

CBN insert

**BXA10/BXA20/BR35F**

Tungaloy Report No. 551-G

## Tungaloy's complete CBN solutions for hardened steel turning





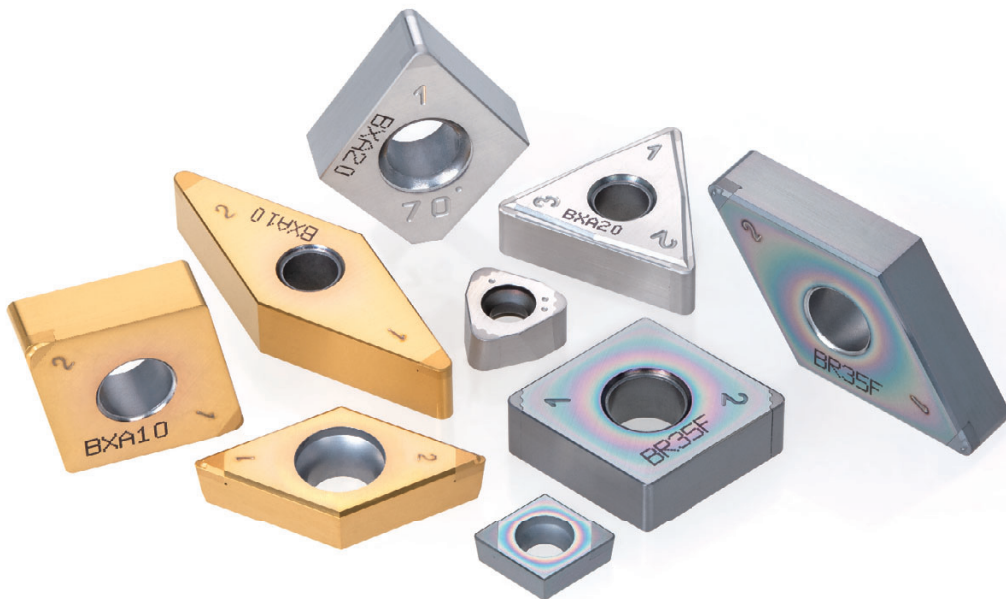


**INDUSTRY 4.0**  
*FEED the SPEED!*



## BXA10 / BXA20 / BR35F

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BR35F coated CBN grade for heavy interrupted cuts of hardened steel parts

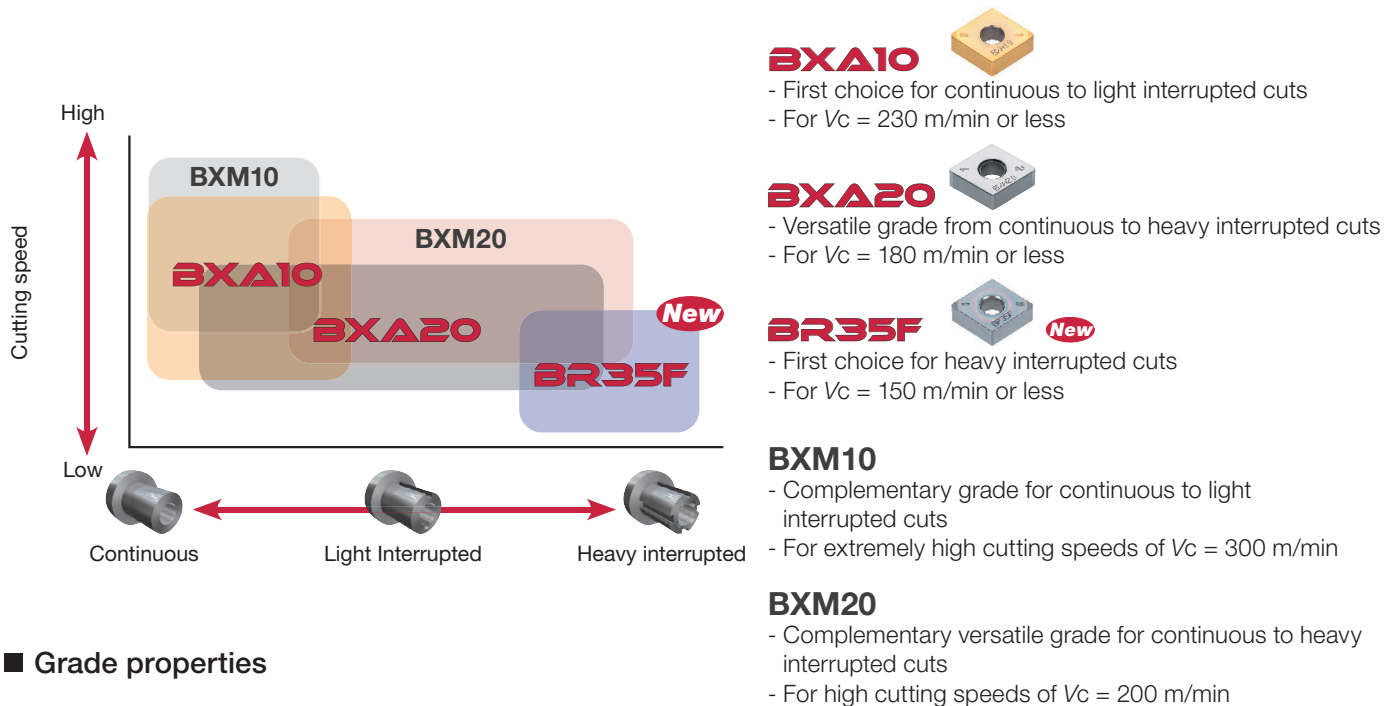


# BXA10 / BXA20 / BR35F

## Coated CBN series for a wide range of hard part turning

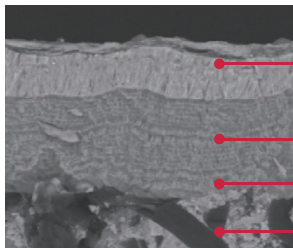
### ■ Application areas

The most suitable grade can be selected for your application requirements



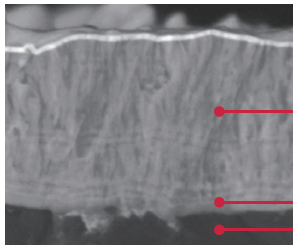
### ■ Grade properties

#### BXA10



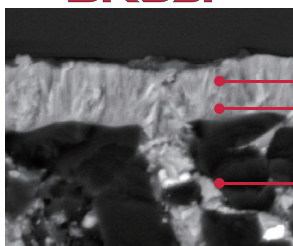
- TiCN coating with high thermal stability and wear resistance
- Multilayer TiAlN coating with good adhesion and resistance to delamination and chipping
- Strong coating-substrate adhesion prevents delamination
- Dedicated CBN substrate with excellent flank wear and crater wear resistance

#### BXA20



- Thick multilayer TiAlN coating with superior wear and chipping resistance
- Strong coating-substrate adhesion prevents delamination
- Dedicated CBN substrate with excellent crater wear and fracture resistance

#### New BR35F

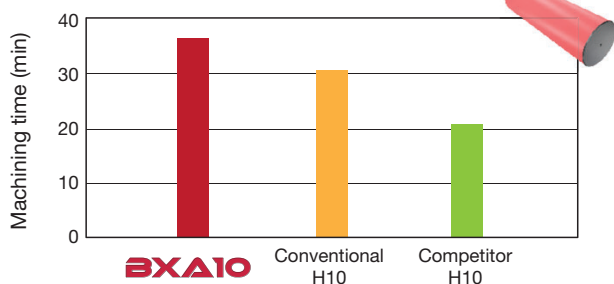


- Multilayer AlCrN coating with excellent fracture resistance
- Strong coating-substrate adhesion prevents delamination
- Dedicated CBN substrate with excellent chipping and fracture resistance

## CUTTING PERFORMANCE

### BXA10

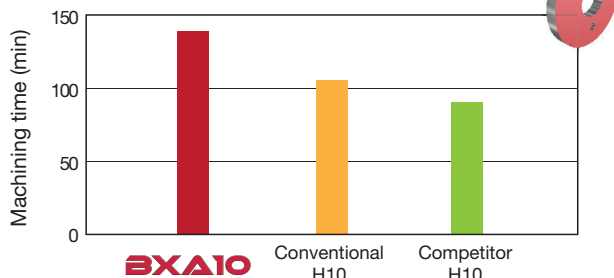
#### H SCM415 (58 - 60HRC)



Insert : CNGA120408  
 Cutting speed :  $V_c = 200$  m/min  
 Feed :  $f = 0.15$  mm/rev  
 Depth of cut :  $a_p = 0.15$  mm  
 Machining : Continuous cutting  
 Coolant : Wet

**BXA10** provided the insert with good wear resistance during high speed continuous cuts of hardened steel parts.

#### H SCM435 / 34CrMo4 (59 - 61HRC)

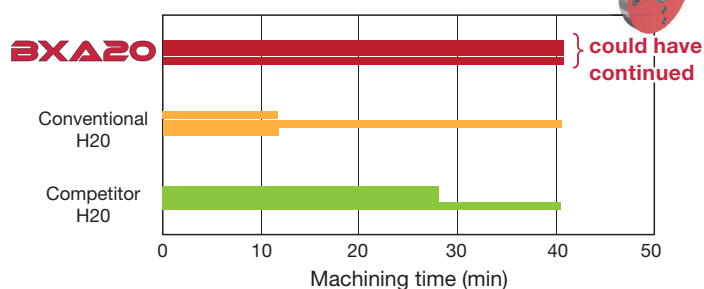


Insert : CNGA120408  
 Cutting speed :  $V_c = 130$  m/min  
 Feed :  $f = 0.15$  mm/rev  
 Depth of cut :  $a_p = 0.15$  mm  
 Machining : Light interrupted cutting  
 Coolant : Wet

**BXA10** provided the insert with good chipping resistance during light interrupted cuts of hardened steel parts.

### BXA20

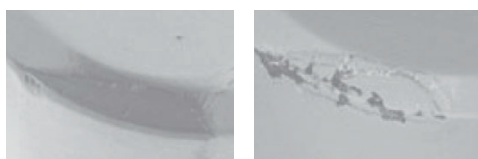
#### H SCM420 / 18CrMo4 (60HRC)



Insert : CNGA120408  
 Cutting speed :  $V_c = 100$  m/min  
 Feed :  $f = 0.1$  mm/rev  
 Depth of cut :  $a_p = 0.2$  mm  
 Machining : Light interrupted cutting  
 Coolant : Wet

**BXA20** provided the insert with good fracture resistance, while preventing delamination, during light interrupted cuts of hardened steel parts.

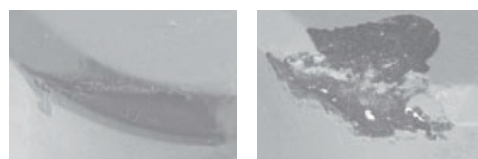
After 7 min



**BXA20**

Conventional  
H20

After 14 min



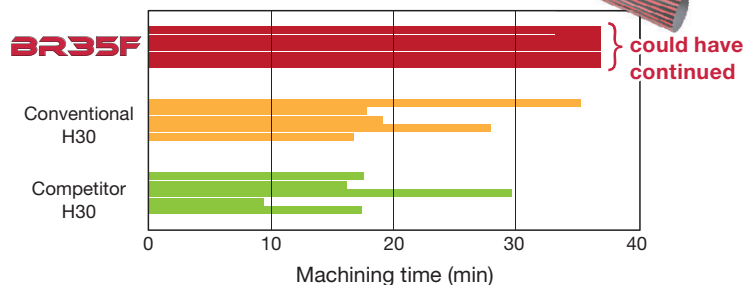
**BXA20**

Conventional  
H20

# BXA10 / BXA20 / BR35F

**New**  
**BR35F**

**H** SCM435 / 34CrMo4 (58 - 60HRC)



Insert : CNGA120408  
 Cutting speed :  $V_c = 100$  m/min  
 Feed :  $f = 0.15$  mm/rev  
 Depth of cut :  $a_p = 0.15$  mm  
 Machining : Heavy interrupted cutting  
 Coolant : Dry

