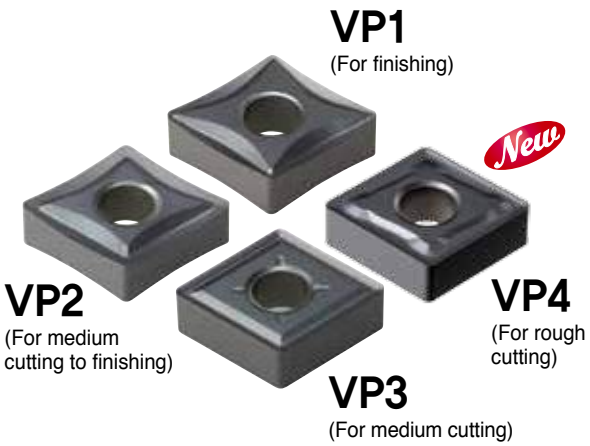
KORLOY
TECH-NEWS

# PC8105 / PC8110 / PC8115




## Solution for Machining Hard-to-cut Materials

Turning inserts specialized in Inconel and titanium alloy machining

- **PC8100 Series**
  Turning grades for heat resistant alloy, with exceptional resistance to wear and chipping
- **VP Chip Breaker Series**
  Excellent cutting performance ensures efficient and stable machining in hard-to-cut materials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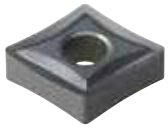
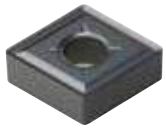
# Turning Inserts for Heat Resistant Alloy

**VP1** For finishing Ground class



**VP2** For medium cutting to finishing



**VP3** For medium cutting


**VP4** For rough cutting

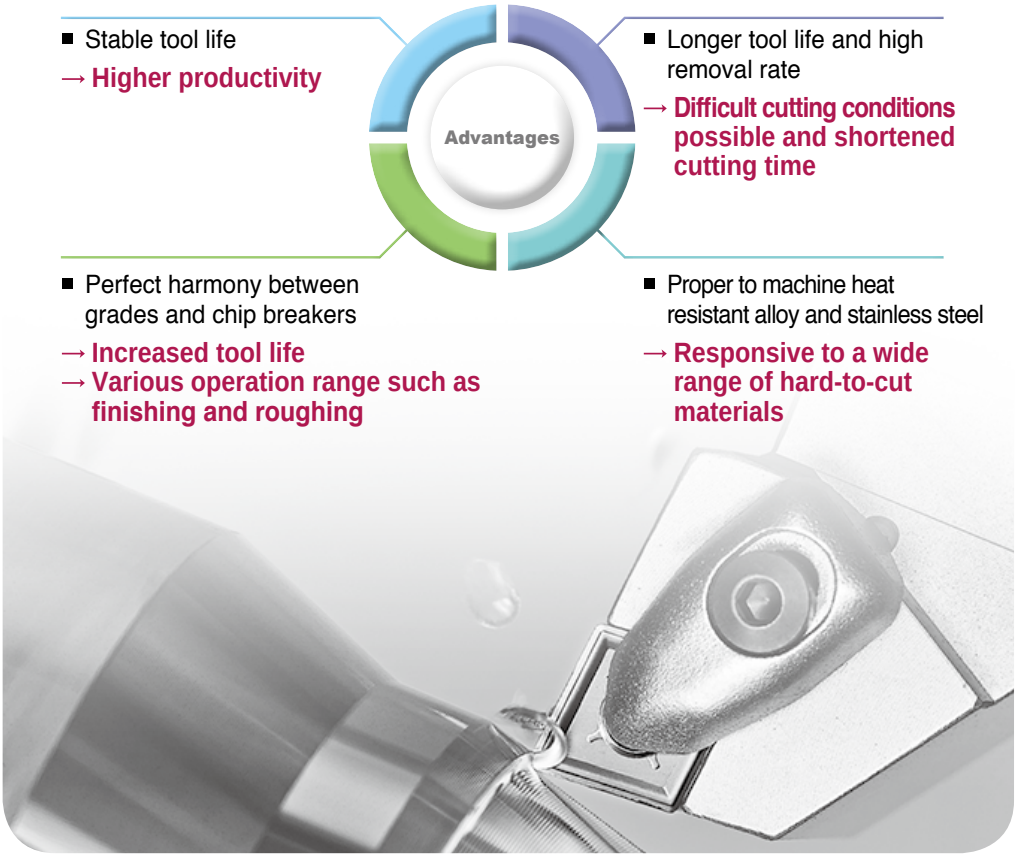
Heat resistant alloys(Inconel, etc.) create high cutting forces and temperatures on cutting edges from their high strength at high temperature and low heat conductivity. Thermal shock and work hardening contribute to chipping, breakage or notch wear, and a need to decrease velocities.

**PC8105, PC8110 and PC8115** are PVD turning grades for Heat resistant alloys.
**PC8105** (S05) is a grade used for finishing heat resistant alloys and stainless steels with its high wear resistance in continuous operation at high speed and high temperature.
**PC8110** (S10) is a universal grade used for medium to finish cutting of heat resistant alloys and stainless steels with high wear and chipping resistance in continuous operations at mid to high speed and high temperature.
**PC8115** (S15) is a universal grade used for finishing, medium cutting, and roughing of heat resistant alloys and stainless steels with high wear and chipping resistance in various machining conditions.

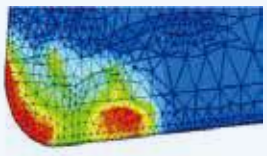
Titanium alloy is highly reactive to chemicals, commonly resulting in built-up edges on blades, which causes rapid increase of cutting loads or unnecessary overlapped cutting actions. These characteristics of low heat conductivity and high work hardening trigger notch wear, while low elasticity is blamed for elastic recovery and bending of workpieces creating chipping on cutting edges or

**H01** and **H05** are specially designed for titanium alloy operation with its special surface treatment to prevent built-up edges and breakage, which in return increases tool life.
**H01** (S05) is a grade used for finishing titanium alloy with its sharp cutting edge in continuous operation at high speed.
**H05** (S15) is the grade highly recommended for medium cutting to finishing of titanium alloy in various machining conditions.

**The VP Series** ensures stability in Inconel and titanium machining.
**VP1 / VP2 / VP3 / VP4** is a chip breaker series that features sharp cutting edges ideal for evacuating heat and preventing built-up edges. **VP1** is a chip breaker to carry out high quality machining with its sharp cutting edges. **VP2** is a chip breaker for medium cutting to finishing, with its characteristics of stable chip control even at varying depth of cuts. **VP3** is a chip breaker for medium cutting that provides stable chip control at high depth of cuts, and reduces cutting loads. **VP4** is a medium to roughing chip breaker ideally suited for Inconel which remains extremely hard at high temperature over 800°C and involves severe work hardening.

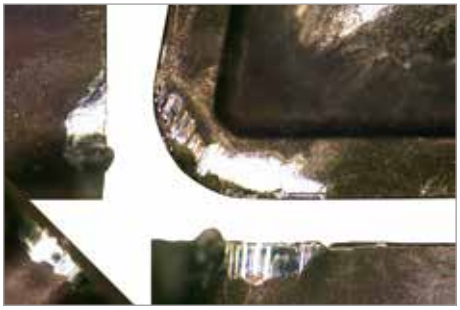


## Common problems when Machining Heat Resistant Alloy

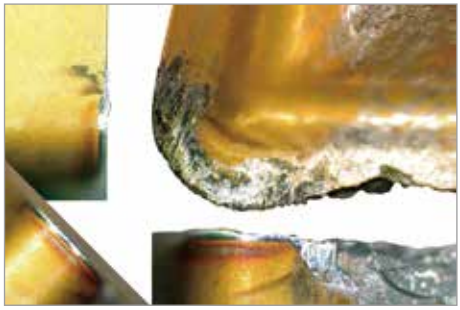


Hard-to-cut materials (Inconel, etc.) feature high hardness and low heat conductivity.
This results in concentrated heat on cutting edges and thus rapid wear at a high temperature over 800°.
In addition, thermal impact and work hardening cause involve chipping or breakage according to the depth of cut.

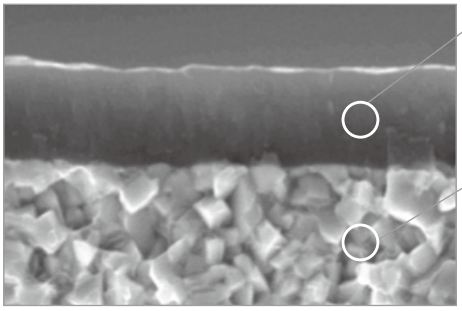
### 1. Severe wear



### 2. Chipping / fracture



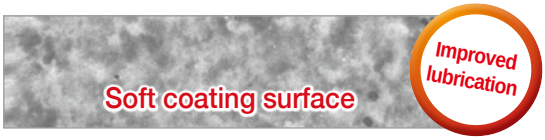
## Development of PC8100 Series



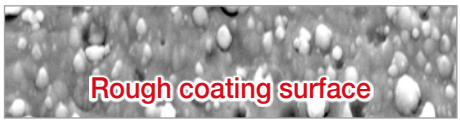
It prevents wear at a high temperature to apply excellent surface roughness and coating with oxidation resistance and high hardness.

