



Series Grade  
**PR13 / SW05**

**Stable Cutting & Long Tool Life**  
when machining **Difficult-to-cut Materials**

**PR13<sup>05</sup>/13<sup>10</sup>/13<sup>25</sup>**

PVD Coated Carbide for:

- Nickel-based heat-resistant alloys
- Iron-based heat-resistant alloys
- Cobalt-based heat-resistant alloys
- Precipitation hardened stainless steel

**SW05**

Uncoated Carbide for:

- Titanium Alloys

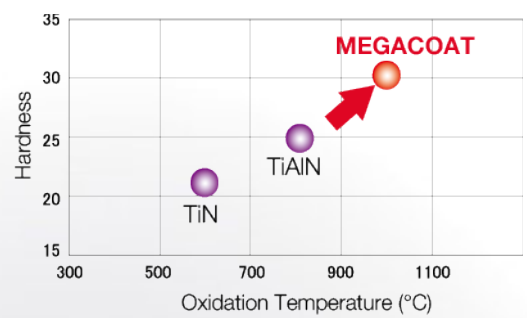
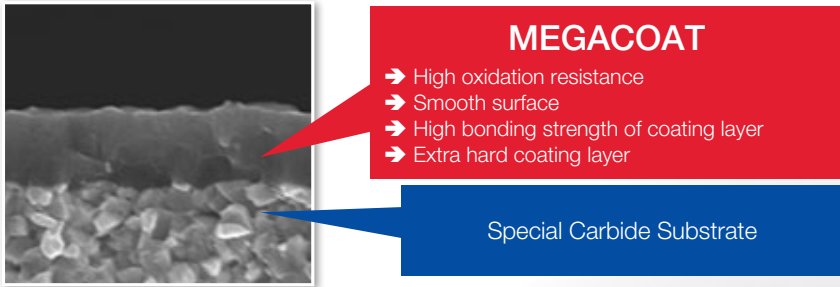


For Heat Resistant Alloys

# PR13<sup>05</sup>/13<sup>10</sup>/13<sup>25</sup>

## MEGACOAT Technology for Extended Tool Life

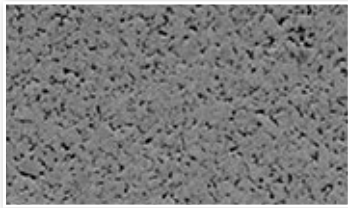
- Excellent Wear & Heat Resistance



MEGACOAT's oxidation resistance and physical hardness are superior to that of TiAlN providing improved crater wear resistance and extended tool life.

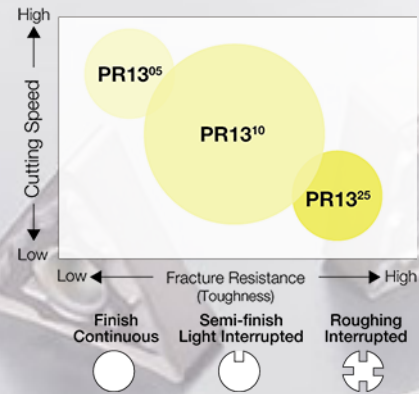
## Special Carbide Substrates

- Fracture Resistance and Stabilization



A uniform grain structure provides superior thermal shock resistance and hardness stability

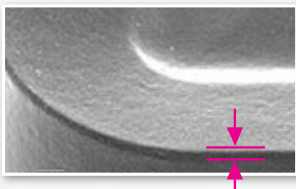
| Insert Grade | Application                                      |
|--------------|--|
| PR1305       | Continuous / Finishing                           |
| PR1310       | Mid to High-Speed Machining / Light Interruption |
| PR1325       | Interrupted / Roughing                           |



## New Edge Preparation for PR13-series & SW05

\*Fine Edge Treatment (FET)

- Low Cutting Forces for Reduced Shattering



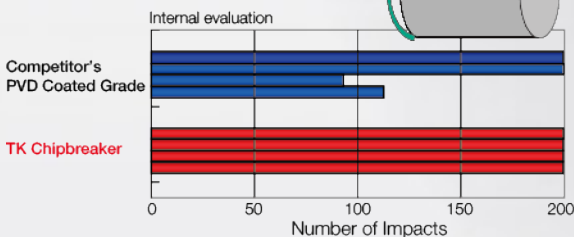
Large rake angle and minimal honing controls burrs and notching and improves surface finish