**BR35F** provided the insert with good fracture resistance during heavy interrupted cuts of hardened steel parts.

## STANDARD CUTTING CONDITIONS

| ISO      | Grade        | Workpiece condition | Cutting speed<br>$V_c$ (m/min) | Depth of cut<br>$a_p$ (mm) | Feed<br>$f$ (mm/rev) |
|----------|--------------|---------------------|--------------------------------|----------------------------|----------------------|
| <b>H</b> | <b>BXA10</b> | Continuous          | 100 - 230                      | 0.05 - 0.5                 | 0.05 - 0.3           |
|          |              | Light interrupted   | 100 - 230                      | 0.05 - 0.3                 | 0.05 - 0.2           |
|          | <b>BXA20</b> | Continuous          | 60 - 180                       | 0.05 - 0.5                 | 0.05 - 0.3           |
|          |              | Interrupted         | 60 - 180                       | 0.05 - 0.3                 | 0.05 - 0.2           |
|          | <b>BR35F</b> | Heavy interrupted   | 50 - 150                       | 0.05 - 0.3                 | 0.05 - 0.2           |

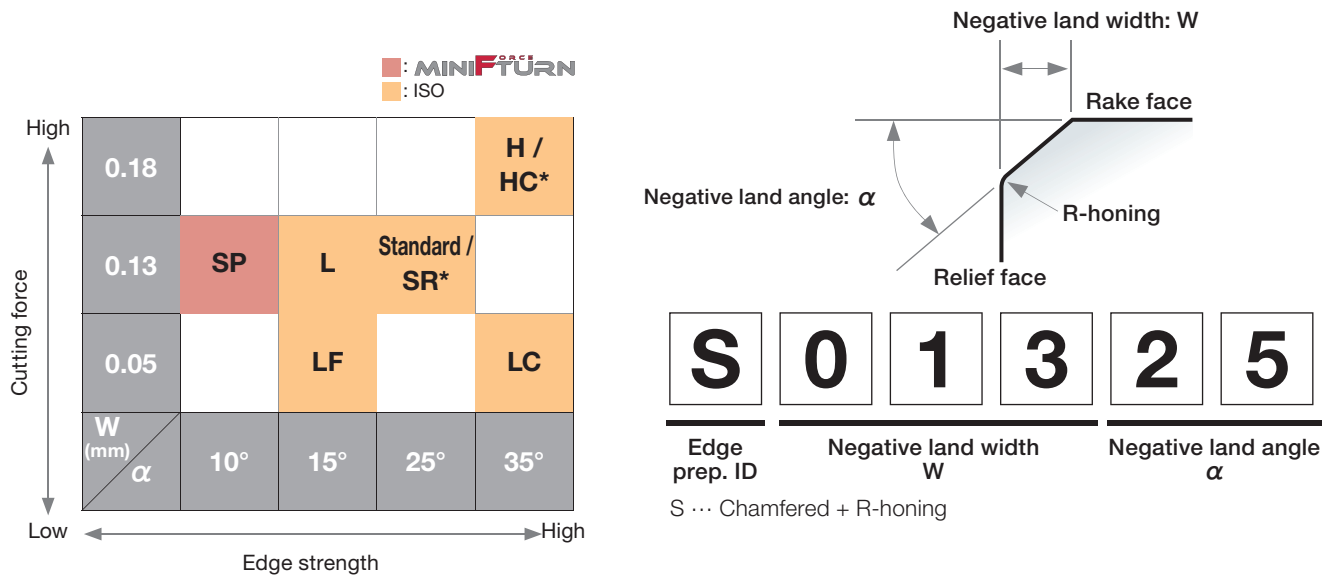
## ■ Edge preparations

Various styles of edge preparations are available according to the application needs

BXA10 and BXA20 grade ISO inserts are available in five different styles of edge preps: L, LF, LC, standard and -H; BR35F grade ISO inserts are offered in two styles of edge preps: SR and HC.

\*For the new BR35F grade ISO inserts, "SR" is assigned for the edge prep symbol for S01325, instead of "Standard" as previously assigned. Likewise, "HC" for S01835, instead of conventional "H".

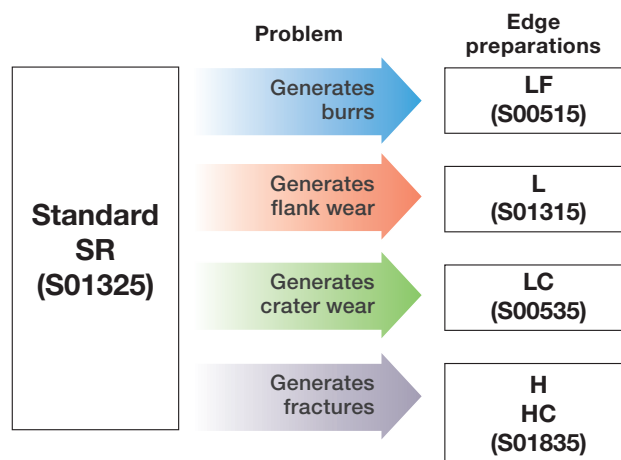
MiniForce-Turn inserts are available in the SP style edge prep (S01310).



\*Edge prep symbol for BR35F grade inserts only

## ■ Selections of edge preparations

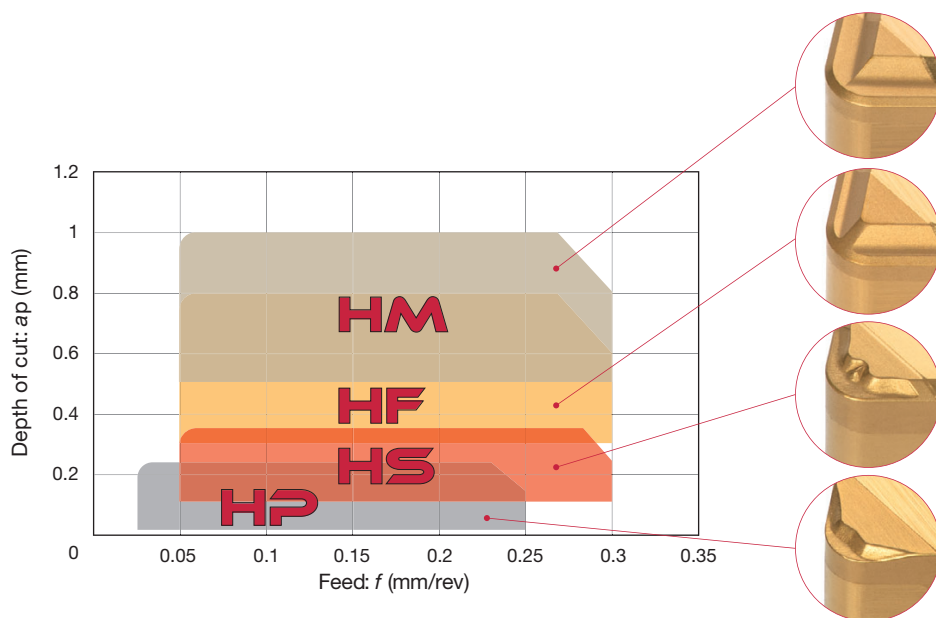
Optimized edge preparations for machining challenges



## HARDBREAKER SERIES

CBN inserts with chipbreaker

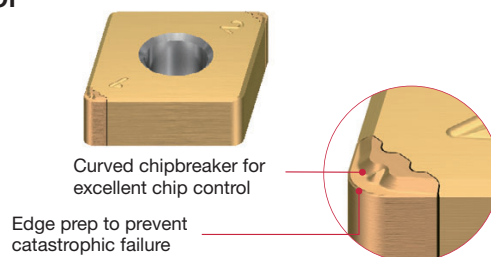
ideal for carburized layer removal and finishing hardened steel



### HS chipbreaker

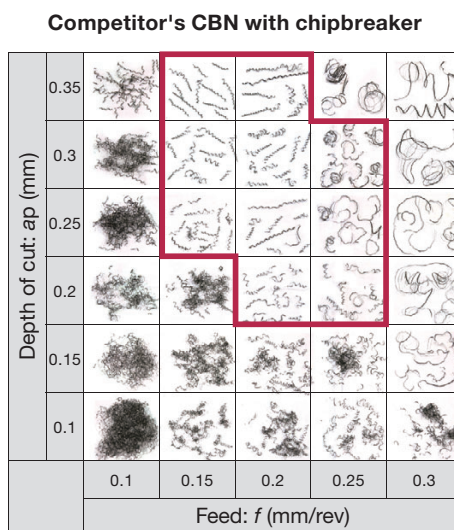
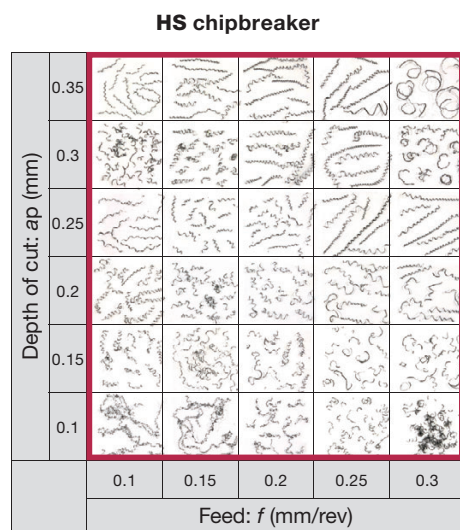
Optimized chipbreaker design for excellent chip control during hard turning at aggressive conditions

- Designed for high feed machining
- Provides excellent chip control for a wide range of D.O.C. and feed rates
- Edge preparation is designed to prevent catastrophic failure



### CUTTING PERFORMANCE

HS provides all-round chip breaking capability even at increased feed rates vs. competitors



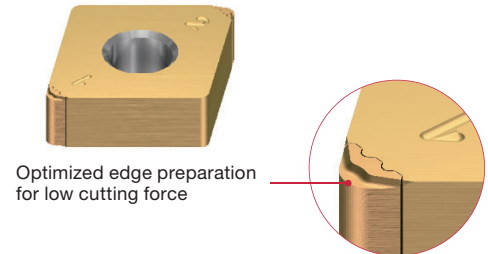
Insert : 2QP-CNGM120408-**HS**  
 Workpiece material : SCM420 / 18CrMo4 (58HRC)  
 Cutting speed :  $V_c = 150$  m/min  
 Toolholder : ACLNL2525M12-A  
 Machining : External continuous cutting  
 Coolant : Wet



## HP chipbreaker

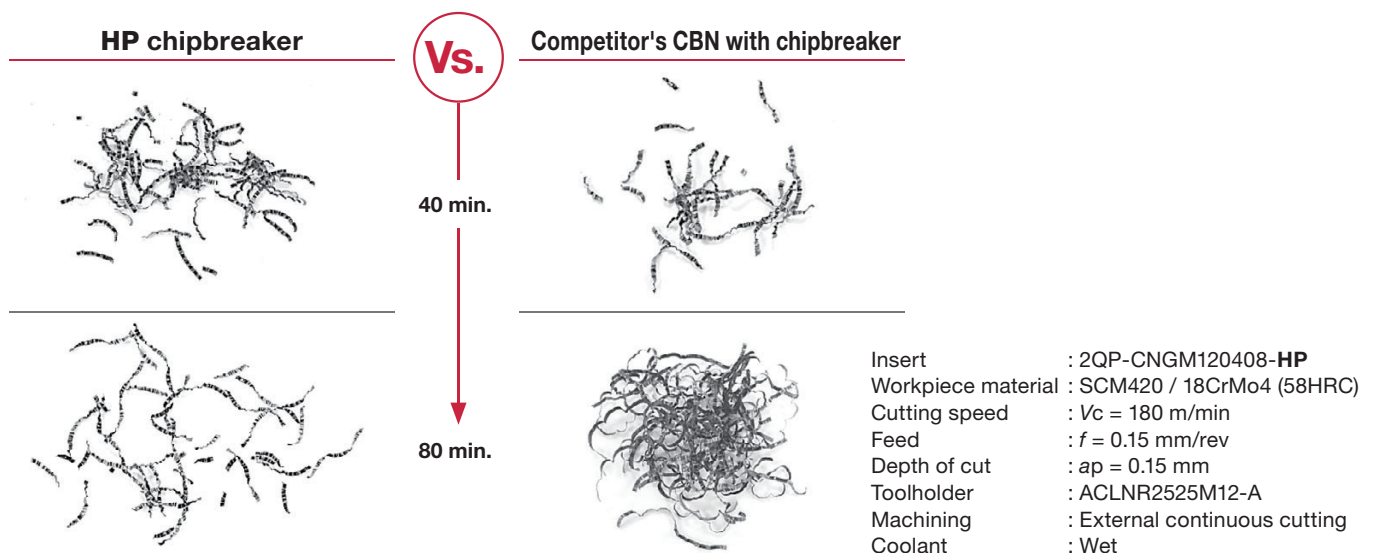
### Designed for finish machining of hardened parts with close tolerances

