.05~0.20	
	2NG27N-08G-F1	2.7	20	2.2	0.8	○	●	○	0.05~0.25	
	2NG30N-02G-F1	3	20	2.2	0.2	○	●	○	0.05~0.20	
	2NG30N-03G-F1	3	20	2.2	0.3	○	●	○	0.05~0.20	
	2NG30N-04G-F1	3	20	2.2	0.4	○	●	○	0.05~0.20	
	2NG30N-06G-F1	3	20	2.2	0.6	○	●	○	0.05~0.25	
	2NG30N-08G-F1	3	20	2.2	0.8	○	●	○	0.05~0.25	
	2NG40N-02G-F1	4	20	3.2	0.2	○	●	○	0.05~0.20	
	2NG40N-03G-F1	4	20	3.2	0.3	○	●	○	0.05~0.20	
	2NG40N-04G-F1	4	20	3.2	0.4	○	●	○	0.05~0.20	
	2NG40N-06G-F1	4	20	3.2	0.6	○	●	○	0.05~0.25	
	2NG40N-08G-F1	4	20	3.2	0.8	○	●	○	0.05~0.25	
	2NG50N-02G-F1	5	25	4	0.2	○	●	○	0.05~0.20	
	2NG50N-03G-F1	5	25	4	0.3	○	●	○	0.05~0.22	
	2NG50N-04G-F1	5	25	4	0.4	○	●	○	0.05~0.22	
	2NG50N-06G-F1	5	25	4	0.6	○	●	○	0.05~0.25	
	2NG50N-08G-F1	5	25	4	0.8	○	●	○	0.05~0.25	
	2NG60N-02G-F1	6	25	5	0.2	○	●	○	0.03~0.12	
	2NG60N-03G-F1	6	25	5	0.3	○	●	○	0.05~0.20	
	2NG60N-04G-F1	6	25	5	0.4	○	●	○	0.05~0.20	
	2NG60N-06G-F1	6	25	5	0.6	○	●	○	0.05~0.25	
	2NG60N-08G-F1	6	25	5	0.8	○	●	○	0.05~0.25	
	2NG80N-04G-F1	8	30.3	6	0.4	○	●	○	0.05~0.20	
	2NG80N-06G-F1	8	30.3	6	0.6	○	●	○	0.05~0.25	
2NG80N-08G-F1	8	30.3	6	0.8	○	●	○	0.05~0.25		
2NG80N-12G-F1	8	30.3	6	1.2	○	●	○	0.05~0.30		

● Stock item

GROOVING TOOL

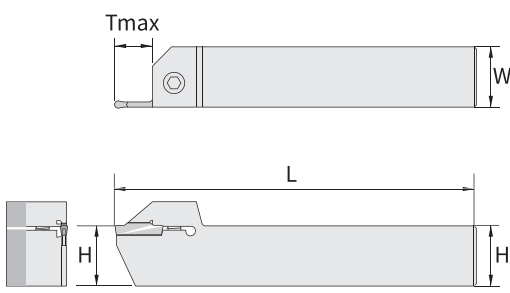
# GROOVING INSERT SERIES – G CLASS

Insert shape	Designation	Dimension (mm)				Coated			Feed (mm/rev)	Configuration
		W	L	B	R	NV3005	NV3025	NV3065		
 <p>F1M</p>	2NG30N-02G-F1M	3	20	2.2	0.2	○	●	○	0.05~0.18	
	2NG30N-03G-F1M	3	20	2.2	0.3	○	●	○	0.05~0.20	
	2NG30N-04G-F1M	3	20	2.2	0.4	○	●	○	0.05~0.20	
	2NG30N-06G-F1M	3	20	2.2	0.6	○	●	○	0.05~0.22	
	2NG30N-08G-F1M	3	20	2.2	0.8	○	●	○	0.05~0.22	
	2NG40N-02G-F1M	4	20	3.2	0.2	○	●	○	0.05~0.18	
	2NG40N-03G-F1M	4	20	3.2	0.3	○	●	○	0.05~0.20	
	2NG40N-04G-F1M	4	20	3.2	0.4	○	●	○	0.05~0.20	
	2NG40N-06G-F1M	4	20	3.2	0.6	○	●	○	0.05~0.22	
	2NG40N-08G-F1M	4	20	3.2	0.8	○	●	○	0.05~0.22	
	2NG50N-02G-F1M	5	25	4	0.2	○	●	○	0.03~0.12	
	2NG50N-03G-F1M	5	25	4	0.3	○	●	○	0.05~0.20	
	2NG50N-04G-F1M	5	25	4	0.4	○	●	○	0.05~0.20	
	2NG50N-06G-F1M	5	25	4	0.6	○	●	○	0.05~0.25	
2NG50N-08G-F1M	5	25	4	0.8	○	●	○	0.05~0.25		
 <p>M1 (Radius)</p>	2NG20R-10G-M1	2	20	1.7	1	○	●	○	0.03~0.15	
	2NG30R-15G-M1	3	20	2.2	1.5	○	●	○	0.05~0.20	
	2NG40R-20G-M1	4	20	3.2	2	○	●	○	0.05~0.22	
	2NG50R-25G-M1	5	25	4	2.5	○	●	○	0.05~0.25	
	2NG60R-30G-M1	6	25	5	3	○	●	○	0.05~0.25	
	2NG80R-40G-M1	8	30.3	6	4	○	●	○	0.05~0.30	
 <p>F1 (Radius)</p>	2NG30R-15G-F1	3	20	2.2	1.5	○	●	○	0.05~0.15	
	2NG40R-20G-F1	4	20	3.2	2	○	●	○	0.05~0.20	
	2NG50R-25G-F1	5	25	4	2.5	○	●	○	0.05~0.22	
 <p>C1</p>	2NG20C-02G-L/Rα-C1	2	20	1.7	0.2	○	●	○	0.03~0.12	
	2NG20C-03G-L/Rα-C1	2	20	1.7	0.3	○	●	○	0.03~0.15	
	2NG20C-04G-L/Rα-C1	2	20	1.7	0.4	○	●	○	0.03~0.20	
	2NG30C-02G-L/Rα-C1	3	20	2.2	0.2	○	●	○	0.03~0.15	
	2NG30C-03G-L/Rα-C1	3	20	2.2	0.3	○	●	○	0.03~0.18	
2NG30C-04G-L/Rα-C1	3	20	2.2	0.4	○	●	○	0.03~0.20		

● Stock item

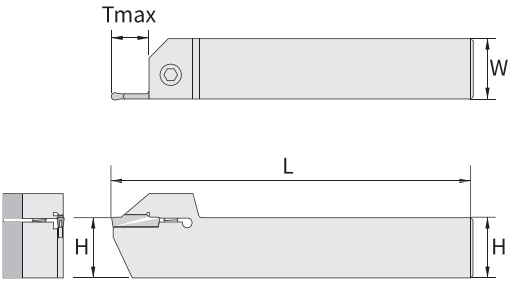


# GROOVING TOOL HOLDER SERIES

Application	Designation	Dimension (mm)					Configuration
		Insert width	H	W	L	Tmax	
External holder	NG2EHR/L2020-T09	2	20	20	125	9	 <p>※ Right hand shown</p>
	NG2EHR/L2020-T13		20	20	125	13	
	NG2EHR/L2020-T15		20	20	125	15	
	NG2EHR/L2525-T09		25	25	150	9	
	NG2EHR/L2525-T13		25	25	150	13	
	NG2EHR/L2525-T15		25	25	150	15	
	NG2EHR/L2525-T17		25	25	150	17	
	NG2EHR/L3225-T09		32	25	150	9	
	NG2EHR/L3225-T13		32	25	150	13	
	NG2EHR/L3225-T15		32	25	150	15	
	NG2EHR/L3225-T17	32	25	150	17		
	NG3EHR/L2020-T09	3	20	20	120	9	
	NG3EHR/L2020-T11		20	20	120	11	
	NG3EHR/L2020-T13		20	20	120	13	
	NG3EHR/L2020-T15		20	20	120	15	
	NG3EHR/L2020-T17		20	20	120	17	
	NG3EHR/L2020-T20		20	20	120	20	
	NG3EHR/L2525-T09		25	25	150	9	
	NG3EHR/L2525-T11		25	25	150	11	
	NG3EHR/L2525-T13		25	25	150	13	
	NG3EHR/L2525-T15		25	25	150	15	
	NG3EHR/L2525-T17		25	25	150	17	
	NG3EHR/L2525-T20		25	25	150	20	
	NG3EHR/L3225-T09		32	25	150	9	
	NG3EHR/L3225-T11		32	25	150	11	
	NG3EHR/L3225-T13		32	25	150	13	
	NG3EHR/L3225-T15		32	25	150	15	
	NG3EHR/L3225-T17		32	25	150	17	
	NG3EHR/L3225-T20		32	25	150	20	
	NG3EHR/L3232-T09		32	32	150	9	
	NG3EHR/L3232-T11		32	32	150	11	
	NG3EHR/L3232-T13	32	32	150	13		
	NG3EHR/L3232-T15	32	32	150	15		
	NG3EHR/L3232-T17	32	32	150	17		
	NG3EHR/L3232-T20	32	32	150	20		
	NG4EHR/L2020-T09	4	20	20	125	9	
	NG4EHR/L2020-T11		20	20	125	11	
	NG4EHR/L2020-T13		20	20	125	13	
	NG4EHR/L2020-T15		20	20	125	15	
	NG4EHR/L2525-T09		25	25	150	9	
	NG4EHR/L2525-T11		25	25	150	11	
	NG4EHR/L2525-T13		25	25	150	13	
	NG4EHR/L2525-T15		25	25	150	15	
	NG4EHR/L3225-T09		32	25	150	9	
	NG4EHR/L3225-T11		32	25	150	11	
	NG4EHR/L3225-T13		32	25	150	13	
	NG4EHR/L3225-T15		32	25	150	15	
	NG4EHR/L3225-T17		32	25	150	17	
NG4EHR/L3225-T20	32		25	150	20		

\*Holder can be customized by customer's order

# GROOVING TOOL HOLDER SERIES

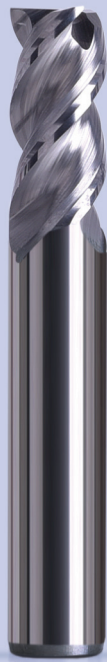
Application	Designation	Dimension (mm)					Configuration
		Insert width	H	W	L	Tmax	
External holder	NG5EHR/L2525-T15	5	25	25	150	15	 <p>※ Right hand shown</p>
	NG5EHR/L2525-T20		25	25	150	20	
	NG5EHR/L3225-T15		32	25	150	15	
	NG5EHR/L3225-T20		32	25	150	20	
	NG5EHR/L3225-T25		32	25	150	25	
	NG5EHR/L3232-T15	6	32	32	170	15	
	NG5EHR/L3232-T20		32	32	170	20	
	NG5EHR/L3232-T25		32	32	170	25	
	NG6EHR/L2525-T15		25	25	150	15	
	NG6EHR/L2525-T20		25	25	150	20	
	NG6EHR/L2525-T25	25	25	150	25		
	NG6EHR/L3225-T15	8	32	25	150	15	
	NG6EHR/L3225-T20		32	25	150	20	
	NG6EHR/L3225-T25		32	25	150	25	
	NG6EHR/L3232-T15		32	32	170	15	
	NG6EHR/L3232-T20		32	32	170	20	
	NG6EHR/L3232-T25	32	32	170	25		
	NG8EHR/L3225-T15	8	32	25	170	15	
	NG8EHR/L3225-T20		32	25	170	20	
	NG8EHR/L3225-T25		32	25	170	25	
	NG8EHR/L3225-T30		32	25	170	30	
	NG8EHR/L3232-T15		32	32	170	15	
	NG8EHR/L3232-T20		32	32	170	20	
	NG8EHR/L3232-T25		32	32	170	25	
NG8EHR/L3232-T30	32		32	170	30		
NG8EHR/L3232-T32	32		32	170	32		

\*Holder can be customized by customer's order

# GROOVING TOOL

Meet the best NANOTECHNOLOGY





**NANOLOY** ● ● ● ●

# END MILLS SERIES

## “SOLID CARBIDE ENDMILLS” SERIES

Excellent tool life with superior NANO ultrafine grade

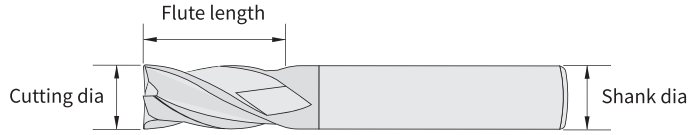
“N-SM” for stainless steel machining.

“N-SH” for high hardened steel machining.

“N-SG” for general material machining.

# End mills

## Numbering system (End mills)



### End mills

**N B G R 4 (R) - (MH)**

Nanoloy	Type	Workpiece	Neck type	Number of flutes	( ) : general end mill R : roughing end mill	Modular type ( ) : Solid MH : Shrinkage fit MT : Screw
	B : Ball R : Corner R F : Flat C : Chamfer D : Drill	H : Hardened M : Stainless S : HRSA N : Non-ferrous G : General D : Graphite	S : Standard R : Rib N : Tapered			

**- 005 - (0005) - (05) - 003 - S04 - L80**

Cutting dia	Corner R & Chamfer	Taper angle	Flute length	Shank dia	Overall length
0.5mm : 005 1mm : 010	0.05mm : 0005 0.1mm : 0010	0°30' : 05 1°30' : 15	3mm : 030 4mm : 040	Ø4mm : S04 Ø8mm : S08	80mm : L80

# END MILLS

Meet the best NANOTECHNOLOGY



END MILLS

N-SM SOLID END MILLS

# N-SM Series

## End mills for stainless steel

1. Superior material, coating, geometry for stainless steel & Ni based alloy & Ti alloy machining
2. Excellent performance in ISO M,S group
3. Wide range of applications with various geometries and specifications



### PRODUCT FEATURE

Unique powder, special geometry, coating guarantee excellent cutting performance in stainless steel & Ni based alloy & Ti alloy machining

- Provide highest machining quality and tool life with excellent cutting edge in difficult to cut materials machining
- Longer tool life and minimization cutting force with high rake angle and enhanced edge resistance

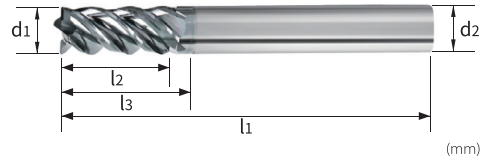
### Recommended cutting conditions

Material group	Stainless steel		HRSA	
	Dia (mm)	RPM	Feed (mm/rev)	RPM
2	5,400	240	2,500	90
4	4,000	250	2,000	95
6	3,200	350	1,250	95
8	2,000	380	1,050	100
10	1,600	400	800	115



## N-SM SOLID END MILLS SERIES

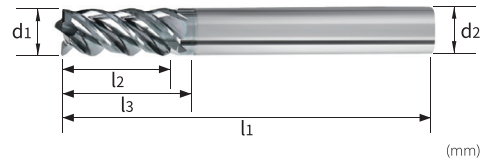
### Short Flat End mills



Designation	d1	d2	l1	l2	l3	z
NFMS4-020-060-S04-L45	2.00	4.0	45.00	4.00	6.00	4
NFMS4-040-080-S04-L50	4.00	4.0	50.00	6.00	8.00	4
NFMS4-050-150-S06-L55	5.00	6.0	55.00	8.00	15.00	4
NFMS4-060-150-S06-L55	6.00	6.0	55.00	10.00	15.00	4
NFMS4-080-200-S08-L60	8.00	8.0	60.00	12.00	20.00	4
NFMS4-100-220-S10-L70	10.00	10.0	70.00	15.00	22.00	4
NFMS4-120-260-S12-L75	12.00	12.0	75.00	18.00	26.00	4

Order made / Possible to ordered by changing d1,l2,l3

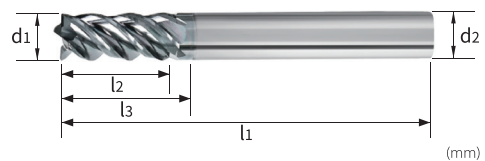
### Medium Flat End mills



Designation	d1	d2	l1	l2	l3	z
NFMS4-020-080-S04-L50	2.00	4.0	50.00	6.00	8.00	4
NFMS4-040-160-S04-L55	4.00	4.0	55.00	12.00	16.00	4
NFMS4-050-200-S06-L60	5.00	6.0	60.00	15.00	20.00	4
NFMS4-060-200-S06-L60	6.00	6.0	60.00	15.00	20.00	4
NFMS4-080-250-S08-L70	8.00	8.0	70.00	20.00	25.00	4
NFMS4-100-260-S10-L80	10.00	10.0	80.00	22.00	26.00	4
NFMS4-120-300-S12-L80	12.00	12.0	80.00	26.00	30.00	4

Order made / Possible to ordered by changing d1,l2,l3

### Long Flat End mills



Designation	d1	d2	l1	l2	l3	z
NFMS4-020-120-S04-L55	2.00	4.0	55.00	8.00	12.00	4
NFMS4-040-220-S04-L60	4.00	4.0	60.00	18.00	22.00	4
NFMS4-050-220-S06-L60	5.00	6.0	60.00	18.00	22.00	4
NFMS4-060-300-S06-L80	6.00	6.0	80.00	25.00	30.00	4
NFMS4-080-300-S08-L80	8.00	8.0	80.00	25.00	30.00	4
NFMS4-100-350-S10-L100	10.00	10.0	100.00	30.00	35.00	4
NFMS4-120-350-S12-L100	12.00	12.0	100.00	30.00	35.00	4