Improved cutting edge condition by Fine Edge Treatment (FET) technology

## Cutting Performance Evaluation of PR13-series

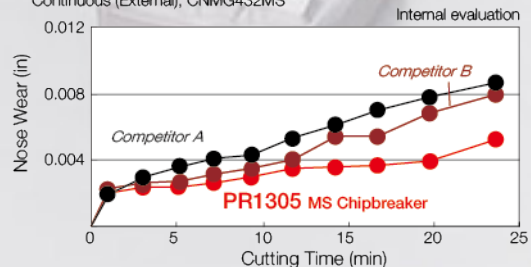
### Excellent Fracture Resistance

Cutting Capability (Inconel 718)  
Condition Vc=100 sfm, d.o.c=0.010", lpr=0.006"  
Inconel 718 Interrupted (External), CNMG432



### Excellent Wear Resistance

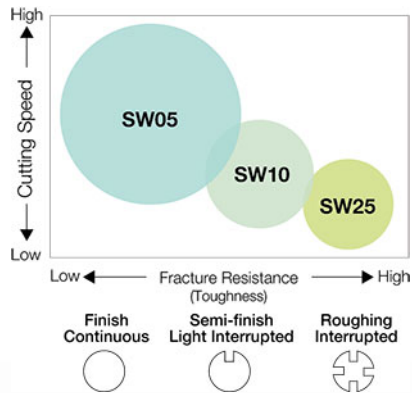
In-house cutting test (Inconel 718)  
Condition Vc=150 sfm, d.o.c=0.010", lpr=0.006"  
Continuous (External), CNMG432MS



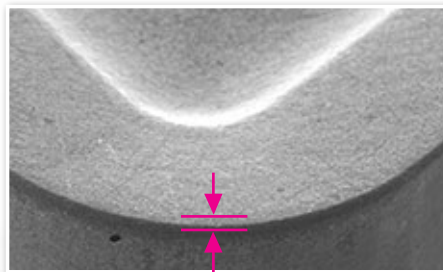
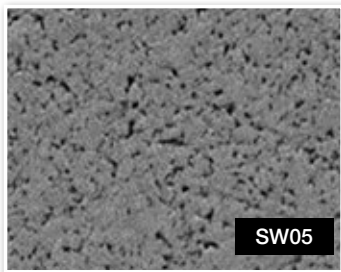
# For Titanium Alloys SW05

## Great Wear Resistance & Long Tool Life

| Insert Grade | Application  |
|--------------|--|
| SW05         | High Speed Finishing to Medium-Roughing of Titanium Alloys |



## Special Carbide Substrates



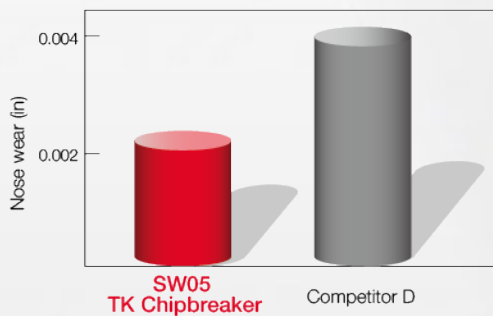
Special carbide maintains hardness at elevated temperatures and provides improved wear resistance for **high-speed finishing to medium cutting**

Improved Cutting Edge Condition with FET Technology

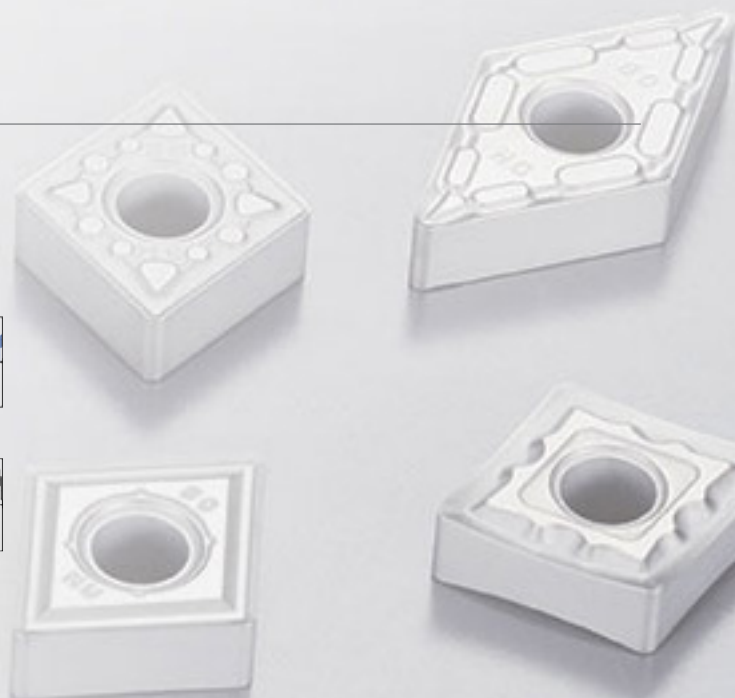
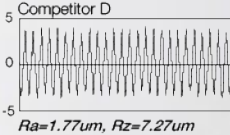
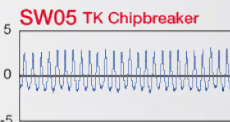
## Special Carbide Substrate