- Optimized chipbreaker geometry significantly reduces cutting force imposed on the cutting edge, ensuring long tool life
- The edge preparation is designed to generate low cutting force, providing chatter-free machining and close tolerances
- The built-in wiper yields excellent surface quality and good chip control



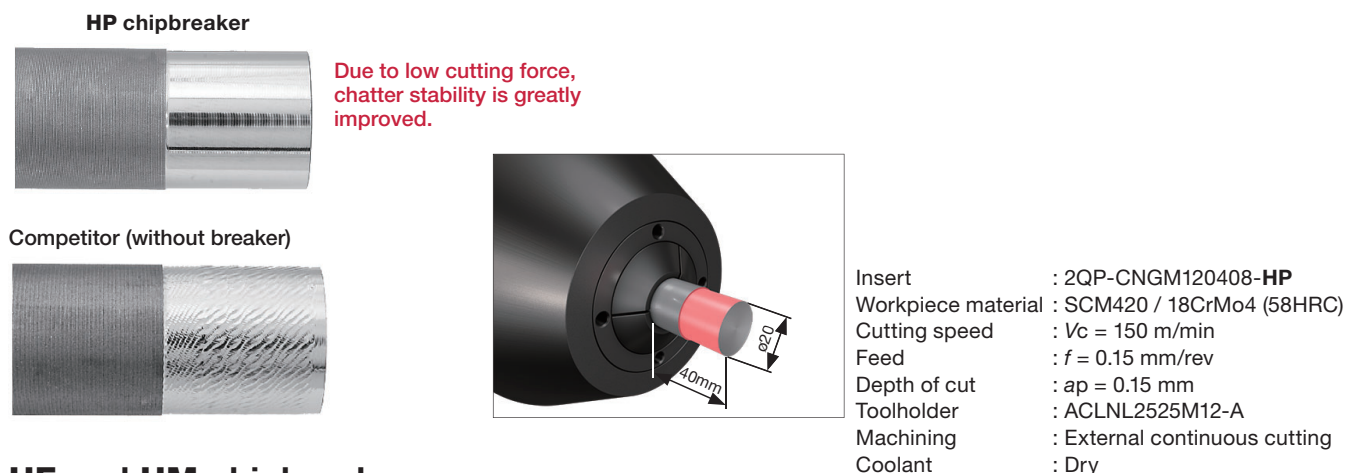
## CUTTING PERFORMANCE

### HP chipbreaker provides better chip control over the competitors



## Chatter stability

### → Prevents chattering and provides the finest machined surface



## HF and HM chipbreakers

- Suited for hard turning applications requiring great D.O.C. such as carburized layer removal
- Effective chip breaking is possible for a wide range of hard materials
- BXA20 and BXM20 CBN grade inserts are available for aggressive cutting depths

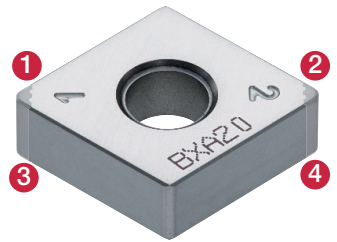
## WavyJoint

### New brazing technology for increased machining efficiency

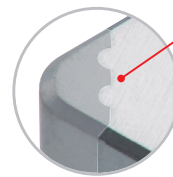
A maximum depth of cut up to 0.8 mm.  
Reduces the number of passes to increase productivity.

#### Innovative WavyJoint brazing technology

Prevents the CBN tips from debrazing, eliminating abrupt insert fractures during demanding dry machining, while securing stable and predictable hard turning operations.

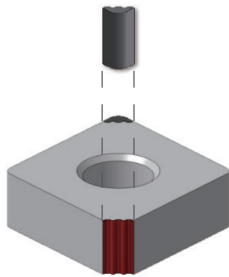


Double sided inserts



The "wavy" contact surface enhances the brazing strength

WavyJoint

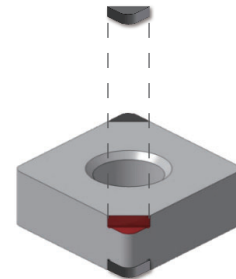


Vs.

**CBN Tip Size: 200%** larger for improved wear resistance of the cutting edge

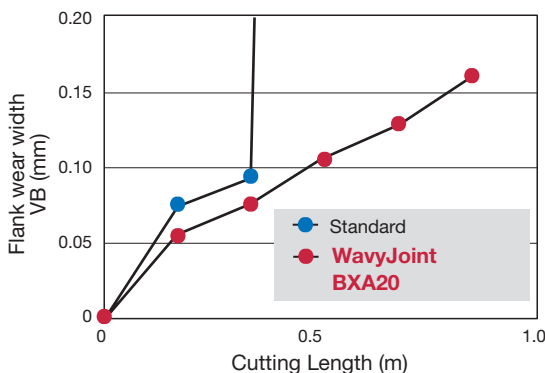
**Brazing Area: 160%** larger for enhanced brazing strength

Standard



## CUTTING PERFORMANCE

### Effect of increased brazing area



**H**

Insert

: Standard = 2QP-CNGM12408-HM BXA20

**WavyJoint** = 4QS-CNGG120408-HM BXA20

Workpiece material : SCM420 / 18CrMo4 (60HRC)

Cutting speed

:  $V_c = 150$  m/min

Feed

:  $f = 0.2$  mm/rev

Depth of cut

:  $a_p = 0.75$  mm

Toolholder

: ACLNL2525M12-A

Machining

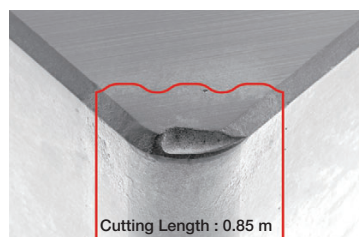
: External turning

Coolant

: Dry



Standard



WavyJoint BXA20

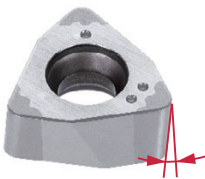
The **WavyJoint** technology prevents the braze from overheating due to the increase in cutting edge temperature during dry cutting, greatly improving the brazing strength. The result: stable machining and extended tool life.

## Double-sided **positive** insert with CBN tips

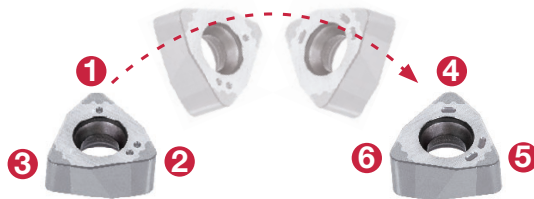
MiniForce-Turn now offers WavyJoint CBN inserts that provide additional strength and security in aggressive cutting conditions.

### ■ WXGQ0403... insert

Double-sided positive inserts

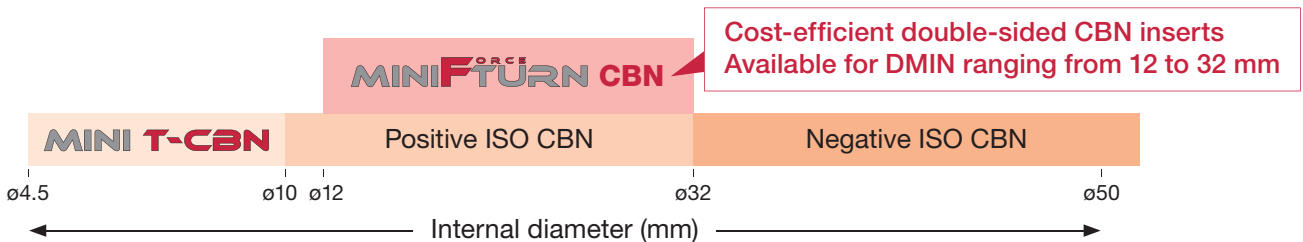


6-edged insert with dovetail design



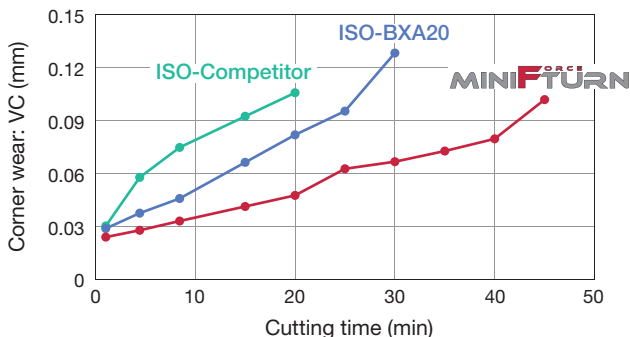
## APPLICATION RANGE

ID turning of hardened steel



## CUTTING PERFORMANCE

For ID turning of continuous cut (4xD)



Insert : 6QS-WXGQ040304SPL BXA20 (**MiniForce-Turn**)  
2QP-CCGW060204 BXA20 (ISO)  
CCGW060204 type Competitor's H20 grade (ISO)

Toolholder : E10M-SWLXR04-D120 (**MiniForce-Turn**)  
E10M-SCLCR06-D120 (ISO)

Workpiece material : SCM420 / 18CrMo4 (60HRC)

Cutting speed :  $V_c = 150$  m/min

Feed :  $f = 0.1$  mm/rev

Depth of cut :  $a_p = 0.15$  mm

Coolant : Wet

Thanks to unique geometry design,  
**MiniForce-Turn** insert provides double tool life  
over competitor's ISO positive insert.



## GNGA / FNGA / YNGA

### New CBN inserts for general turning

#### GNGA insert with 70° corner angle

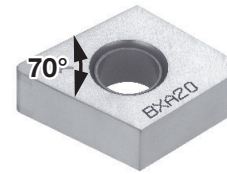
#### FNGA insert with 45° corner angle

- Smaller corner angle provides the insert with greater clearance between the insert flank and workpiece surface, allowing better chip flow and evacuation
- Enables greater D.O.C. in face turning applications in which the insert is pulled outward (fed away from the workpiece center)

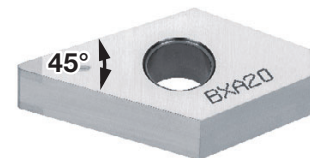
#### YNGA insert with 25° corner angle

Allows undercutting, V grooving, and other applications that are not possible with traditional V inserts

#### GNGA



#### FNGA



#### YNGA



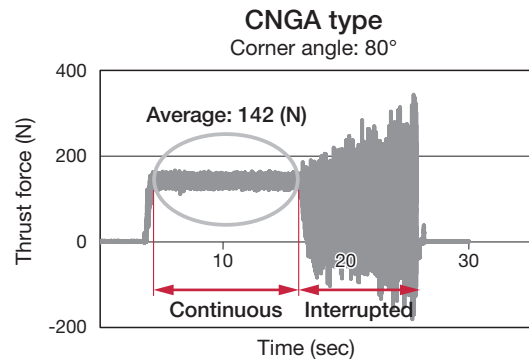
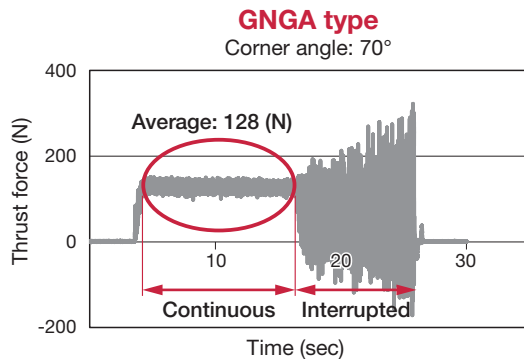
### ■ High versatility

- Existing ISO turning toolholder can be used for these inserts
  - For GNGA insert: use the holder for CN\*\*1204 insert
  - For FNGA insert: use the holder for DN\*\*1504 insert
  - For YNGA insert: use the holder for VN\*\*1604 insert
- No offsets needed compared to ISO inserts, due to same geometry of cutting edge position
- Double sided insert with 2 cutting edges



## CUTTING PERFORMANCE

### ■ Cutting force (Thrust force)



Cutting force of **GNGA** insert is lower than regular **CNGA** insert's.