Order made / Possible to ordered by changing d1,l2,l3

N-SH SOLID END MILLS

# N-SH Series

## End mills for high hardened material

1. Specially designed for machining high hardened material (HRC45~65)
2. Excellent quality and performance for automotive and mold industry
3. Apply optimal design for cutting edge and coating improve wear resistance and toughness



## PRODUCT FEATURE

Apply for optimized material and coating guarantee excellent cutting and tool life in automobile and mold industry hardened material machining



- Improve productivity and reduce cutting force at high speed machining
- Improve surface quality and high precision machining with high quality of end mills
- Stable machining with optimized rake-angle and clearance angle
- Excellent tool life with excellent NANO ultrafine grade and coating

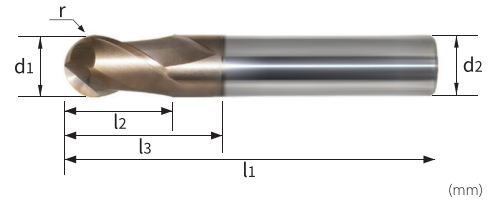
## Recommended cutting conditions

Material group	High hardened Steel	
Dia (mm)	RPM	Feed (mm/rev)
2	4,200	230
4	3,100	270
6	2,500	270
8	2,100	290
10	1,600	300

## N-SH SOLID END MILLS SERIES

### Short Ball End mills



WC   30°  $d_1$   $d_1$   $r$   $r$   
 $0 \sim 0.01$   $\begin{matrix} -0.01 \\ \sim -0.025 \end{matrix}$   $\pm 0.005$   $\pm 0.01$   
 $d_1 \leq 5$   $d_1 > 5$   $r \leq 2.5$   $r > 2.5$

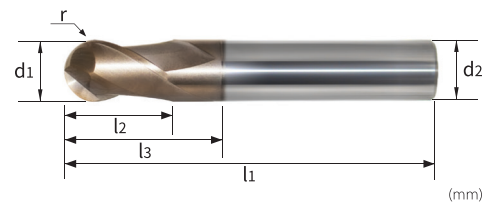


Designation	d1	r	d2	l1	l2	l3	z
NBHS2-040-020-080-S04-L45	4.00	2.00	4.0	45	6.0	8.0	2
NBHS2-060-030-100-S06-L55	6.00	3.00	6.0	55	7.0	10.0	2
NBHS2-080-040-120-S08-L55	8.00	4.00	8.0	55	9.0	12.0	2
NBHS2-100-050-130-S10-L65	10.00	5.00	10.0	65	10.0	13.0	2
NBHS2-120-060-170-S12-L70	12.00	6.00	12.0	70	14.0	17.0	2

Order made / Possible to ordered by changing d1,l2,l3

### Medium Ball End mills



WC   30°  $d_1$   $d_1$   $r$   $r$   
 $0 \sim 0.01$   $\begin{matrix} -0.01 \\ \sim -0.025 \end{matrix}$   $\pm 0.005$   $\pm 0.01$   
 $d_1 \leq 5$   $d_1 > 5$   $r \leq 2.5$   $r > 2.5$

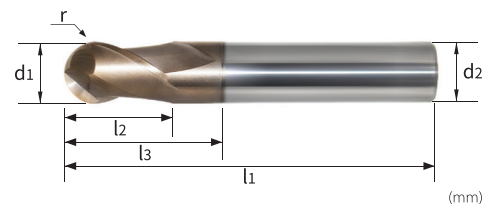


Designation	d1	r	d2	l1	l2	l3	z
NBHS2-040-020-140-S04-L55	4.00	2.00	4.0	55	12.0	14.0	2
NBHS2-060-030-180-S06-L55	6.00	3.00	6.0	55	16.0	18.0	2
NBHS2-080-040-230-S08-L60	8.00	4.00	8.0	60	20.0	23.0	2
NBHS2-100-050-250-S10-L70	10.00	5.00	10.0	70	22.0	25.0	2
NBHS2-120-060-280-S12-L80	12.00	6.00	12.0	80	25.0	28.0	2

Order made / Possible to ordered by changing d1,l2,l3

### Long Ball End mills

WC   30°  $d_1$   $d_1$   $r$   $r$   
 $0 \sim 0.01$   $\begin{matrix} -0.01 \\ \sim -0.025 \end{matrix}$   $\pm 0.005$   $\pm 0.01$   
 $d_1 \leq 5$   $d_1 > 5$   $r \leq 2.5$   $r > 2.5$

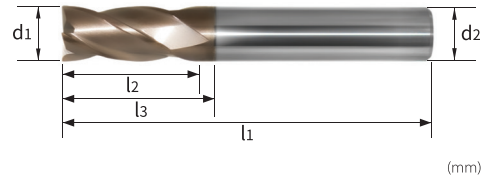


Designation	d1	r	d2	l1	l2	l3	z
NBHS2-040-020-170-S04-L70	4.00	2.00	4.0	70	15.0	17.0	2
NBHS2-060-030-230-S06-L80	6.00	3.00	6.0	80	20.0	23.0	2
NBHS2-080-040-280-S08-L90	8.00	4.00	8.0	90	25.0	28.0	2
NBHS2-100-050-280-S10-L100	10.00	5.00	10.0	100	25.0	28.0	2
NBHS2-120-060-330-S12-L110	12.00	6.00	12.0	110	30.0	33.0	2

Order made / Possible to ordered by changing d1,l2,l3

## N-SH SOLID END MILLS SERIES

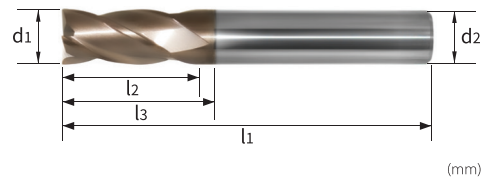
### Short Flat End mills



Designation	d1	d2	l1	l2	l3	z
NFHS4-020-060-S04-L45	2.00	4.0	45.00	4.00	6.00	4
NFHS4-040-080-S04-L50	4.00	4.0	50.00	6.00	8.00	4
NFHS4-050-150-S06-L55	5.00	6.0	55.00	8.00	15.00	4
NFHS4-060-150-S06-L55	6.00	6.0	55.00	10.00	15.00	4
NFHS4-080-200-S08-L60	8.00	8.0	60.00	12.00	20.00	4
NFHS4-100-220-S10-L70	10.00	10.0	70.00	15.00	22.00	4
NFHS4-120-260-S12-L75	12.00	12.0	75.00	18.00	26.00	4

Order made / Possible to ordered by changing d1,l2,l3

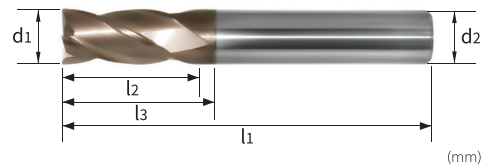
### Medium Flat End mills



Designation	d1	d2	l1	l2	l3	z
NFHS4-020-080-S04-L50	2.00	4.0	50.00	6.00	8.00	4
NFHS4-040-160-S04-L55	4.00	4.0	55.00	12.00	16.00	4
NFHS4-050-200-S06-L60	5.00	6.0	60.00	15.00	20.00	4
NFHS4-060-200-S06-L60	6.00	6.0	60.00	15.00	20.00	4
NFHS4-080-250-S08-L70	8.00	8.0	70.00	20.00	25.00	4
NFHS4-100-260-S10-L80	10.00	10.0	80.00	22.00	26.00	4
NFHS4-120-300-S12-L80	12.00	12.0	80.00	26.00	30.00	4

Order made / Possible to ordered by changing d1,l2,l3

### Long Flat End mills





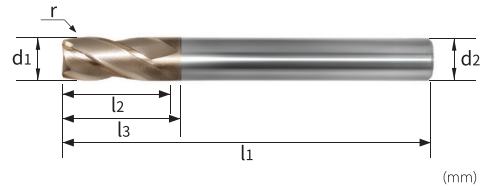
Designation	d1	d2	l1	l2	l3	z
NFHS4-020-120-S04-L55	2.00	4.0	55.00	8.00	12.00	4
NFHS4-040-220-S04-L60	4.00	4.0	60.00	18.00	22.00	4
NFHS4-050-220-S06-L60	5.00	6.0	60.00	18.00	22.00	4
NFHS4-060-300-S06-L80	6.00	6.0	80.00	25.00	30.00	4
NFHS4-080-300-S08-L80	8.00	8.0	80.00	25.00	30.00	4
NFHS4-100-350-S10-L100	10.00	10.0	100.00	30.00	35.00	4
NFHS4-120-350-S12-L100	12.00	12.0	100.00	30.00	35.00	4

Order made / Possible to ordered by changing d1,l2,l3

# N-SH SOLID END MILLS SERIES

## Corner Radius End mills

WC			30°	d <sub>1</sub> 0~-0.01 d <sub>1</sub> ≤5	d <sub>1</sub> -0.01 ~-0.025 d <sub>1</sub> >5	r ±0.005 r≤0.5	r ±0.01 0.5<r≤2	r ±0.01 r>2
----	---	---	-----	--	---	----------------------	-----------------------	-------------------



Designation	d1	r	d2	l1	l2	l3	z
NRHS4-040-003-170-S04-L55	4.00	0.30	4.0	55.00	15.00	17.00	4
NRHS4-040-005-170-S04-L55	4.00	0.50	4.0	55.00	15.00	17.00	4
NRHS4-050-003-170-S06-L60	5.00	0.30	6.0	60.00	15.00	17.00	4
NRHS4-050-005-170-S06-L60	5.00	0.50	6.0	60.00	15.00	17.00	4
NRHS4-060-003-230-S06-L60	6.00	0.30	6.0	60.00	20.00	23.00	4
NRHS4-060-005-230-S06-L60	6.00	0.50	6.0	60.00	20.00	23.00	4
NRHS4-060-010-230-S06-L60	6.00	1.00	6.0	60.00	20.00	23.00	4
NRHS4-080-003-280-S08-L70	8.00	0.30	8.0	70.00	25.00	28.00	4
NRHS4-080-005-280-S08-L70	8.00	0.50	8.0	70.00	25.00	28.00	4
NRHS4-080-003-280-S08-L70	8.00	1.00	8.0	70.00	25.00	28.00	4
NRHS4-080-003-280-S08-L70	8.00	1.50	8.0	70.00	25.00	28.00	4
NRHS4-080-003-280-S08-L70	8.00	2.00	8.0	70.00	25.00	28.00	4
NRHS4-100-003-330-S10-L90	10.00	0.30	10.0	90.00	30.00	33.00	4
NRHS4-100-005-330-S10-L90	10.00	0.50	10.0	90.00	30.00	33.00	4
NRHS4-100-010-330-S10-L90	10.00	1.00	10.0	90.00	30.00	33.00	4
NRHS4-100-015-330-S10-L90	10.00	1.50	10.0	90.00	30.00	33.00	4
NRHS4-100-020-330-S10-L90	10.00	2.00	10.0	90.00	30.00	33.00	4
NRHS4-120-005-330-S12-L90	12.00	0.50	12.0	90.00	30.00	33.00	4
NRHS4-120-010-330-S12-L90	12.00	1.00	12.0	90.00	30.00	33.00	4
NRHS4-120-015-330-S12-L90	12.00	1.50	12.0	90.00	30.00	33.00	4
NRHS4-120-020-330-S12-L90	12.00	2.00	12.0	90.00	30.00	33.00	4

Order made / Possible to ordered by changing d1,l2,l3

N-SG SOLID END MILLS

# N-SG Series

## End mills for General material

1. Superior material, coating, geometry for general materials (HRC 50 ↓)
2. Excellent quality and performance for mold and parts machining
3. Wide range of applications with various geometries and specifications



### PRODUCT FEATURE

Apply for optimized material and coating guarantee excellent cutting and tool life in mold and parts for general material machining.

- Improve wear resistance with NANO ultrafine grade
- Improve surface quality, high precision machining with high quality of end mills
- Stable machining with optimized rake-angle and clearance

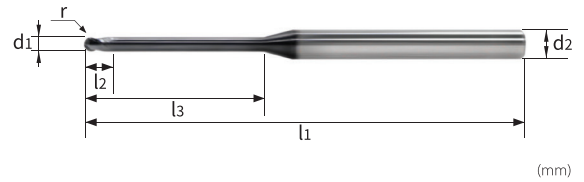
### Recommended cutting conditions

Material group Dia (mm)	Under HRC30		Under HRC45	
	RPM	Feed (mm/rev)	RPM	Feed (mm/rev)
2	18,000	1,500	16,000	1,200
4	12,000	1,300	10,000	1,000
6	10,000	1,600	9,000	1,300
8	8,000	1,500	7,000	1,200
10	6,000	1,000	5,000	800

# N-SG SOLID END MILLS SERIES

## Ball End mills (Rib type)

WC			$35^\circ$	$d_1$	$d_1$	$r$	$r$
				$0 \sim 0.01$	$-0.005 \sim -0.015$	$\pm 0.005$	$\pm 0.01$
				$d_1 \leq 5$	$d_1 > 5$	$r \leq 2.5$	$r > 2.5$

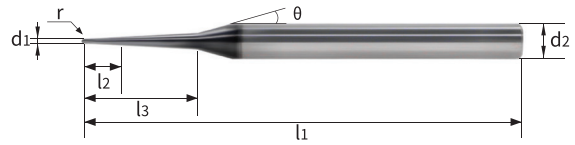


Designation	d1	d2	r	l1	l2	l3	z
NBGR2-001-0005-003-S04-L40	0.1	4	0.05	40	0.3	-	2
NBGR2-002-001-010-S04-L40	0.2	4	0.10	40	0.2	1	2
NBGR2-003-0015-020-S04-L40	0.3	4	0.15	40	0.3	2	2
NBGR2-004-002-030-S04-L40	0.4	4	0.20	40	0.5	3	2
NBGR2-005-0025-040-S04-L45	0.5	4	0.25	45	0.6	4	2
NBGR2-005-0025-080-S04-L45	0.5	4	0.25	45	0.6	8	2
NBGR2-006-003-050-S04-L45	0.6	4	0.30	45	0.7	5	2
NBGR2-006-003-120-S04-L45	0.6	4	0.30	45	0.7	12	2
NBGR2-007-0035-080-S04-L45	0.7	4	0.35	45	0.8	8	2
NBGR2-008-004-100-S04-L45	0.8	4	0.40	45	0.9	10	2
NBGR2-010-005-050-S04-L45	1.0	4	0.50	45	1.2	5	2
NBGR2-010-005-120-S04-L50	1.0	4	0.50	50	1.2	12	2
NBGR2-010-005-200-S04-L50	1.0	4	0.50	50	1.2	20	2
NBGR2-012-006-060-S04-L45	1.2	4	0.60	45	1.4	6	2
NBGR2-012-006-120-S04-L50	1.2	4	0.60	50	1.4	12	2
NBGR2-014-007-120-S04-L50	1.4	4	0.70	50	1.6	12	2
NBGR2-015-0075-060-S04-L45	1.5	4	0.75	45	1.8	6	2
NBGR2-015-0075-140-S04-L50	1.5	4	0.75	50	1.8	14	2
NBGR2-015-0075-250-S04-L60	1.5	4	0.75	60	1.8	25	2
NBGR2-016-008-160-S04-L50	1.6	4	0.80	50	1.9	16	2
NBGR2-018-009-160-S04-L50	1.8	4	0.90	50	2.1	16	2
NBGR2-020-010-080-S04-L45	2.0	4	1.00	45	2.4	8	2
NBGR2-020-010-180-S04-L50	2.0	4	1.00	50	2.4	18	2
NBGR2-020-010-300-S04-L70	2.0	4	1.00	70	2.4	30	2
NBGR2-025-0125-200-S04-L50	2.5	4	1.25	50	3.0	20	2
NBGR2-030-015-200-S06-L60	3.0	6	1.50	60	3.6	20	2
NBGR2-030-015-450-S06-L90	3.0	6	1.50	90	3.6	45	2
NBGR2-040-020-250-S06-L65	4.0	6	2.00	65	4.8	25	2
NBGR2-040-020-450-S06-L90	4.0	6	2.00	90	4.8	45	2
NBGR2-050-025-250-S06-L70	5.0	6	2.50	70	6.0	25	2
NBGR2-060-030-300-S06-L110	6.0	6	3.00	110	10.0	30	2
NBGR2-080-040-300-S08-L100	8.0	8	4.00	100	12.0	30	2
NBGR2-100-050-350-S10-L100	10.0	10	5.00	100	16.0	35	2
NBGR2-120-060-400-S12-L110	12.0	12	6.00	110	18.0	40	2

Order made / Possible to ordered by changing d1,l2,l3

## N-SG SOLID END MILLS SERIES

### Ball End mills (Taper type)



WC			$d_1$ 0~0.01	$d_1$ -0.005 ~ -0.015	$r$ ±0.005	$r$ ±0.01
			$d_1 \leq 5$	$d_1 > 5$	$r \leq 2.5$	$r > 2.5$

(mm)