It improves wear resistance to equalize submicron matrix, secure stability between corners and improve chipping and wear resistance

### Coating surface treatment technology (Pictures of coating layer)

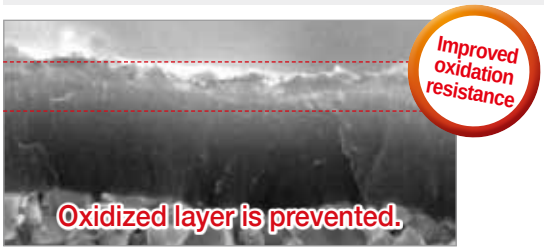



[ PC8100 Series ]




[ Conventional coating ]

### Oxidation resistant coating technology (Pictures of coating layer heat-treated at 900°C)




[ PC8100 Series ]


[ Competitor ]

## Development Effect

### 1. Increased wear resistance


[ PC8105 ]

[ Competitor S05 ]

### 2. Reduced chipping / fracture


[ PC8115 ]

[ Competitor S15 ]

# Chip Breakers for Hard-to-cut Materials Machining

## VP1 Chip Breaker Features

- **Cutting edges designed in high-positive**
  Reduced contact area between rake surface and chip minimizes cutting heat and improved tool life.
- **Recommended cutting conditions**
  fn(mm/rev) = 0.05~0.2, ap(mm) = 0.1~1.5

### Optimized design for finishing


- Obtains excellent cutting performance and quality surface finish at low depth of cut and high speed

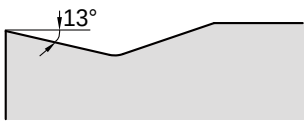
### High-positive blade design

- Minimizes cutting heat by reducing the contact area between flank surface and chips
- Prevents built-up edge and extends tool life

## VP2 Chip Breaker Features

- **High-positive cutting edge design / Side rake angle applied**
  Stable chip control improves machinability when ball machining at variable depths of cut.
- **Recommended cutting conditions**
  fn(mm/rev) = 0.1~0.4, ap(mm) = 0.5~4.5

### Sharp blades and wide chip pockets




- Increase productivity
- Ideal for medium to finish cutting

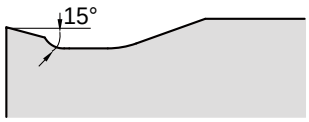
### High-positive blade design

- Improves cutting performance with its stable chip control at varying depth of cuts

## VP3 Chip Breaker Features

- **High-positive cutting edge design / Wide land applied**
  Improved stability at interrupted cutting when toughness is required. Stable chip control and machinability at high depth of cut.
- **Recommended cutting conditions**
  fn(mm/rev) = 0.1~0.45, ap(mm) = 0.5~5.0

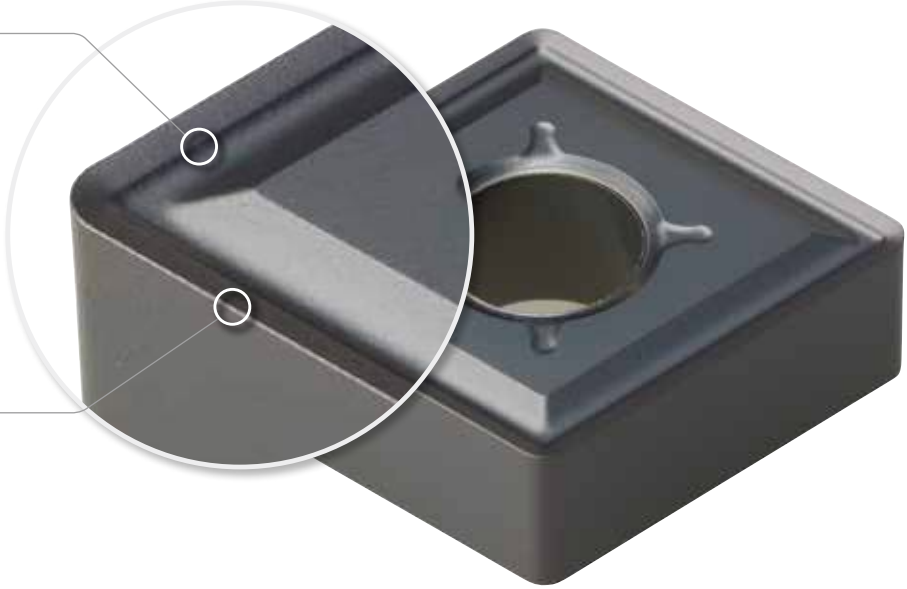
**Chip pocket design leading to a R-shaped cutting edge**




- Creates a stepped space between edge and land to make smooth chip flow at low and high depth of cuts

**High-positive blade design / Wide land**

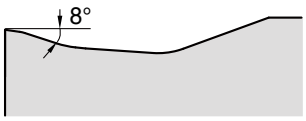
- Minimize heat concentration at high depth of cut
- Improves stability in interrupted machining of a tough workpiece



## VP4 Chip Breaker Features New

- **The 1st recommended chip breakers for machining Inconel which remains highly resistant to and hard at high temperature**
- **Rough machining stability resulting from reinforced cutting edges and wide chip pockets**

**Rake angle design resistant to high hardness cutting**




- Reinforces cutting edges and prevents notch wear in rough surface machining
- Prevents chipping in interrupted cutting

**Wide chip pockets**

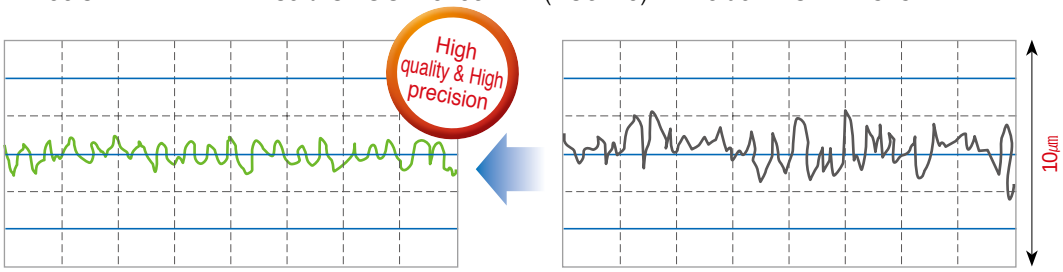
- Reduce cutting loads and improve stability even at high depth of cut in roughing

## Performance Evaluation

• **VP1 chip breaker :**
A ground class insert realizes high quality and high precision machining

### VP1 evaluation of surface roughness

- Workpiece: Inconel718 (HRC45)
- Cutting conditions: vc(m/min) = 60, fn(mm/rev) = 0.1, ap(mm) = 0.2, wet
- Tools: Insert CNGG120408-VP1 (PC8110) Holder DCLNR2525-M12

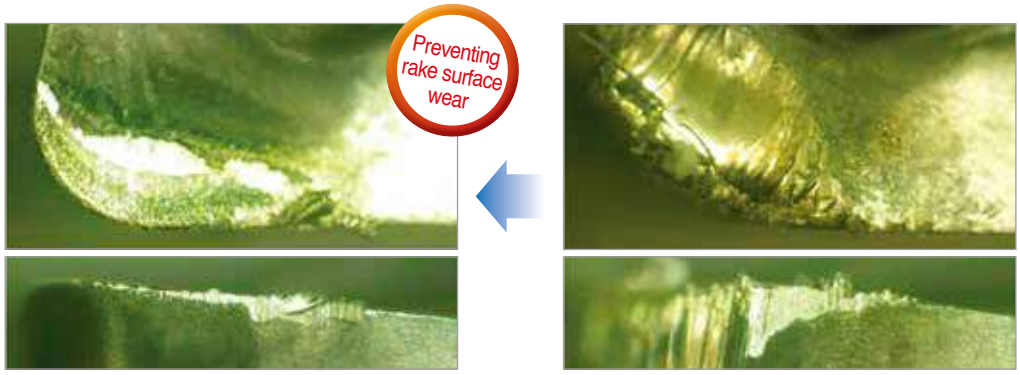



[ KORLOY ] [ Competitor ]

• **VP2 chip breaker :**
Smooth chip control prevents wear on rake surface of insert when machining hard-to-cut materials

### VP2 evaluation of tool life

- Workpiece: X5CrNi18-9 / X5CrNiMo17-12-2 (HRC25~30)
- Cutting conditions: vc(m/min) = 60, fn(mm/rev) = 0.25, ap(mm) = 1.5, wet
- Tools: Insert CNMG120408-VP2 (PC8110) Holder DCLNR2525-M12

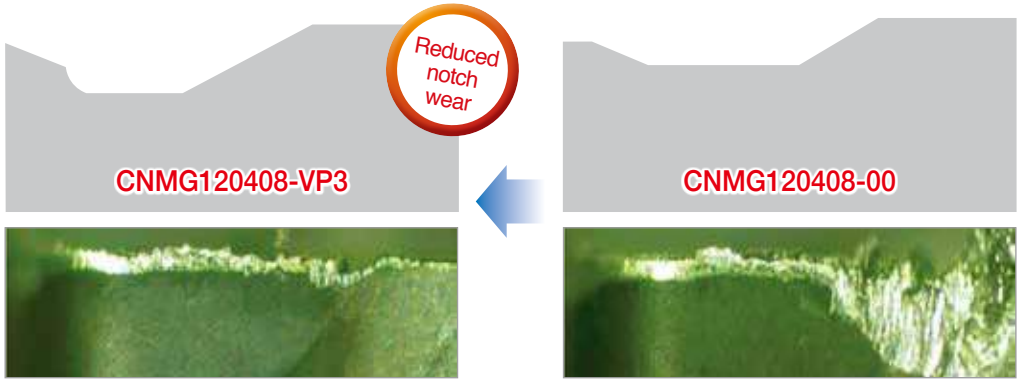



[ KORLOY (After 300 passes) ] [ Competitor (After 300 passes) ]

• **VP3 chip breaker :**
Sharp blades and wide lands noticeably reduce notch wear

### VP3 evaluation of tool life

- Workpiece: Inconel718 (HRC40)
- Cutting conditions: vc(m/min) = 60, fn(mm/rev) = 0.2, ap(mm) = 2.0, wet
- Tools: Insert CNMG120408-VP3 (PC8110) Holder DCLNR2525-M12

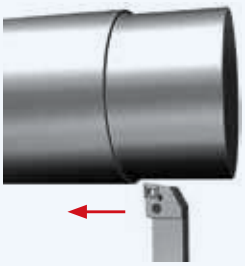



[ KORLOY (After 10 passes) ] [ Competitor (After 7 passes) ]

# Performance Evaluation

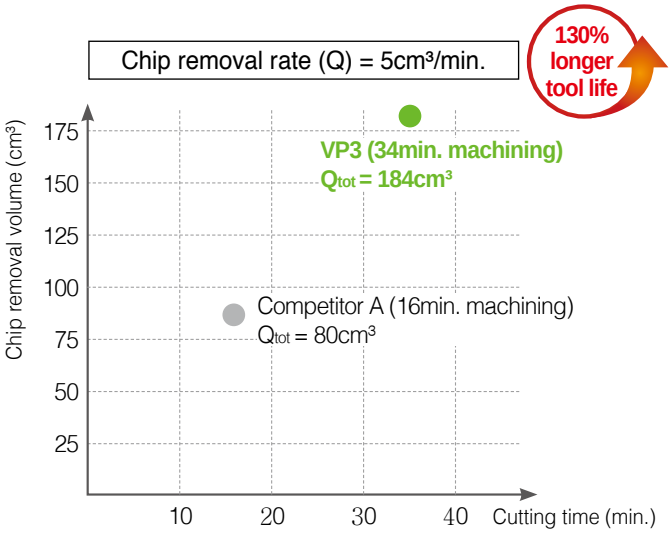
## VP3 evaluation of tool life

- 130% longer tool life thanks to the combination of the specialized chip breaker VP3 for titanium alloy, and the highly wear resistant substrate H01, at low depth of cut and high speed

