NEW

2026.04

B272E

# MP1200 SERIES

## PVD COATED CARBIDE GRADE FOR MILLING


MITSUBISHI MATERIALS

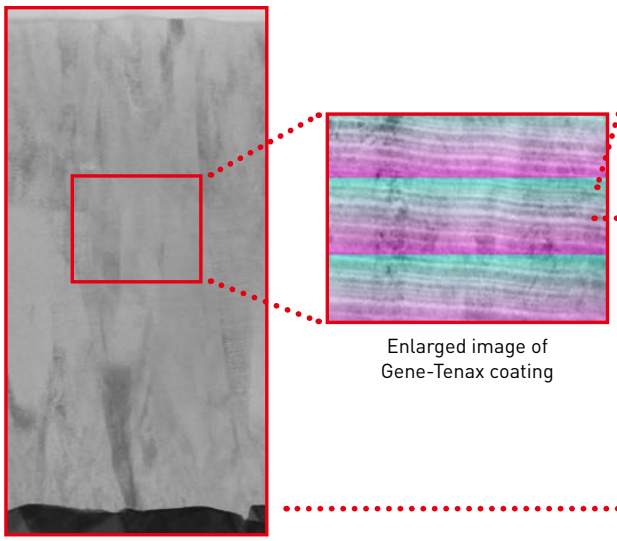
# MP1220 / MP1230 / MP1240

## MULTI-LAYER PVD COATING FOR MILLING

**ONE INSERT SERIES TO SOLVE ALL PROBLEMS WHEN MACHINING STEELS, STAINLESS STEELS, HEAT RESISTANT AND TITANIUM ALLOYS.**

### GENE-TENAX COATING

By controlling the coating structure at the nano level, damage to the coating has been vastly reduced compared to conventional lamination. By successfully laminating multiple films, simultaneous strengthening of heat, wear and welding resistance is achieved. Additionally the coating is now much less prone to cracking and with the increased adhesive strength, the most stable grade for milling has been created.



Enlarged image of Gene-Tenax coating

Dedicated carbide base material

**Al-RICH TECHNOLOGY AlTiN-BASED**

Improved wear and heat resistance.

**ORIGINAL AlTiN COMPOSITE FUNCTIONAL LAYER**

Increasingly resistant to oxidation and welding.

Technology to improve adhesion strength.

### ACHIEVES TOUGHNESS FOR A WIDE RANGE OF WORK MATERIALS

**STEEL MACHINING DAMAGE**

Cutting edge that is resistant to wear when machining steel

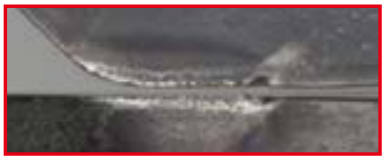
Thermal cracking

**STAINLESS STEEL MACHINING DAMAGE**

Cutting edge that is less susceptible to notching when machining stainless steel

Notching

**HEAT RESISTANT AND TITANIUM ALLOYS MACHINING DAMAGE**



Cutting edge that is resistant to chipping when machining heat resistant and titanium alloys

