

2007-2008

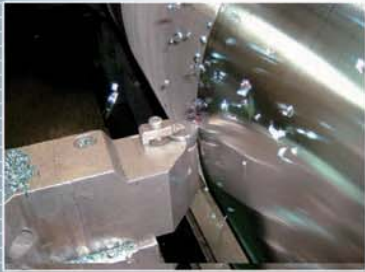


<http://www.ngkntk.de/>
<http://www.ntkcuttingtools.co.uk/>
<http://www.ngkntk.co.jp/>

NTK

CUTTING

TOOLS



NGK | **NTK**
SPARK PLUGS | TECHNICAL CERAMICS

NGK SPARK PLUG EUROPE GMBH
NGK SPARK PLUGS(U.K.), LTD

2007
2008
NTK
CUTTING TOOLS

High Speed Cutting for Cast Iron

SX1

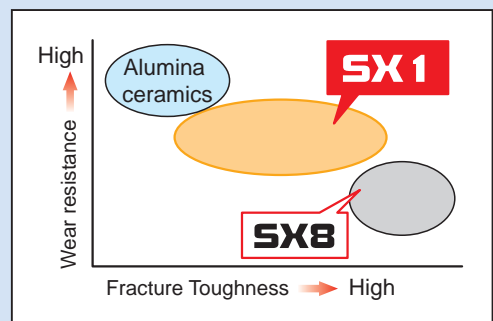
Feature

- Outstanding wear resistance by reducing binder.
- Improved fracture toughness
- Available high-speed cutting (*up to 1000 m/min*)



Recommended Cutting Conditions

| Material | Work piece | Applications | Cutting speed (m/min) | Feed (mm/rev) | Coolant |
|------------|------------|--------------|-----------------------|---------------|-----------|
| SX1 | Cast Iron | Turning | ~1,000 | ~0.7 | DRY (WET) |
| | | Milling | ~800 | ~0.3 | |

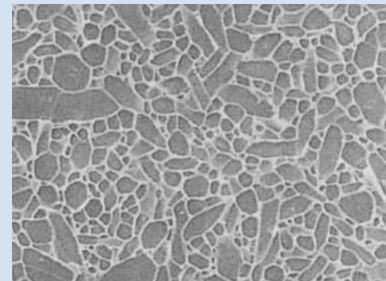


Data

Physical Characteristics

| Material | Density (g/m ³) | Hardness (HRA) | Bending strength (M Pa) | Young's modulus (GPa) | Thermal expansion coefficient (X10 ⁻⁶ /K) |
|------------|-----------------------------|----------------|-------------------------|-----------------------|--|
| SX1 | 3.2 | 93.5 | 1,200 | 320 | 3.0 |
| SX8 | 3.2 | 93 | 1,200 | 320 | 3.0 |

Micro structure of **SX1**


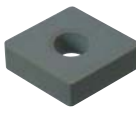
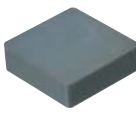
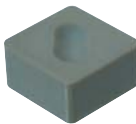
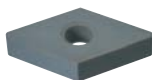
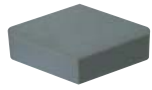
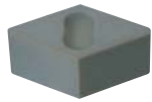

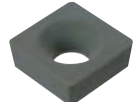



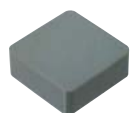
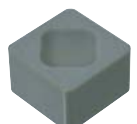
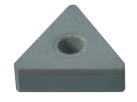
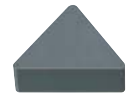
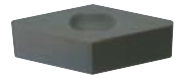
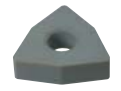
Case Study

| Disc brake | 250 (Gray Cast Iron) |
|----------------------------------|----------------------|
| Insert: SNGN 120420 TNF (T02025) | |
| | |
| Cutting speed (m/min) | 800 |
| Feed (mm/rev) | 0.65 |
| Depth of cut (mm) | 2 |
| Coolant | WET |
| SX1 | 150 pcs |
| Competitor's Ceramic | 100 pcs |

| Disc rotor | 250 (Gray Cast Iron) |
|----------------------------------|----------------------|
| Insert: CNGA 120412 TNF (T02025) | |
| | |
| Cutting speed (m/min) | 188~374 |
| Feed (mm/rev) | 0.3 |
| Depth of cut (mm) | 2.5 |
| Coolant | Dry |
| SX1 | 200 pcs |
| Competitor's CBN | 120 pcs |

SX1

| Shape | Item-No. IC, T, R | SX 1 |
|---|--|---|
|  | CCGW 120404 TNCE 120408 TNCE 120412 TNCE 120416 TNCE | ● ● ● ● |
|  | CNGA 120408 TNF 120412 TNF 120416 TNF 120716 TN 160608 SNF 160612 TN 160616 TN 190616 TN | ● ● ● ● ● ● ● ● |
|  | CNGN 120408 TNF 120412 TNF 120416 TNF 120708 TNF 120712 TNF 120716 TNF | ● ● ● ● ● ● |
|  | CNGX 120708 TN DP5 120712 TN DP5 120716 TN DP5 120720 TN DP5 160708 TN DP5 160712 TN DP5 160716 TN DP5 160720 TN DP5 160732 TN DP5 | ● ● ● ● ● ● ● ● ● |
|  | DNGA 150408 TNF 150412 TNF 150416 TNF 150608 SNF 150612 SNF | ● ● ● ● ● |
|  | DNGN 150408 TNF 150412 TNF | ● ● |
|  | DNGX 120708 TN DP5 120712 TN DP5 120716 TN DP5 120720 TN DP5 150708 TN DP5 150712 TN DP5 150716 TN DP5 150720 TN DP5 | ● ● ● ● ● ● ● ● |
|  | RNGN 120400 TN 120700 TN | ● ● |
|  | SCGW 120404 TNCE 120408 TNCE 120412 TNCE 120416 TNCE | ● ● ● ● |

| Shape | Item-No. IC, T, R | SX 1 |
|--|---|---|
|  | SNGA 120408 TNF 120412 TNF 120416 TNF 120420 TN | ● ● ● ● |
|  | SNGN 120408 TNF 120412 TNF 120416 TNF 120420 TNF 120424 TNF 120708 TNF 120712 TNF 120716 TNF 120720 TNF | ● ● ● ● ● ● ● ● ● |
|  | SNGX 120708 TN DP5 120712 TN DP5 120716 TN DP5 120720 TN DP5 150708 TN DP5 150712 TN DP5 150716 TN DP5 150720 TN DP5 | ● ● ● ● ● ● ● ● |
|  | TNGA 160408 TNF 160412 TNF 160416 TNF 160420 TNF | ● ● ● ● |
|  | TNGN 160408 TNF 160412 TNF 160416 TNF 160420 TNF | ● ● ● ● |
|  | VNGX 160704 TN DP5 160708 TN DP5 160712 TN DP5 160716 TN DP5 | ● ● ● ● |
|  | WNGA 080408 TNF 080412 TNF 080416 TNF | ● ● ● |

Edge-Preparation

| Description | ISO | T |
|-------------|--------|--------|
| TN | T01025 | 04 |
| | T02025 | 06, 07 |
| TNCE | T01020 | — |
| TNF | T02025 | — |
| SNF | S02025 | — |

Improved Flank Wear Resistance

SP2

Feature

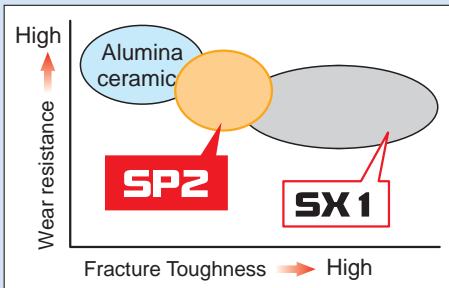
- Greatly improved flank wear resistance
- Excellent heat resistance
- High-speed rough turning of gray cast iron



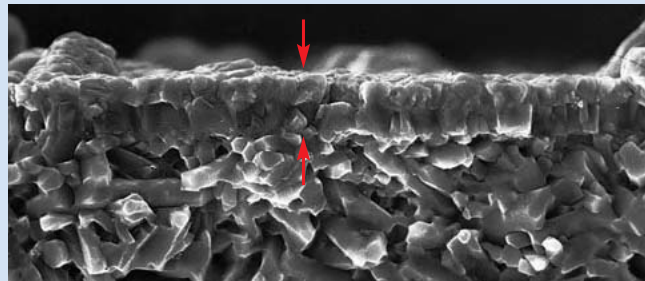
Recommended Cutting Conditions

| Material | Work piece | Applications | Cutting speed (m/min) | Feed (mm/rev) | Coolant |
|------------|----------------|--------------|-----------------------|---------------|---------------------|
| SP2 | Gray Cast Iron | Turning | ~1000 | ~0.5 | DRY (WET) |

Data



Coating layer of **SP2**

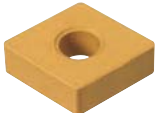

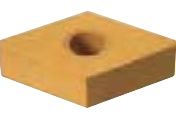








Case Study

| Brake drum | | 250 (Gray Cast Iron) |
|----------------------------------|---------|----------------------|
| Insert: SNGN 120420 TNF (T02025) | | |
| | | |
| Cutting speed (m/min) | 200 | |
| Feed (mm/rev) | 0.4 | |
| Depth of cut (mm) | 2 | |
| Coolant | WET | |
| SP2 | 200 pcs | |
| Cermet | 100 pcs | |

| Disc brake | | 250 (Gray Cast Iron) |
|-----------------------------------|--------|----------------------|
| Insert: SNGN 120412 TNFE (T02020) | | |
| | | |
| Cutting speed (m/min) | 600 | |
| Feed (mm/rev) | 0.32 | |
| Depth of cut (mm) | 3.0 | |
| Coolant | Dry | |
| SP2 | 75 pcs | |
| Competitor's CBN | 30 pcs | |

SP2

| Shape | Item-No. IC, T, R | SP2 |
|---|----------------------|-----|
|  | CNGA 120408 TNF | ● |
| | 120412 TNF | ● |
| | 120712 TN | |
| | 120716 TN | ● |
|  | CNGN 120408 TNF | |
| | 120412 TNF | |
| | 120416 TNF | ● |
| | 120704 TN | ● |
| | 120708 TN | ● |
| | 120712 TN | ● |
| | 160708 TN | ● |
| 160712 TN | ● | |
|  | DNGA 150608 TN | ● |
| | 150612 TN | ● |
| | 150416 TNF | |
|  | RNGN 090400 TNF | ● |
| | 120400 TN | ● |
| | 120400 TNF | ● |
| | 250700 PN | ● |

| Shape | Item-No. IC, T, R | SP2 |
|---|----------------------|-----|
|  | SNGA 120412 TNF | ● |
| | 120412 TNFE | ● |
|  | SNGN 120412 TNF | ● |
| | 120416 TNF | ● |
| | 120708 TN | ● |
| | 120712 TN | ● |
| | 120716 TN | ● |
| 150716 TN | ● | |
|  | TNGA 160404 TN | ● |
| | 160404 TNF | |
| | 160408 TNF | ● |
| 160412 TNF | ● | |
|  | TNGN 160408 TNF | ● |
| | 160412 TNF | |
| | 160416 TNF | ● |
|  | WNGA 080408 TNF | ● |
| | 080412 TNF | ● |

Edge-Preparation

| Description | ISO | T |
|-------------|---------------------------|--------|
| TN | T01025 | 04 |
| | T02025 | 06, 07 |
| TNCE | T01020 | — |
| TNF | T02025 | — |
| TNFE | T02020 | — |
| PN | Double T-land with R-horn | — |

Specialist for Milling and Interrupted Cutting of Cast Iron

SX8

Feature




- Good performance in rough milling with coolant
- Good heat-resistance in interrupted cutting with coolant