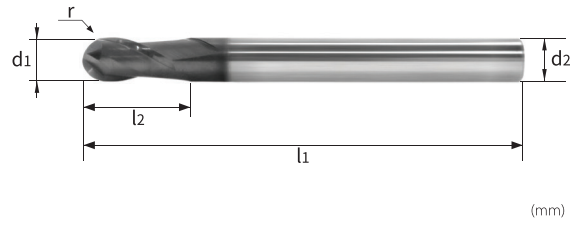
Designation	d1	d2	r	l1	l2	l3	θ	Z
NBGN2-002-001-15-020-S04-L40	0.2	4	0.10	40	0.2	2	1°30	2
NBGN2-002-001-20-025-S04-L40	0.2	4	0.10	40	0.2	2.5	2°	2
NBGN2-003-0015-05-030-S04-L40	0.3	4	0.15	40	0.3	3	0°30	2
NBGN2-003-0015-15-030-S04-L40	0.3	4	0.15	40	0.3	3	1°30	2
NBGN2-003-0015-20-050-S04-L40	0.3	4	0.15	40	0.3	5	2°	2
NBGN2-004-002-05-030-S04-L40	0.4	4	0.20	40	0.4	3	0°30	2
NBGN2-004-002-15-040-S04-L40	0.4	4	0.20	40	0.4	4	1°30	2
NBGN2-004-002-20-050-S04-L40	0.4	4	0.20	40	0.4	5	2°	2
NBGN2-005-0025-05-040-S04-L45	0.5	4	0.25	45	0.5	4	0°30	2
NBGN2-005-0025-15-060-S04-L45	0.5	4	0.25	45	0.5	6	1°30	2
NBGN2-005-0025-20-080-S04-L45	0.5	4	0.25	45	0.5	8	2°	2
NBGN2-006-003-05-060-S04-L45	0.6	4	0.30	45	0.6	6	0°30	2
NBGN2-006-003-15-080-S04-L45	0.6	4	0.30	45	0.6	8	1°30	2
NBGN2-006-003-20-100-S04-L45	0.6	4	0.30	45	0.6	10	2°	2
NBGN2-008-004-05-080-S04-L45	0.8	4	0.40	45	0.8	8	0°30	2
NBGN2-008-004-15-100-S04-L45	0.8	4	0.40	45	0.8	10	1°30	2
NBGN2-008-004-20-120-S04-L50	0.8	4	0.40	50	0.8	12	2°	2
NBGN2-008-004-30-160-S04-L50	0.8	4	0.40	50	0.8	16	3°	2
NBGN2-010-005-05-080-S04-L50	1.0	4	0.50	50	1.0	8	0°30	2
NBGN2-010-005-15-100-S04-L50	1.0	4	0.50	50	1.0	10	1°30	2
NBGN2-010-005-20-200-S04-L50	1.0	4	0.50	50	1.0	20	2°	2
NBGN2-010-005-30-300-S06-L70	1.0	6	0.50	70	1.0	30	3°	2
NBGN2-012-006-05-080-S04-L50	1.2	4	0.60	50	1.2	8	0°30	2
NBGN2-012-006-15-120-S04-L50	1.2	4	0.60	50	1.2	12	1°30	2
NBGN2-012-006-20-240-S04-L60	1.2	4	0.60	60	1.2	24	2°	2
NBGN2-015-0075-05-120-S04-L50	1.5	4	0.75	50	1.5	12	0°30	2
NBGN2-015-0075-15-150-S04-L50	1.5	4	0.75	50	1.5	15	1°30	2
NBGN2-015-0075-20-300-S04-L70	1.5	4	0.75	70	1.5	30	2°	2
NBGN2-015-0075-20-420-S06-L80	1.5	6	0.75	80	1.5	42	3°	2
NBGN2-020-010-05-120-S04-L50	2.0	4	1.00	50	2.0	12	0°30	2
NBGN2-020-010-15-160-S04-L50	2.0	4	1.00	50	2.0	16	1°30	2
NBGN2-020-010-20-300-S06-L70	2.0	6	1.00	70	2.0	30	2°	2
NBGN2-020-010-30-400-S06-L80	2.0	6	1.00	80	2.0	40	3°	2
NBGN2-030-015-05-160-S06-L60	3.0	6	1.50	60	3.0	16	0°30	2
NBGN2-030-015-15-160-S06-L60	3.0	6	1.50	60	3.0	16	1°30	2
NBGN2-030-015-20-300-S06-L70	3.0	6	1.50	70	3.0	30	2°	2
NBGN2-030-015-30-500-S08-L90	3.0	8	1.50	90	3.0	50	3°	2
NBGN2-040-020-15-450-S06-L90	4.0	6	2.00	90	4.0	45	1°30	2
NBGN2-040-020-30-250-S06-L70	4.0	6	2.00	70	4.0	25	3°	2
NBGN2-050-025-15-400-S08-L90	5.0	8	2.50	90	5.0	40	1°30	2
NBGN2-050-025-30-400-S08-L90	5.0	8	2.50	90	5.0	40	3°	2
NBGN2-060-030-15-490-S08-L110	6.0	8	3.00	110	9.0	49	1°30	2
NBGN2-060-030-30-290-S08-L90	6.0	8	3.00	90	9.0	29	3°	2
NBGN2-080-040-15-520-S10-L110	8.0	10	4.00	110	12.0	52	1°30	2
NBGN2-080-040-30-330-S10-L100	8.0	10	4.00	100	12.0	33	3°	2
NBGN2-100-040-30-540-S12-L130	10.0	12	5.00	130	18.0	54	1°30	2
NBGN2-100-050-30-370-S12-L110	10.0	12	5.00	110	18.0	37	3°	2
NBGN2-120-060-15-850-S16-L160	12.0	16	6.00	160	22.0	85	1°30	2

Order made / Possible to ordered by changing d1,l2,l3



# N-SG SOLID END MILLS SERIES

## Ball End mills (Standard type)



WC			35°	d <sub>1</sub> 0~0.01	d <sub>1</sub> -0.005 ~0.015	r ±0.005	r ±0.01
				d <sub>1</sub> ≤5	d <sub>1</sub> >5	r≤2.5	r>2.5

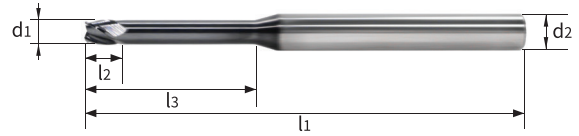
Designation	d1	d2	r	l1	l2	Z
NBGS2-010-005-025-S06-L50	1	6	0.5	50	2.5	2
NBGS2-010-005-025-S06-L70	1	6	0.5	70	2.5	2
NBGS2-010-005-025-S06-L100	1	6	0.5	100	2.5	2
NBGS2-012-006-030-S04-L50	1.2	4	0.6	50	3	2
NBGS2-015-0075-040-S04-L50	1.5	4	0.75	50	4	2
NBGS2-015-0075-040-S06-L50	1.5	6	0.75	50	4	2
NBGS2-015-0075-040-S06-L70	1.5	6	0.75	70	4	2
NBGS2-015-0075-040-S06-L100	1.5	6	0.75	100	4	2
NBGS2-020-010-050-S06-L50	2	6	1	50	5	2
NBGS2-020-010-050-S06-L75	2	6	1	75	5	2
NBGS2-020-010-050-S06-L100	2	6	1	100	5	2
NBGS2-025-0125-060-S04-L50	2.5	4	1.25	50	6	2
NBGS2-025-0125-060-S06-L60	2.5	6	1.25	60	6	2
NBGS2-025-0125-060-S06-L75	2.5	6	1.25	75	6	2
NBGS2-025-0125-060-S06-L100	2.5	6	1.25	100	6	2
NBGS2-030-015-080-S04-L50	3	4	1.5	50	8	2
NBGS2-030-015-080-S06-L80	3	6	1.5	80	8	2
NBGS2-030-015-080-S06-L100	3	6	1.5	100	8	2
NBGS2-035-0175-080-S06-L60	3.5	6	1.75	60	8	2
NBGS2-040-020-080-S04-L80	4	4	2	80	8	2
NBGS2-040-020-080-S06-L70	4	6	2	70	8	2
NBGS2-040-020-080-S06-L90	4	6	2	90	8	2
NBGS2-040-020-080-S06-L120	4	6	2	120	8	2
NBGS2-045-0225-080-S06-L70	4.5	6	2.25	70	8	2
NBGS2-050-025-100-S06-L75	5	6	2.5	75	10	2
NBGS2-055-0275-100-S06-L75	5.5	6	2.75	75	10	2
NBGS2-060-030-100-S06-L60	6	6	3	60	10	2
NBGS2-060-030-120-S06-L100	6	6	3	100	12	2
NBGS2-060-030-120-S06-L120	6	6	3	120	12	2
NBGS2-070-035-140-S08-L80	7	8	3.5	80	14	2
NBGS2-080-040-120-S08-L60	8	8	4	60	12	2
NBGS2-080-040-140-S08-L110	8	8	4	110	14	2
NBGS2-080-040-140-S08-L150	8	8	4	150	14	2
NBGS2-090-045-160-S10-L100	9	10	4.5	100	16	2
NBGS2-100-050-150-S10-L70	10	10	5	70	15	2
NBGS2-100-050-180-S10-L120	10	10	5	120	18	2
NBGS2-100-050-180-S10-L150	10	10	5	150	18	2
NBGS2-100-050-180-S10-L180	10	10	5	180	18	2
NBGS2-110-055-200-S12-L110	11	12	5.5	110	20	2
NBGS2-120-060-180-S12-L70	12	12	6	70	18	2
NBGS2-120-060-220-S12-L130	12	12	6	130	22	2
NBGS2-120-060-220-S12-L150	12	12	6	150	22	2
NBGS2-120-060-220-S12-L200	12	12	6	200	22	2
NBGS2-130-065-240-S14-L110	13	14	6.5	110	24	2
NBGS2-140-070-240-S14-L110	14	14	7	110	24	2
NBGS2-160-080-300-S16-L130	16	16	8	130	30	2
NBGS2-160-080-300-S16-L160	16	16	8	160	30	2
NBGS2-160-080-300-S16-L200	16	16	8	200	30	2
NBGS2-200-100-380-S20-L160	20	20	10	160	38	2
NBGS2-200-100-380-S20-L200	20	20	10	200	38	2

Order made / Possible to ordered by changing d1,l2,l3

# N-SG SOLID END MILLS SERIES

## Flat End mills (Rib type)

WC   35°  $d_1$   $d_1$   
0~-0.01    -0.01  
 ~-0.025  
 d1≤5    d1>5



(mm)

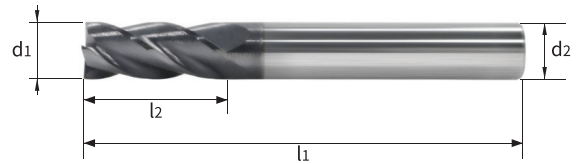
Designation	d1	d2	l1	l2	l3	z
NFGR2-001-003-S04-L40	0.1	4	40	0.3	-	2
NFGR2-002-005-S04-L40	0.2	4	40	0.3	0.5	2
NFGR2-003-020-S04-L40	0.3	4	40	0.3	2	2
NFGR2-004-030-S04-L40	0.4	4	40	0.5	3	2
NFGR2-005-040-S04-L45	0.5	4	45	0.6	4	2
NFGR2-006-050-S04-L45	0.6	4	45	0.7	5	2
NFGR2-007-060-S04-L45	0.7	4	45	0.8	6	2
NFGR2-008-080-S04-L45	0.8	4	45	0.9	8	2
NFGR2-009-100-S04-L45	0.9	4	45	1.0	10	2
NFGR2-010-040-S04-L45	1.0	4	45	1.2	4	2
NFGR2-010-120-S04-L50	1.0	4	50	1.2	12	2
NFGR2-010-200-S04-L50	1.0	4	50	1.2	20	2
NFGR2-012-120-S04-L50	1.2	4	50	1.4	12	2
NFGR2-014-140-S04-L50	1.4	4	50	1.6	14	2
NFGR2-015-080-S04-L45	1.5	4	45	1.8	8	2
NFGR2-016-180-S04-L50	1.6	4	50	1.9	18	2
NFGR2-018-180-S04-L50	1.8	4	50	2.1	18	2
NFGR2-020-100-S04-L50	2.0	4	50	2.4	10	2
NFGR2-020-200-S04-L50	2.0	4	50	2.4	20	2
NFGR2-020-300-S04-L70	2.0	4	70	2.4	30	2
NFGR2-025-200-S04-L50	2.5	4	50	3.0	20	2
NFGR2-030-100-S06-L50	3.0	6	50	3.6	10	2
NFGR2-030-250-S06-L65	3.0	6	65	3.6	25	2
NFGR2-030-450-S06-L90	3.0	6	90	3.6	45	2
NFGR2-040-120-S06-L50	4.0	6	50	4.8	12	2
NFGR2-040-300-S06-L70	4.0	6	70	4.8	30	2
NFGR2-040-500-S06-L100	4.0	6	100	4.8	50	2
NFGR2-050-350-S06-L75	5.0	6	75	6.0	35	2
NFGR2-060-400-S06-L80	6.0	6	80	10.0	40	2
NFGR2-080-400-S08-L100	8.0	8	100	12.0	40	2
NFGR2-100-450-S10-L100	10.0	10	100	15.0	45	2
NFGR2-120-500-S12-L120	12.0	12	120	18.0	50	2
NFGR4-008-060-S04-L45	0.8	4	45	0.9	6	4
NFGR4-010-080-S04-L45	1.0	4	45	1.2	8	4
NFGR4-010-160-S04-L50	1.0	4	50	1.2	16	4
NFGR4-012-100-S04-L50	1.2	4	50	1.4	10	4
NFGR4-015-100-S04-L50	1.5	4	50	1.8	10	4
NFGR4-020-060-S04-L50	2.0	4	50	2.4	12	4
NFGR4-020-060-S04-L60	2.0	4	60	2.4	25	4
NFGR4-025-120-S04-L50	2.5	4	50	3.0	12	4
NFGR4-030-160-S06-L55	3.0	6	55	3.6	16	4
NFGR4-040-200-S06-L60	4.0	6	60	4.8	20	4
NFGR4-040-450-S06-L90	4.0	6	90	4.8	45	4
NFGR4-050-250-S06-L65	5.0	6	65	6.0	25	4
NFGR4-060-300-S06-L75	6.0	6	75	10.0	30	4
NFGR4-080-400-S08-L100	8.0	8	100	12.0	40	4
NFGR4-100-450-S10-L110	10.0	10	110	15.0	45	4
NFGR4-120-500-S12-L120	12.0	12	120	18.0	50	4

Order made / Possible to ordered by changing d1,l2,l3

# N-SG SOLID END MILLS SERIES

## Flat End mills (Standard type)

WC   35°  $d_1$   $d_1$   
0~-0.01     -0.01  
 ~-0.025  
d1≤5     d1>5



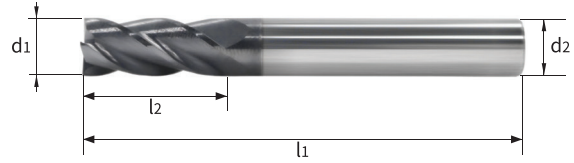
(mm)

Designation	d1	d2	l1	l2	z
NFGS2-001-002-S04-L38	0.1	4	38	0.2	2
NFGS2-002-004-S04-L38	0.2	4	38	0.4	2
NFGS2-003-006-S04-L38	0.3	4	38	0.6	2
NFGS2-004-008-S04-L38	0.4	4	38	0.8	2
NFGS2-005-010-S04-L38	0.5	4	38	1.0	2
NFGS2-006-012-S04-L38	0.6	4	38	1.2	2
NFGS2-007-014-S04-L38	0.7	4	38	1.4	2
NFGS2-008-016-S04-L38	0.8	4	38	1.6	2
NFGS2-009-020-S04-L38	0.9	4	38	2.0	2
NFGS2-010-025-S04-L40	1.0	4	40	2.5	2
NFGS2-012-030-S04-L40	1.2	4	40	3.0	2
NFGS2-014-035-S04-L40	1.4	4	40	3.5	2
NFGS2-016-040-S04-L40	1.6	4	40	4.0	2
NFGS2-018-045-S04-L40	1.8	4	40	4.5	2
NFGS2-020-060-S04-L40	2.0	4	40	6.0	2
NFGS2-025-080-S04-L45	2.5	4	45	8.0	2
NFGS2-030-080-S06-L45	3.0	6	45	8.0	2
NFGS2-040-110-S06-L45	4.0	6	45	11.0	2
NFGS2-050-130-S06-L50	5.0	6	50	13.0	2
NFGS2-060-130-S06-L50	6.0	6	50	13.0	2
NFGS2-080-190-S08-L60	8.0	8	60	19.0	2
NFGS2-100-220-S10-L70	10.0	10	70	22.0	2
NFGS2-120-260-S12-L75	12.0	12	75	26.0	2
NFGS4-008-020-S04-L40	0.8	4	40	2.0	4
NFGS4-010-025-S04-L40	1.0	4	40	2.5	4
NFGS4-012-030-S04-L40	1.2	4	40	3.0	4
NFGS4-015-040-S04-L40	1.5	4	40	4.0	4
NFGS4-020-060-S04-L40	2.0	4	40	6.0	4
NFGS4-025-080-S04-L45	2.5	4	45	8.0	4
NFGS4-030-080-S06-L45	3.0	6	45	8.0	4
NFGS4-040-110-S06-L45	4.0	6	45	11.0	4
NFGS4-050-130-S06-L50	5.0	6	50	13.0	4
NFGS4-060-130-S06-L50	6.0	6	50	13.0	4
NFGS4-080-190-S08-L60	8.0	8	60	19.0	4
NFGS4-100-220-S10-L70	10.0	10	70	22.0	4
NFGS4-120-260-S12-L75	12.0	12	75	26.0	4