Chipped cutting edge

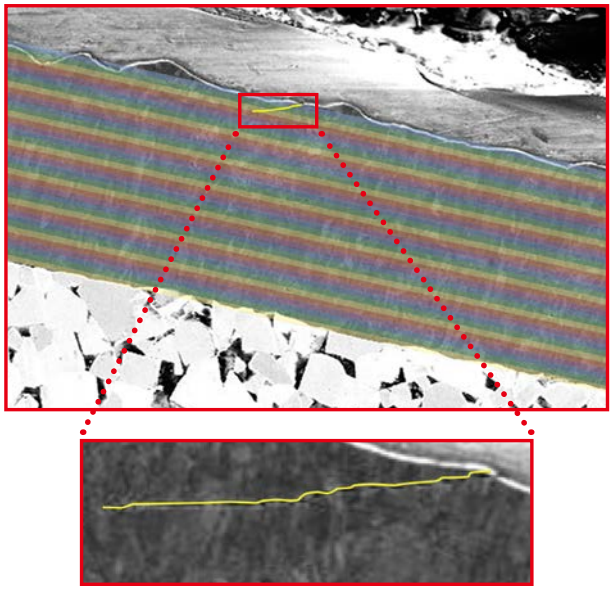


■ : MP1200 Series ■ : Conventional PVD

# NEW MULTILAYER TECHNOLOGY

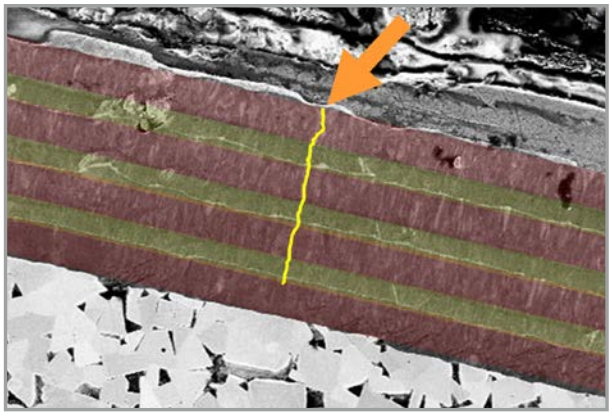
The adoption of a new multi-layer technology has succeeded in suppressing crack propagation and dramatically improved fracture resistance when compared to conventional technology.

**MP1200 SERIES MULTI-LAYER TECHNOLOGY**



Prevents cracks

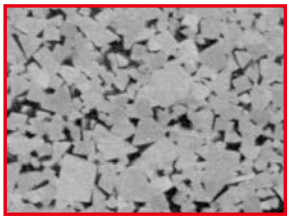
**CONVENTIONAL LAYER TECHNOLOGY**



## MULTI-GRADE SYSTEM

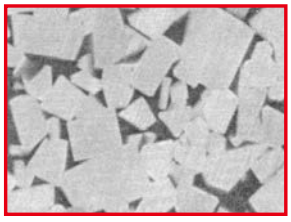
Using simulation technology, precise analysis of the cutting edge load and temperature when machining different workpiece materials was carried out. This led to the creation of different substrates for three different grades and ensures optimal performance for each type of workpiece material. Ensuring the best performance over a wide range of applications.

**MP1220**



**MP1230**

**MP1240**




## SELECTION GUIDELINES

**Steel, Carbon steel** — **Stainless steel** — **Titanium alloys, Heat resistant alloys**

- Hard grade
- Stable cutting
- Emphasis on wear resistance and mechanical properties

- Tough grade
- Unstable cutting
- Emphasis on fracture resistance and thermal properties

# CUTTING PERFORMANCE

## PVD COATED CARBIDE GRADE FOR MILLING

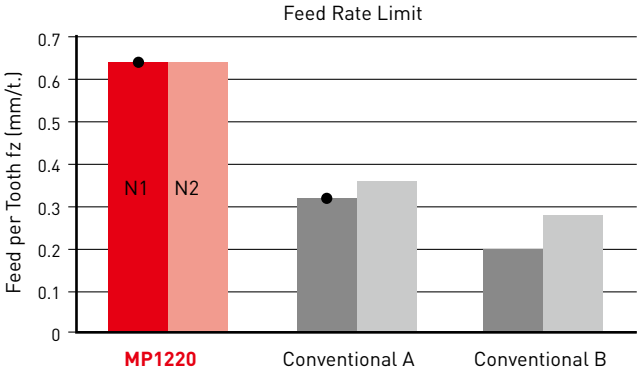
### FRACTURE RESISTANCE COMPARISON WHEN MACHINGING 42CrMo4

The MP1220 grade suppresses breakage during high-load machining and exhibits more than twice the breakage resistance of conventional product A.