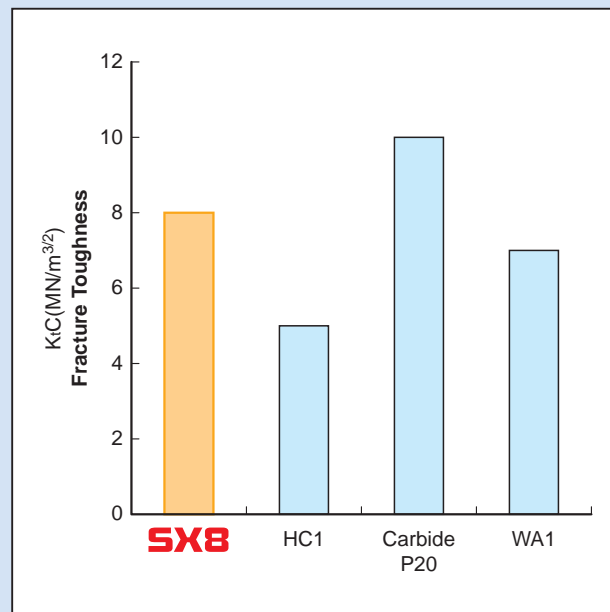
Recommended Cutting Conditions

| Material | Work | Machining method | Cutting speed (m/min) | Feed (mm/rev) |
|------------|-----------|---------------------------------|-----------------------|---------------|
| SX8 | Cast Iron | Milling and Interrupted cutting | ~600 | ~0.5 |

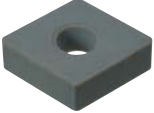
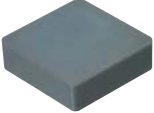
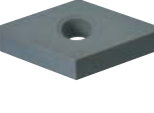
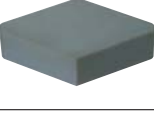
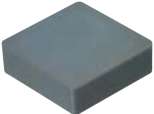

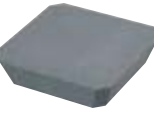

• Case Study

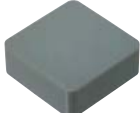
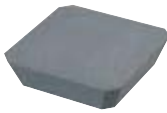

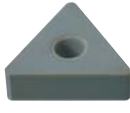

| | |
|---|---|
| Cylinder block | 250 (Gray Cast Iron) |
| Insert: SPGN 120432 TN (T01025) | |
|  | |
| Cutting speed (m/min) | 150 |
| Feed (mm/rev) | 0.15 |
| Depth of cut (mm) | 5.0 |
| Coolant | Wet |
| SX8 |  630 pcs |
| Cermet |  180 pcs |

Fracture Toughness



SX8

| Shape | Item-No. IC, T, R | SX8 |
|---|----------------------|-----|
|  | CNGA 120404 TN | ● |
| | 120408 TN | ● |
| | 120408 TNF | ● |
| | 120412 TN | ● |
| | 120412 TNF | ● |
| | 120416 TN | ● |
| | 120708 TN | ● |
| | 120712 TN | ● |
| | 120716 TN | ● |
|  | CNGN 120408 TN | ● |
| | 120408 TNF | ● |
| | 120412 TN | ● |
| | 120412 TNF | ● |
| | 120416 TN | ● |
| | 120708 TN | ● |
| | 120712 TN | ● |
| | 120716 TN | ● |
| | 160612 TN | ● |
| 160616 TN | ● | |
|  | DNGA 150412 TN | ● |
| | 150608 TN | ● |
| | 150612 TN | ● |
| | 150708 TN | ● |
| | 150716 TN | ● |
|  | DNGN 150612 TN | ● |
| | 150708 TN | ● |
| | 150712 TN | ● |
| | 150716 TN | ● |
|  | ENGN 130408 TN | ● |
| | 130412 TN | ● |
| | 130708 TN | ● |
| | 130712 TN | ● |
| | 130716 TN | ● |
| | 130720 TN | ● |
| | 130724 TN | ● |
|  | RNGN 120400 TN | ● |
| | 120400 TNF | ● |
| | 120700 TN | ● |
|  | SCGN 1204ZZ FNX08 | |
| | 120412 TNFE | |
| | 120416 TNFE | |
| | SDCA 1204 AETN | ● |
| | 120408 TN | ● |
|  | SECN 1203 AFTN | ● |
| | SNGA 120408 TNF | ● |
| | 120412 TN | ● |
| | 120416 TN | ● |

| Shape | Item-No. IC, T, R | SX8 |
|---|----------------------|-----|
|  | SNGN 120408 TN | ● |
| | 120412 TN | ● |
| | 120412 TNF | ● |
| | 120416 TNF | ● |
| | 120420 TN | ● |
| | 120424 TN | ● |
| | 120432 TN | ● |
| | 120708 TN | ● |
| | 120712 TN | ● |
| | 120716 TN | ● |
| | 120720 TN | ● |
|  | SPCN 1203 EDTR | ● |
| | 1204 EDTR | ● |
| | 1504 EDTR | ● |
|  | SPGN 120308 TN | ● |
| | 120312 TN | ● |
| | 120408 TN | ● |
| | 120412 TNCE | ● |
| | | |
|  | TNGA 160408 TN | ● |
| | 160412 TN | ● |
| | 160416 TN | ● |
| | 160420 TN | ● |
| | 160708 TN | ● |
| | 160712 TN | ● |
| | 160716 TN | ● |
| | 160720 TN | ● |
| | 190712 TN | ● |
| | | |
|  | TPGN 110302 TN | ● |
| | 110304 TN | ● |
| | 160308 TN | ● |
| | 220412 TN | ● |
| | 220416 TN | ● |

Edge-Preparation

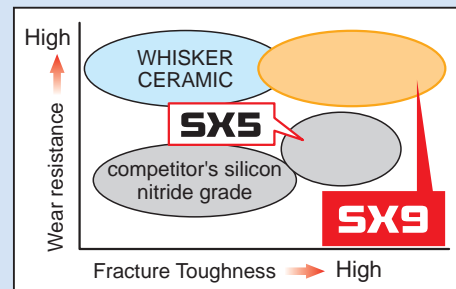
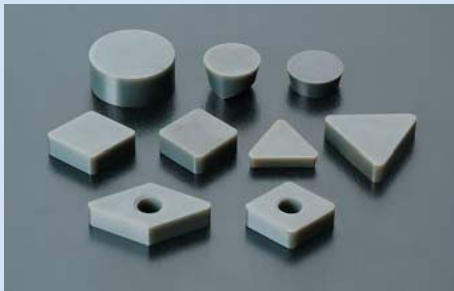
| Description | ISO | T |
|-------------|-------------|--------|
| TN | T01025 | 04 |
| | T02025 | 06. 07 |
| TNCE | T01020 | — |
| TNF | T02025 | — |
| TNFE | T02020 | — |
| TR | T01025 | — |
| FNX08 | Without E.P | — |

For Machining Nickel Based Alloys

SX9

Feature

- Our special manufacturing process dramatically increases heat resistance and fracture toughness
- Excellent wear resistance is achieved by optimizing binding compound
- Designed for high speed machining of Inconel, Waspaloy, Hasteloy and Stellite
- Drastic cost reduction compared to whisker reinforced ceramics



Recommended Cutting Conditions

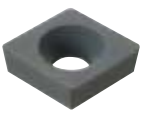
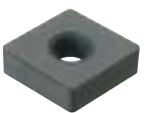
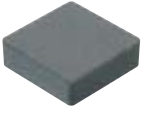
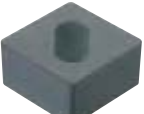
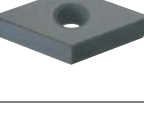

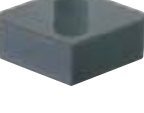


| Material | Work piece | Applications | Cutting speed (m/min) | Feed (mm/rev) |
|------------|---|--------------|-----------------------|---------------|
| SX9 | Nickel Based Alloys (Inconel, etc.) | Turning | Continuous | ~300 |
| | | | Scale Cut (roughing) | ~230 |
| | Cobalt Based Alloys (Stellite, etc.) | Milling | Lightly Interrupted | ~200 |
| | | | | ~1000 |
| | | | | ~0.5 |
| | | | | ~0.4 |
| | | | | ~0.3 |
| | | | | ~0.2 |

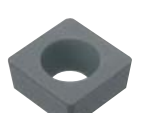

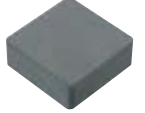

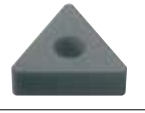

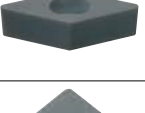

Case Study

| Aircraft part | Inconel 718 | |
|----------------------------------|-------------|---|
| Insert: RNGN 120700 TNB (T00525) | | |
| | | |
| Cutting speed (m/min) | 180 | |
| Feed (mm/rev) | 0.2 | |
| Depth of cut (mm) | 0.6 | |
| Coolant | WET | |
| SX9 | 2 pcs | |
| Whisker ceramics | 1 pc | |
| | | Competitor's tool chipped frequently due to notch wear SX9 excelled in notch wear resistance and obtained double tool life |

| Aircraft part | Inconel 600 | |
|----------------------------------|-------------|--|
| Insert: RNGN 120700 TNB (T00525) | | |
| | | |
| Cutting speed (m/min) | 250 | |
| Feed (mm/rev) | 0.2 | |
| Depth of cut (mm) | 2.0 | |
| Coolant | WET | |
| SX9 | 2 pass | |
| Competitor's ceramics | 2 pass | |
| | | Competitor's ceramic tool showed inconsistent tool life SX9 showed better wear resistance compared to the competition |

SX9

| Shape | Item-No. IC, T, R | SX9 |
|---|--|---|
|  | CCGW 120404 TNCE 120408 TNCE 120412 TNCE 120416 TNCE | ● ● ● ● |
|  | CNGA 120408 TNF 120412 TNF 120416 TNF 120716 TN 160608 SNF 160612 TN 160616 TN 190616 TN | ● ● ● ● ● ● ● ● |
|  | CNGN 120408 TNF 120412 TNF 120416 TNF 120708 TNF 120712 TNF 120716 TNF 160712 TN 160716 TN | ● ● ● ● ● ● ● ● |
|  | CNGX 120708 TN DP5 120712 TN DP5 120716 TN DP5 120720 TN DP5 160708 TN DP5 160712 TN DP5 160716 TN DP5 160720 TN DP5 160732 TN DP5 | ● ● ● ● ● ● ● ● ● |
|  | DNGA 150408 TNF 150412 TNF 150416 TNF 150608 SNF 150612 TNFE | ● ● ● ● ● |
|  | DNGN 150408 TNF 150412 TNF 150408 TN 150412 TN 150416 TN | ● ● ● ● ● |
|  | DNGX 120708 TN DP5 120712 TN DP5 120716 TN DP5 120720 TN DP5 150708 TN DP5 150712 TN DP5 150716 TN DP5 150720 TN DP5 | ● ● ● ● ● ● ● ● |
|  | RCGX 0908 TNB 1208 TNB | ● ● |
|  | RNGN 120400 TN 120700 TNB 120700 TN 190700 TNB | ● ● ● ● |

| Shape | Item-No. IC, T, R | SX9 |
|---|---|---|
|  | SCGW 09T308 TNCE 120404 TNCE 120408 TNCE 120412 TNCE 120416 TNCE | ● ● ● ● ● |
|  | SNGA 120408 TNF 120412 TNF 120416 TNF 120420 TN | ● ● ● ● |
|  | SNGN 120408 TNF 120412 TNF 120416 TNF 120420 TNF 120424 TNF 120708 TNF 120712 TNF 120716 TNF 120720 TNF 150712 TN 150716 TN | ● ● ● ● ● ● ● ● ● ● ● |
|  | SNGX 120708 TN DP5 120712 TN DP5 120716 TN DP5 120720 TN DP5 150708 TN DP5 150712 TN DP5 150716 TN DP5 150720 TN DP5 | ● ● ● ● ● ● ● ● |
|  | TNGA 160408 TNF 160412 TNF 160416 TNF | ● ● ● |
|  | TNGN 160408 TNF 160412 TNF 160416 TNF 160420 TNF | ● ● ● ● |
|  | VNGX 160704 TN DP5 160708 TN DP5 160712 TN DP5 160716 TN DP5 | ● ● ● ● |
|  | WNGA 080408 TNF 080412 TNF 080416 TNF | ● ● ● |

Edge-Preparation

| Description | ISO | T |
|-------------|--------|--------|
| TN | T01025 | 04 |
| | T02025 | 06, 07 |
| TNB | T00525 | — |
| TNCE | T01020 | — |
| TNF | T02025 | — |
| TNFE | T02020 | — |
| SNF | S02025 | — |

Cast Iron for High-Speed Finishing

HC1, HW2

Feature

Alumina/zirconia-based ceramic material

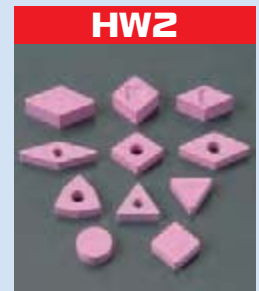
This new type of Alumina ceramics improves the reliability of the cutting edge.