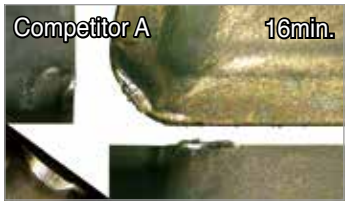


**[ Machining method ]**

- **Workpiece** Ti-6Al-4V (HRC45~47)
- **Cutting conditions** vc(m/min) = 100, fn(mm/rev) = 0.1, ap(mm) = 0.5, wet
- **Tools** **Insert** CNMG120408-VP3 (H01) **Holder** PCLNR2525-M12

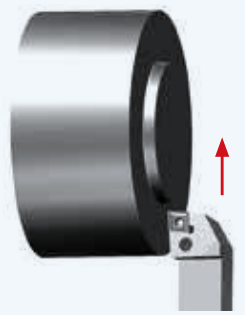






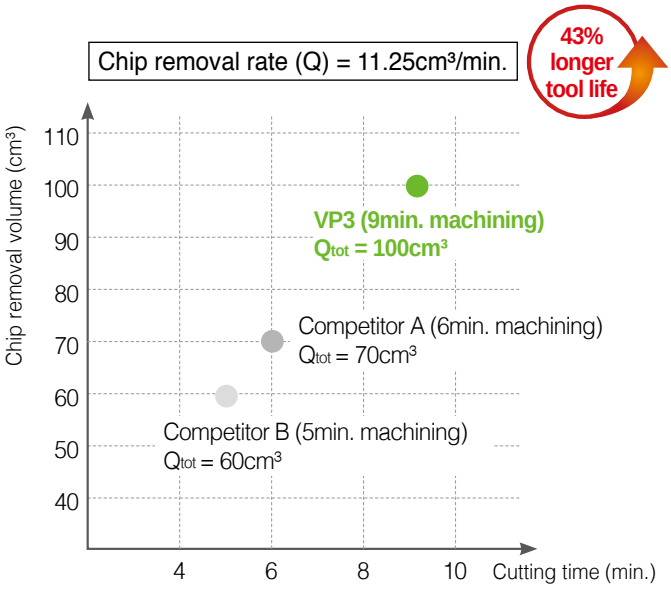

## VP3 evaluation of tool life

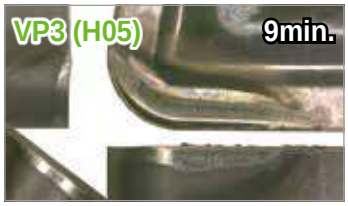
- 43% longer tool life thanks to the combination of the specialized chip breaker VP3 for titanium alloy, and the 1st recommended substrate H05, at medium depth of cut

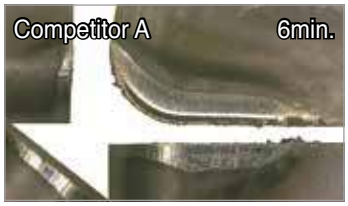


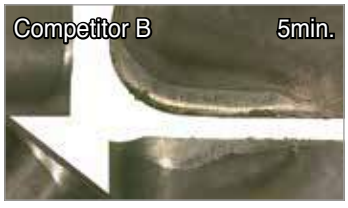
**[ Machining method ]**

- **Workpiece** Ti-6Al-4V (HRC45~47)
- **Cutting conditions** vc(m/min) = 80, fn(mm/rev) = 0.2, ap(mm) = 2.0, wet
- **Tools** **Insert** CNMG120408-VP3 (H05) **Holder** PCLNR2525-M12



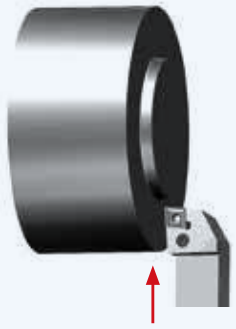



## Performance Evaluation

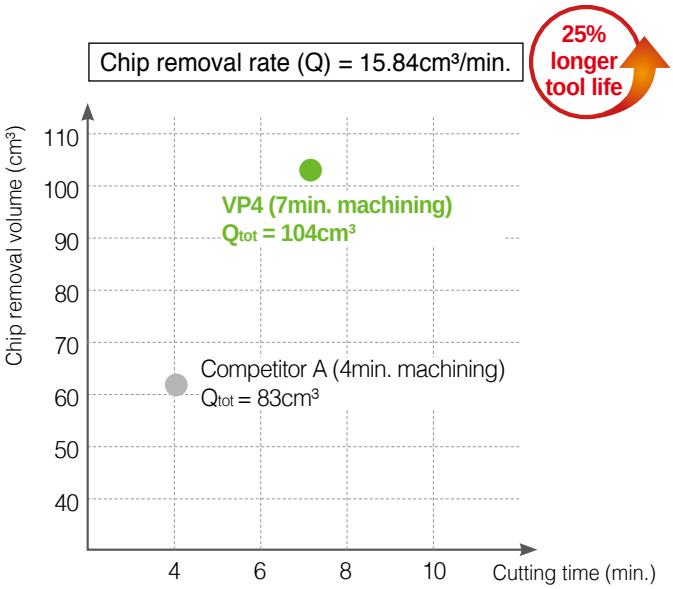
### VP4 evaluation of tool life

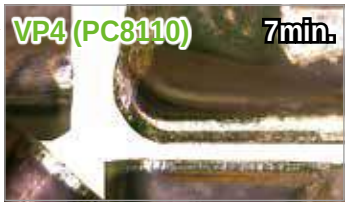
- 25% longer tool life thanks to the combination of the specialized chip breaker VP4 for Inconel, and the PVD coated grade PC8110 for continuous cutting of heat resistant alloy

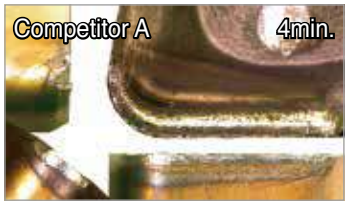


**[ Machining method ]**

- **Workpiece** Inconel718 (HRC38~40)
- **Cutting conditions** vc(m/min) = 40, fn(mm/rev) = 0.2, ap(mm) = 3.0, wet
- **Tools** **Insert** CNMG120408-VP4 (PC8110) **Holder** PCLNR2525-M12

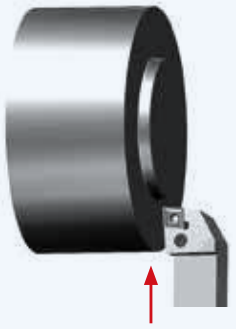


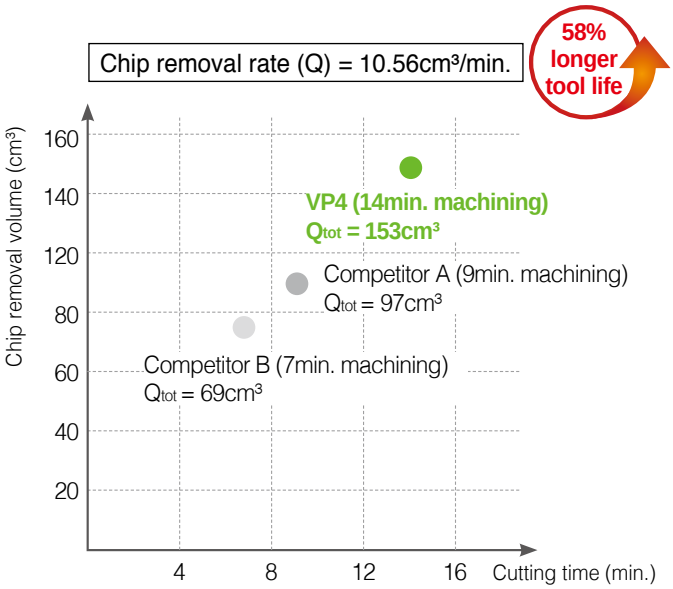

### VP4 evaluation of tool life

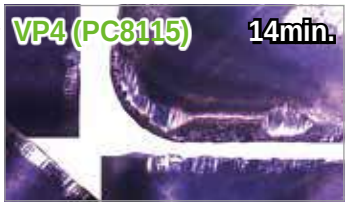
- 58% longer tool life thanks to the combination of the specialized chip breaker VP4 for Inconel, and the PVD coated grade PC8115 for heat resistant alloy available under various cutting conditions



**[ Machining method ]**

- **Workpiece** Inconel718 (HRC38~40)
- **Cutting conditions** vc(m/min) = 50, fn(mm/rev) = 0.15, ap(mm) = 1.5, wet
- **Tools** **Insert** CNMG120408-VP3(PC8115) **Holder** PCLNR2525-M12





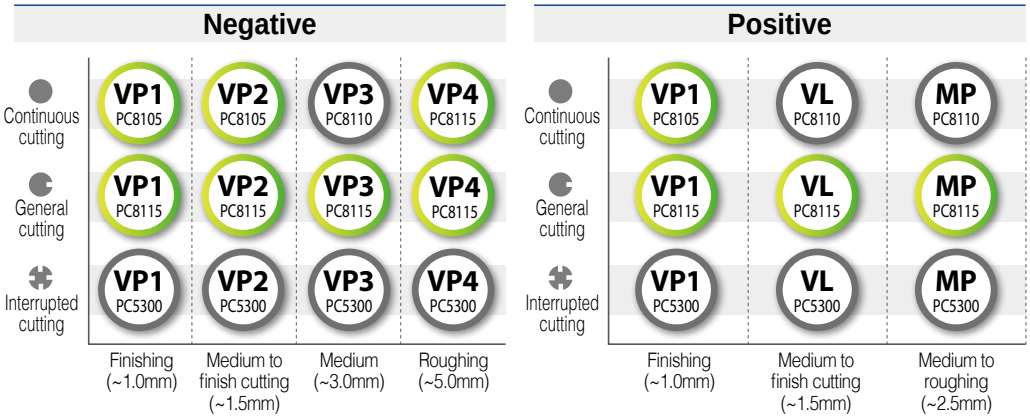
## Recommended Cutting Conditions (Negative Type)

• It is important to select an appropriate chip breaker and grade dependent upon machining characteristics of either Inconel or titanium alloy