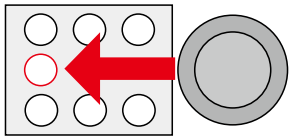
| | |
|---|---|
| Material | DIN 1.7225 |
| Tool | ASX445 DC = 125 mm |
| Insert | MP1220 JM |
| Vc (m / min) | 200 |
| ap (mm) | 3 |
| ae (mm) | 100 |
| Cutting mode | Dry cutting<br>Single insert<br>Centre cut |

MP1220

Conventional A




● Photo taken at this length of cutting.



Machining image

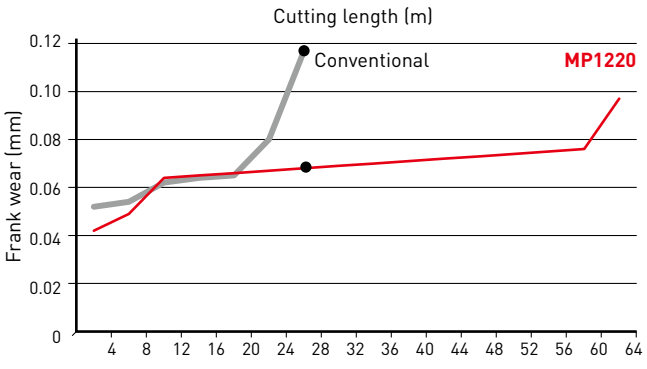
### WEAR RESISTANCE COMPARISON WHEN MACHINING 42CrMo4

Stable machining is achieved by suppressing rake face wear and preventing the occurrence of thermal cracks.

| | |
|---|---|
| Material | DIN 1.7225 |
| Tool | VPX300 DC = 32 mm |
| Insert | MP1220 M |
| Vc (m / min) | 200 |
| fz (mm/t.) | 0.15 |
| ap (mm) | 4 |
| ae (mm) | 16 |
| Cutting mode | Dry cutting<br>Single insert<br>Centre cut |

MP1220

Conventional




● Taken after cutting length of 28 m

# MP1200 SERIES

## INSERTS

| Order number | MP1220 | MP1230 | MP1240 | Class | Specifications | Note | Geometry |
|---|---|---|---|---|---|---|---|
| **Face milling** | | | | | | | |
| SNGU140812ANER-L | ● | ● | ● | G | Low resistance | Light cutting | **WSX445** |
| SNGU140812ANEL-L | ★ | ★ | | G | Low resistance | Light cutting | |
| SNGU140812ANER-M | ● | ● | ● | G | 1st recommendation | General cutting | |
| SNGU140812ANEL-M | ★ | ★ | | G | 1st recommendation | General cutting | |
| SNMU140812ANER-M | ● | ● | ● | M | 1st recommendation | General cutting | |
| SNMU140812ANEL-M | ● | ★ | | M | 1st recommendation | General cutting | |
| SNMU140812ANER-R | ● | ● | ● | M | Strong cutting edge | Rough cutting | |
| SNMU140812ANEL-R | ★ | ★ | | M | Strong cutting edge | Rough cutting | |
| SNMU140812ANER-H | ● | ● | ● | M | Strong cutting edge | Heavy cutting | |
| WNGU1406ANEN8C-M | ● | | | G | Wiper | Finish cutting | **WSX445** |
| NNMU130508ZER-L | ● | ● | ★ | M | Low resistance | General cutting | **AHX440S** |
| NNMU130508ZEN-M | ● | ● | ● | M | 1st recommendation | General cutting | |
| WNEU1305ZEN4C-M | ★ | | | E | Wiper | Finish cutting | **AHX440S** |
| NNMU130532ZEN-M | ● | ● | ● | M | 1st recommendation | High feed cutting | **AHX475S** |
| NNMU130532ZEN-R | ● | ● | ★ | M | Strong cutting edge | High feed cutting | |
| NNMU200608ZEN-MK | ● | | | M | 1st recommendation | General cutting | **AHX640S** |
| NNMU200608ZEN-HK | ● | | | M | Strong cutting edge | General cutting | |
| NNMU200712ZER-L | ● | ● | ● | M | Low resistance | General cutting | |
| NNMU200708ZEN-M | ● | ● | ● | M | 1st recommendation | General cutting | |
| WNEU2007ZEN7C-M | ★ | | | E | Wiper | Finish cutting | **AHX640S** |
| SEET13T3AGEN-JL | ● | ● | ● | E | Low resistance | Finish – Light cutting | **ASX445** |
| SEMT13T3AGSN-JM | ● | ● | ● | M | 1st recommendation | Light – Rough cutting | |
| SEMT13T3AGSN-JH | ● | ● | ● | M | Strong cutting edge | Medium – Heavy cutting | |



(10 inserts in one case.)