- Outstanding fracture toughness
- Excellent wear resistance
- Stable machining performance at high-speed machining ranges



Recommended Cutting Conditions

| Material | Work material | Purpose | Cutting speed (m/min) | Feed (mm/rev) |
|--------------------|---------------|----------------|-----------------------|---------------|
| HC1 HW2 | Cast Iron | Finish turning | ~1,000 | ~0.4 |

















• Case Study

| Disc brake | 250 (Gray Cast Iron) |
|----------------------------------|----------------------|
| Insert: TNGN 160412 TNF (T02025) | |
| | |
| Cutting speed (m/min) | 360 |
| Feed (mm/rev) | 0.3 |
| Depth of cut (mm) | 0.5 |
| Coolant | DRY |
| HW2 | 130 pcs |
| Ceramic | 65 pcs |

| Cylinder liner | 250 (Gray Cast Iron) |
|----------------------------------|----------------------|
| Insert: SNGN 120716 SNC (S01025) | |
| | |
| Cutting speed (m/min) | 260 - 600 |
| Feed (mm/rev) | 0.32 |
| Depth of cut (mm) | 2 |
| Coolant | DRY |
| HW2 | 70 pcs |
| Ceramic | 30 pcs |

Standard insert

| Shape | Item-No. IC, T, R | HC1 | HW2 |
|---|---|-----|-----|
|  | CNGA 120404 TN 120408 TN 120412 TN 120416 TN | ● | ● |
|  | CNGN 120404 TN 120408 TN 120412 TN 120416 TN 120704 TN 120708 TN 120712 TN 120716 TN | ● | ● |
|  | CNGX 120708 TN DP5 120712 TN DP5 120716 TN DP5 120720 TN DP5 120724 TN DP5 CNMX 120708 TN DP5 | | ● |
|  | DNGA 150404 TN 150408 TN 150412 TN 150416 TN | ● | ● |
|  | DNGN 150708 TNFE 150712 TNFE 150716 TN 150716 TNFE | ● | ● |
|  | DNGX 120704 TNB DP5 120708 TN DP5 120712 TN DP5 120716 TN DP5 120720 TN DP5 150704 TN DP5 150708 TN DP5 150712 TN DP5 150716 TN DP5 150720 TN DP5 DNMX 120708 TN DP5 120712 TN DP5 | | ● |
|  | RNGN 120400 TN 120700 TN 190700 TN | ● | ● |
|  | SNGA 120404 TN 120408 TN 120412 TN 120416 TN | ● | ● |

| Shape | Item-No. IC, T, R | HC1 | HW2 |
|---|--|-----|-----|
|  | SNGN 120404 TN 120408 TN 120412 TN 120416 TN 120704 TN 120708 TN 120712 TN 120716 TN 120730 TN 150716 TN 150730 TN | ● | ● |
|  | SNGX 120704 TN DP5 120708 TN DP5 120712 TN DP5 120716 TN DP5 120720 TN DP5 120724 TN DP5 SNMX 120712 TN DP5 120716 TN DP5 | | ● |
|  | TNGA 160404 TN 160408 TN 160412 TN 160416 TN | ● | ● |
|  | TNGN 160408 TN 160412 TN 160416 TN 160708 TN 160712 TNFE 160716 TNFE | ● | ● |
|  | VNGA 160404 TN 160408 TN | ● | ● |
|  | WNGA 080404 TN 080408 TN 080412 TN | | ● |

※ Pictures are **HW2**

Edge-Preparation

| Description | ISO | T |
|-------------|--------|----|
| TN | T01025 | 04 |
| | T02025 | 07 |
| TNB | T00525 | — |
| TNFE | T02020 | — |

For Heat Resistant Aerospace Alloys

WA1

Feature

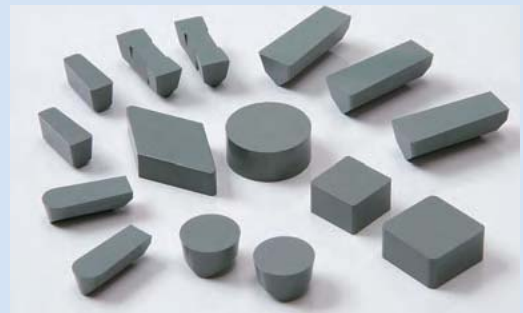
- Excellent wear resistance with high toughness
Excellent crack resistance
- Whisker-reinforcing technology for
Heat-resistant alloys
High-hardened mill rolls

WA1 is a whisker-reinforced composite ceramic material with silicon-carbide whisker added to alumina, the main component.



Recommended Cutting Conditions

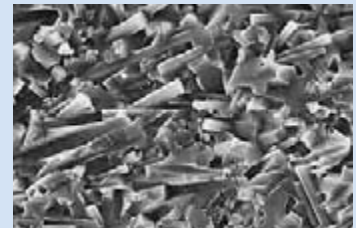
| Cutting | Work material | Heat resistant alloys |
|-----------------|---------------|-----------------------|
| Cutting speed V | (m / min) | 200~500 |
| Feed f | (mm / rev) | 0.1~0.3 |
| Depth of cut d | (mm) | ~3.0 |
| Coolant | | WET |



• Characteristics of WA1

| | WA1 | Al ₂ O ₃ -based |
|--|------|---------------------------------------|
| Density (g/cm ³) | 3.7 | 4.0 |
| Hardness (HRA) | 94.5 | 94.0 |
| Fracture toughness (MPa · m ^{1/2}) | 7.0 | 4.0 |

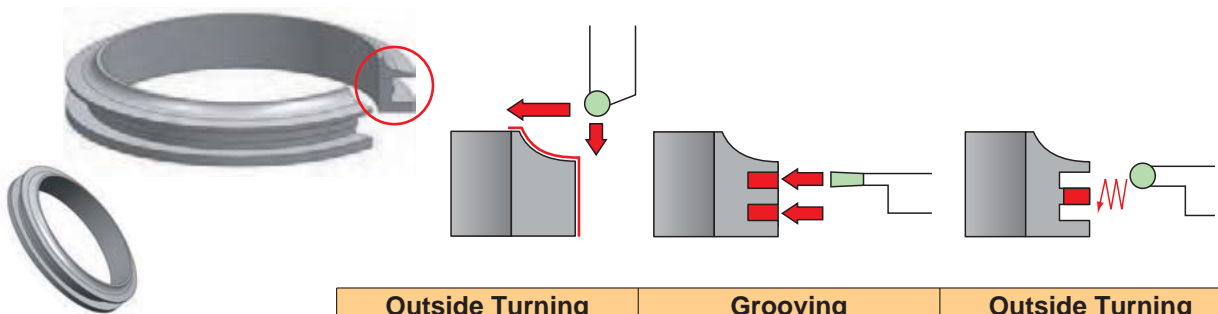
• Structure



• Case Study

Ring for bearing housing


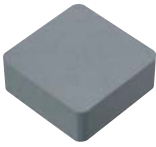

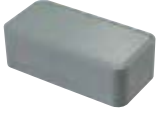
Inconel 718 (Aircraft parts)



| | Outside Turning | Grooving | Outside Turning |
|-----------------------|--------------------------|-----------------------|------------------------|
| Insert | RNGN 120700 TNB (T00525) | VGW-375-2ENA (R-horn) | RPGX 0908 TNB (T00525) |
| Cutting speed (m/min) | 300 | 300 | 300 |
| Feed (mm/rev) | 0.15 | 0.1 | 0.06 |
| Depth of cut (mm) | 3 - 4 | - | 2 - 3 |
| Coolant | WET | WET | WET |

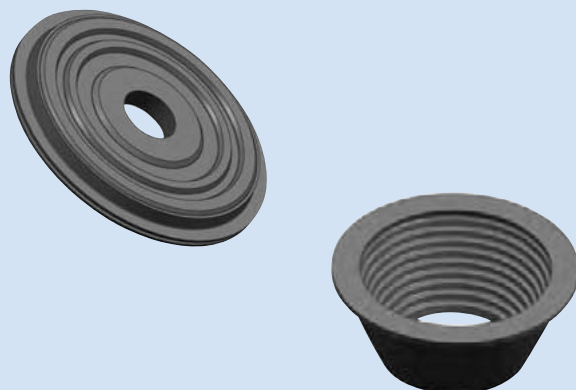
WA1

| Shape | Item-No. | WA 1 |
|---|------------------------|------|
|  | CNGN 120404 TN | |
| | 120408 TN | ● |
| | 120408 TNB | ● |
| | 120412 TN | ● |
| | 120412 TNB | ● |
| | 120416 TNB | ● |
| | 120708 TNB | ● |
| | 120712 TNB | ● |
| | 160712 TNB | ● |
| | 160716 TNB | ● |
|  | DNGN 150412 TNB | ● |
| | 150708 TN | ● |
| | 150708 TNB | |
| | 150712 TN | ● |
| | 150712 TNB | ● |
| | 150716 PN9 | ● |
| | 190612 TNB | ● |
|  | RBGX 16S SN2 | |
| | 26S SN3 | |
|  | RCGX 0608 TNB | ● |
| | 0908 TNB | ● |
| | 0908 PN | ● |
| | 1208 TNB | ● |
| | 1510 PN | |
| | 1910 PN | ● |
|  | RCGY 090603 TNB | |
| | 120603 TNB | |
|  | RNGN 090300 TNB | |
| | 120400 TN | ● |
| | 120400 TNB | ● |
| | 120700 PN9 | ● |
| | 120700 TN | ● |
| | 120700 TNB | ● |
| | 150700 TN | |
| | 190700 TN | |

| Shape | Item-No. | WA 1 |
|---|------------------------|------|
|  | RPGX 0604 TNB | |
| | 0908 TNB | ● |
| | 1208 TNB | ● |
|  | SNGN 120408 TNB | |
| | 120412 TNB | ● |
| | 120416 TNB | ● |
| | 120708 TNB | ● |
| | 120712 TNB | ● |
| | 120716 TNB | ● |
| | 150712 TN | ● |
| | 150716 TN | ● |
| | 190712 TN | ● |
| | 190716 TN | |
|  | TNGN 160404 TN | ● |
| | 160408 TN | |
| | 160412 TN | |
| | | |
|  | LNMN 6688 PN | |