### Excellent Wear Resistance

- (Ti-6Al-4V)  
In-house cutting test  
Condition  $V_c = 200 \text{sfm}$ ,  $d.o.c = 0.020''$ ,  $f = 0.006 \text{ipr}$ , wet Continuous (External), CNGG432



Finished Surface Roughness (after 153.2min)



# Grade & Chipbreaker Selection Guide

| PR13-Series & SW05 Insert Grade Selection  |                 |               |
|--|-----------------|---------------|
| Material   | Cutting Range   | Insert Grades |
| <ul style="list-style-type: none"> <li>➔ Nickel-based heat-resistant alloys (Inconel 718, etc.)</li> <li>➔ Iron-based heat-resistant alloys (A286, etc.)</li> <li>➔ Cobalt-based heat-resistant alloys (S816, Stellite, etc.)</li> <li>➔ Precipitation hardened stainless steels (SUS630, etc.)</li> </ul> | Finishing       | PR1305        |
|  | Medium-Roughing | PR1310        |
|  | Roughing        | PR1325        |
| <ul style="list-style-type: none"> <li>➔ Titanium alloys (Ti-6Al-4V, etc.)</li> </ul>  | Finishing       | SW05          |
|  | Medium-Roughing | SW05          |

### MQ Chipbreaker

For Finishing to Medium Cutting

- ➔ Large rake angle
- ➔ Low cutting force
- ➔ Good chip control

★ First Choice Chipbreaker

### MS Chipbreaker

For Medium to Roughing Cutting

- ➔ Positive land
- ➔ Tough cutting edge
- ➔ Good chip control

### MU Chipbreaker

For Medium to Roughing Cutting

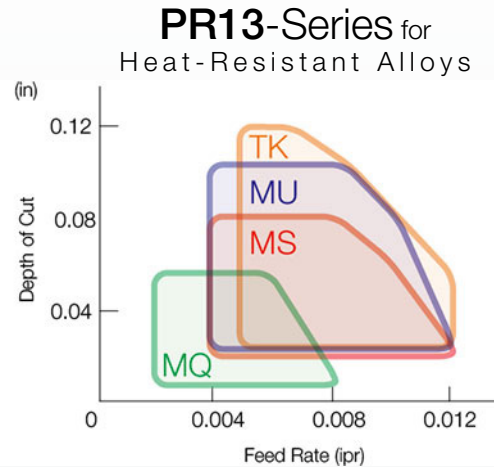
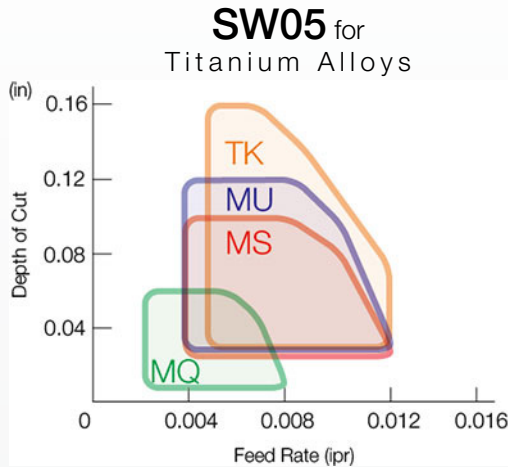
- ➔ Large rake angle
- ➔ Low cutting resistance
- ➔ Reduces notching & burrs
- ➔ Sharp cutting performance

Higher edge strength than MS chipbreaker at large D.O.C. cutting

### TK Chipbreaker

For Medium to Roughing Cutting

- ➔ Improved chip evacuation
- ➔ Produces large curled chips



## Case Studies

### Inconel 718

- Ring (Aircraft Parts)
- Vc=125sfm
- D.O.C.=0.039"
- f = 0.008ipr
- Wet
- CNMG432TK (PR1305)

Good Wear Resistance!

|              |                        |
|--------------|------------------------|
| PR1305       | More than 10pcs / Edge |
| Competitor A | 10pcs / Edge           |

After 10 pieces, the PR1305 insert showed better wear resistance than Competitor A which allowed for continued machining.