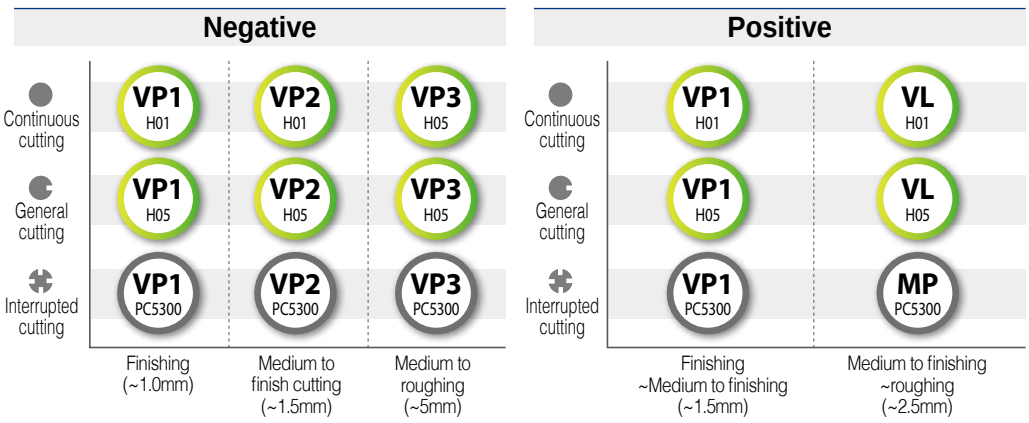
| Workpiece | Application | Chip breaker | Recommended cutting conditions | | |
|---|---|---|---|---|---|
| | | | vc(m/min) | fn(mm/rev) | ap(mm) |
| Heat resistant alloy (Inconel) | Finishing | VP1 | 25 ~ 85 | 0.1 ~ 0.25 | 0.2 ~ 1.5 |
| | Medium to finish cutting | VP2 | 25 ~ 80 | 0.1 ~ 0.25 | 0.2 ~ 3.0 |
| | Medium | VP3 | 25 ~ 80 | 0.1 ~ 0.25 | 0.5 ~ 4.0 |
| | Roughing | VP4 | 20 ~ 75 | 0.2 ~ 0.35 | 1.0 ~ 4.5 |
| Titanium alloy (Ti-6Al-4V) | Finishing | VP1 | 40 ~ 85 | 0.1 ~ 0.25 | 0.2 ~ 1.5 |
| | Medium to finish cutting | VP2 | 40 ~ 85 | 0.1 ~ 0.25 | 0.2 ~ 3.0 |
| | Medium to roughing | VP3 | 40 ~ 80 | 0.1 ~ 0.25 | 0.5 ~ 4.5 |

## Chip Breaker Line-Up

### Heat Resistant Alloy




### Titanium Alloy




* Detailed depth of cut and feed rate for each designation can differ from the above data, dependent upon the insert shape and nose radius. See page 13~16 for detailed information.

# Application Examples

## Parts for an aircraft turbine

- Workpiece: Inconel718 (HRC40)
- Cutting conditions: vc(m/min) = 50~80, fn(mm/rev) = 0.25, ap(mm) = 0.2~0.7, wet
- Tools: Insert CNMG120404-VP2 (PC8115)

| | |
|---|---|
| VP2 | 5ea / corner |
| Competitor | 4ea / corner |

25% longer

➔ 25% longer tool life per corner

## Aircraft pipe ring

- Workpiece: Inconel718 (HRC46)
- Cutting conditions: vc(m/min) = 30, fn(mm/rev) = 0.2, ap(mm) = 1.0, wet
- Tools: Insert CNMG120404-VP3 (PC8105)

| | |
|---|---|
| VP3 | 4ea / corner |
| Competitor | 2ea / corner |

100% longer

➔ 100% longer tool life per corner

## Aircraft turbine spool

- Workpiece: Inconel718 (HRC45)
- Cutting conditions: vc(m/min) = 50~60, fn(mm/rev) = 0.2, ap(mm) = 3.0, wet
- Tools: Insert CNMG120408-VP3 (PC8110)

| | |
|---|---|
| VP3 | 3ea / corner |
| Competitor | 2ea / corner |

50% longer

➔ 50% longer tool life per corner

## Parts for an aircraft turbine

- Workpiece: Alloy400 (HRC40)
- Cutting conditions: vc(m/min) = 103, fn(mm/rev) = 0.127, ap(mm) = 1.3, wet
- Tools: Insert CNMG120408-VP3 (PC8115)

| | |
|---|---|
| VP3 | 35ea / corner |
| Competitor | 30ea / corner |

17% longer

➔ 17% longer tool life per corner

## Parts for an aircraft engine

- Workpiece: Ti829 (HRC45)
- Cutting conditions: vc(m/min) = 35~40, fn(mm/rev) = 0.25, ap(mm) = 1.0~2.0, wet
- Tools: Insert SNMG120412-VP4 (PC8115)

| | |
|---|---|
| VP4 | 12ea / corner |
| Competitor | 6ea / corner |

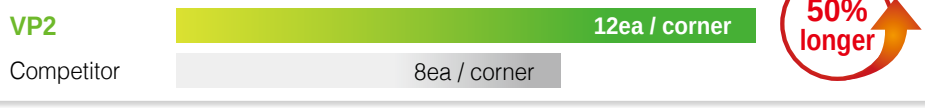
100% longer

➔ 100% longer tool life per corner

# Application Examples

## Parts for an aircraft turbine

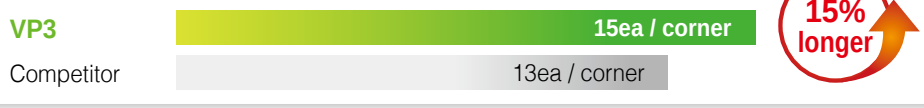
- Workpiece: Ti-6Al-4V (HRC50)
- Cutting conditions: vc(m/min) = 60, fn(mm/rev) = 0.2, ap(mm) = 0.8, wet
- Tools: Insert CNMG120404-VP2 (H01)




**50% longer tool life per corner**

## Parts for precision machinery

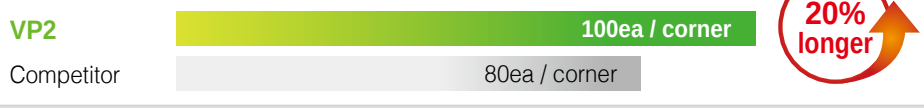
- Workpiece: Ti-6Al-4V (HRC47)
- Cutting conditions: vc(m/min) = 50, fn(mm/rev) = 0.15, ap(mm) = 2.0, wet
- Tools: Insert CNMG120404-VP3 (H05)



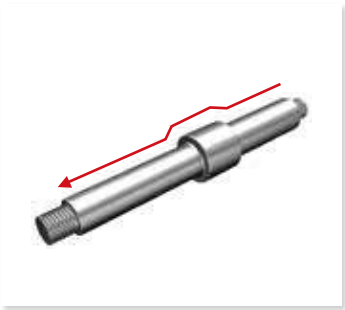

**15% longer tool life per corner**

## Ball valve

- Workpiece: X2CrMiMo17-12-2 (HRC30)
- Cutting conditions: vc(m/min) = 70, fn(mm/rev) = 0.18, ap(mm) = 3.0, wet
- Tools: Insert CNMG120408-VP2 (PC8110)

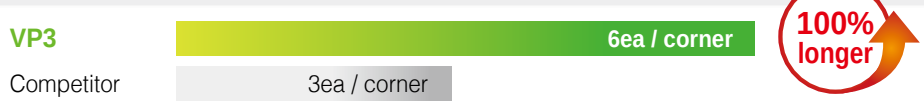



**20% longer tool life per corner**



## Parts for general machinery

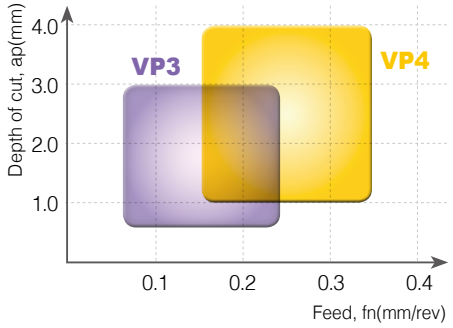
- Workpiece: X2CrMiMo17-12-2 (HRC22)
- Cutting conditions: vc(m/min) = 80, fn(mm/rev) = 0.2, ap(mm) = 2.0, wet
- Tools: Insert CNMG120408-VP3 (PC8115)



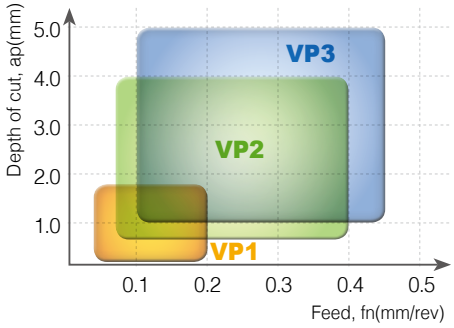

**100% longer tool life per corner**

## Recommended Cutting Range per Chip Breaker

### Heat resistant alloy (Inconel)




### Titanium alloy

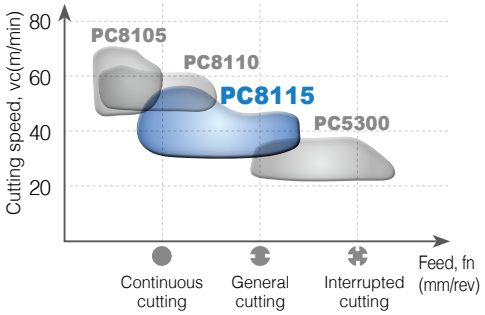



## Chip Breaker Comparison for Hard-to-Cut Materials (Heat Treated Alloy / Titanium Alloy)

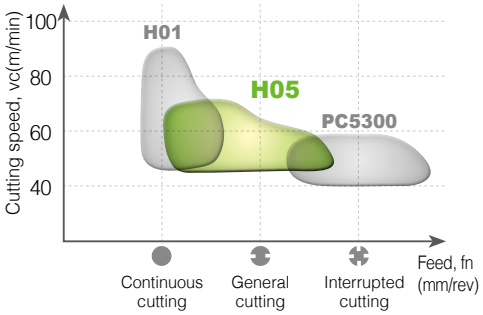
| ISO | KORLOY | Competitor A | Competitor B | Competitor C | Competitor D | Competitor E | Competitor F | Competitor G |
|---|---|---|---|---|---|---|---|---|
| R (Roughing) | **VP4** | SMR | RS, GJ | TF | MS | ET | MR4 | NRT, NRS |
| M (Medium cutting) | **VP3** | SM | MS | VL | MU | EM | MR3 | NMS |
| L (Medium to finish cutting) | **VP2** | NGP | MJ | PP | TK | ML | MF1 | NMT |
| F (Finishing) | **VP1** | SF | LS, FJ | SF | MQ | EA | M1 | NFT |