● : Inventory maintained. ★ : Inventory maintained in Japan.

## MP1200 SERIES – INSERTS

| Order number | MP1220 | MP1230 | MP1240 | Class | Specifications | Note | Geometry |
|---|---|---|---|---|---|---|---|
| **Shoulder milling** | | | | | | | |
| SOMT083304PEER-L | ● | ● | ● | M | Low resistance, RE0.4 | Stable cutting | **ASX300** |
| SOMT083308PEER-L | ● | ● | ● | M | Low resistance, RE0.8 | Stable cutting |  |
| SOMT083308PEER-M | ● | ● | ● | M | RE0.8 | General cutting | |
| SOMT083312PEER-M | ● | ● | ● | M | RE1.2 | General cutting | |
| SOMT083316PEER-M | ● | ● | ● | M | RE1.6 | General cutting | |
| SOMT083308PEER-R | ● | ● | ● | M | Strong cutting edge, RE0.8 | Unstable cutting | |
| SOMT083312PEER-R | ● | ● | ● | M | Strong cutting edge, RE1.2 | Unstable cutting | |
| SOMT083316PEER-R | ● | ● | ● | M | Strong cutting edge, RE1.6 | Unstable cutting | |
| SOET12T308PEER-JL | ● | ● | ● | E | Low resistance | Finish – Light cutting | **ASX400** |
| SOMT12T308PEER-JM | ● | ● | ● | M | Left-hand | Cast iron rough cutting |  |
| SOMT12T308PEER-JH | ● | ● | ● | M | Strong cutting edge | Medium – Heavy cutting | |
| SOMT12T320PEER-FT | ● | ★ | ★ | M | Strong cutting edge | Heavy and interrupted cutting | |
| SONX1206PER | ★ | | | N | Right-hand | Cast iron rough cutting | **VOX400** |
| | | | | | | |  |
| WOEX1206PER5C | ★ | | | E | Wiper | Finish cutting | **VOX400** |
| | | | | | | |  |
| 6NGU0906040PNER-L | ★ | ★ | ★ | G | Low resistance, RE0.4 | Stable cutting | **WWX200** |
| 6NGU0906080PNER-L | ★ | ★ | ★ | G | Low resistance, RE0.8 | Stable cutting |  |
| 6NMU0906040PNER-M | ● | ● | ● | M | RE0.4 | General cutting | |
| 6NMU0906080PNER-M | ● | ● | ● | M | RE0.8 | General cutting | |
| 6NMU0906080PNER-R | ● | ● | ● | M | Strong cutting edge, RE0.8 | Unstable cutting | |
| 6NGU1409040PNER-L | ● | ● | ● | G | Low resistance, RE0.4 | Stable cutting | **WWX400** |
| 6NGU1409080PNER-L | ● | ● | ● | G | Low resistance, RE0.8 | Stable cutting |  |
| 6NGU1409040PNER-M | ★ | ● | ★ | G | RE0.4 | General cutting | |
| 6NGU1409080PNER-M | ● | ● | ● | G | RE0.8 | General cutting | |
| 6NMU1409040PNER-M | ● | ● | ● | M | RE0.4 | General cutting | |
| 6NMU1409080PNER-M | ● | ● | ● | M | RE0.8 | General cutting | |
| 6NMU1409160PNER-M | ● | ● | ● | M | RE1.6 | General cutting | |
| 6NMU1409200PNER-M | ★ | ★ | ★ | M | RE2.0 | General cutting | |
| 6NMU1409080PNER-R | ● | ● | ● | M | RE0.8 | Unstable cutting | |
| 6NMU1409160PNER-R | ★ | ★ | ★ | M | RE1.6 | Unstable cutting | |
| 6NMU1409200PNER-R | ★ | ★ | ★ | M | RE2.0 | Unstable cutting | |
| 2NGU1406ZNER6C-M | ● | | | G | Wiper | Finish cutting | **WWX400** |
| | | | | | | |  |

1/1

(10 inserts in one case.)