(User Evaluation)

### Inconel 718

- Stator
- Vc=125sfm
- D.O.C.=0.020"
- f = 0.008ipr
- Wet
- WNMG432MU (PR1310)

Double the Tool Life!

|              |                 |
|--------------|-----------------|
| PR1310       | 30-40pcs / Edge |
| Competitor B | 15-20pcs / Edge |

Kyocera showed 2 times longer tool life than Competitor B

(User Evaluation)

Case Studies

### Incoloy A286

- Shoulder Bush
- Vc=225sfm
- D.O.C.=0.059"
- f = 0.007ipr
- Wet
- CNMG432MS (PR1310)

1.5 Times the Tool Life!  
27% Increase in Cutting Speed!

|                      |             |             |
|----------------------|-------------|-------------|
| <b>PR1310</b>        | 3pcs / Edge | Vc = 225sfm |
| Competitor Coating C | 2pcs / Edge | Vc = 175sfm |

Kyocera processed 1.5 times as many workpieces compared to Competitor C  
Cutting speed increased 27% allowing improved productivity

(User Evaluation)

### Inconel 718

- Connector
- Vc=175sfm
- D.O.C.=0.079"
- f = 0.008ipr
- Wet
- CNMG432MS (PR1310)

More than Double the Tool Life!

|               |             |  |
|---------------|-------------|--|
| <b>PR1310</b> | 7pcs / Edge |  |
| Competitor D  | 3pcs / Edge |  |

Kyocera showed 2 times longer tool life than Competitor D

(User Evaluation)

### 316L SS

- Nozzle (Aircraft Parts)
- Vc=300sfm
- D.O.C.=0.049"~0.079"
- f = 0.005ipr
- Wet
- CNMG432MU (PR1310)

Five Times the Tool Life!

|               |                       |  |
|---------------|-----------------------|--|
| <b>PR1310</b> | More than 5pcs / Edge |  |
| Competitor E  | 1pc / Edge            |  |

Kyocera showed 5 times longer tool life than Competitor E

(User Evaluation)

### 316L SS

- Valve
- Vc=650sfm
- D.O.C.=0.098"
- f = 0.010ipr
- Wet
- CNMG432MS (PR1310)

Two Times the Tool Life!

|               |                   |  |
|---------------|-------------------|--|
| <b>PR1310</b> | 110-125pcs / Edge |  |
| Competitor F  | 60pcs / Edge      |  |

Kyocera showed 2 times longer tool life than Competitor F

(User Evaluation)

### Inconel 625

- Aircraft Parts
- Vc=125sfm
- D.O.C.=0.063"
- f = 0.006ipr
- Wet
- CNMG432MS (PR1310)

Up to 2 Times the Tool Life!

|               |               |  |
|---------------|---------------|--|
| <b>PR1310</b> | 8pcs / Edge   |  |
| Competitor G  | 4-5pcs / Edge |  |

Kyocera showed up to 2 times longer tool life than Competitor G

(User Evaluation)

### Inconel 718

- Square Bar
- Vc=75sfm
- D.O.C.=0.049"
- f = 0.009ipr
- Wet
- CNMG432MS (PR1325)

Over 4 Times the Tool Life!