Insert : 2QP-GNGA120408  
2QP-CNGA120408  
Workpiece material : SCM420 / 18CrMo4 (59HRC)  
Cutting speed :  $V_c = 150$  m/min  
Feed :  $f = 0.15$  mm/rev  
Depth of cut :  $a_p = 0.125$  mm  
Toolholder : ACLNL2525M12-A  
Machining : Face turning  
Coolant : Dry

### ■ Chip flow and control in face turning

#### Chip flow of continuous face turning



**GNGA type**  
Corner angle: 70°

**CNGA type**  
Corner angle: 80°

Since **GNGA** type inserts have enough space for chip flow, chip packing doesn't occur, improving surface finish and preventing sudden chipping on cutting edge.

#### Chip control in interrupted face turning

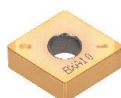


**GNGA type**  
Corner angle: 70°

**CNGA type**  
Corner angle: 80°

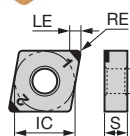


Insert : 2QP-GNGA120408  
2QP-CNGA120408  
Workpiece material : SCM420 / 18CrMo4 (60HRC)  
Cutting speed :  $V_c = 150$  m/min  
Feed :  $f = 0.10$  mm/rev  
Depth of cut :  $a_p = 0.125$  mm  
Toolholder : ACLNL2525M12-A  
Machining : Face turning  
Coolant : Dry



# CNGA1204

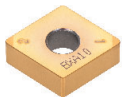
**Rhombic, 80°  
with hole**



IC : 12.7 mm  
D1 : 5.16 mm  
S : 4.76 mm

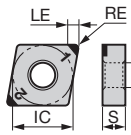
[illegible][illegible]

- : New product
- : Line up



# CNGA1204

**Rhombic, 80°  
with hole**



IC : 12.7 mm  
D1 : 5.16 mm  
S : 4.76 mm

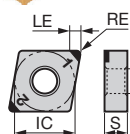
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● : New product  
● : Line up





**Rhombic, 80°  
with hole**



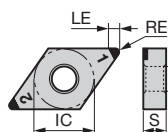
IC : 12.7 mm  
D1 : 5.16 mm  
S : 4.76 mm

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- : New product
- : Line up



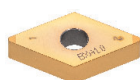
**Rhombic, 55°  
with hole**



IC : 9.525 mm  
D1 : 3.81 mm  
S : 4.76 mm

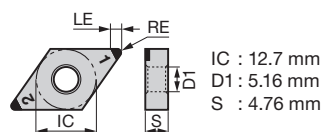
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● : Line up

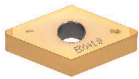


# DNGA1504

**Rhombic, 55°  
with hole**

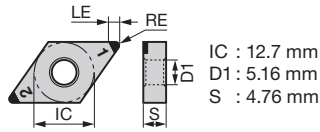
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- : New product
- : Line up

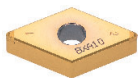


# DNGA1504

**Rhombic, 55°  
with hole**

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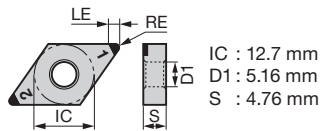
● : New product  
● : Line up



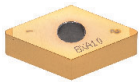
# DNG 1504

**Rhombic, 55°  
with hole**

With chipbreaker

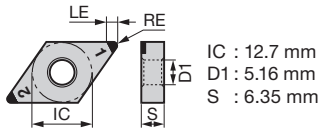
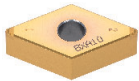
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● : New product  
● : Line up



# DNGA1506

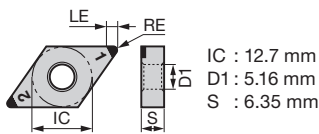
**Rhombic, 55°  
with hole**

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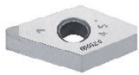
# DNGM1506

**Rhombic, 55°  
with hole**

### With chipbreaker

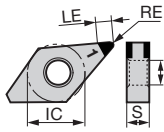
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# FNGA1504

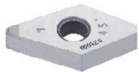
### Polygon, 45° with hole



IC : 12.7 mm  
D1 : 5.16 mm  
S : 4.76 mm

[illegible][illegible]

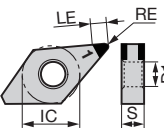
● : Line up



# FNGG1504

**Polygon, 45°  
with hole**

### With chipbreaker



IC : 12.7 mm  
D1 : 5.16 mm  
S : 4.76 mm

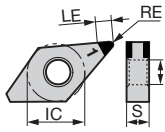
[illegible][illegible]

● : Line up



# FNGA1506

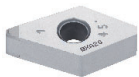
### Polygon, 45° with hole



IC : 12.7 mm  
D1 : 5.16 mm  
S : 6.35 mm

[illegible][illegible]

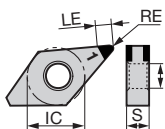
● : Line up



# FNGG1506

**Polygon, 45°  
with hole**

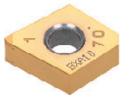
With chipbreaker



IC : 12.7 mm  
D1 : 5.16 mm  
S : 6.35 mm

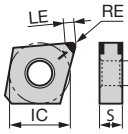
[illegible][illegible]

● : Line up



# GNGA1204

### Polygon, 70° with hole



IC : 12.7 mm  
D1 : 5.16 mm  
S : 4.76 mm

[illegible][illegible]

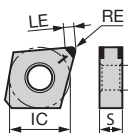
● : New product  
● : Line up



# GNGG1204

**Polygon, 70°  
with hole**

With chipbreaker



IC : 12.7 mm  
D1 : 5.16 mm  
S : 4.76 mm

[illegible][illegible]

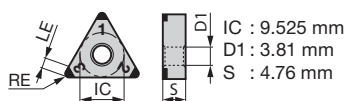
● : Line up

● : New product  
● : Line up



# TNGA1604

**Triangular, 60°  
with hole**

[illegible]

| Application         | Designation       | Dimension (mm) |     | No. of corners | Wiper | Entered metal |       |       |       |       |  |  |  |  |  |  |  |  |  |  |
|---------------------|-------------------|----------------|-----|----------------|-------|---------------|-------|-------|-------|-------|--|--|--|--|--|--|--|--|--|--|
|                     |                   | RE             | LE  |                |       | BXA10         | BXA20 | BR35F | BXM10 | BXM20 |  |  |  |  |  |  |  |  |  |  |
|                     |                   |                |     |                |       |               |       |       |       |       |  |  |  |  |  |  |  |  |  |  |
| Precision finishing | 3QP-TNGA160402-LF | 0.2            | 2.3 | 3              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160402-L  |                | 2.3 | 3              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160404-LF | 0.4            | 2.2 | 3              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 6QS-TNGA160404-LF |                | 1.9 | 6              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160404-L  |                | 2.2 | 3              |       | ●             | ●     |       | ●     | ●     |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160404WG  |                | 2.4 | 3              | ○     | ●             | ●     |       |       | ●     |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160408-LF | 0.8            | 1.9 | 3              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 6QS-TNGA160408-LF |                | 1.6 | 6              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160408-L  |                | 1.9 | 3              |       | ●             | ●     |       | ●     | ●     |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160408WG  |                | 2.2 | 3              | ○     | ●             | ●     |       | ●     | ●     |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160412-LF | 1.2            | 2.4 | 3              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 6QS-TNGA160412-LF |                | 1.8 | 6              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160412-L  |                | 2.4 | 3              |       | ●             | ●     |       | ●     | ●     |  |  |  |  |  |  |  |  |  |  |
| Finishing           | 3QP-TNGA160402    | 0.2            | 2.3 | 3              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160402-LC |                | 2.3 | 3              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160404    | 0.4            | 2.2 | 3              |       | ●             | ●     |       | ●     | ●     |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160404SR  |                | 2.2 | 3              |       |               |       | ●     |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 6QS-TNGA160404    |                | 1.9 | 6              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 6QS-TNGA160404SR  |                | 1.9 | 6              |       |               |       | ●     |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160404-LC |                | 2.2 | 3              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 6QS-TNGA160404-LC |                | 1.9 | 6              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160408    | 0.8            | 1.9 | 3              |       | ●             | ●     |       | ●     | ●     |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160408SR  |                | 1.9 | 3              |       |               |       | ●     |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 6QS-TNGA160408    |                | 1.6 | 6              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 6QS-TNGA160408SR  |                | 1.6 | 6              |       |               |       | ●     |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160408-LC |                | 1.9 | 3              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 6QS-TNGA160408-LC |                | 1.6 | 6              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160412    | 1.2            | 2.4 | 3              |       | ●             | ●     |       | ●     | ●     |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160412SR  |                | 2.4 | 3              |       |               |       | ●     |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 6QS-TNGA160412    |                | 1.8 | 6              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 6QS-TNGA160412SR  |                | 1.8 | 6              |       |               |       | ●     |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160412-LC |                | 2.4 | 3              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 6QS-TNGA160412-LC |                | 1.8 | 6              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160416    | 1.6            | 3.3 | 3              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160416SR  |                | 3.3 | 3              |       |               |       | ●     |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160420    | 2              | 3   | 3              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160420SR  |                | 3   | 3              |       |               |       | ●     |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160424    | 2.4            | 2.7 | 3              |       | ●             | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |
|                     | 3QP-TNGA160424SR  |                | 2.7 | 3              |       |               |       | ●     |       |       |  |  |  |  |  |  |  |  |  |  |

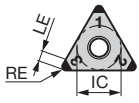
● : New product  
● : Line up





# TNGA1604

**Triangular, 60°  
with hole**



IC : 9.525 mm  
D1 : 3.81 mm  
S : 4.76 mm

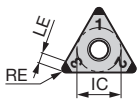
● : New product  
● : Line up



# TNG 1604

**Triangular, 60°  
with hole**

With chipbreaker



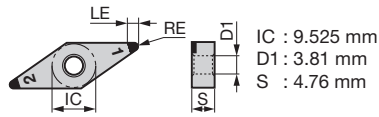
IC : 9.525 mm  
D1 : 3.81 mm  
S : 4.76 mm

● : New product  
● : Line up



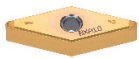
# VNGA1604

**Rhombic, 35°  
with hole**

[illegible][illegible]

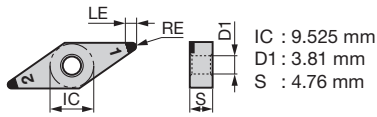
● : New product  
● : Line up

### With chipbreaker



# VNG 1604

**Rhombic, 35°  
with hole**

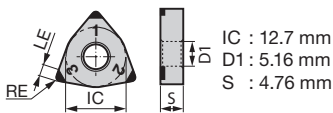


● : Line up



# WNGA0804

**Trigon, 80°  
with hole**

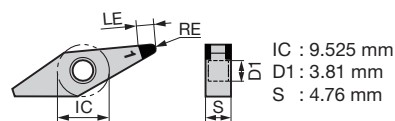


● : Line up



# YNGA1604

**Polygon, 25°  
with hole**



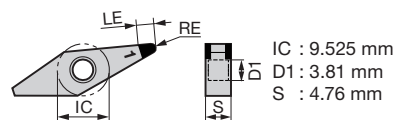
● : Line up

### With chipbreaker

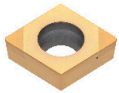


# YNGG1604

**Polygon, 25°  
with hole**

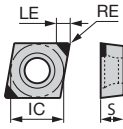
[illegible]

● : Line up



**CCGW0602**

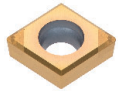
**Rhombic, 80°  
with hole, Positive 7°**



IC : 6.35 mm  
D1 : 2.8 mm  
S : 2.38 mm

[illegible][illegible]

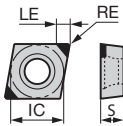
● : New product  
● : Line up



# CCGT0602

**Rhombic, 80°  
with hole, Positive 7°**

With chipbreaker

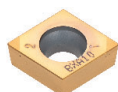


IC : 6.35 mm  
D1 : 2.8 mm  
S : 2.38 mm

[illegible][illegible]

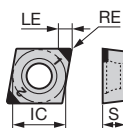
● : New product  
● : Line up





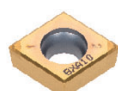
**CCGW09T3**

**Rhombic, 80°  
with hole, Positive 7°**



IC : 9.525 mm  
D1 : 4.4 mm  
S : 3.97 mm

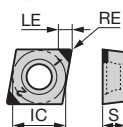
- : New product
- : Line up



# CCGT09T3

**Rhombic, 80°  
with hole, Positive 7°**

With chipbreaker



IC : 9.525 mm  
D1 : 4.4 mm  
S : 3.97 mm

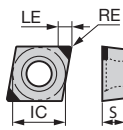
[illegible]

- : New product
- : Line up



# CPGW0802

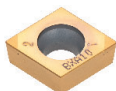
**Rhombic, 80°  
with hole, Positive 11°**