## Grade Line-Up

### Heat resistant alloy (Inconel)




### Titanium alloy




## Grade Comparison

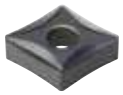
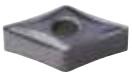
### Heat Resistant Alloy

| ISO | KORLOY | Competitor A | Competitor B | Competitor C | Competitor D | Competitor E | Competitor F | Competitor G |
|---|---|---|---|---|---|---|---|---|
| **S05** | **PC8105** | S05F | MP9005<br>VP05RT | IC808 | PR1305 | TT5080 | TS2000 | WSM10 |
| **S10** | **PC8110** | GC1105 | VP10RT | IC907 | PR1310 | | | |
| **S15** | **PC8115** | GC1115 | MP9015 | - | - | | | |
| **S25** | **PC5300** | GC1125<br>GC2025 | VP15TF<br>VP20MF | IC908 | PR1125 | TT9030<br>TT9080 | CP500<br>TS2500 | WSM20 |
| **S35** | **PC5400** | GC2035 | MP7035 | IC328 | PRI325 | TT8020<br>TT8080 | TM4000<br>F40M | WSM30 |

### Titanium Alloy

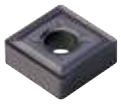
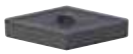
| ISO | KORLOY | Competitor A | Competitor B | Competitor C | Competitor D | Competitor E | Competitor F | Competitor G |
|---|---|---|---|---|---|---|---|---|
| **S05** | **H01** | - | - | - | - | - | - | - |
| **S15** | **H05** | H13A | MT9015 | IC20 | - | TT5080 | THR | WS10 |
| **S25** | **PC5300** | GC1125 | RT9015 | IC908 | PR1125<br>PR1325 | TT9030<br>TT9080 | CP500<br>TS2500 | WSM20 |

# Stock Management (Negative Type)

| Shape | | Designation | | Class | Coated | | | | Uncoated | | Dimensions(mm) | | | | | Cutting conditions(mm) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PC5300 | PC8105 | PC8110 | PC8115 | H01 | H05 | l | d | t | r | $d_1$ | Feed, fn(mm/rev) | Depth of cut, ap(mm) |
| Finishing |  | CNGG | 120402-VP1 | G | | | | | | | 12.6 | 12.7 | 4.76 | 0.2 | 5.16 | 0.01 ~ 0.10 | 0.10 ~ 1.50 |
| | | | 120404-VP1 | G | | | | | | | 12.4 | 12.7 | 4.76 | 0.4 | 5.16 | 0.05 ~ 0.15 | 0.10 ~ 1.50 |
| | | | 120408-VP1 | G | | | | | | | 12.0 | 12.7 | 4.76 | 0.8 | 5.16 | 0.07 ~ 0.20 | 0.10 ~ 1.50 |
| | | CNMG | 120404-VP1 | M | | ● | ● | | ● | | 12.4 | 12.7 | 4.76 | 0.4 | 5.16 | 0.05 ~ 0.15 | 0.10 ~ 1.50 |
| | | | 120408-VP1 | M | | ● | ● | | ● | | 12.0 | 12.7 | 4.76 | 0.8 | 5.16 | 0.07 ~ 0.20 | 0.10 ~ 1.50 |
| | | | | | | | | | | | | | | | | | |
| Medium to finish cutting |  | CNMG | 120404-VP2 | M | ● | ● | ● | ● | ● | | 12.4 | 12.7 | 4.76 | 0.4 | 5.16 | 0.07 ~ 0.25 | 0.30 ~ 3.00 |
| | | | 120408-VP2 | M | ● | ● | ● | ● | ● | | 12.0 | 12.7 | 4.76 | 0.8 | 5.16 | 0.10 ~ 0.30 | 0.30 ~ 3.00 |
| | | | | | | | | | | | | | | | | | |
| Medium |  | CNGG | 120404-VP3 | G | | ● | ● | ● | ● | | 12.4 | 12.7 | 4.76 | 0.4 | 5.16 | 0.10 ~ 0.30 | 0.40 ~ 4.00 |
| | | | 120408-VP3 | G | | ● | ● | ● | ● | | 12.0 | 12.7 | 4.76 | 0.8 | 5.16 | 0.15 ~ 0.35 | 0.50 ~ 4.00 |
| | | | 120412-VP3 | G | | ● | ● | ● | ● | | 11.6 | 12.7 | 4.76 | 1.2 | 5.16 | 0.20 ~ 0.40 | 0.50 ~ 4.00 |
| | | CNMG | 120404-VP3 | M | ● | ● | ● | ● | ● | ● | 12.4 | 12.7 | 4.76 | 0.4 | 5.16 | 0.10 ~ 0.30 | 0.40 ~ 4.00 |
| | | | 120408-VP3 | M | ● | ● | ● | ● | ● | ● | 12.0 | 12.7 | 4.76 | 0.8 | 5.16 | 0.15 ~ 0.35 | 0.50 ~ 4.00 |
| | | | 120412-VP3 | M | ● | ● | ● | ● | ● | ● | 11.6 | 12.7 | 4.76 | 1.2 | 5.16 | 0.20 ~ 0.40 | 0.50 ~ 4.00 |
| Roughing |  | CNMG | 120408-VP4 | M | | | | ● | | | 12.0 | 12.7 | 4.76 | 0.8 | 5.16 | 0.20 ~ 0.45 | 1.00 ~ 5.00 |
| | | | 120412-VP4 | M | | | | ● | | | 11.6 | 12.7 | 4.76 | 1.2 | 5.16 | 0.25 ~ 0.50 | 1.00 ~ 5.00 |
| | | | 190608-VP4 | M | | | | ● | | | 18.5 | 19.05 | 6.35 | 0.8 | 7.93 | 0.20 ~ 0.45 | 2.00 ~ 8.00 |
| | | | 190612-VP4 | M | | | | ● | | | 18.1 | 19.05 | 6.35 | 1.2 | 7.93 | 0.25 ~ 0.50 | 2.00 ~ 8.00 |
| Finishing |  | DNGG | 150404-VP1 | G | | | | | | | 15.1 | 12.7 | 4.76 | 0.4 | 5.16 | 0.05 ~ 0.15 | 0.10 ~ 1.50 |
| | | | 150408-VP1 | G | | | | | | | 14.7 | 12.7 | 4.76 | 0.8 | 5.16 | 0.07 ~ 0.20 | 0.10 ~ 1.50 |
| | | | 150604-VP1 | G | | | | | | | 15.1 | 12.7 | 6.35 | 0.4 | 5.16 | 0.05 ~ 0.15 | 0.10 ~ 1.50 |
| | | | 150608-VP1 | G | | | | | | | 14.7 | 12.7 | 6.35 | 0.8 | 5.16 | 0.07 ~ 0.20 | 0.10 ~ 1.50 |
| | | DNMG | 150404-VP1 | M | | ● | ● | ● | ● | | 15.1 | 12.7 | 4.76 | 0.4 | 5.16 | 0.05 ~ 0.15 | 0.10 ~ 1.50 |
| | | | 150408-VP1 | M | | ● | ● | ● | ● | | 14.7 | 12.7 | 4.76 | 0.8 | 5.16 | 0.07 ~ 0.20 | 0.10 ~ 1.50 |
| | | | 150604-VP1 | M | | ● | ● | ● | ● | | 15.1 | 12.7 | 6.35 | 0.4 | 5.16 | 0.05 ~ 0.15 | 0.10 ~ 1.50 |
| | | | 150608-VP1 | M | | ● | ● | ● | ● | | 14.7 | 12.7 | 6.35 | 0.8 | 5.16 | 0.07 ~ 0.20 | 0.10 ~ 1.50 |
| Medium to finish cutting |  | DNMG | 150404-VP2 | M | ● | ● | ● | ● | ● | | 15.1 | 12.7 | 4.76 | 0.4 | 5.16 | 0.07 ~ 0.25 | 0.30 ~ 3.00 |
| | | | 150408-VP2 | M | ● | ● | ● | ● | ● | | 14.7 | 12.7 | 4.76 | 0.8 | 5.16 | 0.10 ~ 0.30 | 0.30 ~ 3.00 |
| | | | 150604-VP2 | M | ● | ● | ● | ● | ● | | 15.1 | 12.7 | 6.35 | 0.4 | 5.16 | 0.07 ~ 0.25 | 0.30 ~ 3.00 |
| | | | 150608-VP2 | M | ● | ● | ● | ● | ● | | 14.7 | 12.7 | 6.35 | 0.8 | 5.16 | 0.10 ~ 0.30 | 0.30 ~ 3.00 |
| Medium |  | DNGG | 150404-VP3 | G | | ● | ● | ● | ● | | 15.1 | 12.7 | 4.76 | 0.4 | 5.16 | 0.10 ~ 0.30 | 0.40 ~ 4.00 |
| | | | 150408-VP3 | G | | ● | ● | ● | ● | | 14.7 | 12.7 | 4.76 | 0.8 | 5.16 | 0.15 ~ 0.35 | 0.50 ~ 4.00 |
| | | | 150412-VP3 | G | | ● | ● | ● | ● | | 14.4 | 12.7 | 4.76 | 1.2 | 5.16 | 0.20 ~ 0.40 | 0.50 ~ 4.00 |
| | | | 150604-VP3 | G | | ● | ● | ● | ● | | 15.1 | 12.7 | 6.35 | 0.4 | 5.16 | 0.10 ~ 0.30 | 0.40 ~ 4.00 |
| | | | 150608-VP3 | G | | ● | ● | ● | ● | | 14.7 | 12.7 | 6.35 | 0.8 | 5.16 | 0.15 ~ 0.35 | 0.50 ~ 4.00 |
| | | | 150612-VP3 | G | | ● | ● | ● | ● | | 14.4 | 12.7 | 6.35 | 1.2 | 5.16 | 0.20 ~ 0.40 | 0.50 ~ 4.00 |
| | | DNMG | 150404-VP3 | M | ● | ● | ● | ● | ● | ● | 15.1 | 12.7 | 4.76 | 0.4 | 5.16 | 0.10 ~ 0.30 | 0.40 ~ 4.00 |
| | | | 150408-VP3 | M | ● | ● | ● | ● | ● | ● | 14.7 | 12.7 | 4.76 | 0.8 | 5.16 | 0.15 ~ 0.35 | 0.50 ~ 4.00 |
| | | | 150412-VP3 | M | ● | ● | ● | ● | ● | ● | 14.4 | 12.7 | 4.76 | 1.2 | 5.16 | 0.20 ~ 0.40 | 0.50 ~ 4.00 |
| | | | 150604-VP3 | M | ● | ● | ● | ● | ● | ● | 15.1 | 12.7 | 6.35 | 0.4 | 5.16 | 0.10 ~ 0.30 | 0.40 ~ 4.00 |
| | | | 150608-VP3 | M | ● | ● | ● | ● | ● | ● | 14.7 | 12.7 | 6.35 | 0.8 | 5.16 | 0.15 ~ 0.35 | 0.50 ~ 4.00 |
| | | | 150612-VP3 | M | ● | ● | ● | ● | ● | ● | 14.4 | 12.7 | 6.35 | 1.2 | 5.16 | 0.20 ~ 0.40 | 0.50 ~ 4.00 |
| Roughing |  | DNMG | 150408-VP4 | M | | | | | | | 14.7 | 12.7 | 4.76 | 0.8 | 5.16 | 0.20 ~ 0.45 | 1.00 ~ 5.00 |
| | | | 150412-VP4 | M | | | | | | | 14.4 | 12.7 | 4.76 | 1.2 | 5.16 | 0.25 ~ 0.50 | 1.00 ~ 5.00 |
| | | | 150608-VP4 | M | | | | ● | | | 14.7 | 12.7 | 6.35 | 0.8 | 5.16 | 0.20 ~ 0.45 | 1.00 ~ 5.00 |
| | | | 150612-VP4 | M | | | | ● | | | 14.4 | 12.7 | 6.35 | 1.2 | 5.16 | 0.25 ~ 0.50 | 1.00 ~ 5.00 |