Order made / Possible to ordered by changing d1,l2,l3

# N-SG SOLID END MILLS SERIES

Flat End mills (Standard type)



WC   35°  $d_1$   $d_1$   
0~0.01 -0.01  
-0.025  
d1≤5 d1>5

(mm)

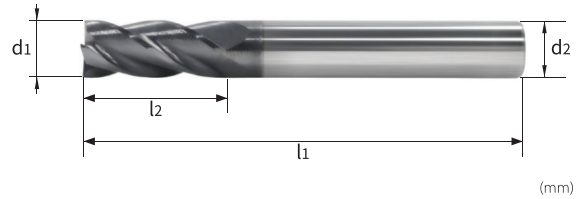
Designation	d1	d2	l1	l2	Z
NFGS4-010-025-S06-L40	1	6	40	2.5	4
NFGS4-010-025-S06-L60	1	6	60	2.5	4
NFGS4-010-025-S06-L80	1	6	80	2.5	4
NFGS4-010-040-S06-L50	1	6	50	4	4
NFGS4-020-060-S06-L40	2	6	40	6	4
NFGS4-020-060-S06-L60	2	6	60	6	4
NFGS4-020-060-S06-L100	2	6	100	6	4
NFGS4-030-080-S04-L45	3	4	45	8	4
NFGS4-030-080-S06-L70	3	6	70	8	4
NFGS4-030-080-S06-L100	3	6	100	8	4
NFGS4-035-100-S06-L45	3.5	6	45	10	4
NFGS4-040-110-S04-L45	4	4	45	11	4
NFGS4-040-110-S06-L70	4	6	70	11	4
NFGS4-040-110-S06-L100	4	6	100	11	4
NFGS4-045-110-S06-L45	4.5	6	45	11	4
NFGS4-050-130-S06-L80	5	6	80	13	4
NFGS4-050-130-S06-L100	5	6	100	13	4
NFGS4-055-130-S06-L50	5.5	6	50	13	4
NFGS4-060-130-S06-L80	6	6	80	13	4
NFGS4-060-130-S06-L100	6	6	100	13	4
NFGS4-065-160-S08-L60	6.5	8	60	16	4
NFGS4-070-160-S08-L60	7	8	60	16	4
NFGS4-075-160-S08-L60	7.5	8	60	16	4
NFGS4-085-190-S10-L70	8.5	10	70	19	4
NFGS4-090-190-S10-L70	9	10	70	19	4
NFGS4-095-190-S10-L70	9.5	10	70	19	4
NFGS4-100-250-S10-L75	10	10	75	25	4
NFGS4-105-220-S12-L75	10.5	12	75	22	4
NFGS4-110-220-S12-L75	11	12	75	22	4
NFGS4-120-300-S12-L80	12	12	80	30	4
NFGS4-140-260-S14-L80	14	14	80	26	4
NFGS4-140-260-S16-L85	14	16	85	26	4
NFGS4-160-350-S16-L100	16	16	100	35	4
NFGS4-160-400-S16-L100	16	16	100	40	4
NFGS4-180-350-S18-L100	18	18	100	35	4
NFGS4-200-400-S20-L100	20	20	100	40	4
NFGS4-200-450-S20-L100	20	20	100	45	4

Order made / Possible to ordered by changing d1,l2,l3

# N-SG SOLID END MILLS SERIES

Long Flat End mills (standard type)

WC   35°  $d_1$   $d_1$   
 $0 \sim -0.01$   $-0.01$   
 $d1 \leq 5$   $d1 > 5$



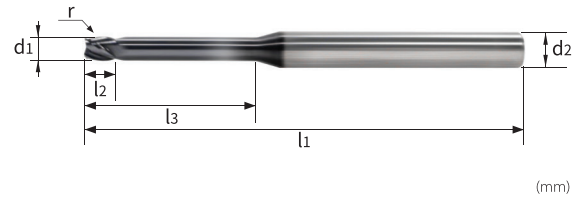
Designation	d1	d2	l1	l2	Z
NFGL4-010-030-S06-L60	1	6	60	3	4
NFGL4-010-050-S06-L60	1	6	60	5	4
NFGL4-015-060-S06-L60	1.5	6	60	6	4
NFGL4-015-080-S06-L60	1.5	6	60	8	4
NFGL4-020-080-S06-L60	2	6	60	8	4
NFGL4-020-100-S06-L60	2	6	60	10	4
NFGL4-030-100-S06-L70	3	6	70	10	4
NFGL4-030-150-S06-L70	3	6	70	15	4
NFGL4-030-200-S06-L70	3	6	70	20	4
NFGL4-030-250-S06-L70	3	6	70	25	4
NFGL4-040-120-S06-L70	4	6	70	12	4
NFGL4-040-150-S06-L70	4	6	70	15	4
NFGL4-040-200-S06-L70	4	6	70	20	4
NFGL4-040-250-S06-L70	4	6	70	25	4
NFGL4-040-300-S06-L75	4	6	75	30	4
NFGL4-050-200-S06-L70	5	6	70	20	4
NFGL4-050-250-S06-L75	5	6	75	25	4
NFGL4-050-300-S06-L80	5	6	80	30	4
NFGL4-060-200-S06-L75	6	6	75	20	4
NFGL4-060-200-S06-L100	6	6	100	20	4
NFGL4-060-250-S06-L75	6	6	75	25	4
NFGL4-060-300-S06-L80	6	6	80	30	4
NFGL4-060-350-S06-L80	6	6	80	35	4
NFGL4-080-250-S08-L75	8	8	75	25	4
NFGL4-080-250-S08-L100	8	8	100	25	4
NFGL4-080-300-S08-L80	8	8	80	30	4
NFGL4-080-350-S08-L90	8	8	90	35	4
NFGL4-080-400-S08-L90	8	8	90	40	4
NFGL4-080-450-S08-L100	8	8	100	45	4
NFGL4-100-300-S10-L80	10	10	80	30	4
NFGL4-100-300-S10-L110	10	10	110	30	4
NFGL4-100-350-S10-L90	10	10	90	35	4
NFGL4-100-400-S10-L90	10	10	90	40	4
NFGL4-100-500-S10-L100	10	10	100	50	4
NFGL4-100-600-S10-L110	10	10	110	60	4
NFGL4-120-300-S12-L90	12	12	90	30	4
NFGL4-120-350-S12-L110	12	12	110	35	4
NFGL4-120-400-S12-L100	12	12	100	40	4
NFGL4-120-500-S12-L100	12	12	100	50	4
NFGL4-120-600-S12-L110	12	12	110	60	4
NFGL4-120-700-S12-L130	12	12	130	70	4
NFGL4-140-500-S14-L110	14	14	110	50	4
NFGL4-160-550-S16-L120	16	16	120	55	4
NFGL4-160-700-S16-L130	16	16	130	70	4
NFGL4-180-800-S18-L160	18	18	160	80	4
NFGL4-200-500-S20-L160	20	20	160	50	4
NFGL4-200-600-S20-L130	20	20	130	60	4
NFGL4-200-1000-S20-L200	20	20	200	100	4

Order made / Possible to ordered by changing d1,l2,l3

END MILLS

# N-SG SOLID END MILLS SERIES

## Corner Radius End mills (Rib type)



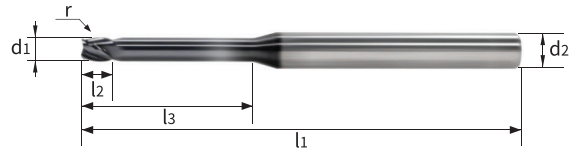
WC 35°  $d_1$   $d_1$   $r$   $r$   
 $0 \sim 0.01$   $\sim 0.015$   $\pm 0.005$   $\pm 0.01$   
 $d_1 \leq 5$   $d_1 > 5$   $r \leq 0.5$   $0.5 < r$

Designation	d1	d2	r	l1	l2	l3	z
NRGR2-002-0002-015-S04-L40	0.2	4	0.02	40	0.2	1.5	2
NRGR2-003-0005-020-S04-L40	0.3	4	0.05	40	0.3	2	2
NRGR2-004-001-030-S04-L40	0.4	4	0.1	40	0.5	3	2
NRGR2-005-0005-030-S04-L45	0.5	4	0.05	45	0.6	3	2
NRGR2-005-001-040-S04-L45	0.5	4	0.1	45	0.6	4	2
NRGR2-006-0005-040-S04-L45	0.6	4	0.05	45	0.7	4	2
NRGR2-006-001-060-S04-L45	0.6	4	0.1	45	0.7	6	2
NRGR2-008-001-080-S04-L45	0.8	4	0.1	45	0.9	8	2
NRGR2-010-001-100-S04-L50	1.0	4	0.1	50	1.2	10	2
NRGR2-010-002-120-S04-L50	1.0	4	0.2	50	1.2	12	2
NRGR2-010-003-160-S04-L50	1.0	4	0.3	50	1.2	16	2
NRGR2-012-001-120-S04-L50	1.2	4	0.1	50	1.4	12	2
NRGR2-012-002-160-S04-L50	1.2	4	0.2	50	1.4	16	2
NRGR2-012-003-160-S04-L50	1.2	4	0.3	50	1.4	16	2
NRGR2-015-001-160-S04-L50	1.5	4	0.1	50	1.8	16	2
NRGR2-015-002-200-S04-L50	1.5	4	0.2	50	1.8	20	2
NRGR2-015-003-220-S04-L60	1.5	4	0.3	60	1.8	22	2
NRGR2-015-005-250-S04-L60	1.5	4	0.5	60	1.8	25	2
NRGR2-020-001-120-S04-L50	2.0	4	0.1	50	2.4	12	2
NRGR2-020-002-200-S04-L50	2.0	4	0.2	50	2.4	20	2
NRGR2-020-003-250-S04-L60	2.0	4	0.3	60	2.4	25	2
NRGR2-020-005-250-S04-L60	2.0	4	0.5	60	2.4	25	2
NRGR2-025-002-200-S04-L50	2.5	4	0.2	50	3.0	20	2
NRGR2-025-003-250-S04-L60	2.5	4	0.3	60	3.0	25	2
NRGR2-025-005-300-S04-L70	2.5	4	0.5	70	3.0	30	2
NRGR2-030-001-200-S06-L60	3.0	6	0.1	60	3.6	20	2
NRGR2-030-002-250-S06-L65	3.0	6	0.2	65	3.6	25	2
NRGR2-030-003-300-S06-L70	3.0	6	0.3	70	3.6	30	2
NRGR2-030-005-300-S06-L70	3.0	6	0.5	70	3.6	30	2
NRGR2-030-010-350-S06-L75	3.0	6	1.0	75	3.6	35	2
NRGR2-040-001-200-S06-L60	4.0	6	0.1	60	4.8	20	2
NRGR2-040-002-300-S06-L70	4.0	6	0.2	70	4.8	30	2
NRGR2-040-003-300-S06-L70	4.0	6	0.3	70	4.8	30	2
NRGR2-040-005-350-S06-L75	4.0	6	0.5	75	4.8	35	2
NRGR2-040-010-400-S06-L80	4.0	6	1.0	80	4.8	40	2
NRGR2-050-002-400-S06-L80	5.0	6	0.2	80	6.0	40	2
NRGR2-050-005-400-S06-L80	5.0	6	0.5	80	6.0	40	2
NRGR2-050-010-500-S06-L100	5.0	6	1.0	100	6.0	50	2
NRGR2-060-003-400-S06-L90	6.0	6	0.3	90	7.0	40	2
NRGR2-060-010-400-S06-L90	6.0	6	1.0	90	7.0	40	2
NRGR2-080-005-400-S08-L100	8.0	8	0.5	100	9.0	40	2
NRGR2-080-010-400-S08-L100	8.0	8	1.0	100	9.0	40	2
NRGR2-100-005-450-S10-L100	10.0	10	0.5	100	11.0	45	2
NRGR2-100-010-450-S10-L100	10.0	10	1.0	100	11.0	45	2
NRGR2-120-005-500-S12-L110	12.0	12	0.5	110	13.0	50	2
NRGR2-120-010-500-S12-L110	12.0	12	1.0	110	13.0	50	2

Order made / Possible to ordered by changing d1,l2,l3

# N-SG SOLID END MILLS SERIES

## Corner Radius End mills (Rib type)



WC		35°	$d_1$ 0 ~ 0.01 $d_1 \leq 5$	$d_1$ -0.005 ~ -0.015 $d_1 > 5$	$r$ $\pm 0.005$ $r \leq 0.5$	$r$ $\pm 0.01$ $0.5 < r$
----	--	-----	-----------------------------------	---------------------------------------	------------------------------------	--------------------------------

(mm)

Designation	$d_1$	$d_2$	$r$	$l_1$	$l_2$	$l_3$	$z$
NRGR4-010-001-040-S04-L45	1.0	4	0.1	45	1.2	4	4
NRGR4-010-002-100-S04-L50	1.0	4	0.2	50	1.2	10	4
NRGR4-010-003-160-S04-L50	1.0	4	0.3	50	1.2	16	4
NRGR4-012-001-060-S04-L45	1.2	4	0.1	45	1.4	6	4
NRGR4-012-002-100-S04-L50	1.2	4	0.2	50	1.4	10	4
NRGR4-012-003-160-S04-L50	1.2	4	0.3	50	1.4	16	4
NRGR4-015-001-080-S04-L45	1.5	4	0.1	45	1.8	8	4
NRGR4-015-002-160-S04-L50	1.5	4	0.2	50	1.8	16	4
NRGR4-015-003-200-S04-L50	1.5	4	0.3	50	1.8	20	4
NRGR4-015-005-250-S04-L60	1.5	4	0.5	60	1.8	25	4
NRGR4-020-001-080-S04-L45	2.0	4	0.1	45	2.4	8	4
NRGR4-020-002-100-S04-L50	2.0	4	0.2	50	2.4	10	4
NRGR4-020-003-160-S04-L50	2.0	4	0.3	50	2.4	16	4
NRGR4-020-005-200-S04-L50	2.0	4	0.5	50	2.4	20	4
NRGR4-025-002-100-S04-L50	2.5	4	0.2	50	3.0	10	4
NRGR4-025-003-160-S04-L50	2.5	4	0.3	50	3.0	16	4
NRGR4-025-005-250-S04-L60	2.5	4	0.5	60	3.0	25	4
NRGR4-030-001-100-S06-L50	3.0	6	0.1	50	3.6	10	4
NRGR4-030-002-160-S06-L55	3.0	6	0.2	55	3.6	16	4
NRGR4-030-003-200-S06-L60	3.0	6	0.3	60	3.6	20	4
NRGR4-030-005-250-S06-L65	3.0	6	0.5	65	3.6	25	4
NRGR4-030-010-350-S06-L75	3.0	6	1.0	75	3.6	35	4
NRGR4-040-001-160-S06-L55	4.0	6	0.1	55	4.8	16	4
NRGR4-040-002-200-S06-L60	4.0	6	0.2	60	4.8	20	4
NRGR4-040-003-250-S06-L65	4.0	6	0.3	65	4.8	25	4
NRGR4-040-005-300-S06-L70	4.0	6	0.5	70	4.8	30	4
NRGR4-040-010-350-S06-L75	4.0	6	1.0	75	4.8	35	4
NRGR4-050-002-300-S06-L70	5.0	6	0.2	70	6.0	30	4
NRGR4-050-005-400-S06-L80	5.0	6	0.5	80	6.0	40	4
NRGR4-050-010-500-S06-L100	5.0	6	1.0	100	6.0	50	4
NRGR4-060-003-400-S06-L80	6.0	6	0.3	80	7.0	40	4
NRGR4-060-010-500-S06-L100	6.0	6	1.0	100	7.0	50	4
NRGR4-080-005-400-S08-L100	8.0	8	0.5	100	9.0	40	4
NRGR4-080-010-400-S08-L100	8.0	8	1.0	100	9.0	40	4
NRGR4-100-005-400-S10-L100	10.0	10	0.5	100	11.0	40	4
NRGR4-100-010-400-S10-L100	10.0	10	1.0	100	11.0	40	4
NRGR4-120-005-400-S12-L110	12.0	12	0.5	110	13.0	40	4
NRGR4-120-010-400-S12-L110	12.0	12	1.0	110	13.0	40	4

Order made / Possible to ordered by changing  $d_1, l_2, l_3$

# N-SG SOLID END MILLS SERIES

## Corner Radius End mills (Taper type)



WC		35°	d <sub>1</sub> 0~-0.01 d <sub>1</sub> ≤5	d <sub>1</sub> -0.005 ~0.015 d <sub>1</sub> >5	r ±0.005 r≤0.5	r ±0.01 0.5<r
----	--	-----	--	---	----------------------	---------------------

(mm)