IC : 7.94 mm  
D1 : 3.4 mm  
S : 2.38 mm

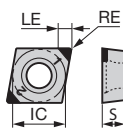
[illegible][illegible]

● : Line up



# CPGW0903

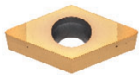
**Rhombic, 80°  
with hole, Positive 11°**



IC : 9.525 mm  
D1 : 4.4 mm  
S : 3.18 mm

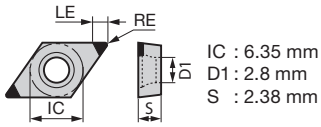
[illegible][illegible]

● : Line up



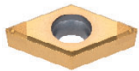
# DCGW0702

**Rhombic, 55°  
with hole, Positive 7°**

[illegible]

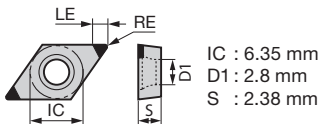
● : New product  
● : Line up

With chipbreaker

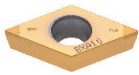


# DCGT0702

**Rhombic, 55°  
with hole, Positive 7°**

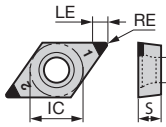
[illegible]

● : New product  
● : Line up



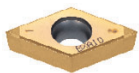
# DCGW11T3

**Rhombic, 55°  
with hole, Positive 7°**



IC : 9.525 mm  
D1 : 4.4 mm  
S : 3.97 mm

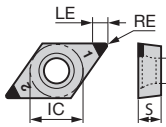
● : New product  
● : Line up



# DCGT11T3

**Rhombic, 55°  
with hole, Positive 7°**

With chipbreaker



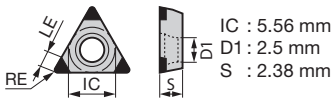
IC : 9.525 mm  
D1 : 4.4 mm  
S : 3.97 mm

- : New product
- : Line up



## TCGW0902

Triangular, 60°  
with hole, Positive 7°



| Application | Designation    | Dimension (mm) |     | No. of corners | Wiper |       |       |       |       |       |  |  |  |  |  |
|-------------|----------------|----------------|-----|----------------|-------|-------|-------|-------|-------|-------|--|--|--|--|--|
|             |                | RE             | LE  |                |       | BXA10 | BXA20 | BR35F | BXM10 | BXM20 |  |  |  |  |  |
| Finishing   | 3QP-TCGW090202 | 0.2            | 2.3 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|             | 3QP-TCGW090204 | 0.4            | 2.2 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|             | 3QP-TCGW090208 | 0.8            | 1.9 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|             |                |                |     |                |       |       |       |       |       |       |  |  |  |  |  |

● : Line up



## TCGW1102

Triangular, 60°  
with hole, Positive 7°



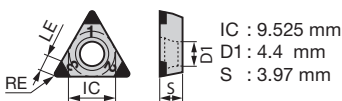
| Application | Designation    | Dimension (mm) |     | No. of corners | Wiper |       |       |       |       |       |  |  |  |  |  |
|-------------|----------------|----------------|-----|----------------|-------|-------|-------|-------|-------|-------|--|--|--|--|--|
|             |                | RE             | LE  |                |       | BXA10 | BXA20 | BR35F | BXM10 | BXM20 |  |  |  |  |  |
| Finishing   | 3QP-TCGW110202 | 0.2            | 2.3 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|             | 3QP-TCGW110204 | 0.4            | 2.2 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|             | 3QP-TCGW110208 | 0.8            | 1.9 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|             |                |                |     |                |       |       |       |       |       |       |  |  |  |  |  |

● : Line up



## TCGW16T3

Triangular, 60°  
with hole, Positive 7°



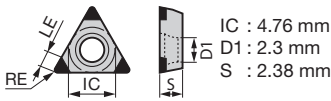
| Application | Designation    | Dimension (mm) |     | No. of corners | Wiper |       |       |       |       |       |  |  |  |  |  |
|-------------|----------------|----------------|-----|----------------|-------|-------|-------|-------|-------|-------|--|--|--|--|--|
|             |                | RE             | LE  |                |       | BXA10 | BXA20 | BR35F | BXM10 | BXM20 |  |  |  |  |  |
| Finishing   | 3QP-TCGW16T302 | 0.2            | 2.3 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|             | 3QP-TCGW16T304 | 0.4            | 2.2 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|             | 3QP-TCGW16T308 | 0.8            | 1.9 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|             |                |                |     |                |       |       |       |       |       |       |  |  |  |  |  |

● : Line up



# TPGW0802

**Triangular, 60°  
with hole, Positive 11°**



● : Line up



**TPGW0902**

**Triangular, 60°  
with hole, Positive 11°**



● : Line up



# TPGW1102

**Triangular, 60°  
with hole, Positive 11°**



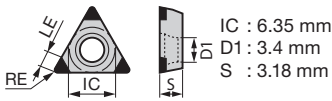
● : Line up





# TPGW1103

**Triangular, 60°  
with hole, Positive 11°**



● : New product  
● : Line up



# TPGT1103

**Triangular, 60°  
with hole, Positive 11°**

### With chipbreaker

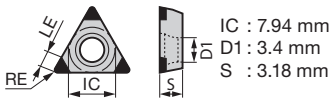


● : New product  
● : Line up



## TPGW1303

Triangular, 60°  
with hole, Positive 11°



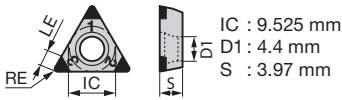
| Application | Designation    | Dimension (mm) |     | No. of corners | Wiper |       |       |       |       |       |  |  |  |  |  |
|-------------|----------------|----------------|-----|----------------|-------|-------|-------|-------|-------|-------|--|--|--|--|--|
|             |                | RE             | LE  |                |       | BXA10 | BXA20 | BR35F | BXM10 | BXM20 |  |  |  |  |  |
| Finishing   | 3QP-TPGW130302 | 0.2            | 2.3 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|             | 3QP-TPGW130304 | 0.4            | 2.2 | 3              |       | ●     | ●     |       | ●     | ●     |  |  |  |  |  |
|             | 3QP-TPGW130308 | 0.8            | 1.9 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|             |                |                |     |                |       |       |       |       |       |       |  |  |  |  |  |

● : Line up



## TPGW16T3

Triangular, 60°  
with hole, Positive 11°



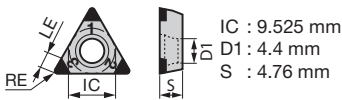
| Application | Designation    | Dimension (mm) |     | No. of corners | Wiper |       |       |       |       |       |  |  |  |  |  |
|-------------|----------------|----------------|-----|----------------|-------|-------|-------|-------|-------|-------|--|--|--|--|--|
|             |                | RE             | LE  |                |       | BXA10 | BXA20 | BR35F | BXM10 | BXM20 |  |  |  |  |  |
| Finishing   | 3QP-TPGW16T302 | 0.2            | 2.3 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|             | 3QP-TPGW16T304 | 0.4            | 2.2 | 3              |       | ●     | ●     |       | ●     | ●     |  |  |  |  |  |
|             | 3QP-TPGW16T308 | 0.8            | 1.9 | 3              |       | ●     | ●     |       | ●     | ●     |  |  |  |  |  |
|             |                |                |     |                |       |       |       |       |       |       |  |  |  |  |  |

● : Line up



## TPGW1604

Triangular, 60°  
with hole, Positive 11°



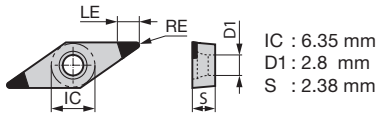
| Application    | Designation      | Dimension (mm) |     | No. of corners | Wiper |       |       |       |       |       |  |  |  |  |  |
|----------------|------------------|----------------|-----|----------------|-------|-------|-------|-------|-------|-------|--|--|--|--|--|
|                |                  | RE             | LE  |                |       | BXA10 | BXA20 | BR35F | BXM10 | BXM20 |  |  |  |  |  |
| Finishing      | 3QP-TPGW160402   | 0.2            | 2.3 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|                | 3QP-TPGW160404   | 0.4            | 2.2 | 3              |       | ●     | ●     |       | ●     | ●     |  |  |  |  |  |
|                | 3QP-TPGW160408   | 0.8            | 1.9 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|                |                  |                |     |                |       |       |       |       |       |       |  |  |  |  |  |
| Medium cutting | 3QP-TPGW160402-H | 0.2            | 2.3 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|                | 3QP-TPGW160404-H | 0.4            | 2.2 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|                | 3QP-TPGW160408-H | 0.8            | 1.9 | 3              |       | ●     | ●     |       |       |       |  |  |  |  |  |
|                |                  |                |     |                |       |       |       |       |       |       |  |  |  |  |  |

● : Line up



# VBGW1102

**Rhombic, 35°  
with hole, Positive 5°**

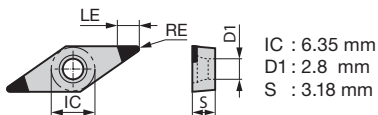


● : Line up



# VBGW1103

**Rhombic, 35°  
with hole, Positive 5°**

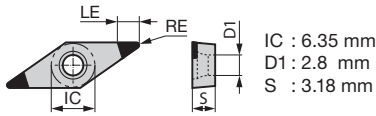


- : New product
- : Line up

With chipbreaker

## VBGT1103

Rhombic, 35°  
with hole, Positive 5°

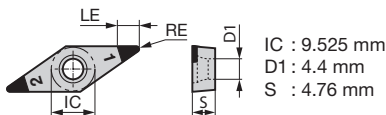


| Application         | Designation       | Dimension (mm) |     | No. of corners | Wiper |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |  |
|---------------------|-------------------|----------------|-----|----------------|-------|-------|-------|-------|-------|-------|--|--|--|--|--|--|--|--|--|--|--|
|                     |                   | RE             | LE  |                |       | BXA10 | BXA20 | BR35F | BXM10 | BXM20 |  |  |  |  |  |  |  |  |  |  |  |
| Precision finishing | 2QP-VBGT110304-HP | 0.4            | 3   | 2              |       | ●     | ●     |       | ●     |       |  |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGT110304-HS |                | 3   | 2              |       | ●     | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGT110308-HP | 0.8            | 2.2 | 2              |       | ●     | ●     |       | ●     |       |  |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGT110308-HS |                | 2.2 | 2              |       | ●     | ●     |       |       |       |  |  |  |  |  |  |  |  |  |  |  |

● : Line up

## VBGW1604

Rhombic, 35°  
with hole, Positive 5°



| Application         | Designation       | Dimension (mm) |     | No. of corners | Wiper |       |       |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
|---------------------|-------------------|----------------|-----|----------------|-------|-------|-------|-------|-------|-------|---|--|--|--|--|--|--|--|--|--|--|
|                     |                   | RE             | LE  |                |       | BXA10 | BXA20 | BR35F | BXM10 | BXM20 |   |  |  |  |  |  |  |  |  |  |  |
| Precision finishing | 2QP-VBGW160402-LF | 0.2            | 3.5 | 2              |       | ●     | ●     |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160402-L  |                | 3.5 | 2              |       | ●     | ●     |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160404-LF | 0.4            | 3.1 | 2              |       | ●     | ●     |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160404-L  |                | 3.1 | 2              |       | ●     | ●     |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160408-LF | 0.8            | 2.2 | 2              |       | ●     | ●     |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160408-L  |                | 2.2 | 2              |       | ●     | ●     |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
| Finishing           | 2QP-VBGW160402    | 0.2            | 3.5 | 2              |       | ●     | ●     |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160402-LC |                | 3.5 | 2              |       | ●     | ●     |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160404    | 0.4            | 3.1 | 2              |       | ●     | ●     |       |       | ●     | ● |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160404SR  |                | 3.1 | 2              |       | ●     | ●     | ●     |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160404-LC |                | 3.1 | 2              |       | ●     | ●     |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160408    | 0.8            | 2.2 | 2              |       | ●     | ●     |       |       | ●     | ● |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160408SR  |                | 2.2 | 2              |       |       |       | ●     |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160408-LC |                | 2.2 | 2              |       | ●     | ●     |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160412    | 1.2            | 3   | 2              |       | ●     | ●     |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
| Medium cutting      | 2QP-VBGW160402-H  | 0.2            | 3.5 | 2              |       |       | ●     |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160404-H  | 0.4            | 3.1 | 2              |       |       | ●     |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160404HC  |                | 3.1 | 2              |       |       |       | ●     |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160408-H  | 0.8            | 2.2 | 2              |       |       | ●     |       |       |       |   |  |  |  |  |  |  |  |  |  |  |
|                     | 2QP-VBGW160408HC  |                | 2.2 | 2              |       |       |       | ●     |       |       |   |  |  |  |  |  |  |  |  |  |  |