●: Managed stock

## Stock Management (Negative Type)

| Shape | | Designation | | Class | Coated | | | | Uncoated | | Dimensions(mm) | | | | | Cutting conditions(mm) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PC5300 | PC8105 | PC8110 | PC8115 | H01 | H05 | l | d | t | r | $d_1$ | Feed, fn(mm/rev) | Depth of cut, ap(mm) |
| Medium to finish cutting |  | SNMG | 120404-VP2 | M | ● | ● | ● | ● | ● | | 12.3 | 12.7 | 4.76 | 0.4 | 5.16 | 0.07 ~ 0.25 | 0.30 ~ 3.00 |
| | | | 120408-VP2 | M | ● | ● | ● | ● | ● | | 11.9 | 12.7 | 4.76 | 0.8 | 5.16 | 0.10 ~ 0.30 | 0.30 ~ 3.00 |
| | | | 120412-VP2 | M | ● | ● | ● | ● | ● | | 11.5 | 12.7 | 4.76 | 1.2 | 5.16 | 0.15 ~ 0.35 | 0.30 ~ 3.00 |
| Medium |  | SNGG | 120404-VP3 | G | | ● | ● | ● | ● | | 12.3 | 12.7 | 4.76 | 0.4 | 5.16 | 0.10 ~ 0.30 | 0.40 ~ 4.00 |
| | | | 120408-VP3 | G | | ● | ● | ● | ● | | 11.9 | 12.7 | 4.76 | 0.8 | 5.16 | 0.15 ~ 0.35 | 0.50 ~ 4.00 |
| | | | 120412-VP3 | G | | ● | ● | ● | ● | | 11.5 | 12.7 | 4.76 | 1.2 | 5.16 | 0.20 ~ 0.40 | 0.50 ~ 4.00 |
| | | SNMG | 120404-VP3 | M | ● | ● | ● | ● | ● | ● | 12.3 | 12.7 | 4.76 | 0.4 | 5.16 | 0.10 ~ 0.30 | 0.40 ~ 4.00 |
| | | | 120408-VP3 | M | ● | ● | ● | ● | ● | ● | 11.9 | 12.7 | 4.76 | 0.8 | 5.16 | 0.15 ~ 0.35 | 0.50 ~ 4.00 |
| | | | 120412-VP3 | M | ● | ● | ● | ● | | ● | 11.5 | 12.7 | 4.76 | 1.2 | 5.16 | 0.20 ~ 0.40 | 0.50 ~ 4.00 |
| Roughing |  | SNMG | 120408-VP4 | M | | | | ● | | | 11.9 | 12.7 | 4.76 | 0.8 | 5.16 | 0.20 ~ 0.45 | 1.00 ~ 5.00 |
| | | | 120412-VP4 | M | | | | ● | | | 11.5 | 12.7 | 4.76 | 1.2 | 5.16 | 0.25 ~ 0.50 | 1.00 ~ 5.00 |
| | | | 150612-VP4 | M | | | | ● | | | 14.6 | 15.875 | 6.35 | 1.2 | 6.35 | 0.25 ~ 0.50 | 1.50 ~ 6.50 |
| | | | 190608-VP4 | M | | | | ● | | | 18.2 | 19.05 | 6.35 | 0.8 | 7.93 | 0.20 ~ 0.45 | 2.00 ~ 8.00 |
| | | | 190612-VP4 | M | | | | ● | | | 17.8 | 19.05 | 6.35 | 1.2 | 7.93 | 0.25 ~ 0.50 | 2.00 ~ 8.00 |
| | | | 190616-VP4 | M | | | | | | | 17.4 | 19.05 | 6.35 | 1.6 | 7.93 | 0.30 ~ 0.55 | 2.00 ~ 8.00 |
| Medium to finish cutting |  | TNMG | 160404-VP2 | M | ● | ● | ● | ● | ● | | 15.5 | 9.525 | 4.76 | 0.4 | 3.81 | 0.07 ~ 0.25 | 0.30 ~ 2.80 |
| | | | 160408-VP2 | M | ● | ● | ● | ● | ● | | 14.5 | 9.525 | 4.76 | 0.8 | 3.81 | 0.10 ~ 0.30 | 0.30 ~ 2.80 |
| | | | 160412-VP2 | M | | ● | ● | ● | ● | | 13.5 | 9.525 | 4.76 | 1.2 | 3.81 | 0.15 ~ 0.35 | 0.30 ~ 2.80 |
| | | | 220404-VP2 | M | ● | | ● | | | | 21.0 | 12.7 | 4.76 | 0.4 | 5.16 | 0.07 ~ 0.25 | 0.50 ~ 3.50 |
| | | | 220408-VP2 | M | ● | | ● | | | | 20.0 | 12.7 | 4.76 | 0.8 | 5.16 | 0.10 ~ 0.30 | 0.50 ~ 3.50 |
| Medium |  | TNGG | 160404-VP3 | G | | ● | ● | ● | ● | | 15.5 | 9.525 | 4.76 | 0.4 | 3.81 | 0.10 ~ 0.30 | 0.40 ~ 3.50 |
| | | | 160408-VP3 | G | | ● | ● | ● | ● | | 14.5 | 9.525 | 4.76 | 0.8 | 3.81 | 0.15 ~ 0.35 | 0.50 ~ 3.50 |
| | | | | | | | | | | | | | | | | | |
| | | TNMG | 160404-VP3 | M | ● | ● | ● | ● | ● | ● | 15.5 | 9.525 | 4.76 | 0.4 | 3.81 | 0.10 ~ 0.30 | 0.40 ~ 3.50 |
| | | | 160408-VP3 | M | ● | ● | ● | ● | ● | ● | 14.5 | 9.525 | 4.76 | 0.8 | 3.81 | 0.15 ~ 0.35 | 0.50 ~ 3.50 |
| | | | | | | | | | | | | | | | | | |
| Roughing |  | TNMG | 160408-VP4 | M | | | | ● | | | 14.5 | 9.525 | 4.76 | 0.8 | 3.81 | 0.20 ~ 0.45 | 1.00 ~ 4.80 |
| | | | 160412-VP4 | M | | | | ● | | | 13.5 | 9.525 | 4.76 | 1.2 | 3.81 | 0.25 ~ 0.50 | 1.00 ~ 4.80 |
| | | | | | | | | | | | | | | | | | |
| Medium |  | VNGG | 160404-VP3 | G | | ● | ● | ● | ● | | 15.6 | 9.525 | 4.76 | 0.4 | 3.81 | 0.10 ~ 0.30 | 0.40 ~ 3.50 |
| | | | 160408-VP3 | G | | | | | | | 14.6 | 9.525 | 4.76 | 0.8 | 3.81 | 0.15 ~ 0.35 | 0.50 ~ 3.50 |
| | | | | | | | | | | | | | | | | | |
| | | VNMG | 160404-VP3 | M | ● | ● | ● | ● | | ● | 15.6 | 9.525 | 4.76 | 0.4 | 3.81 | 0.10 ~ 0.30 | 0.40 ~ 3.50 |
| | | | 160408-VP3 | M | ● | ● | ● | ● | ● | ● | 14.6 | 9.525 | 4.76 | 0.8 | 3.81 | 0.15 ~ 0.35 | 0.50 ~ 3.50 |
| | | | | | | | | | | | | | | | | | |
| Medium to finish cutting |  | WNMG | 080404-VP2 | M | ● | | ● | | | | 8.4 | 12.7 | 4.76 | 0.4 | 5.16 | 0.07 ~ 0.25 | 0.30 ~ 2.50 |
| | | | 080408-VP2 | M | ● | ● | ● | ● | ● | | 8.3 | 12.7 | 4.76 | 0.8 | 5.16 | 0.10 ~ 0.30 | 0.30 ~ 2.50 |
| | | | 080412-VP2 | M | ● | ● | ● | ● | ● | | 8.2 | 12.7 | 4.76 | 1.2 | 5.16 | 0.15 ~ 0.35 | 0.30 ~ 2.50 |
| Medium |  | WNMG | 080404-VP3 | M | ● | ● | ● | ● | ● | ● | 8.4 | 12.7 | 4.76 | 0.4 | 5.16 | 0.10 ~ 0.30 | 0.40 ~ 4.00 |
| | | | 080408-VP3 | M | ● | ● | ● | ● | ● | ● | 8.3 | 12.7 | 4.76 | 0.8 | 5.16 | 0.15 ~ 0.35 | 0.50 ~ 4.00 |
| | | | 080412-VP3 | M | ● | ● | ● | ● | ● | ● | 8.2 | 12.7 | 4.76 | 1.2 | 5.16 | 0.20 ~ 0.40 | 0.50 ~ 4.00 |
| Roughing |  | WNMG | 080408-VP4 | M | | | | ● | | | 8.3 | 12.7 | 4.76 | 0.8 | 5.16 | 0.20 ~ 0.45 | 1.00 ~ 4.50 |
| | | | 080412-VP4 | M | | | | ● | | | 8.2 | 12.7 | 4.76 | 1.2 | 5.16 | 0.25 ~ 0.50 | 1.00 ~ 4.50 |
| | | | | | | | | | | | | | | | | | |