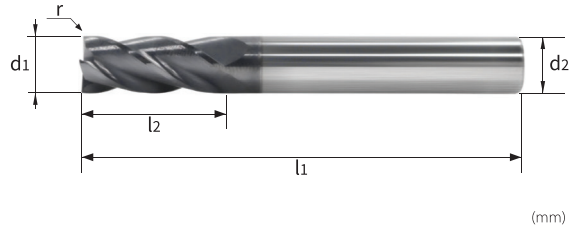
Designation	d <sub>1</sub>	d <sub>2</sub>	r	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	θ	z
NRGN2-010-001-10-100-S04-L50	1.0	4	0.1	50	1.0	10	1°	2
NRGN2-010-002-10-150-S04-L50	1.0	4	0.2	50	1.0	15	1°	2
NRGN2-010-003-10-200-S04-L60	1.0	4	0.3	60	1.0	20	1°	2
NRGN2-015-002-10-150-S04-L50	1.5	4	0.2	50	1.5	15	1°	2
NRGN2-015-003-10-200-S04-L60	1.5	4	0.3	60	1.5	20	1°	2
NRGN2-015-005-10-250-S04-L60	1.5	4	0.5	60	1.5	25	1°	2
NRGN2-020-002-10-160-S04-L50	2.0	4	0.2	50	2.0	16	1°	2
NRGN2-020-003-10-200-S04-L60	2.0	4	0.3	60	2.0	20	1°	2
NRGN2-020-005-10-250-S04-L60	2.0	4	0.5	60	2.0	25	1°	2
NRGN2-030-002-10-200-S06-L60	3.0	6	0.2	60	3.0	20	1°	2
NRGN2-030-003-10-300-S06-L70	3.0	6	0.3	70	3.0	30	1°	2
NRGN2-030-005-10-400-S06-L80	3.0	6	0.5	80	3.0	40	1°	2
NRGN2-030-010-10-500-S06-L90	3.0	6	1.0	90	3.0	50	1°	2
NRGN2-040-002-10-300-S06-L70	4.0	6	0.2	70	4.0	30	1°	2
NRGN2-040-003-10-400-S06-L80	4.0	6	0.3	80	4.0	40	1°	2
NRGN2-040-005-10-500-S06-L90	4.0	6	0.5	90	4.0	50	1°	2
NRGN2-040-010-10-600-S06-L100	4.0	6	1.0	100	4.0	60	1°	2
NRGN4-010-001-10-060-S4-L50	1.0	4	0.1	50	1.0	6	1°	4
NRGN4-010-002-10-100-S4-L50	1.0	4	0.2	50	1.0	10	1°	4
NRGN4-015-002-10-100-S4-L50	1.5	4	0.2	50	1.5	10	1°	4
NRGN4-015-005-10-150-S4-L50	1.5	4	0.5	50	1.5	15	1°	4
NRGN4-020-002-10-120-S4-L50	2.0	4	0.2	50	2.0	12	1°	4
NRGN4-020-005-10-200-S4-L60	2.0	4	0.5	60	2.0	20	1°	4
NRGN4-030-002-10-200-S6-L60	3.0	6	0.2	60	3.0	20	1°	4
NRGN4-030-005-10-300-S6-L70	3.0	6	0.5	70	3.0	30	1°	4
NRGN4-040-002-10-200-S6-L60	4.0	6	0.2	60	4.0	20	1°	4

Order made / Possible to ordered by changing d<sub>1</sub>,l<sub>2</sub>,l<sub>3</sub>



# N-SG SOLID END MILLS SERIES

## Corner Radius End mills (Standard type)



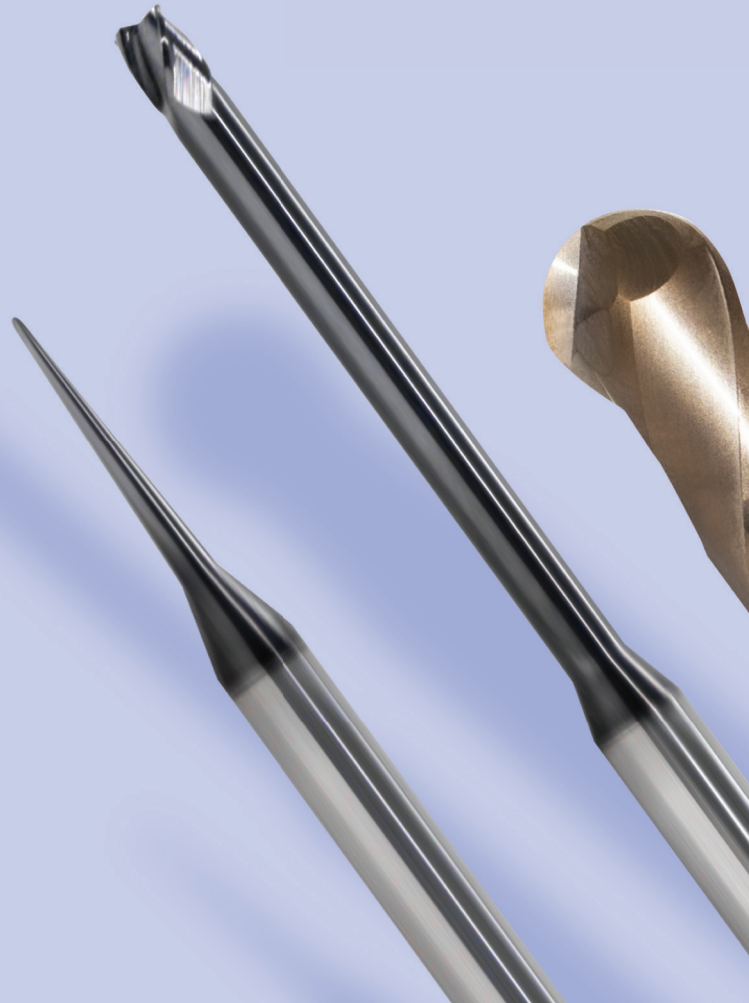
WC		35°	$d_1$ 0~-0.01 d1≤5	$d_1$ -0.005 ~-0.015 d1>5	$r$ ±0.005 r≤0.5	$r$ ±0.01 0.5<r
----	--	-----	--------------------------	------------------------------------	------------------------	-----------------------

Designation	d1	d2	r	l1	l2	z
NRGS2-006-001-012-S04-L45	0.6	4	0.1	45	1.2	2
NRGS2-010-001-025-S04-L45	1	4	0.1	45	2.5	2
NRGS2-020-002-060-S04-L45	2	4	0.2	45	6	2
NRGS2-030-002-080-S06-L60	3	6	0.2	60	8	2
NRGS2-040-002-090-S04-L60	4	4	0.2	60	9	2
NRGS2-040-002-100-S06-L70	4	6	0.2	70	10	2
NRGS2-040-003-090-S04-L80	4	4	0.3	80	9	2
NRGS2-050-002-130-S06-L75	5	6	0.2	75	13	2
NRGS2-060-003-130-S06-L90	6	6	0.3	90	13	2
NRGS2-060-010-130-S06-L90	6	6	1.0	90	13	2
NRGS2-080-005-190-S08-L100	8	8	0.5	100	19	2
NRGS2-080-010-190-S08-L120	8	8	1.0	120	19	2
NRGS2-100-005-220-S10-L100	10	10	0.5	100	22	2
NRGS2-100-010-220-S10-L130	10	10	1.0	130	22	2
NRGS2-120-005-260-S12-L110	12	12	0.5	110	26	2
NRGS4-010-001-025-S04-L45	1	4	0.1	45	2.5	4
NRGS4-015-001-040-S04-L45	1.5	4	0.1	45	4	4
NRGS4-020-002-060-S04-L45	2	4	0.2	45	6	4
NRGS4-030-002-080-S06-L60	3	6	0.2	60	8	4
NRGS4-040-002-090-S04-L60	4	4	0.2	60	9	4
NRGS4-040-002-100-S06-L70	4	6	0.2	70	10	4
NRGS4-040-003-090-S04-L80	4	4	0.3	80	9	4
NRGS4-050-002-130-S06-L75	5	6	0.2	75	13	4
NRGS4-060-002-110-S06-L60	6	6	0.2	60	11	4
NRGS4-060-003-130-S06-L80	6	6	0.3	80	13	4
NRGS4-060-010-130-S06-L80	6	6	1.0	80	13	4
NRGS4-080-002-160-S08-L70	8	8	0.2	70	16	4
NRGS4-080-005-190-S08-L90	8	8	0.5	90	19	4
NRGS4-080-010-190-S08-L110	8	8	1.0	110	19	4
NRGS4-100-002-190-S10-L75	10	10	0.2	75	19	4
NRGS4-100-005-220-S10-L100	10	10	0.5	100	22	4
NRGS4-100-010-220-S10-L120	10	10	1.0	120	22	4
NRGS4-120-003-220-S12-L80	12	12	0.3	80	22	4
NRGS4-120-010-260-S12-L110	12	12	1.0	110	26	4
NRGS4-120-020-260-S12-L130	12	12	2.0	130	26	4

Order made / Possible to ordered by changing d1,l2,l3

# END MILLS

Meet the best NANOTECHNOLOGY





END MILLS



**NANOLOY** ●●●●

# INDEXABLE END MILLS

## “N-IB/IR” SERIES

**Indexable end mills series for hardened materials  
of mold steel machining**

1. New coating layer with nano grade : specially designed for mold steel machining
2. Excellent performance with optimal geometry
3. Wide range of machining application : various geometries and specifications

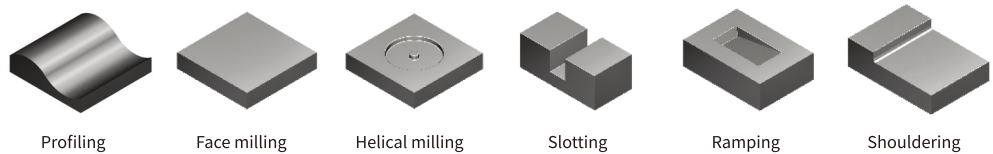
# PRODUCT FEATURE

## Features

Excellent tool life for high hardened materials machining with superior NANO ultrafine grade

1. High precision in R (ball type :  $\pm 0.01$  / corner R type :  $\pm 0.015$ )
2. Wide range of applications with various geometries and specifications
3. Excellent quality and performance for mold and parts machining

## Applications



## Clamping procedure



※ Follow this procedure for optimal precision

- 1 Cleaning the clamping space. (Use air blow)
- 2 Inserts numbering face forward. Insert the insert to holder and tighten the screw.
- 3 Tighten the screw using the torque wrench at a given torque. Don't push the insert during tightening.
- 4 Clamping complete

※ Tightening torque by designation

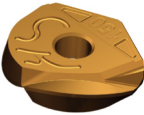
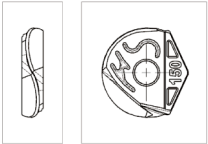
Designation		Tightening torque (N · M)
Ball type	Corner R type	
NBGT-XX-5R	JRGT-HS-100(110)-Rx.x	1.8
NBGT-XX-6R	JRGT-HS-120(130)-Rx.x	3.7
NBGT-XX-8R	JRGT-HS-160(170)-Rx.x	3.7
NBGT-XX-10R	JRGT-HS-200(210)-Rx.x	3.8
NBGT-XX-12.5R	JRGT-HS-250(260)-Rx.x	5.2
NBGT-XX-15R	JRGT-HS-300-Rx.x	5.7

## Geometries features

	Type	Geometry	Application	Features
N-IB Series (Ball End mills insert)	NHS		Hardened material (HRC 50 ↑)	<ol style="list-style-type: none"> <li>1. Enhanced wear resistance with special geometries</li> <li>2. Better tool life and edge strength by applying negative rake angle(<math>\alpha^\circ</math>)</li> <li>3. Applied clearance angle(<math>\beta^\circ</math>) suitable for hardened machining</li> </ol>
N-IR Series (Corner R End mills insert)	HS			<ol style="list-style-type: none"> <li>1. Available various corner R size</li> <li>2. Optimal shape, grade, coating for machining over HRC50</li> <li>3. High quality workpiece's roughness</li> </ol>

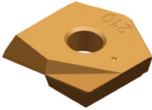
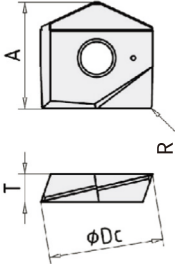
# END MILLS INSERT SERIES

## N-IB Series (Ball End Mills Insert)

Geometry	Designation	Dimension (mm)				Coated			Configuration
		R	ØDc	A	T	TS1125	TS1145	TS1165	
	NBGT-NHS-5R	5	10	12.2	2.7	○	●	○	
	NBGT-NHS-6R	6	12	14.6	3.2	○	●	○	
	NBGT-NHS-8R	8	16	16.6	4.2	○	●	○	
	NBGT-NHS-10R	10	20	20.3	5.2	○	●	○	
	NBGT-NHS-12.5R	12.5	25	24.1	6.2	○	●	○	
	NBGT-NHS-13R	13	26	24.6	6.2	○	●	○	
NBGT-NHS-15R	15	30	29.2	7.2	○	●	○		

● Stock item

## N-IR Series (Corner R End Mills Insert)

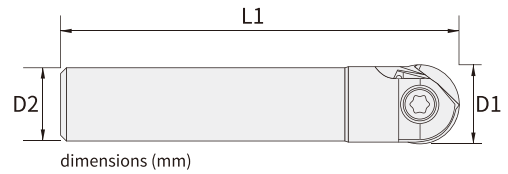
Geometry	Designation	Dimension (mm)				Coated			Configuration
		ØDc	A	T	R	TS1125	TS1145	TS1165	
	JRGT-HS-110-R0.5	11	12.1	2.7	0.5	○	●	○	
	JRGT-HS-110-R1.0	11	12.1	2.7	1.0	○	●	○	
	JRGT-HS-120-R0.5	12	14.6	3.2	0.5	○	●	○	
	JRGT-HS-120-R1.0	12	14.6	3.2	1.0	○	●	○	
	JRGT-HS-130-R0.5	13	14.6	3.2	0.5	○	●	○	
	JRGT-HS-130-R1.0	13	14.6	3.2	1.0	○	●	○	
	JRGT-HS-160-R0.5	16	16.6	4.2	0.5	○	●	○	
	JRGT-HS-160-R1.0	16	16.6	4.2	1.0	○	●	○	
	JRGT-HS-170-R0.5	17	16.4	4.2	0.5	○	●	○	
	JRGT-HS-170-R1.0	17	16.4	4.2	1.0	○	●	○	
	JRGT-HS-200-R0.5	20	19.8	5.2	0.5	○	●	○	
	JRGT-HS-200-R1.0	20	19.8	5.2	1.0	○	●	○	
	JRGT-HS-210-R0.5	21	19.8	5.2	0.5	○	●	○	
	JRGT-HS-210-R1.0	21	19.8	5.2	1.0	○	●	○	
	JRGT-HS-260-R0.5	26	22.6	6.2	0.5	○	●	○	
	JRGT-HS-260-R1.0	26	22.6	6.2	1.0	○	●	○	
JRGT-HS-260-R2.0	26	22.6	6.2	2.0	○	●	○		

● Stock item



# INDEXABLE END MILLS HOLDER SERIES

- ☉ Steel type and cemented carbide type
- ☉ Both ball and corner R inserts are available



Designation	Cutting dia	Shank dia	Length	Applied Insert	Screw	Wrench	
	D1	D2	L1				
NMC (Cemented carbide)	100 10 145	10	10	145	NBGT-5R/JRGT110	TPM35082	T10-T
	100 10 200	10	10	200			
	120 12 155	12	12	155	NBGT-6R/JRGT120	TPM50098	T20-T
	120 12 200	12	12	200			
	160 16 200	16	16	200	NBGT-8R/JRGT160, 170	TPM50136	T25-T
	160 16 250	16	16	250			
	200 20 220	20	20	220	NBGT-10R/JRGT200, 210	TPM60168	T30-T
	200 20 250	20	20	250			
	200 20 300	20	20	300			
	250 25 250	25	25	250	NBGT-12.5R/JRGT210	TPM60219	T30-T
	250 25 300	25	25	300			
	300 30 300	30	30	300	NBGT-15R	TPM80251	TPM80251
	300 30 350	30	30	350			
	320 32 350	32	32	350	NBGT-16R	TPM80251	
320 32 400	32	32	400				
NMS (Steel)	160 16 220	16	16	220	NBGT-8R/JRGT160, 170	TPM50136	T20-T
	160 16 250	16	16	250			
	200 20 220	20	20	220	NBGT-10R/JRGT200, 210	TPM60168	T25-T
	200 20 250	20	20	250			
	250 25 220	25	25	220	NBGT-12.5R/JRGT210	TPM60219	T30-T
	250 25 250	25	25	250			
	250 25 300	25	25	300			
	300 32 220	32	30	220	NBGT-15R	TPM80251	T30-T
	300 32 250	32	30	250			
	300 32 300	32	30	300			
	300 32 350	32	30	350			
	300 32 400	32	30	400			
	320 32 350	32	32	350			
	320 32 400	32	32	400	NBGT-16R	TPM80251	