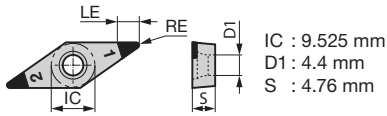
● : New product  
 ● : Line up

### With chipbreaker



# VBGT1604

**Rhombic, 35°  
with hole, Positive 5°**

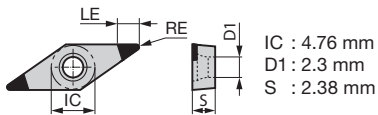


● : Line up



# VCGW0802

**Rhombic, 35°  
with hole, Positive 7°**

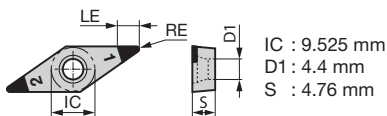
[illegible]

● : Line up



# VCGW1604

**Rhombic, 35°  
with hole, Positive 7°**

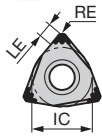


● : New product  
● : Line up



# WXGQ0403

**Trigon, 80°  
with hole**



IC : 6.35 mm  
D1 : 2.7 mm  
S : 3.18 mm

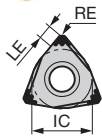
● : New product  
● : Line up



# WXGU0403

**Trigon, 80°  
with hole**

With chipbreaker



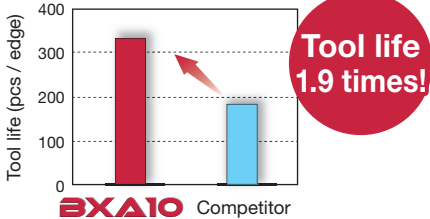
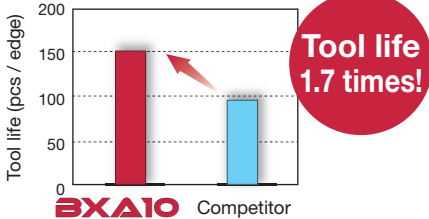
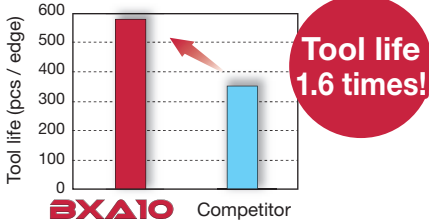
IC : 6.35 mm  
D1 : 2.7 mm  
S : 3.18 mm

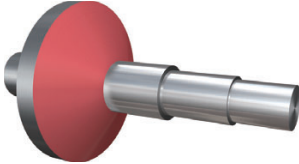
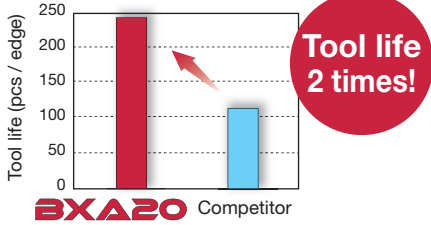
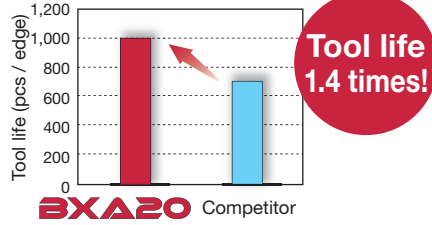
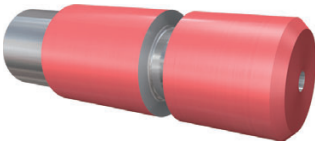
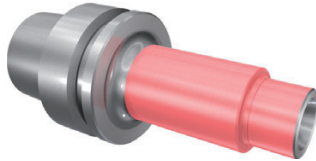
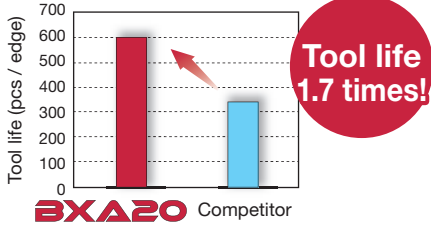
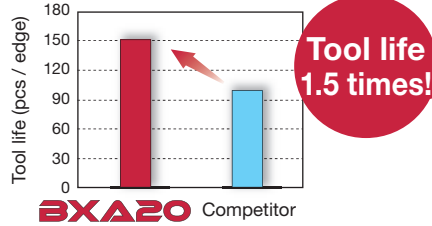
● : New product  
● : Line up



# BXA10 / BXA20 / BR35F

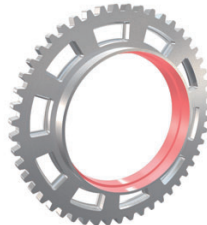
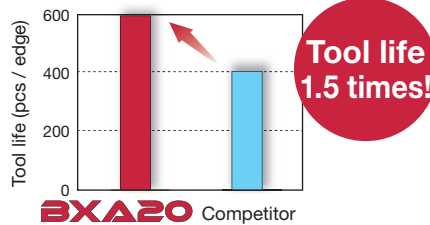
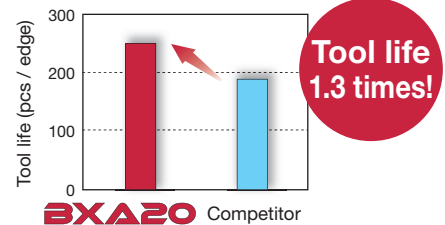
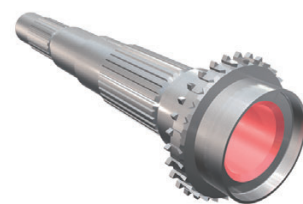
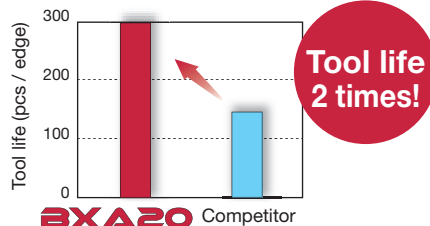
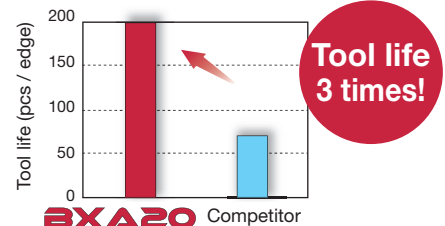
## PRACTICAL EXAMPLES

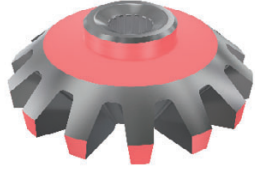
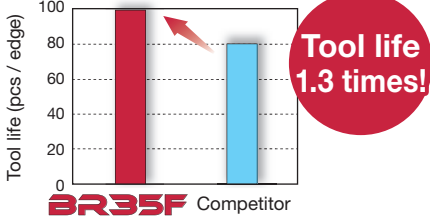
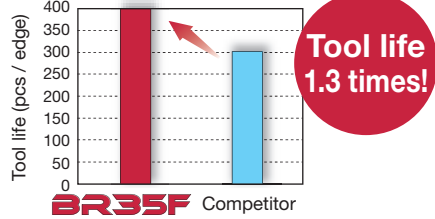
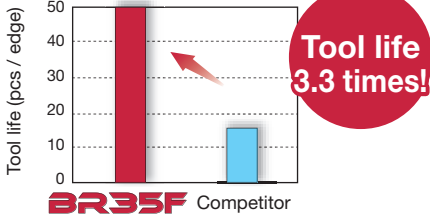
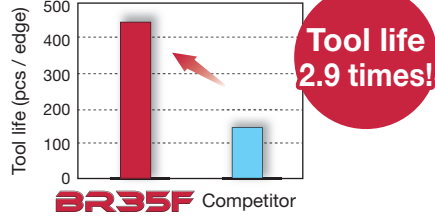
| Workpiece type     |                              | Automotive parts (Gear)                                                                                                                                                                                        | Automotive parts (CVT)                                                                                                                                                                                                              |
|--------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Insert             |                              | 2QP-CNGA120408                                                                                                                                                                                                 | 2QP-DNGA150408                                                                                                                                                                                                                      |
| Grade              |                              | <b>BXA10</b>                                                                                                                                                                                                   | <b>BXA10</b>                                                                                                                                                                                                                        |
| Workpiece material |                              | SCM420 / 18CrMo4 (62HRC)                                                                                                                                                                                       | SCM420 / 18CrMo4 (HV720 - 850)                                                                                                                                                                                                      |
|                    |                              |  <b>H</b>                                                                                                                     |  <b>H</b>                                                                                                                                        |
| Cutting conditions | Cutting speed: $V_c$ (m/min) | 100                                                                                                                                                                                                            | 130                                                                                                                                                                                                                                 |
|                    | Feed : $f$ (mm/rev)          | 0.05                                                                                                                                                                                                           | 0.1                                                                                                                                                                                                                                 |
|                    | Depth of cut : $a_p$ (mm)    | 0.15                                                                                                                                                                                                           | 0.15                                                                                                                                                                                                                                |
|                    | Coolant                      | Dry                                                                                                                                                                                                            | Wet                                                                                                                                                                                                                                 |
| Results            |                              |  <p>Flank wear-resistant, <b>BXA10</b> grade has provided 190% increase in tool life over the competitor's.</p>              |  <p>Good coating layer adhesion of <b>BXA10</b> ensured edge toughness during machining, provided high and stable quality surface finishing.</p> |
|                    |                              |                                                                                                                                                                                                                |                                                                                                                                                                                                                                     |
| Workpiece type     |                              | Automotive parts (Stator)                                                                                                                                                                                      | Automotive parts (Ring)                                                                                                                                                                                                             |
| Insert             |                              | 2QP-DCGW11T308                                                                                                                                                                                                 | 2QP-CCGW09T308-L                                                                                                                                                                                                                    |
| Grade              |                              | <b>BXA10</b>                                                                                                                                                                                                   | <b>BXA10</b>                                                                                                                                                                                                                        |
| Workpiece material |                              | SCM420 / 18CrMo4 (62HRC)                                                                                                                                                                                       | 16MnCr5 (60HRC)                                                                                                                                                                                                                     |
|                    |                              |  <b>H</b>                                                                                                                   |  <b>H</b>                                                                                                                                      |
| Cutting conditions | Cutting speed: $V_c$ (m/min) | 168                                                                                                                                                                                                            | 180                                                                                                                                                                                                                                 |
|                    | Feed : $f$ (mm/rev)          | 0.08                                                                                                                                                                                                           | 0.1 - 0.15                                                                                                                                                                                                                          |
|                    | Depth of cut : $a_p$ (mm)    | 0.2 x 2 passes                                                                                                                                                                                                 | 0.1                                                                                                                                                                                                                                 |
|                    | Coolant                      | Wet                                                                                                                                                                                                            | Dry                                                                                                                                                                                                                                 |
| Results            |                              |  <p>Crater wear resistant <b>BXA10</b> has prevented catastrophic insert failure, providing 170% increase in tool life.</p> |  <p><b>BXA10</b> in combination with the -L edge prep has enhanced the insert's cutting edge toughness, prolonging tool life by 160%.</p>       |
|                    |                              |                                                                                                                                                                                                                |                                                                                                                                                                                                                                     |