●: Managed stock

# Stock Management (Positive Type)

| Shape | | Designation | | Class | Coated | | | | Uncoated | | Dimensions(mm) | | | | | Cutting conditions(mm) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PC5300 | PC8105 | PC8110 | PC8115 | H01 | H05 | l | d | t | r | $d_1$ | Feed, fn(mm/rev) | Depth of cut, ap(mm) |
| Finishing |  | CCGT | 060201-VP1 | G | ● | ● | ● | ● | ● | | 6.4 | 6.35 | 2.38 | 0.1 | 2.8 | 0.03 ~ 0.06 | 0.06 ~ 1.00 |
| | | | 060202-VP1 | G | ● | ● | ● | ● | ● | | 6.2 | 6.35 | 2.38 | 0.2 | 2.8 | 0.04 ~ 0.10 | 0.08 ~ 1.50 |
| | | | 060204-VP1 | G | ● | ● | ● | ● | ● | | 6.0 | 6.35 | 2.38 | 0.4 | 2.8 | 0.06 ~ 0.12 | 0.10 ~ 1.50 |
| | | | 09T301-VP1 | G | ● | ● | ● | ● | ● | | 9.6 | 9.525 | 3.97 | 0.1 | 4.4 | 0.03 ~ 0.13 | 0.06 ~ 1.00 |
| | | | 09T302-VP1 | G | ● | ● | ● | ● | ● | | 9.4 | 9.525 | 3.97 | 0.2 | 4.4 | 0.04 ~ 0.15 | 0.08 ~ 1.50 |
| | | | 09T304-VP1 | G | ● | ● | ● | ● | ● | | 9.2 | 9.525 | 3.97 | 0.4 | 4.4 | 0.06 ~ 0.20 | 0.10 ~ 1.50 |
| Finishing |  | CCMT | 060204-VL | M | ● | ● | ● | ● | | | 6.0 | 6.35 | 2.38 | 0.4 | 2.8 | 0.04 ~ 0.10 | 0.08 ~ 0.90 |
| | | | 060208-VL | M | | | | | | | 5.6 | 6.35 | 2.38 | 0.8 | 2.8 | 0.06 ~ 0.12 | 0.10 ~ 1.00 |
| | | | 09T304-VL | M | ● | ● | ● | ● | ● | ● | 9.2 | 9.525 | 3.97 | 0.4 | 4.4 | 0.05 ~ 0.10 | 0.10 ~ 1.00 |
| | | | 09T308-VL | M | ● | ● | ● | ● | ● | ● | 8.8 | 9.525 | 3.97 | 0.8 | 4.4 | 0.08 ~ 0.15 | 0.10 ~ 1.00 |
| Medium |  | CCMT | 060202-MP | M | ● | ● | ● | ● | | | 6.2 | 6.35 | 2.38 | 0.2 | 2.8 | 0.04 ~ 0.12 | 0.20 ~ 1.50 |
| | | | 060204-MP | M | ● | ● | ● | ● | | | 6.0 | 6.35 | 2.38 | 0.4 | 2.8 | 0.05 ~ 0.15 | 0.30 ~ 1.50 |
| | | | 060208-MP | M | ● | ● | ● | ● | | | 5.8 | 6.35 | 2.38 | 0.8 | 2.8 | 0.07 ~ 0.15 | 0.50 ~ 2.00 |
| | | | 09T302-MP | M | ● | ● | ● | ● | | | 9.4 | 9.525 | 3.97 | 0.2 | 4.4 | 0.07 ~ 0.15 | 0.30 ~ 2.00 |
| | | | 09T304-MP | M | ● | ● | ● | ● | | | 9.2 | 9.525 | 3.97 | 0.4 | 4.4 | 0.08 ~ 0.20 | 0.50 ~ 2.50 |
| | | | 09T308-MP | M | ● | ● | ● | ● | | | 8.8 | 9.525 | 3.97 | 0.8 | 4.4 | 0.10 ~ 0.30 | 0.50 ~ 2.50 |
| | | | 120404-MP | M | | | | | | | 12.4 | 12.7 | 4.76 | 0.4 | 5.5 | 0.10 ~ 0.30 | 0.50 ~ 3.50 |
| | | | 120408-MP | M | | | | | | | 12.0 | 12.7 | 4.76 | 0.8 | 5.5 | 0.15 ~ 0.35 | 0.80 ~ 3.50 |
| Finishing |  | DCGT | 070201-VP1 | G | ● | ● | ● | ● | ● | | 7.7 | 6.35 | 2.38 | 0.1 | 2.8 | 0.03 ~ 0.06 | 0.06 ~ 1.00 |
| | | | 070202-VP1 | G | ● | ● | ● | ● | ● | | 7.5 | 6.35 | 2.38 | 0.2 | 2.8 | 0.03 ~ 0.10 | 0.08 ~ 1.50 |
| | | | 070204-VP1 | G | ● | ● | ● | ● | ● | | 7.3 | 6.35 | 2.38 | 0.4 | 2.8 | 0.05 ~ 0.12 | 0.10 ~ 1.50 |
| | | | 11T301-VP1 | G | ● | | ● | | | | 11.6 | 9.525 | 3.97 | 0.1 | 4.4 | 0.03 ~ 0.13 | 0.06 ~ 1.00 |
| | | | 11T302-VP1 | G | ● | ● | ● | ● | ● | | 11.4 | 9.525 | 3.97 | 0.2 | 4.4 | 0.04 ~ 0.15 | 0.08 ~ 1.50 |
| | | | 11T304-VP1 | G | ● | ● | ● | ● | ● | | 11.2 | 9.525 | 3.97 | 0.4 | 4.4 | 0.06 ~ 0.20 | 0.10 ~ 1.50 |
| Finishing |  | DCMT | 070202-VL | M | | | | | | | 7.5 | 6.35 | 2.38 | 0.2 | 2.8 | 0.02 ~ 0.10 | 0.06 ~ 0.80 |
| | | | 070204-VL | M | ● | ● | ● | ● | ● | ● | 7.3 | 6.35 | 2.38 | 0.4 | 2.8 | 0.04 ~ 0.10 | 0.08 ~ 0.90 |
| | | | 070208-VL | M | | | | | | | 6.8 | 6.35 | 2.38 | 0.8 | 2.8 | 0.06 ~ 0.12 | 0.10 ~ 1.00 |
| | | | 11T302-VL | M | | | | | | | 11.4 | 9.525 | 3.97 | 0.2 | 4.4 | 0.03 ~ 0.10 | 0.07 ~ 0.80 |
| | | | 11T304-VL | M | ● | | ● | | | ● | 11.2 | 9.525 | 3.97 | 0.4 | 4.4 | 0.05 ~ 0.10 | 0.10 ~ 1.00 |
| | | | 11T308-VL | M | ● | ● | ● | ● | ● | ● | 10.8 | 9.525 | 3.97 | 0.8 | 4.4 | 0.08 ~ 0.15 | 0.10 ~ 1.00 |
| Medium |  | DCMT | 070202-MP | M | ● | ● | ● | ● | | | 7.5 | 6.35 | 2.38 | 0.2 | 2.8 | 0.04 ~ 0.12 | 0.12 ~ 1.80 |
| | | | 070204-MP | M | ● | ● | ● | ● | | | 7.3 | 6.35 | 2.38 | 0.4 | 2.8 | 0.05 ~ 0.15 | 0.30 ~ 1.80 |
| | | | 070208-MP | M | ● | ● | ● | ● | | | 6.8 | 6.35 | 2.38 | 0.8 | 2.8 | 0.08 ~ 0.22 | 0.30 ~ 1.80 |
| | | | 11T302-MP | M | ● | ● | ● | ● | | | 11.4 | 9.525 | 3.97 | 0.2 | 4.4 | 0.04 ~ 0.15 | 0.30 ~ 2.00 |
| | | | 11T304-MP | M | ● | ● | ● | ● | | | 11.2 | 9.525 | 3.97 | 0.4 | 4.4 | 0.08 ~ 0.20 | 0.50 ~ 2.30 |
| | | | 11T308-MP | M | ● | ● | ● | ● | | | 10.8 | 9.525 | 3.97 | 0.8 | 4.4 | 0.10 ~ 0.30 | 0.50 ~ 2.30 |
| Finishing |  | SCMT | 09T304-VL | M | ● | ● | ● | ● | | | 9.1 | 9.525 | 3.97 | 0.4 | 4.4 | 0.05 ~ 0.10 | 0.10 ~ 1.00 |
| | | | 09T308-VL | M | ● | ● | ● | ● | | | 8.7 | 9.525 | 3.97 | 0.8 | 4.4 | 0.08 ~ 0.15 | 0.10 ~ 1.00 |
| | | | | | | | | | | | | | | | | | |
| Medium |  | SCMT | 09T304-MP | M | | ● | ● | | | | 9.1 | 9.525 | 3.97 | 0.4 | 4.4 | 0.02 ~ 0.25 | 0.30 ~ 2.80 |
| | | | 09T308-MP | M | | ● | ● | | | | 8.7 | 9.525 | 3.97 | 0.8 | 4.4 | 0.10 ~ 0.30 | 0.50 ~ 2.80 |
| | | | 120408-MP | M | | ● | ● | | | | 11.9 | 12.7 | 4.76 | 0.8 | 5.5 | 0.15 ~ 0.35 | 0.80 ~ 3.50 |
| Finishing |  | TCMT | 090208-VL | M | | | | | | | 7.6 | 5.56 | 2.38 | 0.8 | 2.5 | 0.06 ~ 0.12 | 0.10 ~ 1.00 |
| | | | 110204-VL | M | | | | | | | 10.0 | 6.35 | 2.38 | 0.4 | 2.8 | 0.05 ~ 0.15 | 0.10 ~ 1.30 |
| | | | 110208-VL | M | | | | | | | 9.0 | 6.35 | 2.38 | 0.8 | 2.8 | 0.08 ~ 0.20 | 0.10 ~ 1.30 |
| | | | 16T304-VL | M | ● | ● | ● | ● | | | 15.5 | 9.525 | 3.97 | 0.4 | 4.4 | 0.05 ~ 0.20 | 0.30 ~ 1.50 |
| | | | 16T308-VL | M | ● | ● | ● | ● | | | 14.5 | 9.525 | 3.97 | 0.8 | 4.4 | 0.05 ~ 0.20 | 0.30 ~ 1.50 |