# RECOMMENDED CUTTING CONDITION

## N-IB Series (Ball End Mills Insert) [High hardened Steel (HRC45~63)]

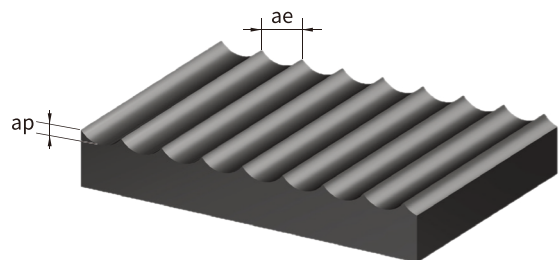
Hardness	Cutting condition	5R		6R		8R		10R		12.5R		15R		16R	
		Semi Finishing	Finishing	Semi Finishing	Finishing	Semi Finishing	Finishing	Semi Finishing	Finishing	Semi Finishing	Finishing	Semi Finishing	Finishing	Semi Finishing	Finishing
HRC45~55	vc (m/min)	100~210	260	100~200	290	100~150	350	100~150	400	100~150	450	100~150	500	100~150	500
	fz (mm/t)	0.10~0.20	0.2	0.10~0.20	0.2	0.12~0.24	0.3	0.12~0.24	0.4	0.12~0.24	0.5	0.12~0.24	0.6	0.12~0.24	0.6
	ap (mm)	0.15~0.25	0.1	0.20~0.30	0.1	0.60~0.80	0.1	0.70~1.00	0.1	0.90~1.25	0.1	1.10~1.60	0.1	1.10~1.60	0.1
	ae (mm)	0.80~1.00	0.25	0.90~1.20	0.3	1.10~1.60	0.3	1.50~2.00	0.4	1.80~2.50	0.5	2.40~3.20	0.6	2.40~3.20	0.6
HRC55~63	vc (m/min)	80~170	200	80~160	230	80~200	280	80~120	320	80~120	360	80~120	400	80~120	400
	fz (mm/t)	0.10~0.20	0.2	0.10~0.20	0.2	0.12~0.24	0.3	0.12~0.24	0.4	0.12~0.24	0.5	0.12~0.24	0.6	0.12~0.24	0.6
	ap (mm)	0.15~0.25	0.1	0.20~0.30	0.1	0.60~0.80	0.1	0.70~1.00	0.1	0.90~1.25	0.1	1.10~1.60	0.1	1.10~1.60	0.1
	ae (mm)	0.80~1.00	0.25	0.90~1.20	0.3	1.10~1.60	0.3	1.50~2.00	0.4	1.80~2.50	0.5	2.40~3.20	0.6	2.40~3.20	0.6

### ※ Caution

- Using suitable coolant for the cutting materials and machining types
- Conditions shown in above table are general guidance  
Adjust the parameters by the user's processing conditions
- Tools are possible to damaged during machining  
Please follow the safety caution  
(safety glasses, cover, shoes, etc)

Overhang	vc(m/min)	fz(mm/t)
0~3D	100%	100%
3D~5D	70%	70%
5D~8D	60%	60%
8D~10D	50%	50%

- ※ If overhang length is 3 times over than diameter,  
Please adjust the speed and feed condition lower  
to use shown in right table



# RECOMMENDED CUTTING CONDITION

## N-IR Series (Corner R End Mills Insert)

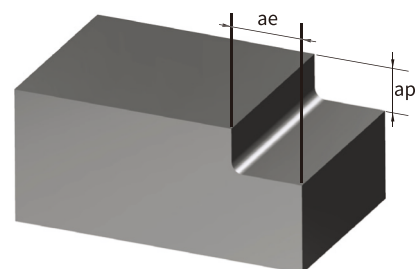
[Hardened Steel (HRC45~63)]

H	Hardness	Cutting condition	Φ10		Φ11		Φ12		Φ13		Φ16		Φ17	
			Semi Finishing	Finishing	Semi Finishing	Finishing	Semi Finishing	Finishing	Semi Finishing	Finishing	Semi Finishing	Finishing	Semi Finishing	Finishing
			HRC45~55	vc (m/min)	100~280	280	110~310	310	100~280	280	110~300	300	100~280	280
	fz (mm/t)	0.05~0.10	0.05	0.05~0.10	0.05	0.05~0.10	0.05	0.05~0.10	0.05	0.06~0.12	0.06	0.06~0.12	0.06	
	ap (mm)	0.25	0.1	0.25	0.1	0.3	0.1	0.3	0.1	0.8	0.2	0.8	0.2	
	ae (mm)	0.25~1.00	0.2	0.25~1.00	0.2	0.30~1.20	0.2	0.30~1.20	0.2	0.80~1.60	0.2	0.80~1.60	0.2	
HRC55~63	vc (m/min)	80~220	220	90~240	240	80~220	220	90~240	240	80~220	220	80~230	230	
	fz (mm/t)	0.05~0.10	0.05	0.05~0.10	0.05	0.05~0.10	0.05	0.05~0.10	0.05	0.06~0.12	0.06	0.06~0.13	0.06	
	ap (mm)	0.25	0.1	0.25	0.1	0.3	0.1	0.3	0.1	0.8	0.2	0.8	0.2	
	ae (mm)	0.25~1.00	0.2	0.25~1.00	0.2	0.30~1.20	0.2	0.30~1.20	0.2	0.80~1.60	0.2	0.80~1.60	0.2	
H	Hardness	Cutting condition	Φ20		Φ21		Φ25		Φ26		Φ30			
			Semi Finishing	Finishing	Semi Finishing	Finishing	Semi Finishing	Finishing	Semi Finishing	Finishing	Semi Finishing	Finishing		
			HRC45~55	vc (m/min)	100~280	280	100~290	290	100~280	280	100~290	290	100~280	280
	fz (mm/t)	0.06~0.12	0.06	0.06~0.13	0.06	0.06~0.12	0.06	0.06~0.12	0.06	0.06~0.12	0.06			
	ap (mm)	1	0.2	1	0.2	1.25	0.2	1.25	0.2	1.6	0.2			
	ae (mm)	1.00~2.00	0.2	1.00~2.00	0.2	1.25~2.50	0.2	1.25~2.50	0.2	1.60~3.20	0.2			
HRC55~63	vc (m/min)	80~220	220	80~230	230	80~220	220	80~230	230	80~220	220			
	fz (mm/t)	0.06~0.12	0.06	0.06~0.12	0.06	0.06~0.12	0.06	0.06~0.12	0.06	0.06~0.12	0.06			
	ap (mm)	1	0.2	1	0.2	1.25	0.2	1.25	0.2	1.6	0.2			
	ae (mm)	1.00~2.00	0.2	1.00~2.00	0.2	1.25~2.50	0.2	1.25~2.50	0.2	1.60~3.20	0.2			

### ※ Caution

- Using suitable coolant for the cutting materials and machining types
- Conditions shown in above table are general guidance  
Adjust the parameters by the user's processing conditions
- Tools are possible to damaged during machining  
Please follow the safety caution  
(safety glasses, cover, shoes, etc)

Overhang	vc(m/min)	fz(mm/t)
0~3D	100%	100%
3D~5D	70%	70%
5D~8D	60%	60%
8D~10D	50%	50%



- ※ If overhang length is 3 times over than diameter,  
Please adjust the speed and feed condition lower  
to use shown in right table



# INDEXABLE END MILLS

Meet the best NANOTECHNOLOGY

INDEXABLE END MILLS



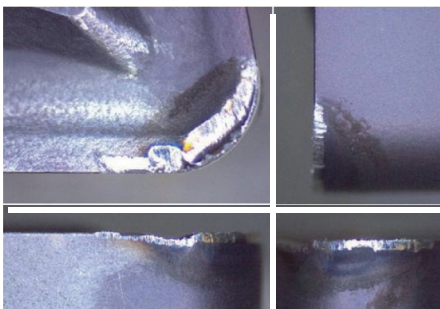
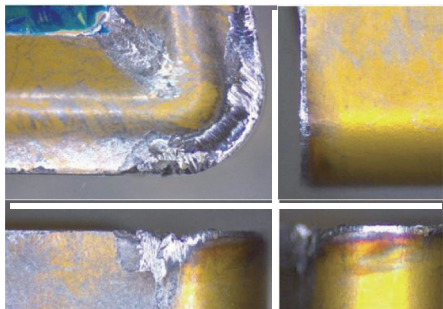
## Results of user test in aerospace industry

---

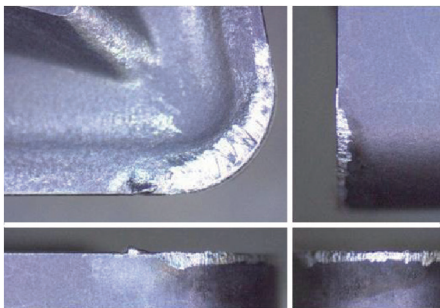
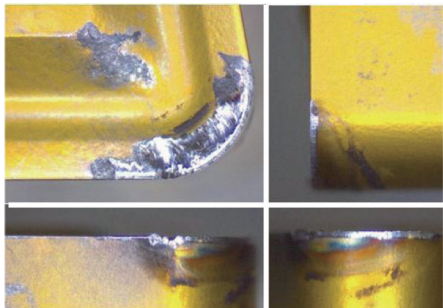


## Results of user test in aerospace industry

User test (Aerospace\_TC\*) Turning (ISO) S grade (HRSA)

Workpiece	Aerospace parts (CASE, HPT STTR)	Material	Inconel 718
Machining type	Ring shape housing / Vertical lathe (Inner dia roughing) / Wet		
Cutting condition	max.dia 600mm vc 60-80m/min fn 0.25mm/rev ap ~1.1mm		
Item	WNMG080412-M22 NV3025		
Division	Nanoloy		Competitor (S)
Tool life / Wear image			
Status comparison	Normal wear (Edge fine chipping)		Breakage by edge chipping
Result	Wear and damage comparison → Better wear resistance performance than competitor		

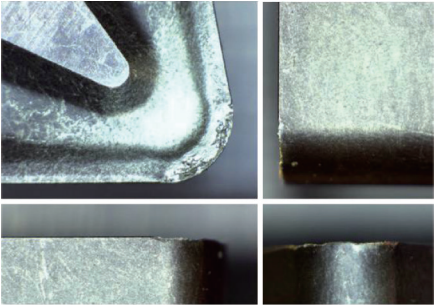
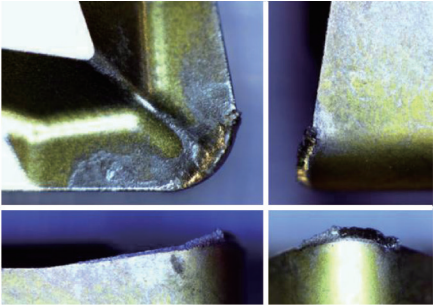
User test (Aerospace\_TC\*) Turning (ISO) S grade (HRSA)

Workpiece	Aerospace parts (CASE, HPT STTR)	Material	Inconel 718
Machining type	Ring shape housing / Vertical lathe (Inner dia finishing) / Wet		
Cutting condition	max.dia 600mm vc 50m/min fn 0.1mm/rev ap 0.5~0.7mm		
Item	WNMG080412-M22 NV3025		
Division	Nanoloy		Competitor (S)
Tool life / Wear image			
Status comparison	Normal wear		Edge chipping
Result	Wear and damage comparison → Better wear resistance performance than competitor		

## Results of user test in aerospace industry

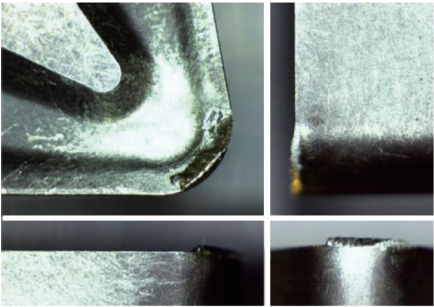
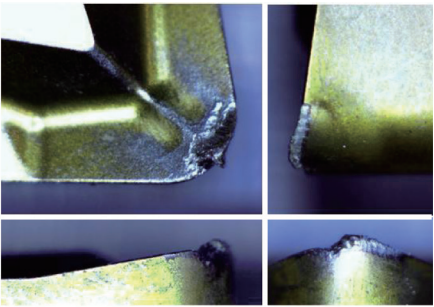
User test (Aerospace\_A\*) Turning (ISO) S grade (HRSA)

Workpiece	Aerospace parts (RING)	Material	C263 (CASTING)
Machining type	Ring shape / Vertical lathe (Section_O.D) / Wet		
Cutting condition	max.dia 520mm vc 30~40m/min fn 0.16mm/rev ap 0.5mm		
Item	CNMG120412-M11 NV3025		

Division	Nanoly	Competitor (T)
Tool life Wear image		
Status comparison	Normal wear	Edge chipping (large wear) and adhesion
Result	Wear and damage comparison → Better wear resistance performance than competitor	

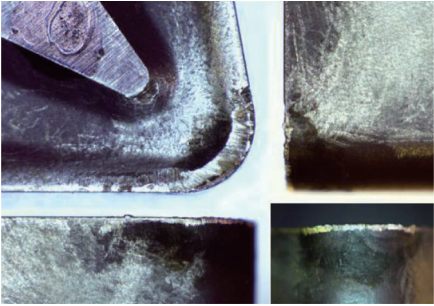
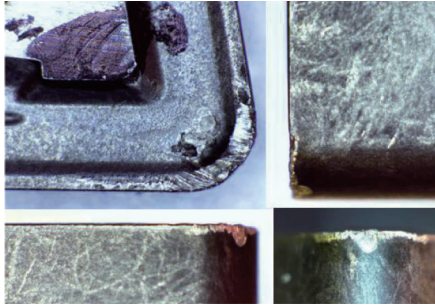
User test (Aerospace\_A\*) Turning (ISO) S grade (HRSA)

Workpiece	Aerospace parts (RING)	Material	C263 (CASTING)
Machining type	Ring shape / Vertical lathe (section_O.D) / Wet		
Cutting condition	max.dia 520mm vc 40~50m/min fn 0.18mm/rev ap 0.5mm		
Item	CNMG120412-M11 NV3025		

Division	Nanoly	Competitor (T)
Tool life / Wear image		
Status comparison	Normal wear	Chipping and adhesion at upper face corne
Result	Wear and damage comparison → Better stability than competitor	

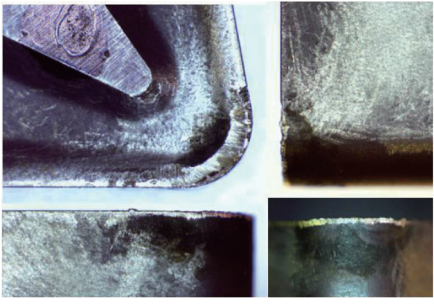
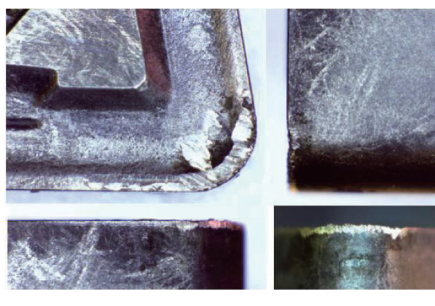
User test (Aerospace\_B\*) Turning (ISO) S grade (HRSA)

Workpiece	Aerospace parts (Housing)	Material	C263 (FORGING)
Machining type	Ring housing shape / Vertical lathe (section_O.D) / Wet		
Cutting condition	max.dia 680mm vc 60~80m/min fn 0.025mm/rev ap 1~2.0mm		
Item	CNMG120412-M11 NV3025		

Division	Nanoly	Competitor (K)
Tool life / Wear image		
Status comparison	Normal wear	Large wear by corner chipping
Result	Wear and damage comparison → Better stability than competitor	

User test (Aerospace\_B\*) Turning (ISO) S grade (HRSA)

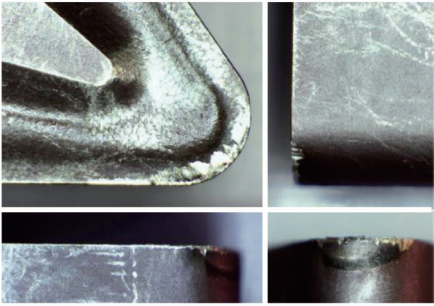
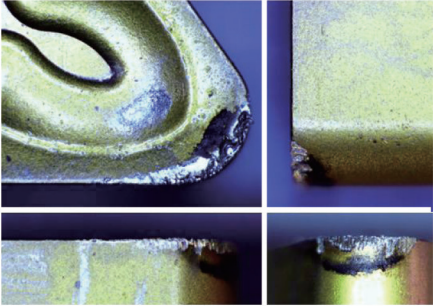
Workpiece	Aerospace parts (Housing)	Material	C263 (FORGING)
Machining type	Ring housing shape / Vertical lathe (section_O.D) / Wet		
Cutting condition	max.dia 680mm vc 60~80m/min fn 0.025mm/rev ap 1~2.0mm		
Item	CNMG120412-M11 NV3025		

Division	Nanoly	Competitor (K)
Tool life / Wear image		
Status comparison	Normal wear	Upper face large wear and corner chipping
Result	Wear and damage comparison → Better stability than competitor	

## Results of user test in aerospace industry

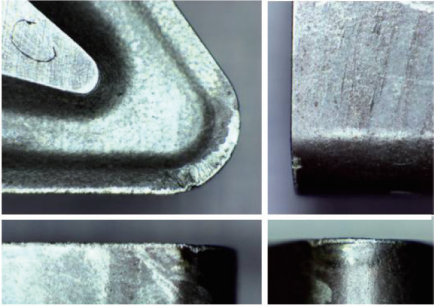
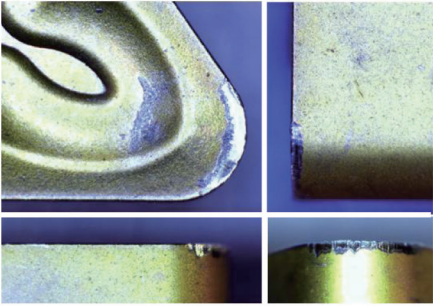
User test (Aerospace\_AP\*\*) Turning (ISO) S grade (HRSA)