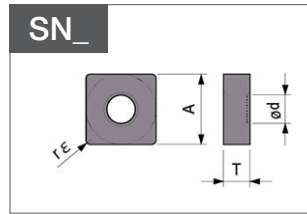
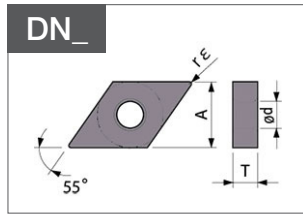
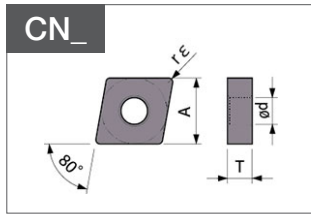
|               |              |  |
|---------------|--------------|--|
| <b>PR1325</b> | 25pcs / Edge |  |
| Competitor H  | 6pcs / Edge  |  |

Kyocera showed 4 times longer tool life than Competitor H

(User Evaluation)



# Negative Inserts

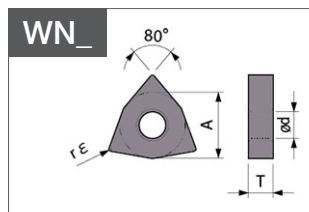
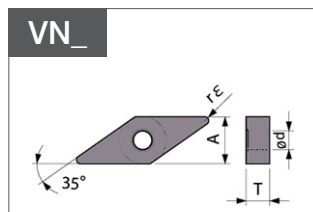
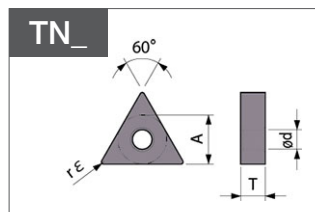


| (inches)    |       |       |       |
|-------------|-------|-------|-------|
| Description | A     | T     | Ød    |
| CN_43_      | 0.500 | 0.188 | 0.203 |
| CN_54_      | 0.630 | 0.250 | 0.250 |
| CN_64_      | 0.750 | 0.250 | 0.312 |
| DN_43_      | 0.500 | 0.188 | 0.203 |
| DN_44_      | 0.500 | 0.250 | 0.203 |
| SN_43_      | 0.500 | 0.188 | 0.203 |
| SN_64_      | 0.750 | 0.250 | 0.312 |

| CN_ / DN_                  |                  |                           |          |        |        |         |
|----------------------------|------------------|---------------------------|----------|--------|--------|---------|
| Shape                      | Part Number      | Dimension<br>(inch)<br>rε | MEGACOAT |        |        | Carbide |
|                            |                  |                           | PR1305   | PR1310 | PR1325 | SW05    |
|                            | CNMG 431MQ       | 0.016                     | ●        | ●      | ●      | ○       |
|                            | 432MQ            | 0.031                     | ●        | ●      | ●      | ○       |
|                            | Finishing-Medium |                           |          |        |        |         |
|                            | CNMG 431MS       | 0.016                     | ●        | ●      | ●      | ○       |
|                            | 432MS            | 0.031                     | ●        | ●      | ●      | ○       |
|                            | 433MS            | 0.047                     | ●        | ●      | ●      | ○       |
|                            | 434MS            | 0.063                     | ●        | ●      | ●      |         |
| Medium-Roughing            |                  |                           |          |        |        |         |
|                            | CNMG 431MU       | 0.016                     | ●        | ●      | ●      | ○       |
|                            | 432MU            | 0.031                     | ●        | ●      | ●      | ○       |
|                            | CNMG 542MU       | 0.031                     | ●        | ●      | ●      |         |
|                            | 543MU            | 0.047                     | ●        | ●      | ●      |         |
|                            | 544MU            | 0.063                     | ●        | ●      | ●      |         |
| Medium-Roughing            |                  |                           |          |        |        |         |
|                            | CNGG 4302MU      | 0.004                     |          | ●      |        |         |
|                            | 4305MU           | 0.008                     |          | ●      |        |         |
| Medium-Roughing Sharp Edge |                  |                           |          |        |        |         |
|                            | CNMG 431TK       | 0.016                     | ●        | ●      | ●      |         |
|                            | 432TK            | 0.031                     | ●        | ●      | ●      |         |
| Medium-Roughing            |                  |                           |          |        |        |         |
|                            | CNGG 431TK       | 0.016                     | ●        | ●      |        | ○       |
|                            | 432TK            | 0.031                     | ●        | ●      |        | ○       |
| Medium-Roughing Sharp Edge |                  |                           |          |        |        |         |
|                            | DNMG 431MQ       | 0.016                     | ●        | ●      | ●      | ○       |
|                            | 432MQ            | 0.031                     | ●        | ●      | ●      | ○       |
|                            | DNMG 441MQ       | 0.016                     | ○        | ○      | ○      | ○       |
|                            | 442MQ            | 0.031                     | ○        | ○      | ○      | ○       |
| Finishing                  |                  |                           |          |        |        |         |