●: Managed stock

# Stock Management (Positive Type)

| Shape | | Designation | | Class | Coated | | | | Uncoated | | Dimensions(mm) | | | | | Cutting conditions(mm) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PC5300 | PC8105 | PC8110 | PC8115 | H01 | H05 | l | d | t | r | $d_1$ | Feed, fn(mm/rev) | Depth of cut, ap(mm) |
| Medium |  | TCMT | 090204-MP | M | | | | | | | 8.6 | 5.56 | 2.38 | 0.4 | 2.5 | 0.05 ~ 0.18 | 0.10 ~ 1.00 |
| | | | 090208-MP | M | | | | | | | 7.6 | 5.56 | 2.38 | 0.8 | 2.5 | 0.08 ~ 0.20 | 0.10 ~ 1.20 |
| | | | 110202-MP | M | | ● | ● | | | | 10.5 | 6.35 | 2.38 | 0.2 | 2.8 | 0.03 ~ 0.12 | 0.20 ~ 1.50 |
| | | | 110204-MP | M | | ● | ● | | | | 10.0 | 6.35 | 2.38 | 0.4 | 2.8 | 0.05 ~ 0.15 | 0.20 ~ 1.50 |
| | | | 110208-MP | M | | ● | ● | | | | 9.0 | 6.35 | 2.38 | 0.8 | 2.8 | 0.10 ~ 0.28 | 0.25 ~ 2.00 |
| | | | 16T304-MP | M | ● | ● | ● | ● | | | 15.5 | 9.525 | 3.97 | 0.4 | 4.4 | 0.08 ~ 0.20 | 0.30 ~ 2.50 |
| | | | 16T308-MP | M | ● | ● | ● | ● | | | 14.5 | 9.525 | 3.97 | 0.8 | 4.4 | 0.10 ~ 0.30 | 0.50 ~ 2.50 |
| | | | 16T312-MP | M | | ● | ● | ● | | | 13.5 | 9.525 | 3.97 | 1.2 | 4.4 | 0.20 ~ 0.35 | 0.50 ~ 2.50 |
| Finishing |  | TPMT | 090204-VL | M | | | | | | | 8.6 | 5.56 | 2.38 | 0.4 | 2.5 | 0.04 ~ 0.10 | 0.08 ~ 0.90 |
| | | | 110304-VL | M | ● | ● | ● | ● | | | 10.0 | 6.35 | 3.18 | 0.4 | 3.4 | 0.05 ~ 0.15 | 0.10 ~ 1.30 |
| | | | 110308-VL | M | | | | | | | 9.0 | 6.35 | 3.18 | 0.8 | 3.4 | 0.08 ~ 0.20 | 0.10 ~ 1.30 |
| | | | 160404-VL | M | | | | | | | 15.5 | 9.525 | 4.76 | 0.4 | 4.4 | 0.05 ~ 0.20 | 0.30 ~ 1.50 |
| | | | 160408-VL | M | | | | | | | 14.5 | 9.525 | 4.76 | 0.8 | 4.4 | 0.05 ~ 0.20 | 0.30 ~ 1.50 |
| Medium |  | TPMT | 110304-MP | M | ● | | | | | | 10.0 | 6.35 | 3.18 | 0.4 | 3.4 | 0.05 ~ 0.15 | 0.20 ~ 1.50 |
| | | | 110308-MP | M | | | | | | | 9.0 | 6.35 | 3.18 | 0.8 | 3.4 | 0.10 ~ 0.28 | 0.25 ~ 2.00 |
| | | | 160404-MP | M | | | | | | | 15.5 | 9.525 | 4.76 | 0.4 | 4.4 | 0.08 ~ 0.20 | 0.30 ~ 2.50 |
| | | | 160408-MP | M | | | | | | | 14.5 | 9.525 | 4.76 | 0.8 | 4.4 | 0.10 ~ 0.30 | 0.50 ~ 2.50 |
| Finishing |  | VCGT | 110301-VP1 | G | ● | ● | ● | ● | ● | | 11.0 | 6.35 | 3.18 | 0.1 | 2.8 | 0.02 ~ 0.15 | 0.05 ~ 0.50 |
| | | | 110302-VP1 | G | ● | ● | ● | ● | ● | | 11.0 | 6.35 | 3.18 | 0.2 | 2.8 | 0.02 ~ 0.18 | 0.10 ~ 1.00 |
| | | | 110304-VP1 | G | ● | ● | ● | ● | ● | | 11.0 | 6.35 | 3.18 | 0.4 | 2.8 | 0.03 ~ 0.18 | 0.15 ~ 1.20 |
| Finishing |  | VPGT | 110301-VP1 | G | ● | ● | ● | ● | ● | | 11.0 | 6.35 | 3.18 | 0.1 | 2.8 | 0.02 ~ 0.15 | 0.05 ~ 0.50 |
| | | | 110302-VP1 | G | ● | ● | ● | ● | ● | | 11.0 | 6.35 | 3.18 | 0.2 | 2.8 | 0.02 ~ 0.18 | 0.10 ~ 1.00 |
| | | | 110304-VP1 | G | ● | ● | ● | ● | ● | | 11.0 | 6.35 | 3.18 | 0.4 | 2.8 | 0.03 ~ 0.18 | 0.15 ~ 1.20 |
| Finishing |  | VBMT | 160404-VL | M | ● | ● | ● | ● | | | 15.6 | 9.525 | 4.76 | 0.4 | 4.4 | 0.05 ~ 0.20 | 0.30 ~ 1.50 |
| | | | 160408-VL | M | ● | ● | ● | ● | | | 14.6 | 9.525 | 4.76 | 0.8 | 4.4 | 0.10 ~ 0.20 | 0.30 ~ 1.50 |
| | | | 160412-VL | M | | ● | ● | ● | | | 13.5 | 9.525 | 4.76 | 1.2 | 4.4 | 0.10 ~ 0.25 | 0.30 ~ 1.50 |
| Medium |  | VBMT | 110304-MP | M | | | | | | | 10.0 | 6.35 | 3.18 | 0.4 | 3.4 | 0.05 ~ 0.15 | 0.20 ~ 1.50 |
| | | | 110308-MP | M | | | | | | | 9.0 | 6.35 | 3.18 | 0.8 | 3.4 | 0.10 ~ 0.28 | 0.25 ~ 2.00 |
| | | | 160404-MP | M | ● | ● | ● | ● | | | 15.6 | 9.525 | 4.76 | 0.4 | 4.4 | 0.08 ~ 0.18 | 0.30 ~ 2.00 |
| | | | 160408-MP | M | ● | ● | ● | ● | | | 14.6 | 9.525 | 4.76 | 0.8 | 4.4 | 0.10 ~ 0.23 | 0.50 ~ 2.30 |
| | | | 160412-MP | M | ● | ● | ● | ● | | | 13.5 | 9.525 | 4.76 | 1.2 | 4.4 | 0.10 ~ 0.35 | 0.50 ~ 2.30 |
| Finishing |  | VCMT | 080202-VL | M | | | | | | | 8.0 | 4.76 | 2.38 | 0.2 | 2.3 | 0.03 ~ 0.08 | 0.08 ~ 0.80 |
| | | | 080204-VL | M | | | | | | | 7.5 | 4.76 | 2.38 | 0.4 | 2.3 | 0.04 ~ 0.10 | 0.08 ~ 0.90 |
| | | | 160404-VL | M | | ● | ● | | | | 15.6 | 9.525 | 4.76 | 0.4 | 4.4 | 0.05 ~ 0.20 | 0.30 ~ 1.50 |
| | | | 160408-VL | M | | ● | ● | | | | 14.6 | 9.525 | 4.76 | 0.8 | 4.4 | 0.10 ~ 0.20 | 0.30 ~ 1.50 |
| | | | 160412-VL | M | | | | | | | 13.5 | 9.525 | 4.76 | 1.2 | 4.4 | 0.10 ~ 0.25 | 0.30 ~ 1.50 |
| Medium |  | VCMT | 080202-MP | M | | | | | | | 8.0 | 4.76 | 2.38 | 0.2 | 2.3 | 0.03 ~ 0.15 | 0.10 ~ 1.00 |
| | | | 080204-MP | M | | | | | | | 7.5 | 4.76 | 2.38 | 0.4 | 2.3 | 0.05 ~ 0.18 | 0.10 ~ 1.00 |
| | | | 160404-MP | M | | ● | ● | | | | 15.6 | 9.525 | 4.76 | 0.4 | 4.4 | 0.08 ~ 0.18 | 0.30 ~ 2.00 |
| | | | 160408-MP | M | | ● | ● | | | | 14.6 | 9.525 | 4.76 | 0.8 | 4.4 | 0.10 ~ 0.23 | 0.50 ~ 2.30 |
| | | | 160412-MP | M | | ● | ● | | | | 13.5 | 9.525 | 4.76 | 1.2 | 4.4 | 0.10 ~ 0.35 | 0.50 ~ 2.30 |

●: Managed stock


KORLOY

Holystar B/D, 1350, Nambusunhwan-ro, Geumcheon-gu, Seoul, 08536, Korea
Tel : +82-2-522-3181 Fax : +82-2-522-3184, +82-2-3474-4744 Web : www.korloy.com E-mail : export@korloy.com

KORLOY AMERICA
620 Maple Avenue, Torrance, CA 90503, USA
Tel : +1-310-782-3800 Toll Free : +1-888-711-0001 Fax : +1-310-782-3885
www.korloyamerica.com E-mail : sales@korloy.us

KORLOY INDIA
Plot NO.415, Sector 8, IMT Manesar, Gurgaon 122051, Haryana, INDIA
Tel : +91-124-4391790 Fax : +91-124-4050032
www.korloyindia.com E-mail : sales.kip@korloy.com

KORLOY EUROPE
Gablonzer Str. 25-27, 61440 Oberursel, Germany
Tel : +49-6171-277-83-0 Fax : +49-6171-277-83-59
www.korloyeurope.com E-mail : sales@korloyeurope.com

KORLOY BRASIL
Av. Aruana 280, conj.12, WLC, Alphaville, Barueri,
CEP06460-010, SP, Brasil
Tel : +55-11-4193-3810 E-mail : vendas@korloy.com