Edge-Preparation



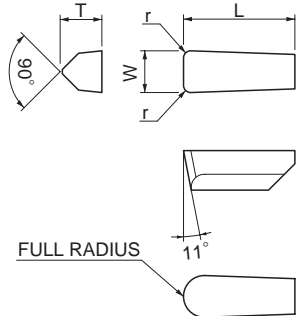
| Description | ISO | T |
|-------------|---------------------------|----|
| TN | T01025 | 04 |
| | T02025 | 07 |
| TNB | T00525 | — |
| PN | Double T-land with R-horn | — |
| PN9 | Double T-land with R-horn | — |



WA1

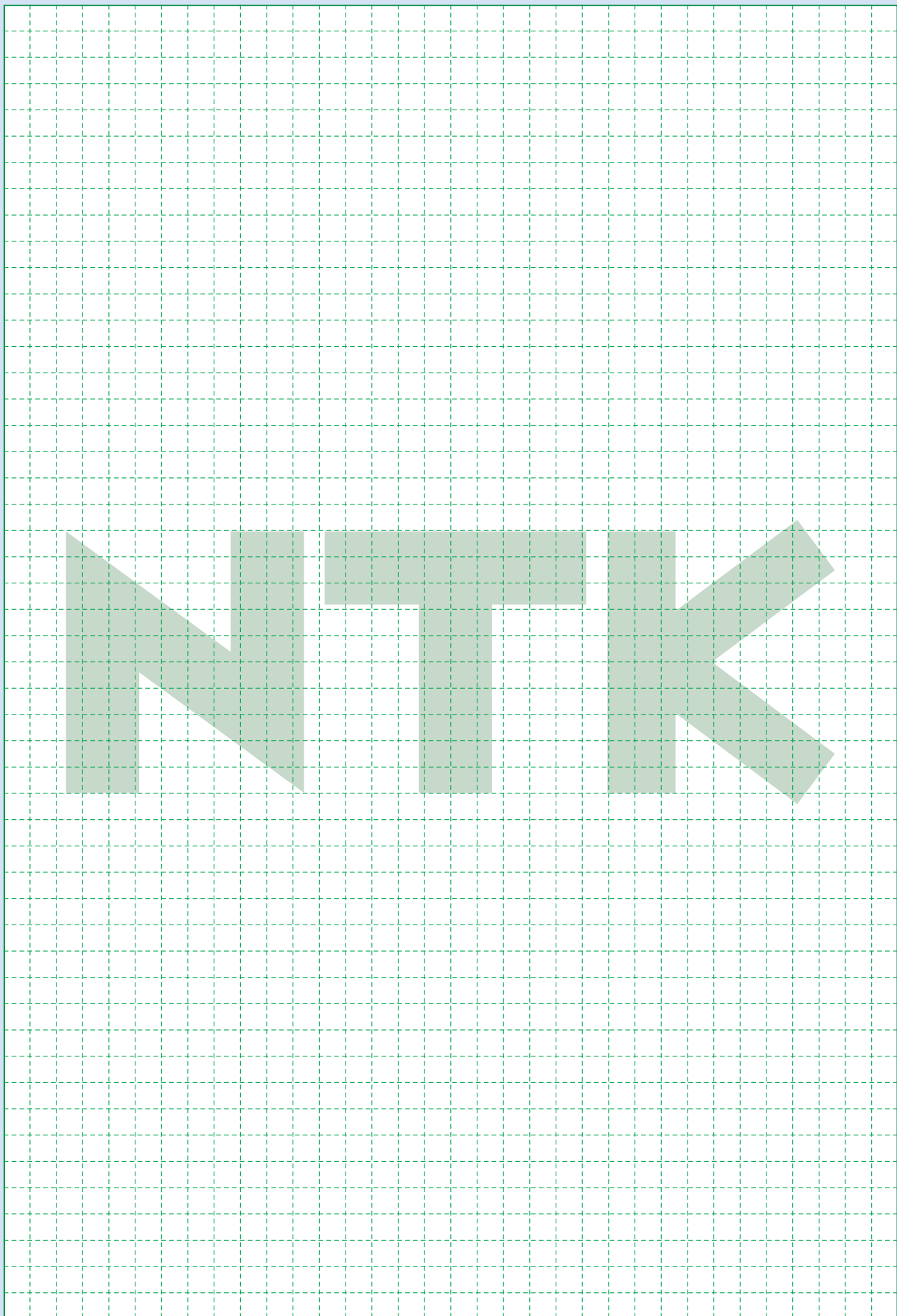
Insert

WA1

| Shape | Item-No. | Dimensions (mm) | | | | WA 1 |
|--|---|-----------------|--------|-------|------|--------|
| | | W | r | L | T | |
|  | VGW4-1 25-R ENA | 3.175 | FULL-R | 12.7 | 4.75 | ▲ |
| | 125-1 TNCE | | 0.4 | | | ▲ |
| | 125-2 T014 | | 0.8 | | | ▲ |
| | 156-R ENA | 3.962 | FULL-R | | | ▲ |
| | 156-1 ENA | | 0.4 | | | ○ |
| | 156-2 ENA | | 0.8 | | | ○ |
| | 187-R ENA | 4.75 | FULL-R | | | ▲ |
| | 187-1 ENA | | 0.4 | | | ▲ |
| | 187-2 TNCE | | 0.8 | | | ● |
|  | VGW6- 250-R ENA | 6.35 | FULL-R | 19.05 | 6.35 | ● |
| | 250-1 ENA | | 0.4 | | | ▲ |
| | 250-2 ENA | | 0.8 | | | ● |
| | 250-3 ENA | 1 | ▲ | | | |
| | 281-R ENA | 7.14 | 1.2 | | | ● |
| | 281-1 ENA | | 0.4 | | | ○ |
| | 281-2 ENA | | 0.8 | | | ○ |
| | 281-3 ENA | | 1.2 | | | ○ |
| |  | VGW8- 312-R ENA | 7.93 | | | FULL-R |
| 312-1 ENA | | 0.4 | | ○ | | |
| 312-2 ENA | | 0.8 | | ○ | | |
| 312-3 ENA | | 1.2 | | ○ | | |
| 312-4 ENA | | 1.6 | ○ | | | |
| 344-R ENA | | 8.74 | FULL-R | ● | | |
| 344-1 ENA | | | 0.4 | ○ | | |
| 344-2 ENA | | | 0.8 | ○ | | |
| 344-3 ENA | | | 1.2 | ○ | | |
| 344-4 ENA | | 1.6 | ○ | | | |
| 375-R ENA | | 9.53 | FULL-R | ● | | |
| 375-1 ENA | | | 0.4 | ○ | | |
| 375-2 ENA | | | 0.8 | ○ | | |
| 375-3 ENA | | | 1.2 | ○ | | |
| 375-4 ENA | | | 1.6 | ○ | | |

Edge-Preparation

| Description | ISO |
|-------------|--------|
| ENA | R-horn |
| TNCE | T01020 |
| T014 | T02220 |



Continuous Cutting for High-Hardness Materials **HC7,ZC7**

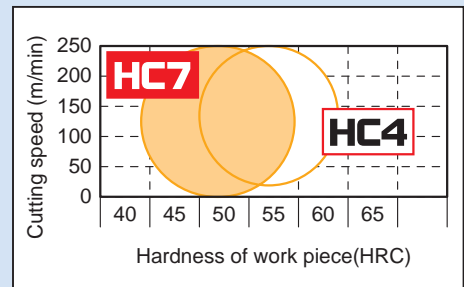
Feature

- Excellent wear resistance in wide hardness range of operations such as removing carburized layer.
- High quality surface with wiper facet inserts.
- Excellent chip control with AG chip form.



Recommended Cutting Conditions

| Material | Work material | Purpose | Cutting speed (m/min) | Feed (mm/rev) |
|--------------------------|---|-------------------------|-----------------------|---------------|
| HC7 HC4 | Carburized steel Hardened steel Die steel | Turning (Continuous) | ~150 | 0.2 |



Data

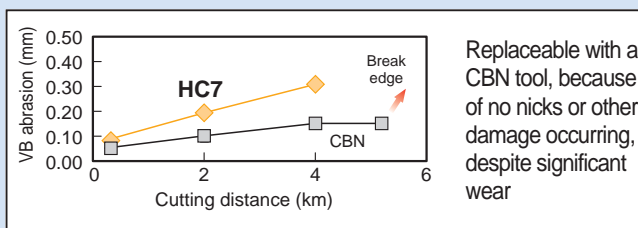
Physical Characteristics

| Material | Density (g/m ³) | Hardness (HRA) | Bending strength (M Pa) | Thermal expansion coefficient |
|------------|-----------------------------|----------------|-------------------------|-------------------------------|
| HC7 | 4.6 | 95.0 | 1,100 | 7.9 |
| HC4 | 4.6 | 95.5 | 1,000 | 7.8 |

Structure of HC7



Cutting Performance



Cutting Conditions

(18CrMo4, HRC60-50)

- V = 100 m/min
- f = 0.1 mm/rev
- d = 0.2 mm
- Coolant: Not used
- Cutting insert

SNGN 120408

Photos of tool damage



Case Study

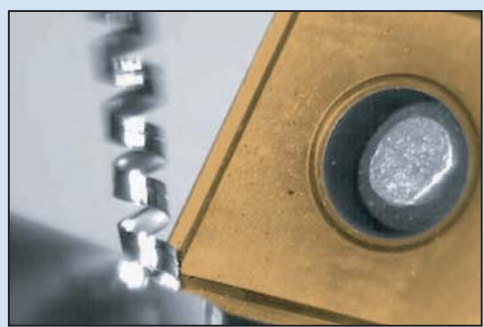
| Gear | |
|---|--------|
| <ul style="list-style-type: none"> ● Work material: Carburized and hardened steel ● Insert: TNGN 160412 ● V=100m/min ● f=0.12mm/rev ● d=0.15mm (max.) ● Coolant: Used | |
| HC7 | 80 pcs |
| CBN | 80 pcs |

Highly cost-effective because of tool life equivalent to CBN's

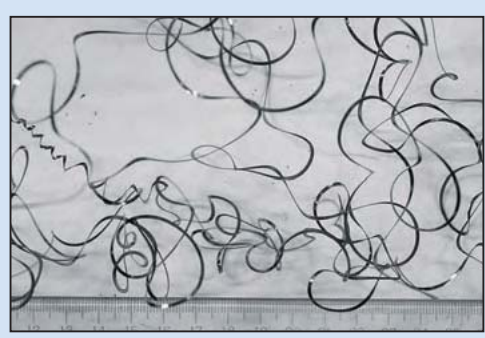
Hardened-Steel Chip Control

Ceramic "ZC7" AG Chipbreaker

With AG chipbreaker



Without AG chipbreaker







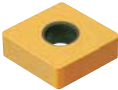
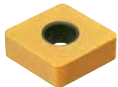
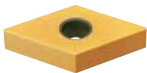
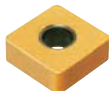



"AG chipbreaker", when added to any **"ZC7"** ceramic tool develops excellent wear resistance in a wide hardness range, during machining operations such as carburized-layer removal, improves surface-machining defects and machine stoppage due to poor formation of chips, thus allowing extended operation.