| DN_ / SN_                  |             |                           |          |        |        |         |
|----------------------------|-------------|---------------------------|----------|--------|--------|---------|
| Shape                      | Part Number | Dimension<br>(inch)<br>rε | MEGACOAT |        |        | Carbide |
|                            |             |                           | PR1305   | PR1310 | PR1325 | SW05    |
|                            | DNMG 431MS  | 0.016                     | ●        | ●      | ●      | ○       |
|                            | 432MS       | 0.031                     | ●        | ●      | ●      | ○       |
|                            | 433MS       | 0.047                     | ●        | ●      | ●      | ○       |
|                            | DNMG 441MS  | 0.016                     | ○        | ○      | ○      |         |
|                            | 442MS       | 0.031                     | ○        | ○      | ○      |         |
| Medium-Roughing            |             |                           |          |        |        |         |
|                            | DNMG 431MU  | 0.016                     | ●        | ●      | ●      | ○       |
|                            | 432MU       | 0.031                     | ●        | ●      | ●      | ○       |
|                            | DNMG 441MU  | 0.016                     | ○        | ○      | ○      | ○       |
|                            | 442MU       | 0.031                     | ○        | ○      | ○      | ○       |
| Medium-Roughing            |             |                           |          |        |        |         |
|                            | DNMG 431TK  | 0.016                     | ●        | ●      | ●      |         |
|                            | 432TK       | 0.031                     | ●        | ●      | ●      |         |
|                            | DNMG 441TK  | 0.016                     | ○        | ○      | ○      |         |
|                            | 442TK       | 0.031                     | ○        | ○      | ○      |         |
| Medium-Roughing            |             |                           |          |        |        |         |
|                            | DNGG 431TK  | 0.016                     | ●        | ●      |        | ○       |
|                            | 432TK       | 0.031                     | ●        | ●      |        | ○       |
|                            | DNGG 441TK  | 0.016                     | ○        | ○      |        | ○       |
|                            | 442TK       | 0.031                     | ○        | ○      |        | ○       |
| Medium-Roughing Sharp Edge |             |                           |          |        |        |         |
|                            | SNMG 431MQ  | 0.016                     | ○        | ○      | ○      | ○       |
|                            | 432MQ       | 0.031                     | ○        | ○      | ○      | ○       |
| Finishing-Medium           |             |                           |          |        |        |         |
|                            | SNMG 431MS  | 0.016                     | ○        | ○      | ○      | ○       |
|                            | 432MS       | 0.031                     | ○        | ○      | ○      | ○       |
|                            | 433MS       | 0.047                     | ○        | ○      | ○      | ○       |
|                            | 434MS       | 0.063                     | ○        | ○      | ○      | ○       |
| Medium-Roughing            |             |                           |          |        |        |         |
|                            | SNMG 643MU  | 0.047                     |          | ○      | ○      |         |
|                            | 644MU       | 0.063                     |          | ○      | ○      |         |
| Medium-Roughing            |             |                           |          |        |        |         |

# Negative Inserts

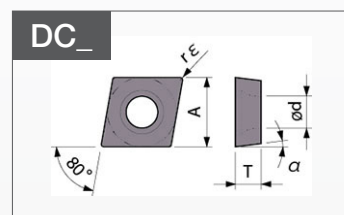
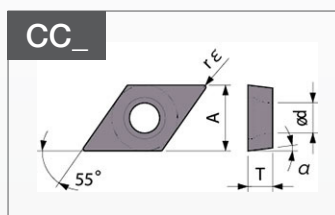


|             |       |       |       | (inches) |  |  |
|-------------|-------|-------|-------|----------|--|--|
| Description | A     | T     | Ød    |          |  |  |
| TN_33_      | 0.375 | 0.188 | 0.150 |          |  |  |
| VN_33_      | 0.375 | 0.188 | 0.150 |          |  |  |
| WN_43_      | 0.500 | 0.188 | 0.203 |          |  |  |