| Workpiece type     |                              | Automotive parts (CVT)                                                                                                                                                                                                                           | Automotive parts (CVJ)                                                                                                                                                                                                                |
|--------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Insert             |                              | 2QP-DNGA150412                                                                                                                                                                                                                                   | 2QP-DNGA150420                                                                                                                                                                                                                        |
| Grade              |                              | <b>BXA20</b>                                                                                                                                                                                                                                     | <b>BXA20</b>                                                                                                                                                                                                                          |
| Workpiece material |                              | SCr420 / 20Cr4 (59HRC)                                                                                                                                                                                                                           | SCr420 / 20Cr4 (60HRC)                                                                                                                                                                                                                |
|                    |                              |  <b>H</b>                                                                                                                                                       |  <b>H</b>                                                                                                                                          |
| Cutting conditions | Cutting speed: $V_c$ (m/min) | 170                                                                                                                                                                                                                                              | 150                                                                                                                                                                                                                                   |
|                    | Feed : $f$ (mm/rev)          | 0.3                                                                                                                                                                                                                                              | 0.25                                                                                                                                                                                                                                  |
|                    | Depth of cut : $a_p$ (mm)    | 0.1                                                                                                                                                                                                                                              | 0.2                                                                                                                                                                                                                                   |
|                    | Coolant                      | Wet                                                                                                                                                                                                                                              | Wet                                                                                                                                                                                                                                   |
| Results            |                              |  <p><b>Tool life 2 times!</b></p> <p><b>BXA20</b> Competitor</p> <p>Tool life is doubled due to higher wear resistance.</p>                                    |  <p><b>Tool life 1.4 times!</b></p> <p><b>BXA20</b> Competitor</p> <p>The operation is stable with <b>BXA20</b> even in interrupted machining.</p> |
| Workpiece type     |                              | Automotive parts (Poppet)                                                                                                                                                                                                                        | Machine parts (Collet chuck holder)                                                                                                                                                                                                   |
| Insert             |                              | 2QP-CCGW09T304                                                                                                                                                                                                                                   | 2QP-DNGA150404                                                                                                                                                                                                                        |
| Grade              |                              | <b>BXA20</b>                                                                                                                                                                                                                                     | <b>BXA20</b>                                                                                                                                                                                                                          |
| Workpiece material |                              | SCr415 (58HRC)                                                                                                                                                                                                                                   | SNCM420 (60HRC)                                                                                                                                                                                                                       |
|                    |                              |  <b>H</b>                                                                                                                                                     |  <b>H</b>                                                                                                                                        |
| Cutting conditions | Cutting speed: $V_c$ (m/min) | 130                                                                                                                                                                                                                                              | 150                                                                                                                                                                                                                                   |
|                    | Feed : $f$ (mm/rev)          | 0.04                                                                                                                                                                                                                                             | 0.07                                                                                                                                                                                                                                  |
|                    | Depth of cut : $a_p$ (mm)    | 0.2                                                                                                                                                                                                                                              | 0.15                                                                                                                                                                                                                                  |
|                    | Coolant                      | Wet                                                                                                                                                                                                                                              | Wet                                                                                                                                                                                                                                   |
| Results            |                              |  <p><b>Tool life 1.7 times!</b></p> <p><b>BXA20</b> Competitor</p> <p><b>BXA20</b> provides stable tool life as only normal wear occurs without chipping.</p> |  <p><b>Tool life 1.5 times!</b></p> <p><b>BXA20</b> Competitor</p> <p>Surface roughness is minimized with <b>BXA20</b>.</p>                       |

# BXA10 / BXA20 / BR35F

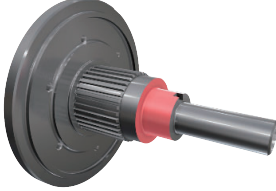
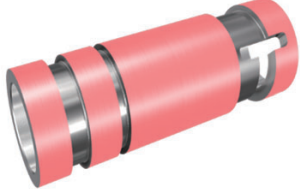
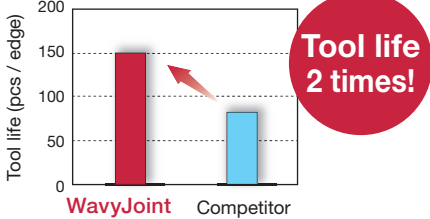
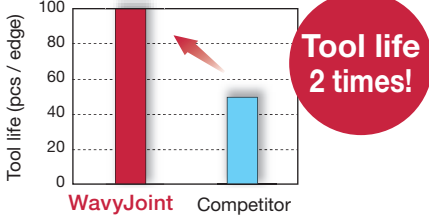
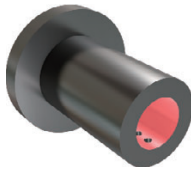
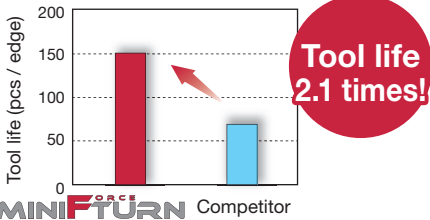
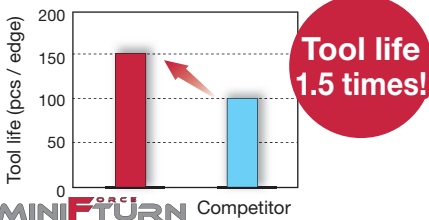
## PRACTICAL EXAMPLES

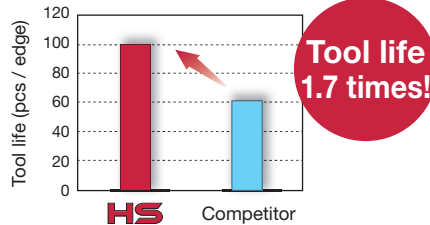
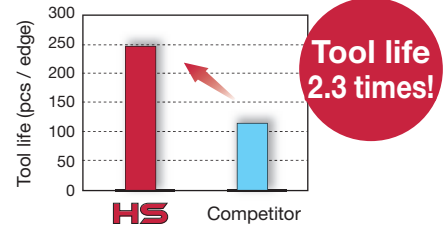
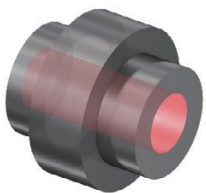
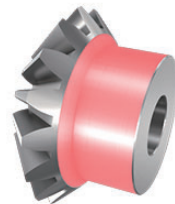
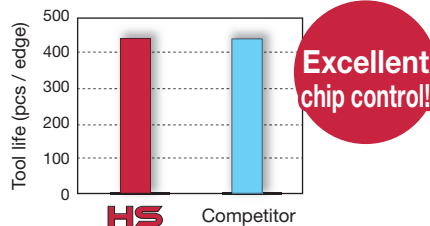
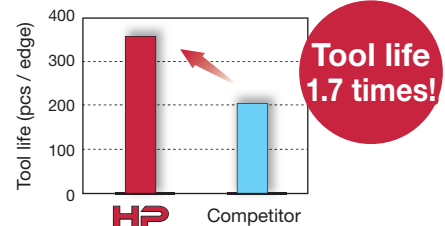
| Workpiece type     |                              | General engineering (Nut)                                                                                                                                                                                    | Automotive parts (Gear)                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Insert             |                              | 3QP-TNGA160408                                                                                                                                                                                               | 2QP-GNGA120408                                                                                                                                                                                                                                                                                                                             |
| Grade              |                              | BXA20                                                                                                                                                                                                        | BXA20                                                                                                                                                                                                                                                                                                                                      |
| Workpiece material |                              | SCM420 / 18CrMo4 (58HRC)                                                                                                                                                                                     | SCr420 / 20Cr4 (60HRC)                                                                                                                                                                                                                                                                                                                     |
|                    |                              |  <b>H</b>                                                                                                                   |  <b>H</b>                                                                                                                                                                                                                                               |
| Cutting conditions | Cutting speed: $V_c$ (m/min) | 200                                                                                                                                                                                                          | 120                                                                                                                                                                                                                                                                                                                                        |
|                    | Feed : $f$ (mm/rev)          | 0.08                                                                                                                                                                                                         | 0.1                                                                                                                                                                                                                                                                                                                                        |
|                    | Depth of cut : $a_p$ (mm)    | 0.15                                                                                                                                                                                                         | 0.1                                                                                                                                                                                                                                                                                                                                        |
|                    | Coolant                      | Wet                                                                                                                                                                                                          | Wet                                                                                                                                                                                                                                                                                                                                        |
| Results            |                              |  <p>Wear resistant, <b>BXA20</b> eliminated cutting edge fracture, providing 150% longer tool life.</p>                    |  <p>Due to thin-walled parts, the competitor's insert generated vibration as edge wear progressed, eventually created scrapped parts. With 70° nose angle, <b>GNGA</b> insert generated reduced radial cutting force, prolonging tool life by 130%.</p> |
|                    |                              |                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                            |
| Workpiece type     |                              | Automotive parts (Input shaft)                                                                                                                                                                               | Automotive parts (Input shaft)                                                                                                                                                                                                                                                                                                             |
| Insert             |                              | 2QP-CCGW060204                                                                                                                                                                                               | 3QP-TPGW110308                                                                                                                                                                                                                                                                                                                             |
| Grade              |                              | BXA20                                                                                                                                                                                                        | BXA20                                                                                                                                                                                                                                                                                                                                      |
| Workpiece material |                              | SCr420 / 20Cr4 (63HRC)                                                                                                                                                                                       | SNCM420 (58HRC)                                                                                                                                                                                                                                                                                                                            |
|                    |                              |  <b>H</b>                                                                                                                 |  <b>H</b>                                                                                                                                                                                                                                             |
| Cutting conditions | Cutting speed: $V_c$ (m/min) | 120                                                                                                                                                                                                          | 170                                                                                                                                                                                                                                                                                                                                        |
|                    | Feed : $f$ (mm/rev)          | 0.1                                                                                                                                                                                                          | 0.08                                                                                                                                                                                                                                                                                                                                       |
|                    | Depth of cut : $a_p$ (mm)    | 0.1                                                                                                                                                                                                          | 0.1                                                                                                                                                                                                                                                                                                                                        |
|                    | Coolant                      | Wet                                                                                                                                                                                                          | Wet                                                                                                                                                                                                                                                                                                                                        |
| Results            |                              |  <p>Chipping-resistant grade, <b>BXA20</b> provided process security, achieving double tool life over the competitor.</p> |  <p><b>BXA20</b> offered good edge line security, achieving triple tool life over the competitor without compromising surface quality.</p>                                                                                                             |
|                    |                              |                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                            |

|                    |                              |                                                                                                                                                                                                                                                         |                                                                                         |                                                                                                                                                                                 |     |
|--------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|                    |                              | New                                                                                                                                                                                                                                                     |                                                                                         |                                                                                                                                                                                 | New |
| Workpiece type     |                              | Automotive parts (Gear)                                                                                                                                                                                                                                 | Automotive parts (Bevel gear)                                                           |                                                                                                                                                                                 |     |
| Insert             |                              | 2QP-CNGA120412HC                                                                                                                                                                                                                                        | 2QP-CNGA120408HC                                                                        |                                                                                                                                                                                 |     |
| Grade              |                              | BR35F                                                                                                                                                                                                                                                   | BR35F                                                                                   |                                                                                                                                                                                 |     |
|                    |                              | SCM420 / 18CrMo4 (60HRC)                                                                                                                                                                                                                                | SCM420 / 18CrMo4 (58HRC)                                                                |                                                                                                                                                                                 |     |
| Workpiece material |                              |  H                                                                                                                                                                     |  H   |                                                                                                                                                                                 |     |
| Cutting conditions | Cutting speed: $V_c$ (m/min) | 70                                                                                                                                                                                                                                                      | 120                                                                                     |                                                                                                                                                                                 |     |
|                    | Feed : $f$ (mm/rev)          | 0.05                                                                                                                                                                                                                                                    | 0.12                                                                                    |                                                                                                                                                                                 |     |
|                    | Depth of cut : $a_p$ (mm)    | 0.15                                                                                                                                                                                                                                                    | 0.1 - 0.3                                                                               |                                                                                                                                                                                 |     |
|                    | Coolant                      | Dry                                                                                                                                                                                                                                                     | Dry                                                                                     |                                                                                                                                                                                 |     |
| Results            |                              |  <p>BR35F offered excellent chipping resistance, providing 130% longer tool life over the competitor.</p>                                                             |                                                                                         |  <p>BR35F provided 130% longer tool life over the competitor with no edge chipping.</p>      |     |
|                    |                              |                                                                                                                                                                                                                                                         |                                                                                         |                                                                                                                                                                                 |     |
| Workpiece type     |                              | New                                                                                                                                                                                                                                                     | Automotive parts (Ring gear shaft)                                                      |                                                                                                                                                                                 | New |
| Insert             |                              | 2QP-DNGA150408HC                                                                                                                                                                                                                                        | 2QP-CNGA120404HC                                                                        |                                                                                                                                                                                 |     |
| Grade              |                              | BR35F                                                                                                                                                                                                                                                   | BR35F                                                                                   |                                                                                                                                                                                 |     |
|                    |                              | SCr420 / 20Cr4 (60HRC)                                                                                                                                                                                                                                  | SCM420 / 18CrMo4 (60HRC)                                                                |                                                                                                                                                                                 |     |
| Workpiece material |                              |  H                                                                                                                                                                   |  H |                                                                                                                                                                                 |     |
| Cutting conditions | Cutting speed: $V_c$ (m/min) | 80                                                                                                                                                                                                                                                      | 110                                                                                     |                                                                                                                                                                                 |     |
|                    | Feed : $f$ (mm/rev)          | 0.06 - 0.08                                                                                                                                                                                                                                             | 0.06                                                                                    |                                                                                                                                                                                 |     |
|                    | Depth of cut : $a_p$ (mm)    | 0.15                                                                                                                                                                                                                                                    | 0.12                                                                                    |                                                                                                                                                                                 |     |
|                    | Coolant                      | Dry                                                                                                                                                                                                                                                     | Dry                                                                                     |                                                                                                                                                                                 |     |
| Results            |                              |  <p>The competitor's insert demonstrated repeated catastrophic failures, providing insecure process. BR35F provided 330% longer tool life with no edge fracture.</p> |                                                                                         |  <p>Extremely wear resistant, BR35F provided 290% longer tool life over the competitor.</p> |     |