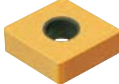
Recommended Cutting Conditions

| Work material | Hardness | Cutting speed (m/min) | Feed (mm/rev) | Cutting depth (mm) |
|---|----------|-----------------------|---------------|--------------------|
| Carburized hardened steel Induction hardened steel | 30~62 | ~150 | 0.1~0.2 | 0.25~0.6 |

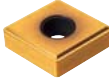
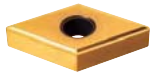

Standard Insert

| Shape | Item-No. IC, T, R | ZC7 |
|---|----------------------|-----|
|  | CNGN 120408 SNF | ● |
| | 120412 SNF | |
|  | DNGN 150408 SNF | ● |
|  | RNGN 120400 SNF | |
| | 120700 SNF | ● |
|  | SNGN 120408 SNF | |
| | 120412 SNF | |
| | 120416 SNF | |
|  | TNGN 160408 SNF | |
| | 160412 SNF | |
|  | TPGN 110304 TNC | ● |
| | 110304 TNC | |
| | 160304 TN | ● |
| | 160308 TN | ● |
|  | CNGA 120404 TN | ● |
| | 120404 SNF | ● |
| | 120408 TN | ● |
| | 120408 SNF | ● |
| | 120412 SNF | ● |
|  | DNGA 150404 TN | |
| | 150404 SNF | ● |
| | 150408 TN | |
| | 150408 SNF | ● |
| | 150412 SNF | |
|  | SNGA 120408 SNF | |
| | 120412 SNF | |
|  | TNGA 160404 TN | ● |
| | 160404 SNF | ● |
| | 160408 SNF | ● |
| | 160412 SNF | |
|  | VNGA 160404 TN | ● |
| | 160404 SNF | ● |
| | 160408 SNF | ● |
| | 160412 SNF | ● |

Wiper Insert

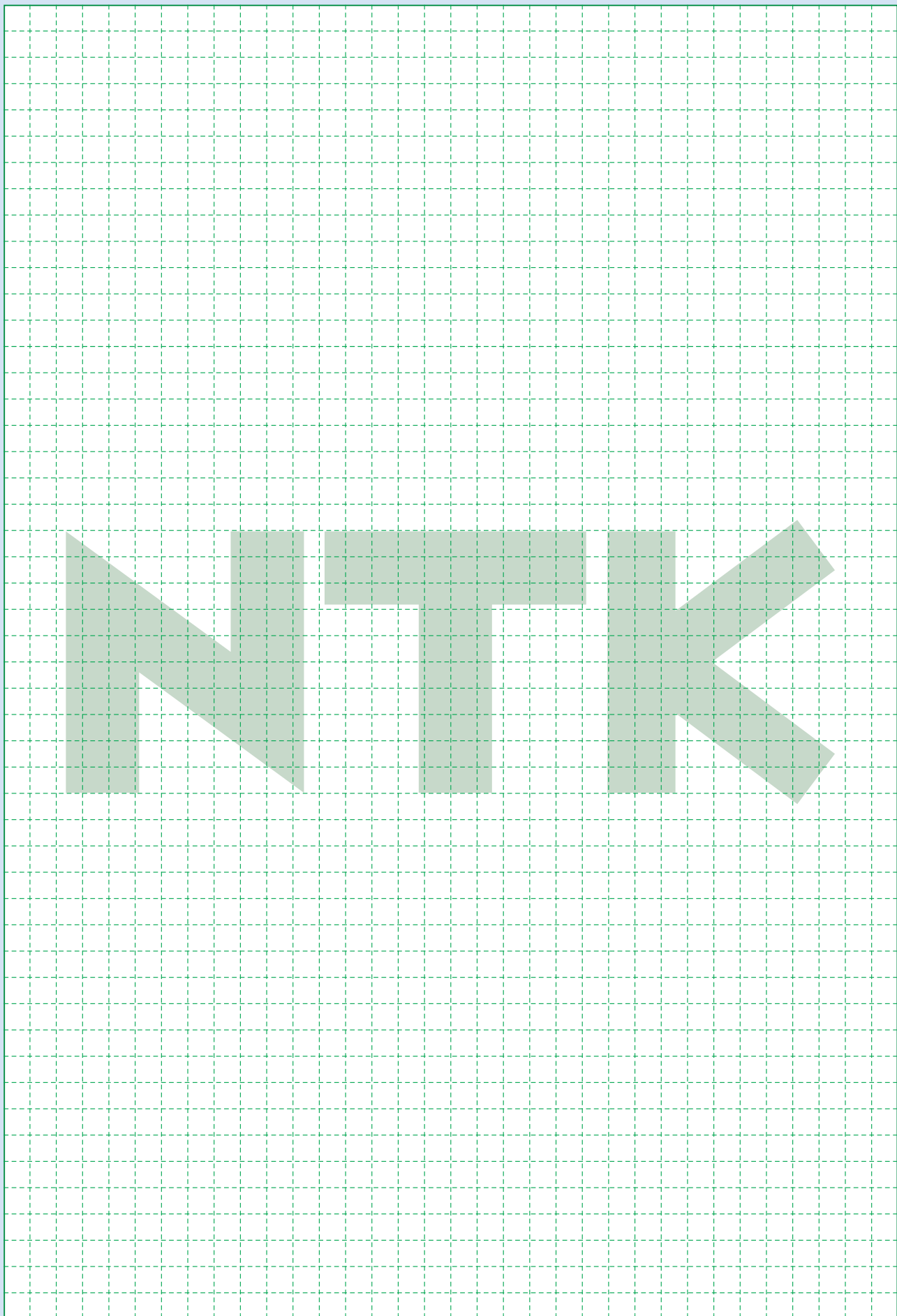
| Shape | Item-No. IC, T, R | ZC7 |
|---|----------------------|-----|
|  | CNGA 120408 WL TN | ● |
| | 120412 WL TN | |

Chipbreaker

| Shape | Item-No. IC, T, R | ZC7 |
|---|----------------------|-----|
|  | CNGG 120408 ZNC GAG | ● |
| | 120412 ZNC GAG | ● |
|  | DNNG 150408 ZNC GAG | ● |
| | 150412 ZNC GAG | ● |
|  | TNGG 160408 ZNC GAG | ● |
| | 160412 ZNC GAG | ● |

Edge-Preparation

| Description | ISO | T |
|-------------|--------|----|
| TN | T01025 | 04 |
| | T02025 | 07 |
| TNC | T01025 | — |
| SNF | S02025 | — |
| ZNC | S01025 | — |



Continuous Cutting for High-Hardness Materials

HC2, HC4, ZC4

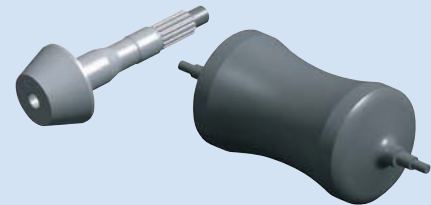
HC2

This grade is used for finishing operations of cast iron and hardened steel.

Excellent wear resistance in a wide hardness range
This grade is our general black ceramic.

HC4 and ZC4





The finest grain size particle, with high melting point, is composited HC4 improves in both hardness and strength, and it shows superior performance as a special material for machining high-hardness materials. ZC4 coated with TiN to further improve wear resistance is also included in the NTK ceramic product line up.

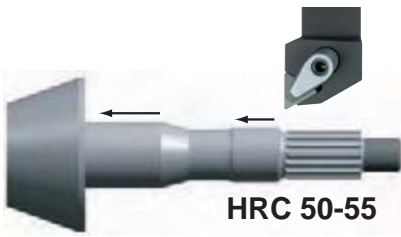




Recommended Cutting Conditions (For turning)







| Work material | Status and others | Machining processes | Cutting speed (m/min) | Recommendation |
|-------------------------|-------------------|---|-----------------------|------------------|
| Gray cast iron | After cast-metal | High-speed semi-finishing and finishing | 100~500 | HC2 / HC7 |
| | Surface removal | | | |
| High-hardened materials | Less than HRC60 | Finishing | ~150 | HC7 |
| | HRC65 or less | | | HC4 |
| Mill Rolls | HS85 or less | Semi-finishing and finishing | ~100 | HC2 / HC7 |






Case Study




| | |
|---|---|
| Roll | 210Cr12 (Alloy Steel) |
| Insert: RCGX 1208 PN HC2 (Double T with R) | |
|   | |
| Cutting speed (m/min) | 80 |
| Feed (mm/rev) | 0.2 |
| Depth of cut (mm) | 0.5~3.0 |
| Coolant | WET |
| HC2 |  |
| Competitor's Ceramic |  |

| | |
|--|---|
| Differential drive | C45 (Carbon Steel) |
| Insert: TNGA 160412 ZNF HC4 (S02025) | |
|  <p>HRC 50-55</p> | |
| Cutting speed (m/min) | 100 |
| Feed (mm/rev) | 0.06 |
| Depth of cut (mm) | 0.2 |
| Coolant | WET |
| HC4 |  |
| Competitor's CBN |  |

HC2

| Shape | Item-No. | HC2 |
|---|--|-----|
|  | CNGA IC ₁ T ₁ R | ● |
| | 120402 TN | |
| | 120404 TN | |
| | 120408 TN | |
| | 120412 TN | |
| | 120416 TN | |
| | 120708 TN | |
| | 120712 TN | |
| | 160612 TN | |
| | 160616 TN | |
|  | CNGN | ● |
| | 120408 TN | |
| | 120412 TN | |
| | 120416 TN | |
| | 120708 TN | |
| | 120712 TN | |
| | 120716 TN | |
| | 120720 TN | |
| | 160704 TN | |
| | 160708 TN | |
|  | CNGX | ● |
| | 120704 TN DP5 | |
| | 120708 TN DP5 | |
| | 120712 TN DP5 | |
|  | DNNG | ● |
| | 150404 TN | |
| | 150408 TN | |
| | 150412 TN | |
| | 150416 TN | |
| | 150608 TN | |
| | 150612 TN | |
| | 150616 TN | |
| | 150704 TN | |
| | 150708 TN | |
| | 150712 TN | |
|  | DNNGN | ● |
| | 150404 TN | |
| | 150408 TN | |
| | 150412 TN | |
| | 150608 TN | |
| | 150612 TN | |
| | 150616 TN | |
| | 150704 TN | |
| | 150708 TN | |
| | 150712 TN | |
| | 150716 TN | |
|  | DNNGX | ● |
| | 120704 TN DP5 | |
| | 120708 TN DP5 | |
| | 120712 TN DP5 | |
| | 120716 TN DP5 | |
| | 150708 TN DP5 | |
| | 150712 TN DP5 | |
| | 150716 TN DP5 | |
| 150720 TN | | |

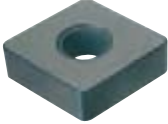
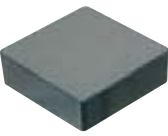
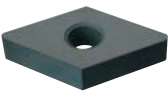

| Shape | Item-No. | HC2 |
|---|--|-----|
|  | ENGN IC ₁ T ₁ R | ● |
| | 130704 TN | |
| | 130708 TN | |
| | 130712 TN | |
| | 130716 TN | |
| | 130720 TN | |
| | 130724 TN | |
|  | RNGN | ● |
| | 060400 TN | |
| | 090400 TN | |
| | 120400 TN | |
| | 120700 TN | |
| | 150700 TN | |
|  | SNGA | ● |
| | 120404 TN | |
| | 120408 TN | |
| | 120412 TN | |
| | 120416 TN | |
| | 120420 TN | |
|  | SNGN | ● |
| | 120404 TN | |
| | 120408 TN | |
| | 120412 TN | |
| | 120416 TN | |
| | 120420 TN | |
| | 120424 TN | |
| | 120430 TN | |
| | 120704 TN | |
| | 120708 TN | |
| | 120712 TN | |
| | 120716 TN | |
| | 120720 TN | |
| | 120724 TN | |
| | 120730 TN | |
| 120732 TN | | |
|  | TNGA | ● |
| | 160404 TN | |
| | 160408 TN | |
| | 160412 TN | |
| | 160416 TN | |
| | 160420 TN | |
| | 220408 TN | |
| | 220412 TN | |
| | 220416 TN | |
| | 220420 TN | |