Workpiece	Aerospace parts (RING)	Material	Inconel 718
Machining type	Ring shape / Vertical lathe (O.D machining) / Wet		
Cutting condition	max.dia 495mm vc 45m/min fn 0.15mm/rev ap 1.0mm		
Item	DNMG150612-M11 NV3005		

Division	Nanoly	Competitor (T)
Tool life / Wear image		
Status comparison	Normal wear	Large wear by chipping at side edge
Result	Wear and damage comparison (17min) → Better stability than competitor	

User test (Aerospace\_AP\*\*) Turning (ISO) S grade (HRSA)

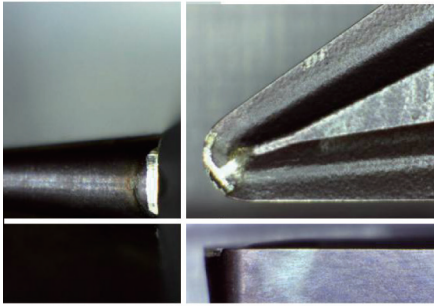
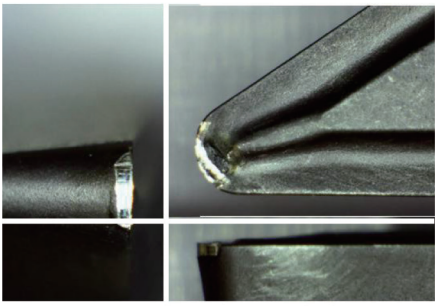
Workpiece	Aerospace parts (RING)	Material	Inconel 718
Machining type	Ring shape / Vertical lathe (O.D machining) / Wet		
Cutting condition	max.dia 495mm vc 40m/min fn 0.14mm/rev ap 1.0mm		
Item	DNMG150612-M11 NV3005		

Division	Nanoly	Competitor (T)
Tool life / Wear image		
Status comparison	Normal wear	Large wear at corner
Result	Wear and damage comparison (18min) → Better stability than competitor	



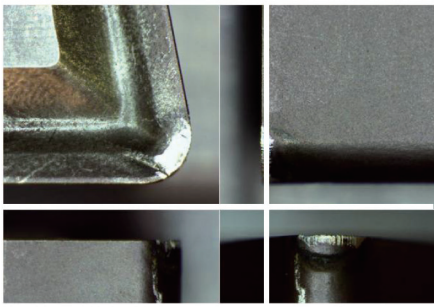
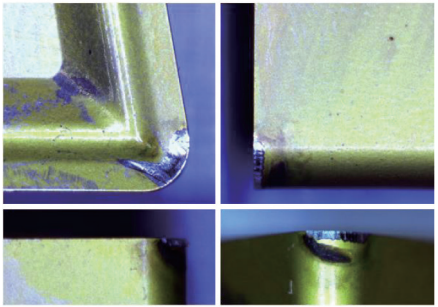
User test (Aerospace\_D\*) Turning (ISO) S grade (HRSA)

Workpiece	Aerospace parts (SEAL-A/O, TRANS~)	Material	MiXED (Rene+Inconel)
Machining type	Ring shape / Vertical lathe (section) / Wet		
Cutting condition	max.dia 495mm vc 45m/min fn 0.15mm/rev ap 1.0mm		
Item	VCGT160408-2FM NV3025		

Division	Nanoly	Competitor (T)
Tool life / Wear image		
Status comparison	Normal wear	Large wear at corner
Result	Wear and damage comparison → Better wear resistance performance than competitor	

User test (Aerospace\_D\*) Turning (ISO) S grade (HRSA)

Workpiece	Aerospace parts (SEAL-A/O, TRANS~)	Material	MiXED (Rene+Inconel)
Machining type	Ring shape / Vertical lathe (O.D / setion) / Wet		
Cutting condition	max.dia 877mm vc 33m/min fn 0.10~0.15mm/rev ap 0.4mm		
Item	WNMG080408-M21 NV3005		

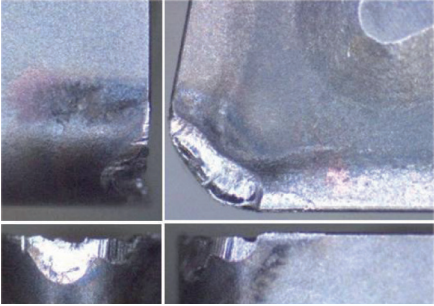
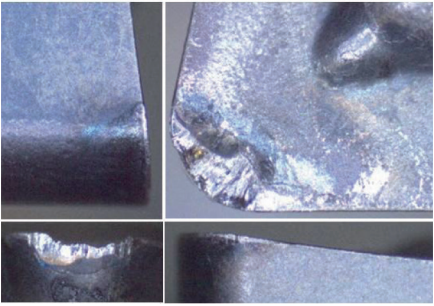
Division	Nanoly	Competitor (S)
Tool life / Wear image		
Status comparison	Normal wear	Normal wear
Result	Wear and damage comparison → Better wear, chipping resistance performance than competitor	

## Results of user test in aerospace industry

User test (Aerospace\_D\*) Turning (ISO) S grade (HRSA)

Workpiece	Aerospace parts (power train shaft)	Material	Titanium
Machining type	Ring shape / Horizontal lathe (section / O.Dmachining) / Wet		
Cutting condition	max.dia 65mm vc 66m/min fn 0.19mm/rev ap 0.8mm		
Item	CNMG120408-M11 NC3005		

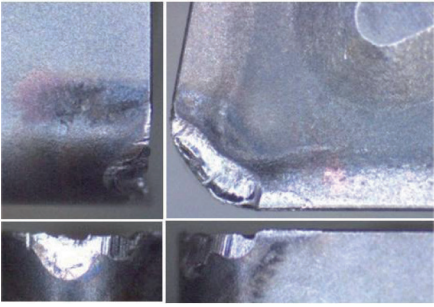
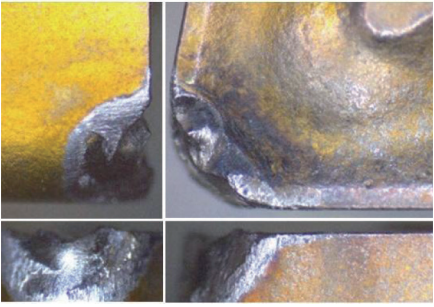


Division	Nanoloy	Competitor (M)
Tool life / Wear image		
Status comparison	10EA machining	6EA machining
Result	Wear and damage comparison → Better wear, chipping resistance performance than competitor	

User test (Aerospace\_I\*\*\*) Turning (ISO) S grade (HRSA)

Workpiece	Aerospace parts (powertrain shaft)	Material	Titanium
Machining type	Ring shape / Horizontal lathe (section / O.D) / Wet		
Cutting condition	max.dia 65mm vc 66m/min fn 0.19mm/rev ap 0.8mm		
Item	CNMG120408-M11 NC3005		



Division	Nanoloy	Competitor (M)
Tool life / Wear image		
Status comparison	10EA machining	6EA machining
Result	Wear and damage comparison → Better wear, chipping resistance performance than competitor	

User test (Aerospace\_TC\*) Grooving insert S grade (HRSA)

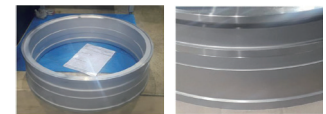
Workpiece	Aerospace parts (CASE, HPT STTR)	Material	Inconel 718
Machining type	Ring shape / Vertical lathe (O.D roughing) / Wet		
Cutting condition	max.dia 630mm vc 30m/min fn 0.15-0.25mm/rev ap 5-8.0mm		
Item	2NG80N-08G-F1 NC3025		



	Nanoly	Competitor (s)
Tool life / Wear image (15min)		
Status comparison	Normal wear	Large wear at corner
Result	Wear and damage comparison → Better wear resistance performance than competitor	

User test (Aerospace\_TC\*) Grooving insert S grade (HRSA)

Workpiece	Aerospace parts (CASE, HPT STTR)	Material	Inconel 718
Machining type	Ring shape / Vertical lathe (Chamfer, O.D) / Wet		
Cutting condition	max.dia 630mm vc 35m/min fn 0.04-0.13mm/rev ap 10.0mm		
Item	2NG50N-08G-F1M NV3025		



	Nanoly	Competitor (S)
Tool life / Wear image (25min)		
Status comparison	Normal wear	Normal wear
Result	Wear and damage comparison → Better wear resistance performance than competitor	


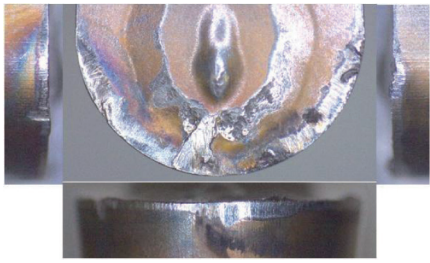
## Results of user test in aerospace industry

User test (Aerospace\_TC\*)

Grooving insert

S grade (HRSA)

Workpiece	Aerospace parts (CASE, HPT STTR)	Material	Inconel 718
Machining type	Ring shape / Vertical lathe (O.D profile machining) / Wet		
Cutting condition	max.dia 630mm vc 30m/min fn 0.05~0.25mm/rev ap 0.5mm		
Item	2NG50R-25G-F1 NV3025		

Division	Nanoly	Competitor (S)
Tool life / Wear image  (50min)		
Status comparison	Normal wear (partial chipping)	Large wear and chipping
Result	Wear and damage comparison → Better wear resistance performance than competitor	

User test (Aerospace\_TC\*)

Grooving insert

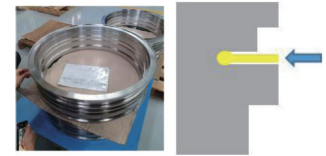
S grade (HRSA)

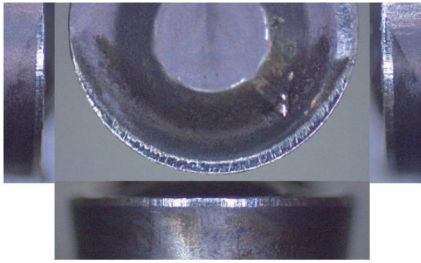

Workpiece	Aerospace parts (CASE, HPT STTR)	Material	Inconel 718
Machining type	Ring shape / Vertical lathe (Inner diameter profile machining) / Wet		
Cutting condition	max.dia 600mm vc 38m/min fn 0.05~0.2mm/rev ap 0.2~0.5mm		
Item	2NG30R-15G-M1 NV3025		

Division	Nanoly	Competitor (S)
Tool life / Wear image  (25min)		
Status comparison	Normal wear	Normal wear
Result	Wear and damage comparison → Better wear resistance performance than competitor	

User test (Aerospace\_TC\*) Grooving insert S grade (HRSA)

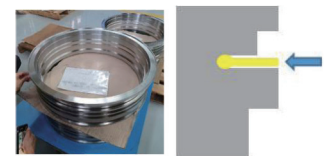
Workpiece	Aerospace parts	Material	Inconel 718
Machining type	Ring shape / Vertical lathe (O.D deep grooving) / Wet		
Cutting condition	max.dia 500mm vc 40m/min fn 0.05~0.1mm/rev ap 15.0mm		
Item	1NG31.8R-15.9G-M1 NC3025		

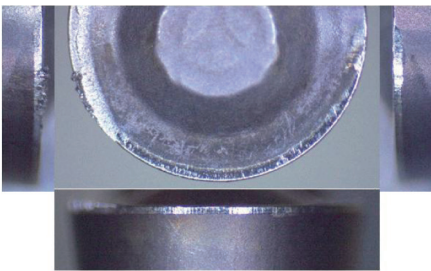
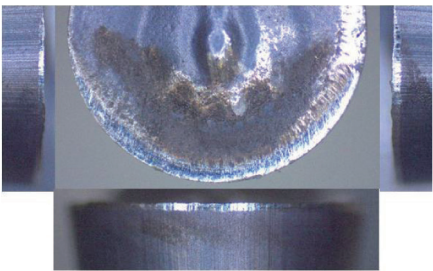


Division	Nanoly	Competitor (S)
Tool life / Wear image		
Status comparison	Normal wear	Partial large wear and chipping
Result	Wear and damage comparison → Better wear resistance performance than competitor	

User test (Aerospace\_TC\*) Grooving insert S grade (HRSA)

Workpiece	Aerospace parts	Material	Inconel 718
Machining type	Ring shape / Vertical lathe (O.D deep grooving) / Wet		
Cutting condition	max.dia 500mm vc 40m/min fn 0.05~0.1mm/rev ap 15.0mm		
Item	1NG31.8R-15.9G-M1 NC3025		



Division	Nanoly	Competitor (S)
Tool life / Wear image		
Status comparison	Normal wear	Partial large wear
Result	Wear and damage comparison → Better wear resistance performance than competitor	

## Results of user test in aerospace industry

User test (Aerospace\_K\*)

Grooving insert

S grade (HRSA)

Workpiece	Aerospace parts	Material	Inconel 718
Machining type	Ring shape / Vertical lathe (O.D deep grooving) / Wet		
Cutting condition	max.dia 700mm vc 45m/min fn 0.1mm/rev ap 2.0mm		
Item	2NG50R-25G-M1 NV3025		



Division	Nanology	Competitor (T)
Tool life / Wear image		
Status comparison	Normal wear	Partial large wear and chipping
Result	Wear and damage comparison → Better wear resistance performance than competitor	

User test (Aerospace\_K\*)

Grooving insert

S grade (HRSA)

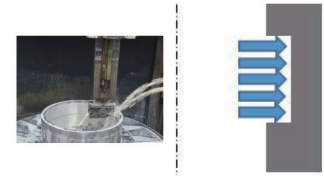
Workpiece	Aerospace parts (COMP AFT INNER)	Material	Inconel 718
Machining type	Ring shape / Vertical lathe (O.D deep grooving) / Wet		
Cutting condition	max.dia 542mm vc 40m/min fn 0.15mm/rev ap 0.7mm		
Item	2NG50R-25G-M1 (NV3025)		



Division	Nanology	Competitor (T)
Tool life / Wear image  (7min)		
Status comparison	Normal wear	Lots of chipping at edge
Result	Wear and damage comparison → Better wear resistance performance than competitor	

User test (Aerospace\_S\*) Grooving insert S grade (HRSA)

Workpiece	Aerospace parts (CASE, CO~STATO~)	Material	Inconel 718
Machining type	Ring shape / Vertical lathe / Inner dia grooving / Wet		
Cutting condition	max.dia 600mm vc 35m/min fn 0.08~mm/rev ap 6.0mm		
Item	2NG80N-08G-F1 NV3025		



Division	Nanoly	Competitor (K)
Tool life / Wear image  (25min)		
Status comparison	Normal wear	large wear and edge chipping
Result	Wear and damage comparison → Better wear resistance performance than competitor	



## Results of user test in automobile industry




---



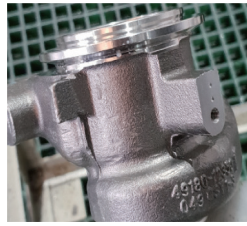

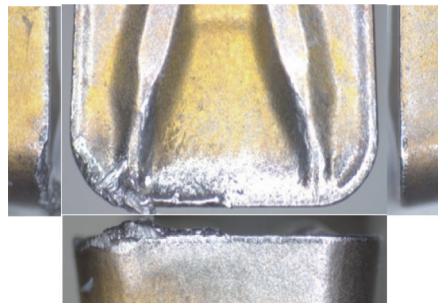


## Results of user test in automobile industry

User test (Automobile) Grooving insert M grade (SUS)

Workpiece	Automobile parts (turbocharger housing)	Material	1.4837	
Machining type	Turbocharger housing / Horizontal lathe (Shouldering, Grooving) / Wet			
Cutting condition	max.dia99mm vc 150m/min fn 0.05-0.2mm/rev ap 3.0mm			
Item	2NG30N-04M-M1 NV3025			
Division	Nanoly		Competitor (T)	
Tool life / Wear image				
Status comparison	After 10pcs machining : normal wear		After 5pcs machining : partial chipping, large wear	
Result	Wear and damage comparison at limit → 2 times better wear, chipping resistance performance than competitor			

User test (Automobile) Grooving insert M grade (SUS)

Workpiece	Automobile parts (Turbocharger housing)	Material	1.4837	
Machining type	Turbocharger housing / Vertical lathe (Shouldering, Grooving) / Wet			
Cutting condition	max.dia 99mm vc 94m/min fn 0.15mm/rev ap 4.0mm			
Item	2NG30N-08M-F1M NV3025			
Division	Nanoly		Competitor (T)	
Tool life / Wear image				
Status comparison	After 10pcs machining : normal wear		After 10pcs machining : partial chipping, large wear	
Result	Wear and damage comparison → Better wear resistance performance than competitor			

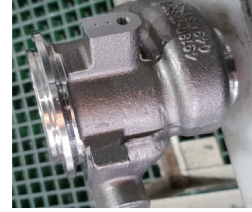
## Results of user test in automobile industry