| TN_ / VN_ / WN_            |             |                        |          |        |        |         |
|----------------------------|-------------|------------------------|----------|--------|--------|---------|
| Shape                      | Part Number | Dimension (inch)<br>rε | MEGACOAT |        |        | Carbide |
|                            |             |                        | PR1305   | PR1310 | PR1325 | SW05    |
| Finishing-Medium           | TNMG 331MQ  | 0.016                  | ●        | ●      | ●      | ○       |
|                            | 332MQ       | 0.031                  | ●        | ●      | ●      | ○       |
| Medium-Roughing            | TNMG 331MS  | 0.016                  | ●        | ●      | ●      | ○       |
|                            | 332MS       | 0.031                  | ●        | ●      | ●      | ○       |
|                            | 333MS       | 0.047                  | ●        | ●      | ●      | ○       |
| Medium-Roughing            | TNMG 331MU  | 0.016                  | ●        | ●      | ●      | ○       |
|                            | 332MU       | 0.031                  | ●        | ●      | ●      | ○       |
| Medium-Roughing Sharp Edge | TNGG 331TK  | 0.016                  | ●        | ●      |        | ○       |
|                            | 332TK       | 0.031                  | ●        | ●      |        | ○       |
| Finishing                  | VNMG 331MQ  | 0.016                  | ●        | ●      | ●      | ○       |
|                            | 332MQ       | 0.031                  | ●        | ●      | ●      | ○       |
| Medium-Roughing            | VNMG 331MS  | 0.016                  | ●        | ●      | ●      | ○       |
|                            | 332MS       | 0.031                  | ●        | ●      | ●      | ○       |
|                            | 333MS       | 0.047                  | ●        | ●      | ●      | ○       |
| Medium-Roughing            | VNMG 331MU  | 0.016                  | ●        | ●      | ●      | ○       |
|                            | 332MU       | 0.031                  | ●        | ●      | ●      | ○       |
| Medium-Roughing Sharp Edge | VNGG 3302MU | 0.004                  |          | ●      |        |         |
|                            | 3305MU      | 0.008                  |          | ●      |        |         |
| Finishing-Medium           | WNMG 431MQ  | 0.016                  | ●        | ●      | ●      | ○       |
|                            | 432MQ       | 0.031                  | ●        | ●      | ●      | ○       |
| Medium-Roughing            | WNMG 431MS  | 0.016                  | ●        | ●      | ●      | ○       |
|                            | 432MS       | 0.031                  | ●        | ●      | ●      | ○       |
|                            | 433MS       | 0.047                  | ●        | ●      | ●      | ○       |

| WN_                        |             |                        |          |        |        |         |
|----------------------------|-------------|------------------------|----------|--------|--------|---------|
| Shape                      | Part Number | Dimension (inch)<br>rε | MEGACOAT |        |        | Carbide |
|                            |             |                        | PR1305   | PR1310 | PR1325 | SW05    |
| Medium-Roughing            | WNMG 431MU  | 0.016                  | ●        | ●      | ●      | ○       |
|                            | 432MU       | 0.031                  | ●        | ●      | ●      | ○       |
| Medium-Roughing            | WNMG 431TK  | 0.016                  | ●        | ●      | ●      | ○       |
|                            | 432TK       | 0.031                  | ●        | ●      | ●      | ○       |
| Medium-Roughing Sharp Edge | WNGG 431TK  | 0.016                  | ●        | ●      |        | ○       |
|                            | 432TK       | 0.031                  | ●        | ●      |        | ○       |

## Positive Inserts



|             |       |       |       |    | (inches) |
|-------------|-------|-------|-------|----|----------|
| Description | A     | T     | Ød    | α  |          |
| CC_325_     | 0.375 | 0.156 | 0.173 |    |          |
| DC_215_     | 0.250 | 0.094 | 0.110 | 7° |          |
| DC_325_     | 0.375 | 0.156 | 0.173 |    |          |

| CC_ / DC_        |              |                        |          |        |        |         |
|------------------|--------------|------------------------|----------|--------|--------|---------|
| Shape            | Part Number  | Dimension (inch)<br>rε | MEGACOAT |        |        | Carbide |
|                  |              |                        | PR1305   | PR1310 | PR1325 | SW05    |
| Finishing-Medium | CCMT 3251MQ  | 0.016                  | ●        | ●      | ●      | ○       |
|                  | 3252MQ       | 0.031                  | ●        | ●      | ●      | ○       |
| Finishing-Medium | DCMT 21505MQ | 0.008                  | ●        | ●      | ●      | ○       |
|                  | 2151MQ       | 0.016                  | ●        | ●      | ●      | ○       |
|                  | DCMT 3251MQ  | 0.016                  | ●        | ●      | ●      | ○       |
| Finishing-Medium | DCMT 3251MQ  | 0.016                  | ●        | ●      | ●      | ○       |
|                  | 3252MQ       | 0.031                  | ●        | ●      | ●      | ○       |