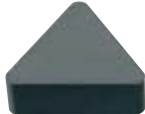
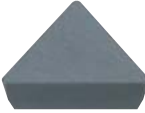
| Shape | Item-No. | HC2 |
|---|--|-----|
|  | TNGN IC ₁ T ₁ R | ● |
| | 110304 TN | |
| | 110308 TN | |
| | 110312 TN | |
| | 220404 TN | |
| | 220408 TN | |
| | 220412 TN | |
| | 220416 TN | |
| | 220708 TN | |
| | 220712 TN | |
|  | TPGN | ● |
| | 060102 TN | |
| | 060104 TN | |
| | 090202 TN | |
| | 090204 TN | |
| | 090208 TN | |
| | 110302 TN | |
| | 110304 TN | |
| | 110308 TN | |
| | 110312 TN | |
|  | VNGA | ● |
| | 160404 TN | |
| | 160408 TN | |
| | 160412 TN | |
| | 160416 TN | |
| | 160416 TN | |

Edge-Preparation

| Description | ISO | T |
|-------------|-------------|--------|
| TN | T01025 | 04 |
| | T02025 | 06. 07 |
| PN | W-T land | — |
| | with R-horn | — |

■ HC4, ZC4

| Shape | Item-No. IC, T, R | HC4 | ZC4 |
|---|----------------------|-----|-----|
|  | CNGA 120404 ZNF | ● | ● |
| | 120408 ZNF | ● | ● |
| | 120412 ZNF | ● | ● |
| | 120416 ZNF | ● | |
|  | CNGN 120408 ZNF | ● | ● |
| | 120412 ZNF | ● | ● |
| | 120708 ZNF | ● | ● |
| | 120712 ZNF | ● | |
|  | DNKA 150404 ZNF | ● | |
| | 150408 ZNF | ● | |
| | 150604 ZNF | ● | ● |
| | 150608 ZNF | ● | ● |
| | 150612 ZNF | ● | |
|  | RNGN 120400 ZNF | ● | |
| | 120700 ZNF | ● | ● |

| Shape | Item-No. IC, T, R | HC4 | ZC4 |
|---|----------------------|-----|-----|
|  | TNGA 160404 ZNF | ● | |
| | 160408 ZNF | ● | |
| | 160412 ZNF | ● | ● |
|  | TNGN 160404 ZNF | | |
| | 160408 ZNF | ● | ● |
| | 160412 ZNF | ● | |
|  | TPGN 090204 ZNC | ● | |
| | 110304 ZNC | ● | ● |
| | 110308 ZNC | ● | ● |
| | 160304 ZNC | ● | |
|  | VNGA 160404 ZNF | ● | |
| | 160408 ZNF | ● | |
| | 160412 ZNF | | |
|  | WNGA 080408 ZNF | ● | |

※Pictures are **HC4**

■ Edge-Preparation

| Description | ISO | T |
|-------------|--------|---|
| ZNC | S01025 | — |
| ZNF | S02025 | — |

Continuous Cutting for Ductile Cast Iron

HC6

Feature

- Excellent wear-resistance for Ductile cast iron
- TiC-based ceramic



Recommended Cutting Conditions

| Work material | Purpose | Cutting speed (m/min) | Feed (mm/rev) |
|-------------------|-----------|-----------------------|---------------|
| Ductile cast iron | Finishing | 100~500 | ~0.4 |

Case Study

| Case | Ductile cast iron |
|---------------------------------|-------------------|
| Insert: DNGN 120412 TN (T01025) | |
| | |
| Cutting speed (m/min) | 300 |
| Feed (mm/rev) | 0.2 |
| Depth of cut (mm) | 0.5 |
| Coolant | WET |
| HC6 | 300 pcs |
| Coated carbide | 150 pcs |

HC6

| Shape | Item-No. IC, T, R | HC6 |
|-------|--|---|
| | CNGN 120404 TN 120408 TN | ● |
| | DNGN 120412 TN 120416 TN 120704 TN 120708 TN 120712 TN 120716 TN 120708 TN 120712 TN 150704 TN 150708 TN 150712 TN | ● ● ● ● ● ● ● ● ● ● ● |
| | RNGN 120400 TN 120700 TN | ● ● |

| Shape | Item-No. IC, T, R | HC6 |
|-------|--|---------------------------------|
| | SNGN 120408 TN 120412 TN 120416 TN 120420 TN 120712 TN 120716 TN | ● ● ● ● ● ● |
| | TNGN 160408 TN 160412 TN 160416 TN | ● ● ● |
| | TPGN 110308 TN 110312 TN 160308 TN 160312 TN 220404 TN 220408 TN 220412 TN | ● ● ● ● ● ● ● |

Edge-Preparation

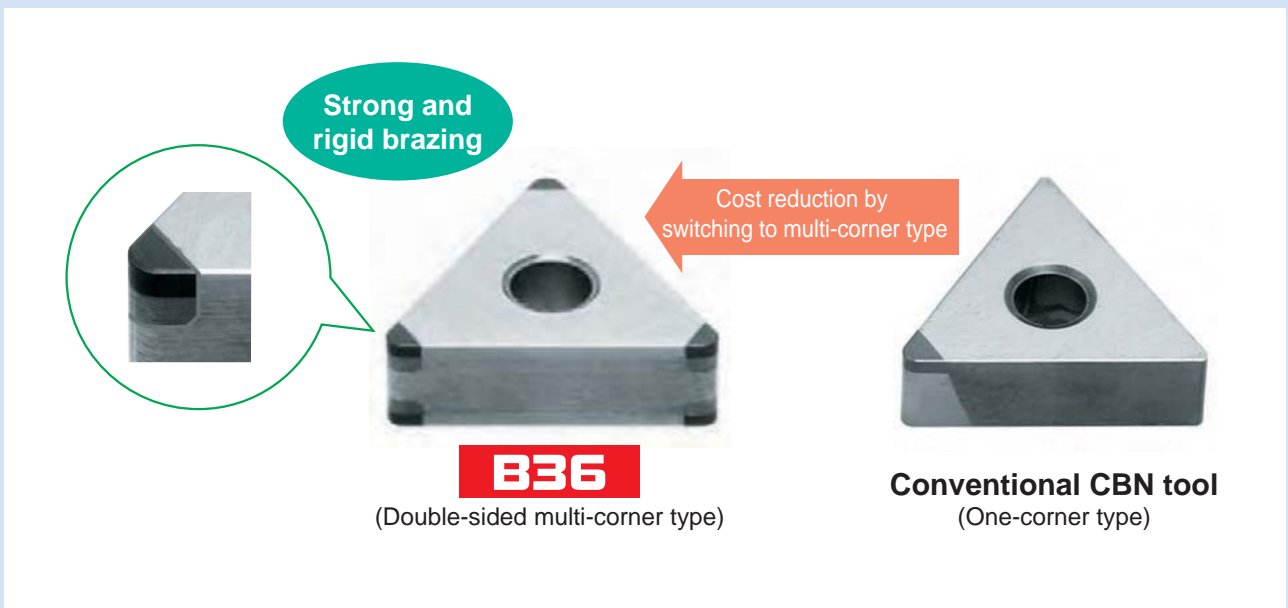
| Description | ISO | T |
|-------------|--------|----|
| TN | T01025 | 04 |
| | T02025 | 07 |

Interrupted Cutting of High-Hardness Materials

B36

Feature

- Optimized in CBN content with a special ceramic binder and based on strong and rigid brazing technology
- Improved damage resistance and thermal shock resistance for interrupted cutting
- Double-sided multi-corner piece excellent in cost performance
- Combination with the NTK ceramic ZC7 for continuous cutting



Recommended Cutting Conditions

| Work material | Hardness | Cutting speed (m/min) | Feed (mm/rev) | Cutting depth (mm) |
|----------------|----------|-----------------------|---------------|--------------------|
| Hardened steel | 45~62 | 50~200 | ~0.2 | ~0.5 |

Carburized-layer Removal Cutting

| Material | Competitor's CBN tool | B36 |
|---------------|-----------------------------|----------------------|
| Part number | CNGA 120408 (2-corner type) | ← (4-corner type) |
| Cutting speed | 130 (m/min) | ← |
| Feed rate | 0.14 (mm/rev) | ← |
| Cutting depth | 0.1 (mm) | ← |
| Coolant | Dry | ← |
| Tool life | 20~50 (pcs/corner) | 50 (pcs/corner) |

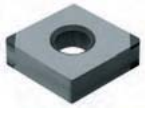




| | |
|--------------------|----------------------|
| Machined part name | Gear |
| Material | 20Cr4(H) (HRc 61~65) |



Compared to a competitor's CBN tool, **B36** does not suffer from abrupt notching or other damage, is stable in life, and leads to the improvement of productivity.

B36

NEW

| Shape | Item-No. IC, T, R | B36 | CBN dimension a |
|--|----------------------|------------|--------------------|
|  4-corner specs. | CNGA 120404 PQ | ● | 2.0 |
| | 120408 PQ | ● | 2.0 |
| | CNMA 120412 PQ | ● | 2.4 |
|  4-corner specs. | DNGA 150404 PQ | ● | 1.8 |
| | 150408 PQ | ● | 1.5 |
| | DNMA 150412 PQ | ● | 2.2 |
|  8-corner specs. | SNGA 120408 PE | ● | 2.0 |
| | SNMA 120412 PE | ● | 2.5 |
|  6-corner specs. | TNGA 160404 PH | ● | 1.7 |
| | 160408 PH | ● | 1.4 |
| | TNMA 160412 PH | ● | 2.0 |
|  4-corner specs. | VNGA 160404 PQ | ● | 2.0 |
| | 160408 PQ | ● | 1.1 |



※The product with a nose radius of R1.2 is an M-grade product.

NTK CBN series **B20, B22, B24 and B26**

Feature

- B20**
High-speed finishing for gray cast iron
- B22**
For high-hardend mill rolls
- B24 / B26 multi corner**
For hardened steel after sintering



• Features and Applications

| Grade | Size of CBN | | Number of corner(s) | Features and applications | Application of NTK CBN Series for each purpose | | | |
|------------------|-------------|--------|---------------------|---------------------------|--|---------------------|----------------|------------|
| | Normal Size | QT-One | | | Quenched steel | Interrupted cutting | Gray cast iron | Mill Rolls |
| B20 | ● | ● | 1 | High-speed finishing | ◎ | | ○ | |
| B22 | ● | | 1 | Hardened Mill rolls | | | ○ | ◎ |
| B24 / B26 | | ● | 1 / multi | sintered steel | ◎ | ○ | | |
| B36 | ● | | multi | | | ◎ | | |

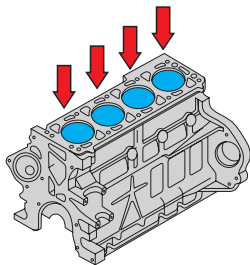
Recommended Cutting Conditions

| Work piece | | Grade | Recommended conditions | | | |
|---------------------|-------------|------------------|------------------------|---------------|--------------------|-------------|
| Material and others | Hardness | | Cutting speed (m/min) | Feed (mm/rev) | Cutting depth (mm) | Coolant |
| Sintered steel | HRC 50~68 | B20 | 60~150 | ~0.2 | ~0.4 | Wet and dry |
| | | B24 / B26 | 70~170 | ~0.3 | ~0.5 | |
| | Interrupted | B36 | 60~150 | ~0.2 | ~0.4 | Dry |
| Gray cast iron | HB ~250 | B22 | Turning 300~1000 | ~0.2 | ~0.5 | Wet |
| | | | Milling 300~500 | | | Wet and Dry |
| Mill Rolls | HS 50~80 | B22 | 40~140 | ~0.5 | ~3.0 | Wet and Dry |
| | | B20 | 80~150 | ~0.5 | ~2.0 | |