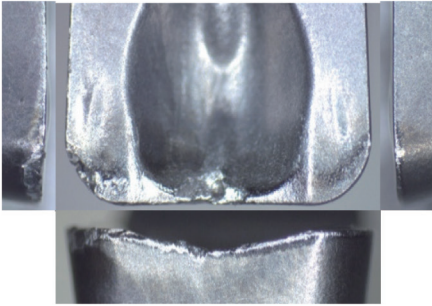
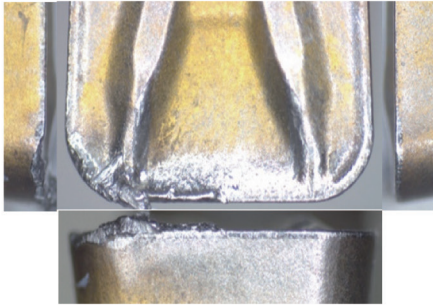
User test (Automobile)

Grooving insert

M grade (SUS)

Workpiece	Automobile parts (Turbocharger housing)	Material	1.4837
Machining type	Turbocharger housing / Vertical lathe (Shouldering, Grooving) / Wet		
Cutting condition	max.dia 99mm vc 94m/min fn 0.15mm/rev ap 4.0mm		
Item	2NG30N-08M-F1M NV3025		



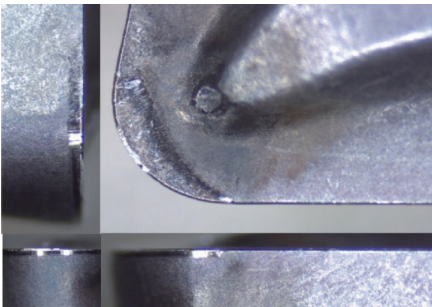
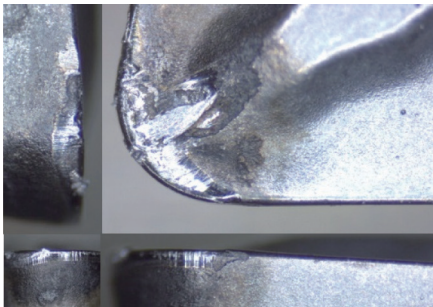
Division	Nanoly	Competitor (T)
Tool life / Wear image		
Status comparison	After 19pcs machining : corner chipping, large wear	After 10pcs machining : partial large wear, chipping
Result	Wear and damage comparison at limit → 1.8 times better wear, chipping resistance performance than competitor	

User test (Automobile)

Turning (ISO)

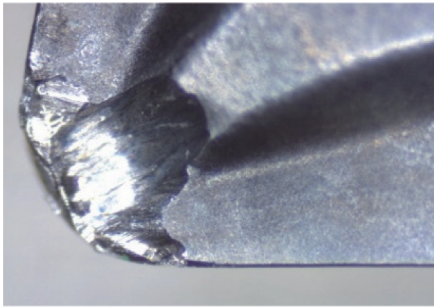
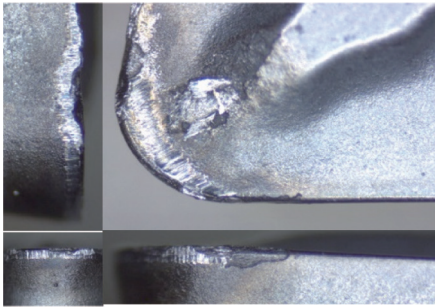
M grade (SUS)

Workpiece	Automobile parts (Cylinder housing)	Material	SUS420J2
Machining type	Cylinder housing / Horizontal lathe (Inner dia roughing) / Wet		
Cutting condition	max.dia 31~38mm vc 120m/min fn 0.12mm/rev ap 0.8mm		
Item	CCMT09T308-F11 NV3025		

Division	Nanoly	Competitor (E)
Tool life / Wear image		
Status comparison	After 40pcs machining : normal wear	After 40pcs machining : partial large wear, chipping
Result	Wear and damage comparison at same pcs → Better wear, chipping resistance performance than competitor	

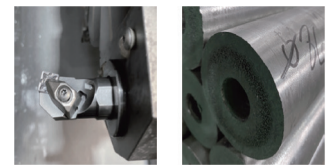
User test (Automobile) Turning (ISO) M grade (SUS)

Workpiece	Automobile parts (cylinder housing)	Material	SUS420J2
Machining type	Cylinder housing / Horizontal lathe (Inner dia roughing) / Wet		
Cutting condition	max.dia 31~38mm vc 120m/min fn 0.12mm/rev ap 0.8mm		
Item	CCMT09T308-F11 NV3025		

Division	Nanoly	Competitor (E)
Tool life / Wear image		
Status comparison	After 70pcs machining : Corner chipping	After 40pcs machini : chipping (breakage)
Result	Wear and damage comparison at limit → 1.7 times better wear, chipping resistance performance than competitor	

User test (Automobile) Turning (ISO) M grade (SUS)

Workpiece	Automobile parts	Material	Stainless steel
Machining type	Tube shape / Horizontal lathe (Inner dia roughing) / Wet		
Cutting condition	max.dia 28 → 40mm vc 90m/min fn 0.16mm/rev ap 6.0mm		
Item	SNMG120412-M11 NV3025		



Division	Nanoly	Competitor (E)
Tool life / Wear image (1pcs)		
Status comparison	After 2pcs machining : normal wear	After 1pcs machining : edge chipping
Result	Wear and damage comparison → 2 times better wear, chipping resistance performance than competitor	

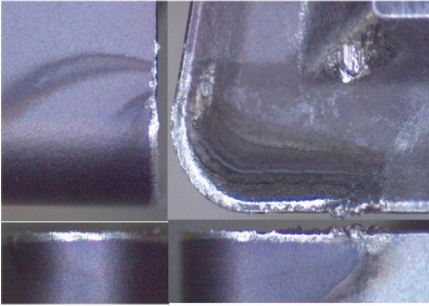
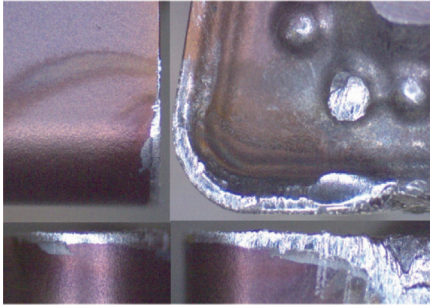
## Results of user test in automobile industry

User test (Automobile)

Turning (ISO)

M grade (SUS)

Workpiece	Automobile parts	Material	1.4837
Machining type	Housing / Horizontal lathe O.D roughing / Wet		
Cutting condition	max.dia 40mm vc 65m/min fn 0.2mm/rev ap 2.0mm		
Item	CNMG120408-9GE NV3025		

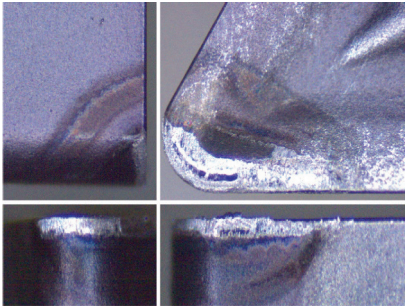
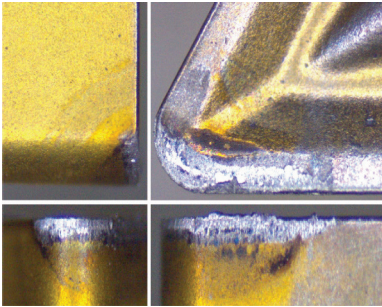
Division	Nanoly	Competitor (H)
Tool life / Wear image		
Status comparison	After 4pcs machining : normal wear	After 4pcs machining : large wear, edge breakage
Result	Wear and damage comparison → 1.5 times better wear, chipping resistance performance than competitor	

User test (Automobile\_Y\*)

Turning (ISO)

S grade (HRSA)

Workpiece	Automobile parts (Housing)	Material	Inconel 718
Machining type	Horizontal lathe (O.D / Finishing) / Wet		
Cutting condition	max.dia 50mm vc 60m/min fn 0.15mm/rev ap 1.0mm		
Item	TNMG160404-M22 NV3005		

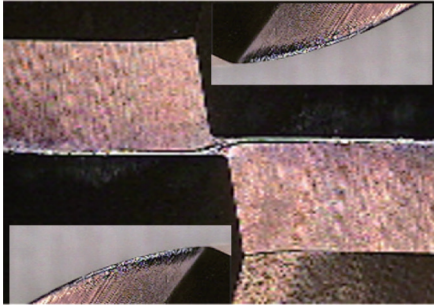
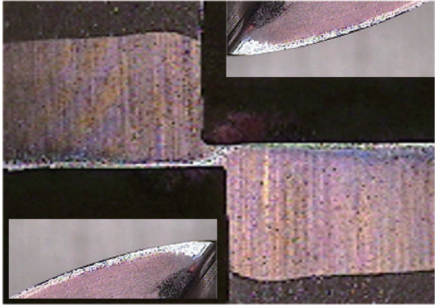
division	Nanoly	Competitor (H)
Tool life / Wear image		
Status comparison	After 24pcs machining : normal wear	After 24pcs machining : chipping & large wear
Result	Wear and damage comparison at same pcs Better wear, chipping resistance performance than competitor	

## Results of user test in automobile industry

User test (Automobile) Indexable endmill H grade (high hardness)

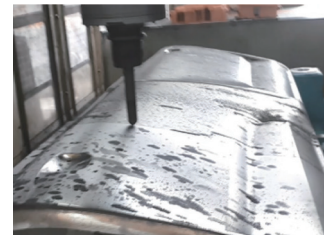
Workpiece	Automobile bumper mold	Material	SKD11 (HRC55)
Machining type	Face milling / Finishing / Dry		
Cutting condition	vc 500m/min fn 0.45mm/tooth ap 0.2mm		
Item	NBGT-HS-15R TS1145		

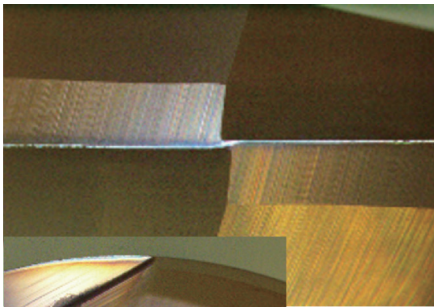
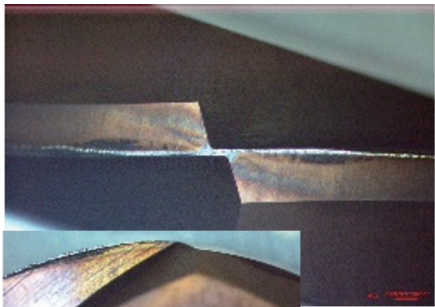


Division	Nanoly	Competitor (H)
Tool life / Wear image (16 hours)		
Status comparison	After 24 hours machining	After 16 hours machining
Result	Wear and damage comparison → 1.5 times better wear resistance performance than competitor	

User test (Automobile) Indexable endmill H grade (high hardness)

Workpiece	Automobile door mold	Material	SKD11 (HRC55)
Machining type	Face milling / Finishing / Dry		
Cutting condition	vc 500m/min fn 0.47mm/tooth ap 0.15mm		
Item	NBGT-HS-15R TS1145		



Division	Nanoly	Competitor (H)
Tool life / Wear image (16 hours)		
Status comparison	After 24 hours machining	After 16 hours machining
Result	Wear and damage comparison → 1.5 times better wear resistance performance than competitor	

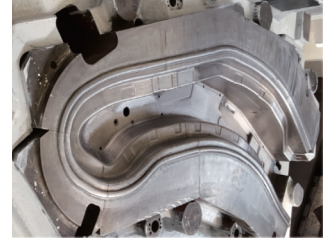
## Results of user test in automobile industry

User test (Automobile)

Indexable endmill

H grade (high hardness)

Workpiece	Automobile mold parts	Material	SKD11 (HRC55~62)
Machining type	Face milling / Finishing / Dry		
Cutting condition	vc 330m/min fn 0.42mm/tooth ap 0.15mm		
Item	NBGT-HS-15R TS114NBGT-HS-15R TS1145		



Division	Nanoly	Competitor (H)
Tool life / Wear image (8 hours)		
Status comparison	After 9 hours machining (normal wear)	After 8 hours machining (side edge chipping)
Result	Wear and damage comparison → 1.5 times better wear resistance performance than competitor	



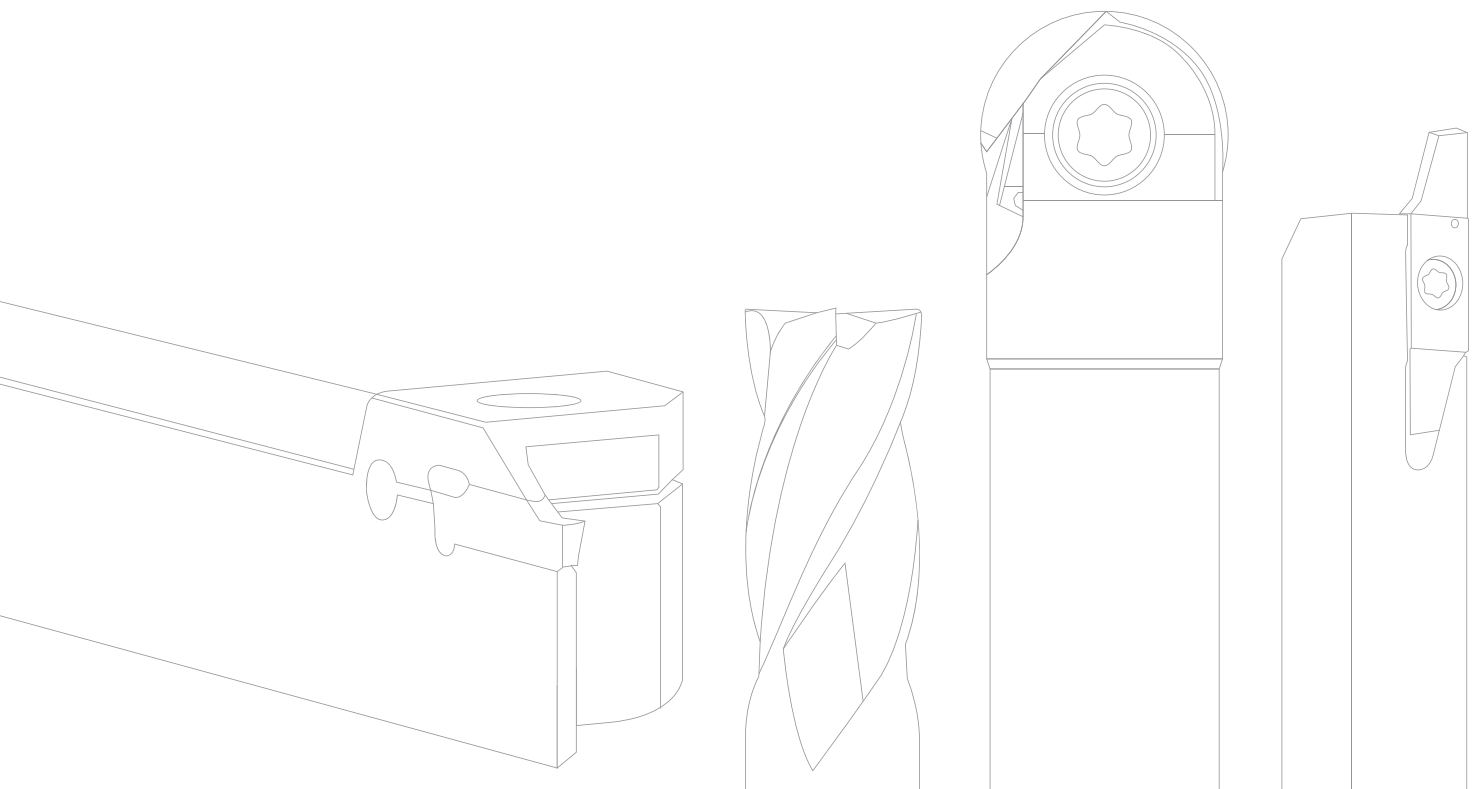












### **NANOTECH (H.Q)**

1249, Chungcheong-daero, Bugi-myeon, Cheongwon-gu, Cheongju-si, Chungcheongbuk-do, Republic of Korea (28139)  
TEL : +82-43-217-6390 / FAX : +82-43-218-6391/ E-mail : sales@nanoloy.co.kr

#### **<Domestic sales office>**

#### **Changwon Office**

56, Yongji-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do, Republic of Korea (51522)  
TEL : +82-43-714-3525 / E-mail : sskim@nanoloy.co.kr

#### **Gyeonggi Office**

59-20, Seouldaehak-ro, Siheung-si, Gyeonggi-do, Republic of Korea (15012)  
TEL : +82-43-217-6390 / E-mail : kjshin@nanoloy.co.kr

#### **<Overseas branch>**

#### **Vietnam**

04 Plot, Ba Thien Industrial Park, Ba Hien Town, Binh Xuyen District, Vinh Phuc Pro., Vietnam  
TEL : +84-211-3887-272

#### **China**

Jiang Jun road, Zhou Tian Village, Qiuchang Town, Huiyang, Huizhou, Guangdong province, China  
TEL : +86-752-356-2988

Ⓜ [www.nanoloy.co.kr](http://www.nanoloy.co.kr)