## Recommended Cutting Conditions

| Workpiece Material   | Cutting Range   | Recommended Insert Grade | Recommended Chipbreaker | Recommendations        |                              |                              |
|--|-----------------|--------------------------|-------------------------|------------------------|------------------------------|------------------------------|
|  |                 |                          |                         | Vc (sfm)               | D.O.C. (inch)                | f (ipr)                      |
| Nickel-Based Heat-Resistant Alloys<br>(Inconel 718, etc.)  | Finishing       | PR1305                   | MQ                      | 150 ~ <b>180</b> ~ 260 | 0.008 ~ <b>0.020</b> ~ 0.039 | 0.002 ~ <b>0.004</b> ~ 0.008 |
|  | Medium-Roughing | PR1310                   | MS / MU                 | 130 ~ <b>150</b> ~ 200 | 0.020 ~ <b>0.039</b> ~ 0.079 | 0.004 ~ <b>0.006</b> ~ 0.010 |
|  | Roughing        | PR1325                   | TK                      | 110 ~ <b>130</b> ~ 160 | 0.039 ~ <b>0.059</b> ~ 0.138 | 0.004 ~ <b>0.008</b> ~ 0.012 |
| Iron-Based Heat-Resistant Alloys<br>(A286, etc.)           | Finishing       | PR1305                   | MQ                      | 160 ~ <b>230</b> ~ 300 | 0.008 ~ <b>0.020</b> ~ 0.039 | 0.002 ~ <b>0.004</b> ~ 0.008 |
|  | Medium-Roughing | PR1310                   | MS / MU                 | 150 ~ <b>180</b> ~ 230 | 0.020 ~ <b>0.039</b> ~ 0.079 | 0.004 ~ <b>0.006</b> ~ 0.010 |
|  | Roughing        | PR1325                   | TK                      | 130 ~ <b>150</b> ~ 180 | 0.039 ~ <b>0.059</b> ~ 0.138 | 0.004 ~ <b>0.008</b> ~ 0.012 |
| Cobalt-Based Heat-Resistant Alloys<br>(Stellite, etc.)     | Finishing       | PR1305                   | MQ                      | 130 ~ <b>160</b> ~ 230 | 0.008 ~ <b>0.020</b> ~ 0.039 | 0.002 ~ <b>0.004</b> ~ 0.008 |
|  | Medium-Roughing | PR1310                   | MS / MU                 | 110 ~ <b>130</b> ~ 180 | 0.020 ~ <b>0.039</b> ~ 0.079 | 0.004 ~ <b>0.006</b> ~ 0.010 |
|  | Roughing        | PR1325                   | TK                      | 100 ~ <b>110</b> ~ 150 | 0.039 ~ <b>0.059</b> ~ 0.118 | 0.004 ~ <b>0.008</b> ~ 0.012 |
| Precipitation Hardened Stainless Steels<br>(17-4 PH, etc.) | Finishing       | PR1305                   | MQ                      | 330 ~ <b>460</b> ~ 590 | 0.008 ~ <b>0.020</b> ~ 0.059 | 0.002 ~ <b>0.004</b> ~ 0.008 |
|  | Medium-Roughing | PR1310                   | MS / MU                 | 260 ~ <b>390</b> ~ 510 | 0.020 ~ <b>0.039</b> ~ 0.098 | 0.006 ~ <b>0.008</b> ~ 0.012 |
|  | Roughing        | PR1325                   | TK                      | 200 ~ <b>260</b> ~ 330 | 0.039 ~ <b>0.079</b> ~ 0.157 | 0.006 ~ <b>0.008</b> ~ 0.014 |
| Titanium Alloys<br>(Ti-6Al-4V, etc.)                       | Finishing       | SW05                     | MQ                      | 130 ~ <b>230</b> ~ 330 | 0.008 ~ <b>0.020</b> ~ 0.039 | 0.002 ~ <b>0.004</b> ~ 0.008 |
|  | Medium-Roughing | SW05                     | MS / MU / TK            | 130 ~ <b>200</b> ~ 260 | 0.020 ~ <b>0.039</b> ~ 0.157 | 0.006 ~ <b>0.008</b> ~ 0.012 |

(Conditions based on CNMG432 type insert)



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