● Case Study

Cylinder block for automobile

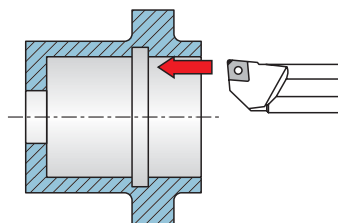
Work material: 250 (Gray Cast Iron)
Insert: SNMA 120408 PTR



| | |
|-----------------------|-----------------|
| Cutting speed (m/min) | 500 |
| Feed (mm/rev) | 0.2 |
| Depth of cut (mm) | 0.2 |
| Coolant | WET |
| B20 | 2300 pcs |
| Competitor's CBN | 1000 pcs |

Housing for automobile

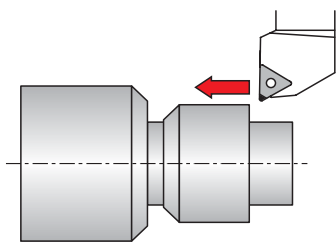
Work material: 15CrMo4 (HRC 62)
Insert: CNMA 120404 PTR



| | |
|-----------------------|---------------|
| Cutting speed (m/min) | 70~80 |
| Feed (mm/rev) | 0.15 |
| Depth of cut (mm) | 0.15 |
| Coolant | DRY |
| B20 | 85 pcs |
| Competitor's CBN | 70 pcs |

Shaft for automobile

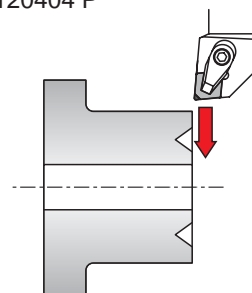
Work material: 20CrS4 (HRC 63)
Insert: TNMA 160408 P



| | |
|-----------------------|----------------|
| Cutting speed (m/min) | 160 |
| Feed (mm/rev) | 0.13 |
| Depth of cut (mm) | 0.25 |
| Coolant | DRY |
| B24 | 500 pcs |
| Competitor's CBN | 300 pcs |

Gear for automobile

Work material: 15CrMo4 (Hv720~860)
Insert: CNMA 120404 P

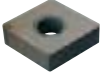

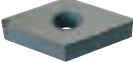




| | |
|-----------------------|----------------|
| Cutting speed (m/min) | 140 |
| Feed (mm/rev) | 0.18 |
| Depth of cut (mm) | 0.15 |
| Coolant | WET |
| B24 | 800 pcs |
| Competitor's CBN | 500 pcs |




● **QT-One**

QT-One has a minimized CBN size for improving cost performance.



■ **B20 QT-One**

| Shape | Item-No. | | B20 | CBN dimension | |
|---|----------|------------|-----|--|-----|
| | IC | T, R | | a | |
|  | CNMA | 120404 PTR | ● |  | 1.9 |
| | | 120408 PTR | | | 1.8 |
|  | DNMA | 150404 PTR | ● | | 1.9 |
| | | 150408 PTR | | | 1.6 |
|  | SNMA | 120404 PTR | ● | | 1.9 |
| | | 120408 PTR | | | 1.9 |
|  | TNMA | 160404 PTR | ● | | 1.9 |
| | | 160408 PTR | | | 1.6 |

■ **B20**

| Shape | Item-No. | | B20 | CBN dimension | |
|---|----------|---------|-----|--|-----|
| | IC | T, R | | a | |
|  | CNGA | 120404 | ● |  | 4.7 |
| | | 120408 | | | 4.6 |
| | | 120412 | | | 4.5 |
|  | DNGA | 150404 | ● | | 4.1 |
| | | 150408 | | | 3.8 |
| | | 150412 | | | 3.4 |
|  | SNGA | 120408 | ● | | 4.7 |
|  | TNGA | 160404 | ● | 4.3 | |
| | | 160408 | | 4.0 | |
|  | TPGN | 160304 | ● | 4.3 | |
| | | 160308 | | 4.0 | |
|  | TBGN | 060104S | ● | | |




■ **B22**

| Shape | Item-No. | | B22 |
|---|----------|---------|-----|
| | IC | T, R | |
|  | RBGX | 16S | |
| | | 20S | |
|  | RNGN | 120300S | |
| | | 120400S | |

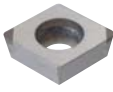

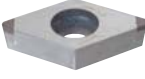
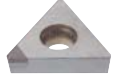

● QT-One

QT-One has a minimized CBN size for improving cost performance.

■ B24

| Shape | Item-No. IC ₁ T ₁ R | B24 | CBN dimension | |
|---|--|-----|--|-----|
| | | | | a |
|  | CNMA 120404 P | ● |  | 2.5 |
| | 120408 P | ● | | 2.4 |
| | 120412 P | ● | | 2.3 |
|  | DNMA 150404 P | ● | | 2.5 |
| | 150408 P | ● | | 2.1 |
|  | SNMA 120408 P | ● | | 2.5 |
| | 120412 P | ● | | 2.5 |
|  | TNMA 160404 P | ● | | 2.3 |
| | 160408 P | ● | | 2.0 |
| | 160412 P | ● | | 2.0 |
|  | VNMA 160404 P | ● | | 2.8 |
| | 160408 P | ● | | 2.0 |
|  | TPGN 110304 P | ● | 2.3 | |
| | 160304 P | ● | 2.3 | |
| | 160308 P | ● | 2.0 | |

■ B26

| Shape | Item-No. IC ₁ T ₁ R | Corner | B26 | CBN dimension | | | |
|---|--|--------|-----|---|-----|---|-----|
| | | | | | a | | |
|  | CCGW 09T304 PD | 2 | ● |  | 2.5 | | |
| | 09T308 PD | 2 | | | 2.4 | | |
| | CPGW 09T304 PD | 2 | | | 2.3 | | |
| | 09T308 PD | 2 | | | 2.5 | | |
| | 090304 PD | 2 | | | 2.1 | | |
| | 090308 PD | 2 | | | 2.5 | | |
|  | DCGW 11T301 PD | 2 | | | ● | 2.5 | |
| | 11T304 PD | 2 | | | ● | 2.3 | |
| | 11T308 PD | 2 | | | ● | 2.0 | |
|  | TCGW 110202 P | 1 | | | ● |  | 2.0 |
| | 110204 P | 1 | | | | | 2.8 |
| | 110208 P | 1 | | | | | 2.0 |
| | 16T302 PT | 3 | 2.3 | | | | |
| | 16T304 PT | 3 | 2.3 | | | | |
| | 16T308 PT | 3 | 2.0 | | | | |

Solid CBN for Gray Cast Iron **B16**

Feature

- Multi-corner specification
- Easy to find a used corner in gold color
- Long cutting edge



Recommended Cutting

| Work piece | | | Recommended conditions | | | |
|----------------|---------------|-----------|------------------------|---------------|--------------------|--------------|
| Material | Hardness (HB) | Use | Cutting speed (m/min) | Feed (mm/rev) | Cutting depth (mm) | Coolant |
| Gray cast iron | 230 | Roughing | 150~1000 | ~0.7 | ~3.0 | Wet type (*) |
| | | Finishing | 300~1500 | ~0.6 | ~0.5 | Dry type |




※A dry type can also be used for parts short in cutting distance (about 10 mm).

● Case Study

| | |
|----------------------------------|----------------------|
| Cylinder bore | 250 (Gray Cast Iron) |
| Insert: SNMN 090312S TN (T01025) | |
| | |
| Cutting speed (m/min) | 560 |
| Feed (mm/rev) | 0.6 |
| Depth of cut (mm) | 0.7 |
| Coolant | WET |
| B16 | 800 pcs |
| Competitor's CBN | 600 pcs |

| | |
|----------------------------------|----------------------|
| Disc brake | 250 (Gray Cast Iron) |
| Insert: SNMN 120420S TN (T01025) | |
| | |
| Cutting speed (m/min) | 1000 |
| Feed (mm/rev) | 0.7 |
| Depth of cut (mm) | 1.0 |
| Coolant | WET |
| B16 | 800 pcs |
| Competitor's CBN | 65 pcs |

B16

| Shape | Item-No. IC, T, R | B16 |
|---|----------------------|-----|
|  | SNMN 090308S TNB | ● |
| | 090312S TN | ● |
| | 120308S TN | |
| | 120312S TN | |
| | 120408S TN | |
| | 120412S TNF | ● |
| | 120416S TNF | |
|  | TNMN 110308S TN | |
| | 110312S TNC | |
| | 160308S TN | |
| | 160312S TN | |
| | 160408S TN | |
| | 160412S TNF | |
|  | RNMN 120300S TN | |
| | 120400STN | |

Edge-Preparation

| Description | ISO | T |
|-------------|--------|--------|
| TN | T01025 | 03, 04 |
| | T02025 | 07 |
| TNB | T00525 | — |
| TNC | T01025 | — |
| TNF | T02025 | — |

High Performance Cermet Grade **C7X, C7Z**

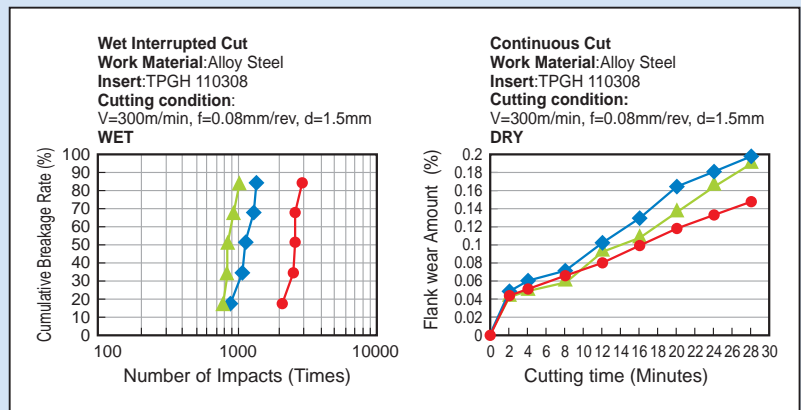
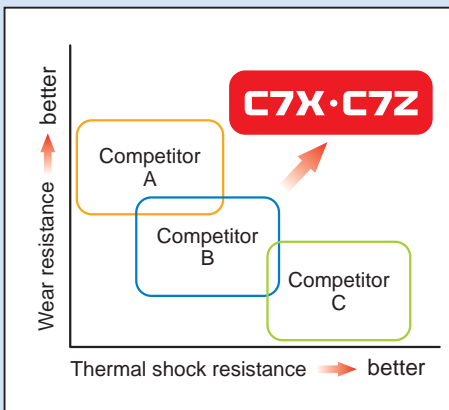
Applications

- Semi-finishing and finishing steel
- Formed tools for bearing industry
- Grooving (interrupted or non-interrupted)



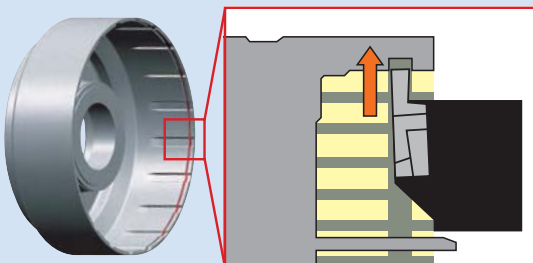
Greatly improved thermal shock resistance compared to conventional cermet

Grade Comparison Chart



• Case Study

ID Interrupted Grooving on Automatic Transmission Clutch Drum



| | |
|-----------------------|----------------|
| Cutting speed (m/min) | 270 |
| Feed (mm/rev) | 0.04 |
| Depth of cut (mm) | 1.5 |
| Coolant | WET |
| C7X | 200 pcs |
| Competitor's | 100 pcs |

Double the tool life compared to competitor
 Dramatically reduced edge wear

Diamond-Coated UC1, UC2

Best Performance for

Al alloy (High Si Al alloy), MMC(FRM)
Ceramics, Reinforced ceramics, Carbon

Feature

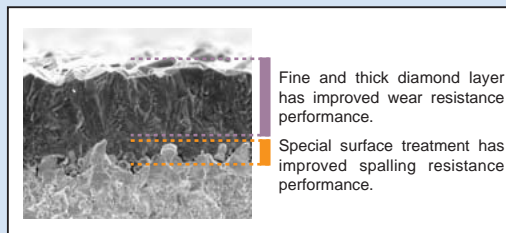
Improvement in Wear Resistance

Superior wear resistance especially for hard-to cut aluminum material I.e. High Si Al alloy and MMC material.