# BXA10 / BXA20 / BR35F

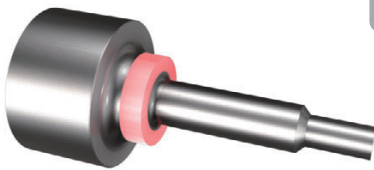
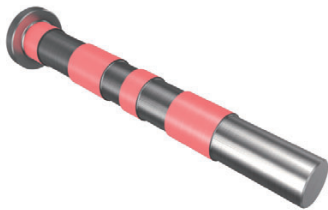
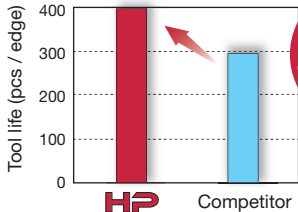
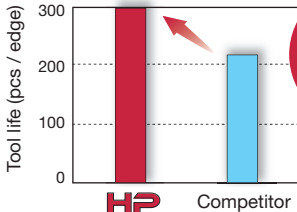
## PRACTICAL EXAMPLES

| Workpiece type     |                              | Automotive parts (Transmission shaft)                                                                                                                                                                                                                                                            | Heavy industries (Movable arm shaft)                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Insert             |                              | 4QS-CNGA120412                                                                                                                                                                                                                                                                                   | 4QS-CNGA120408-H                                                                                                                                                                                                                                                                                                                                                                                       |
| Grade              |                              | <b>BXA20</b>                                                                                                                                                                                                                                                                                     | <b>BXA20</b>                                                                                                                                                                                                                                                                                                                                                                                           |
| Workpiece material |                              | SCM420 / 18CrMo4 (60HRC)                                                                                                                                                                                                                                                                         | S45C / C45 (50HRC)                                                                                                                                                                                                                                                                                                                                                                                     |
|                    |                              |  <b>H</b>                                                                                                                                                                                                       |  <b>H</b>                                                                                                                                                                                                                                                                                                           |
| Cutting conditions | Cutting speed: $V_c$ (m/min) | 100                                                                                                                                                                                                                                                                                              | 180                                                                                                                                                                                                                                                                                                                                                                                                    |
|                    | Feed : $f$ (mm/rev)          | 0.1 - 0.2                                                                                                                                                                                                                                                                                        | 0.1                                                                                                                                                                                                                                                                                                                                                                                                    |
|                    | Depth of cut : $a_p$ (mm)    | 0.7 - 1                                                                                                                                                                                                                                                                                          | 0.5                                                                                                                                                                                                                                                                                                                                                                                                    |
|                    | Coolant                      | Dry                                                                                                                                                                                                                                                                                              | Dry                                                                                                                                                                                                                                                                                                                                                                                                    |
| Results            |                              |  <p><b>Tool life 2 times!</b></p> <p>The <b>WavyJoint</b> technology insert successfully machined 150 pcs/corner, almost twice that of the competitor's, without CBN tip failure.</p>                          |  <p><b>Tool life 2 times!</b></p> <p>Thanks to its capability for aggressive D.O.C., <b>WavyJoint</b> insert completed the process in a single pass, in which the competitor's insert had to use 2 passes. In addition, double tool life was achieved without edge fracture, despite high cutting load imposed.</p> |
|                    |                              |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                        |
| Workpiece type     |                              | Machine parts                                                                                                                                                                                                                                                                                    | Gear parts                                                                                                                                                                                                                                                                                                                                                                                             |
| Insert             |                              | 6QS-WXGQ040304SPL                                                                                                                                                                                                                                                                                | 6QS-WXGQ040304SPL                                                                                                                                                                                                                                                                                                                                                                                      |
| Grade              |                              | <b>BXA20</b>                                                                                                                                                                                                                                                                                     | <b>BXA10</b>                                                                                                                                                                                                                                                                                                                                                                                           |
| Workpiece material |                              | SCM415 (60HRC)                                                                                                                                                                                                                                                                                   | SCM420 / 18CrMo4 (60HRC)                                                                                                                                                                                                                                                                                                                                                                               |
|                    |                              |  <b>H</b>                                                                                                                                                                                                     |  <b>H</b>                                                                                                                                                                                                                                                                                                         |
| Cutting conditions | Cutting speed: $V_c$ (m/min) | 90                                                                                                                                                                                                                                                                                               | 70                                                                                                                                                                                                                                                                                                                                                                                                     |
|                    | Feed : $f$ (mm/rev)          | 0.06                                                                                                                                                                                                                                                                                             | 0.03                                                                                                                                                                                                                                                                                                                                                                                                   |
|                    | Depth of cut : $a_p$ (mm)    | 0.075                                                                                                                                                                                                                                                                                            | 0.1                                                                                                                                                                                                                                                                                                                                                                                                    |
|                    | Coolant                      | Dry                                                                                                                                                                                                                                                                                              | Dry                                                                                                                                                                                                                                                                                                                                                                                                    |
| Results            |                              |  <p><b>Tool life 2.1 times!</b></p> <p>Strong cutting edge design of <b>MiniForce-Turn</b> insert provided fracture resistance, prolonging tool life by 210% times over the competitor's positive insert.</p> |  <p><b>Tool life 1.5 times!</b></p> <p><b>MiniForce-Turn</b> insert provided 150% times longer tool life over competitor's positive insert, while also eliminated chatter during machining.</p>                                                                                                                    |
|                    |                              |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                        |

| Workpiece type     |                              | Heavy equipment (Road roller)                                                                                                                                                                                                                                                                                | Automotive parts (Input shaft)                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Insert             |                              | 3QP-TNGM160408-HS                                                                                                                                                                                                                                                                                            | 2QP-CNGM120408-HS                                                                                                                                                                                                                                                                                                                                                                      |
| Grade              |                              | <b>BXA20</b>                                                                                                                                                                                                                                                                                                 | <b>BXA10</b>                                                                                                                                                                                                                                                                                                                                                                           |
| Workpiece material |                              | S45C / C45 (58HRC)                                                                                                                                                                                                                                                                                           | SCM420 / 18CrMo4 (58 - 60HRC)                                                                                                                                                                                                                                                                                                                                                          |
|                    |                              |  <b>H</b>                                                                                                                                                                                                                   |  <b>H</b>                                                                                                                                                                                                                                                                                           |
| Cutting conditions | Cutting speed: $V_c$ (m/min) | 180                                                                                                                                                                                                                                                                                                          | 113 - 238                                                                                                                                                                                                                                                                                                                                                                              |
|                    | Feed : $f$ (mm/rev)          | 0.15                                                                                                                                                                                                                                                                                                         | 0.17                                                                                                                                                                                                                                                                                                                                                                                   |
|                    | Depth of cut : $a_p$ (mm)    | 0.25                                                                                                                                                                                                                                                                                                         | 0.25                                                                                                                                                                                                                                                                                                                                                                                   |
|                    | Coolant                      | Wet                                                                                                                                                                                                                                                                                                          | Wet                                                                                                                                                                                                                                                                                                                                                                                    |
| Results            |                              |  <p><b>HS</b> Competitor</p> <p><b>HS</b> chipbreaker provided good chip control and eliminated chip re-cutting, improving surface quality.</p>                                                                            |  <p><b>HS</b> Competitor</p> <p>1 out of 10 parts that were machined with the competitor's CBN chipbreaker resulted in chip bird-nesting. BXA10 grade insert with <b>HS</b> chipbreaker eliminated chip bird-nesting and, thanks to its good wear resistance, provided 230% tool life increase.</p> |
| Workpiece type     |                              | Automotive parts                                                                                                                                                                                                                                                                                             | Automotive parts (Bevel gear)                                                                                                                                                                                                                                                                                                                                                          |
| Insert             |                              | 2QP-CCGT060204-HS                                                                                                                                                                                                                                                                                            | 2QP-CNGM120408-HP                                                                                                                                                                                                                                                                                                                                                                      |
| Grade              |                              | <b>BXA20</b>                                                                                                                                                                                                                                                                                                 | <b>BXA20</b>                                                                                                                                                                                                                                                                                                                                                                           |
| Workpiece material |                              | SCM420 / 18CrMo4 (58HRC)                                                                                                                                                                                                                                                                                     | SCM420 / 18CrMo4 (58HRC)                                                                                                                                                                                                                                                                                                                                                               |
|                    |                              |  <b>H</b>                                                                                                                                                                                                                 |  <b>H</b>                                                                                                                                                                                                                                                                                         |
| Cutting conditions | Cutting speed: $V_c$ (m/min) | 130                                                                                                                                                                                                                                                                                                          | 160                                                                                                                                                                                                                                                                                                                                                                                    |
|                    | Feed : $f$ (mm/rev)          | 0.25                                                                                                                                                                                                                                                                                                         | 0.1                                                                                                                                                                                                                                                                                                                                                                                    |
|                    | Depth of cut : $a_p$ (mm)    | 0.2                                                                                                                                                                                                                                                                                                          | 0.15                                                                                                                                                                                                                                                                                                                                                                                   |
|                    | Coolant                      | Wet                                                                                                                                                                                                                                                                                                          | Wet                                                                                                                                                                                                                                                                                                                                                                                    |
| Results            |                              |  <p><b>HS</b> Competitor</p> <p>Out of 100 parts, 1 - 2 that were machined with the competitor's CBN chipbreaker insert resulted in chip bird-nesting. BXA20 with <b>HS</b> chipbreaker eliminated chip bird-nesting.</p> |  <p><b>HP</b> Competitor</p> <p>The competitor's CBN insert had a short tool life because of chip re-cutting. <b>HP</b> chipbreaker insert eliminated chip bird-nesting, while also providing long tool life and excellent surface finish quality.</p>                                             |



## PRACTICAL EXAMPLES

| Workpiece type     |                              | Automotive parts (CVJ part)                                                                                                                                                                               | Automotive parts (Shaft)                                                                                                                                                                                |
|--------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Insert             |                              | 2QP-CNGM120408-HP                                                                                                                                                                                         | 2QP-DCGT11T304-HP                                                                                                                                                                                       |
| Grade              |                              | BXM10                                                                                                                                                                                                     | BXM10                                                                                                                                                                                                   |
| Workpiece material |                              | SCr420 / 20Cr4 (60HRC)                                                                                                                                                                                    | SCM420 / 18CrMo4 (59HRC)                                                                                                                                                                                |
|                    |                              |  <b>H</b>                                                                                                                |  <b>H</b>                                                                                                            |
| Cutting conditions | Cutting speed: $V_c$ (m/min) | 250                                                                                                                                                                                                       | 120                                                                                                                                                                                                     |
|                    | Feed : $f$ (mm/rev)          | 0.2                                                                                                                                                                                                       | 0.05                                                                                                                                                                                                    |
|                    | Depth of cut : $a_p$ (mm)    | 0.2                                                                                                                                                                                                       | 0.2                                                                                                                                                                                                     |
|                    | Coolant                      | Wet                                                                                                                                                                                                       | Wet                                                                                                                                                                                                     |
| Results            |                              |  <p><b>HP</b> chipbreaker eliminated chip nesting on the parts, providing 130% longer tool life over the competitor.</p> |  <p><b>HP</b> chipbreaker generated light cutting action, allowing secure part quality and 120% longer tool life.</p> |
|                    |                              |                                                                                                                                                                                                           |                                                                                                                                                                                                         |



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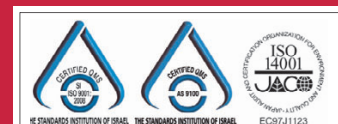
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