Physical Performance

| | UC1-UC2 | Natural diamond | DLC | PCD |
|----------------------|---------|-----------------|-----------|-------------|
| Crystal structure | Diamond | Diamond | Amorphous | Diamond |
| Bonded phase | None | None | None | Co, Ni, etc |
| Density(g/cm3) | 3.5 | 3.5 | 1.7~2.2 | 4.1 |
| Young's modulus(GPa) | 1000 | 280~300 | 280~300 | 800 |
| Hardness(GPa) | 100 | 90~120 | 10~50 | 10~50 |

Composition of Diamond Coating



Variety in Shape

- Moulded chipbreaker ensures better chip control.
- Deeper cutting edge is obtained with coating on all the surface (edge) of insert.

Types of shapes



Lower Cost

Multi-corner availability and less re-grinding cost.

Effective cutting-edge area

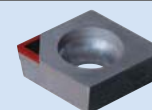
Note: The red line indicates an effective cutting-edge area.

Single-sided chipbreaker



UC1 / UC2

Without chipbreaker



PCD(Brazed with sintered diamond)

Cost reduction by switching to multi-corner type

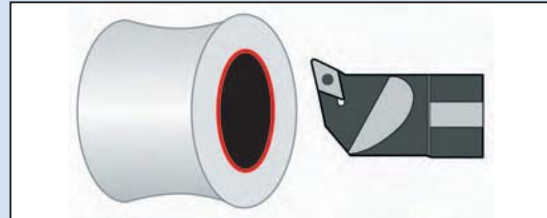
Characteristics of Material

- UC1 has better wear resistance with thick coating layer.
- UC2 has well-balanced durability against spalling and abrasion.

Boring of Al Alloy

| Material | Competitor's PCD (Sintered diamond) | UC2 |
|---------------|-------------------------------------|----------------------------|
| Part number | Brazed cutter | SPMW090312 (4-corner type) |
| Cutting speed | 600m/min | ← |
| Feed rate | 0.4mm/rev | ← |
| Cutting depth | 4.0 mm (Total) | ← |
| Coolant | WET | ← |
| Tool life | 3,000 pcs/corner | 6,000 pcs/corner |

| | |
|-----------|-------------------|
| Part name | Hub of Motor-bike |
| Material | Aluminum alloy |



- **UC2** with a molded chipbreaker raises chip-processing performance and improves brief machine stoppage due to chip-processing defects during competitor's PCD usage.



Chips by PCD

Scale: 10 mm



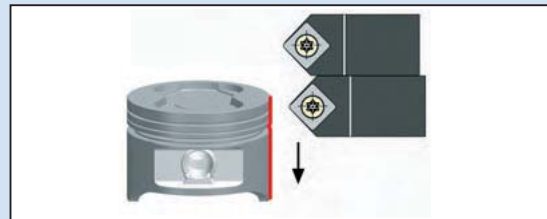
Chips by UC2

Scale: 10 mm

Outer Roughing of Al Alloys

| Material | Competitor's PCD (Sintered diamond) | UC2 |
|---------------|-------------------------------------|----------------------------|
| Part number | Brazed cutter | SPMW090312 (4-corner type) |
| Cutting speed | 600m/min | ← |
| Feed rate | 0.4mm/rev | ← |
| Cutting depth | 4.0 mm (Total) | ← |
| Coolant | WET | ← |
| Tool life | 3,000 pcs/corner | 6,000 pcs/corner |

| | |
|-----------|------------------------------|
| Part name | Piston |
| Material | Aluminum alloy (Al+13vol%Si) |

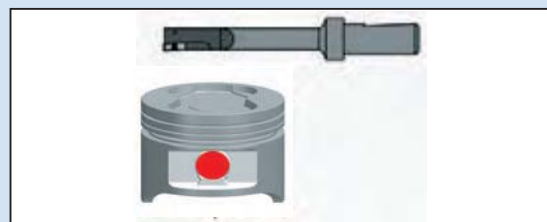


- **UC1** can have its life extended to twice that of the competitor's PCD and allows productivity to be correspondingly improved.
- Although the competitor's PCD tool needs re-grinding eight times, **UC1** allows cost reduction by extending the life of the tool and adopting a four-corner piece.

Rough Boring of Al Alloys

| Material | Competitor's PCD (Sintered diamond) | UC2 |
|---------------|-------------------------------------|---------------------------------|
| Part number | TPGW110304 (1 cutting edge) | Special shape (2 cutting edges) |
| Cutting speed | 8000m/min ⁻¹ | ← |
| Feed rate | 0.15mm/rev | ← |
| Cutting depth | 3.0mm | ← |
| Coolant | WET | ← |
| Tool life | 1 pc/corner | 8,000 pcs/corner |

| | |
|-----------|------------------------------|
| Part name | Piston |
| Material | Aluminum alloy (Al+13vol%Si) |

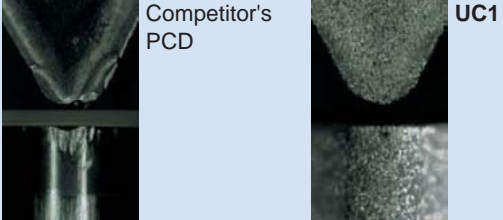


- Because of chatter and peeling-off of a brazed section, competitor's PCD tool cannot machine even a single piece.
- The long effective cutting-edge area of the **UC2** can conduct deeper cutting, and its twin cutting-edge structure suppresses chatter.

C/C Composite Outer Surface

| Material | Competitor's PCD (Sintered diamond) | UC1 |
|---------------|---|---|
| Part number | TNMA160408 (1-corner, w/out chipbreaker) | TNMM160408-ZP (3-corner, w/molded chipbreaker) |
| Cutting speed | 280m/min | ← |
| Feed rate | 0.10mm/rev | ← |
| Cutting depth | 2.0mm | 4.0mm |
| Coolant | DRY | ← |
| Tool life | 50 pcs/corner | 100 pcs/corner |

| | |
|-----------|-------------------------|
| Part name | Sintering-furnace parts |
| Material | Carbon fiber |

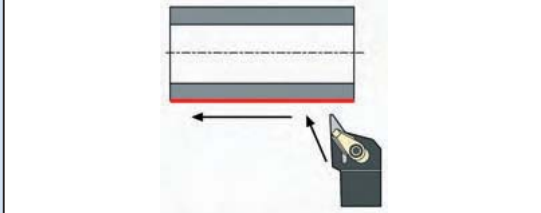


- The life of **UC1** can be extended to twice that of a competitor's PCD tool.
- Compared with the competitor's PCD tool, **UC1** can achieve deeper cutting and thus reduce a cycle time.
- Because of its extended life and cycle time reduction, **UC1** allows the improvement of productivity.

Ceramics Outer Diameter Finishing

| Material | Competitor's PCD (Sintered diamond) | UC2 |
|---------------|--|---|
| Part number | Brazed cutter (w/out chipbreaker) | VNMM160404-ZP (2-corner, w/molded chipbreaker) |
| Cutting speed | 150m/min | ← |
| Feed rate | 0.2mm/rev | ← |
| Cutting depth | 8.0mm | ← |
| Coolant | DRY | ← |
| Tool life | 300 pcs/corner | 400 pcs/corner |

| | |
|-----------|-----------------------|
| Part name | Vacuum switch parts |
| Material | Ceramic calcined body |



- The life of **UC2** can be extended to 1.3 times that of a competitor's PCD tool, thus allowing productivity to be correspondingly improved.
- Since it can cut work materials to greater depths, **UC2** allows indexing difficult in conventional PCD tools, and hence, the improvement of insert-changing frequency.

Aluminum Alloy Plunge Cutting

| Material | Competitor's PCD (Sintered diamond) | UC2 |
|---------------|--|--------------------------------|
| Part number | Special shape | BSMN3207Z24 (Formed insert) |
| Cutting speed | 148m/min | ← |
| Feed rate | 0.06mm/rev | ← |
| Cutting depth | 3.0mm | ← |
| Coolant | WET | ← |
| Tool life | 5,000 pcs/corner | 50,000 pcs/corner |




















| | |
|-----------|-------------------------------------|
| Part name | Two-wheel cylinder, mouth-chamfered |
| Material | Aluminum alloy(Al+12vol%Si) |



- The formed PCD insert is high in cost, and because of machined-surface deterioration due to fusion, the cemented carbide type is found to be short in life.
- The life of **UC2** excellent in fusion resistance and in the diversity of shapes can be extended to 10 times the life of the cemented carbide tool.

Diamond Coated

Standard Stock

| Shape | Item-No. IC T R | UC1 | UC2 | Screw | Wrench |
|--|--------------------|-----|-----|------------------------------------|-----------|
|  Single-sided chipbreaker | CNMM 120404 ZP | | ○ | — | — |
|  Single-sided chipbreaker | TNMM 160404 ZP | | ○ | — | — |
|  Single-sided chipbreaker | VNMM 160404 ZP | | ○ | — | — |
| NEW  Single-sided chipbreaker | CCMT 060204 AM3 | | ○ | LRIS - 2.5×7 | RLR - 15S |
|  Single-sided chipbreaker | CCMT 09T304 AM3 | | ○ | LRIS - 4×6 LRIS - 4×8 | LLR - 25S |
| NEW  Single-sided chipbreaker | CCMT 090308 AF1 | | ○ | | |
|  Single-sided chipbreaker | DCMT 11T304 AM3 | | ○ | | |
|  Without chipbreaker | SPMN 120304 | | ○ | — | — |
| NEW  Single-sided chipbreaker | SPMR 120304 AF1 | | ○ | — | — |
| NEW  Single-sided chipbreaker for left-handed use | TCMT 110204L AP | | ○ | LRIS - 2.5×7 | RLR - 15S |
| | TCMT 110208L AP | | ○ | | |
| NEW  Wiper Single-sided chipbreaker for left-handed use | TCMT 110204 WL AP | | ○ | | |
| NEW  Single-sided chipbreaker for left-handed use | TPMT 110304 L AP | | ○ | | |
| | TPMT 110308L AP | | ○ | | |
| NEW  Single-sided chipbreaker for left-handed use | TPMR 110304L AP | | ○ | | |
|  Single-sided chipbreaker for left-handed use | TPMR 160304 AF1 | | ○ | — | — |
| NEW  Single-sided chipbreaker for left-handed use | TPMH 080204L AP | | ○ | LR - S - 2×4.4 LR - S - 2×5.5 | RLR-13S |
| | TPMT 080204L AP | | ○ | — | |
| | TPMH 090204L AP | | ○ | LR - S - 2.5×4.8 LR - S - 2.5×6 | RLR - 15S |
| | TPMH 110304L AP | | ○ | LR - S - 3×6.2 LR - S - 3×7.8 | RLR - 20S |
| | TPMH 160304LAP | | ○ | LR - S - 4×5.8 LR - S - 4×9 | RLR - 20S |
| NEW  Wiper Single-sided chipbreaker for left-handed use | TPMT 080204WL AP | | ○ | — | — |
|  Single-sided chipbreaker | RPMX 1203 MO GB | | ○ | — | — |
|  Single-sided chipbreaker | VCMT 110304 AM3 | | ○ | LRIS - 2.5×7 | RLR - 15S |
|  W/out chipbreaker | VCMW 110308 | | ○ | LRIS - 2.5×7 | RLR - 15S |