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## MP1200 SERIES – INSERTS

| Order number | MP1220 | MP1230 | MP1240 | Class | Specifications | Note | Geometry |
|---|---|---|---|---|---|---|---|
| **Side cutter** | | | | | | | |
| LNGU130804PNER-M | ★ | | | G | Low resistance, RE1 0.4 | Right-hand | DCV4 |
| LNGU130804PNEL-M | ★ | | | G | Low resistance, RE1 0.4 | Left-hand | |
| LNGU130808PNER-M | ★ | | | G | Low resistance, RE1 0.8 | Right-hand | |
| LNGU130808PNEL-M | ★ | | | G | Low resistance, RE1 0.8 | Left-hand | |
| LNGU130812PNER-M | ★ | | | G | Low resistance, RE1 1.2 | Right-hand | |
| LNGU130812PNEL-M | ★ | | | G | Low resistance, RE1 1.2 | Left-hand | |
| LNGU130816PNER-M | ★ | | | G | Low resistance, RE1 1.6 | Right-hand | |
| LNGU130816PNEL-M | ★ | | | G | Low resistance, RE1 1.6 | Left-hand | |
| LNGU130820PNER-M | ★ | | | G | Low resistance, RE1 2.0 | Right-hand | |
| LNGU130820PNEL-M | ★ | | | G | Low resistance, RE1 2.0 | Left-hand | |
| LNGU130824PNER-M | ★ | | | G | Low resistance, RE1 2.4 | Right-hand | |
| LNGU130824PNEL-M | ★ | | | G | Low resistance, RE1 2.4 | Left-hand | |
| LNGU130830PNER-M | ● | | | G | Low resistance, RE1 3.0 | Right-hand | |
| LNGU130830PNEL-M | ● | | | G | Low resistance, RE1 3.0 | Left-hand | |
| LNGU130840PNER-M | ★ | | | G | Low resistance, RE1 4.0 | Right-hand | |
| LNGU130840PNEL-M | ★ | | | G | Low resistance, RE1 4.0 | Left-hand | |
| LNGU130850PNER-M | ★ | | | G | Low resistance, RE1 5.0 | Right-hand | |
| LNGU130850PNEL-M | ★ | | | G | Low resistance, RE1 5.0 | Left-hand | |
| LNGU130804PNER-R | ★ | | | G | Strong cutting edge, RE1 0.4 | Right-hand | |
| LNGU130804PNEL-R | ★ | | | G | Strong cutting edge, RE1 0.4 | Left-hand | |
| LNGU130808PNER-R | ★ | | | G | Strong cutting edge, RE1 0.8 | Right-hand | |
| LNGU130808PNEL-R | ★ | | | G | Strong cutting edge, RE1 0.8 | Left-hand | |
| LNGU130812PNER-R | ★ | | | G | Strong cutting edge, RE1 1.2 | Right-hand | |
| LNGU130812PNEL-R | ● | | | G | Strong cutting edge, RE1:1.2 | Left-hand | |
| LNGU130816PNER-R | ★ | | | G | Strong cutting edge, RE1 1.6 | Right-hand | |
| LNGU130816PNEL-R | ★ | | | G | Strong cutting edge, RE1 1.6 | Left-hand | |
| LNGU130820PNER-R | ★ | | | G | Strong cutting edge, RE1 2.0 | Right-hand | |
| LNGU130820PNEL-R | ★ | | | G | Strong cutting edge, RE1 2.0 | Left-hand | |
| LNGU130824PNER-R | ★ | | | G | Strong cutting edge, RE1 2.4 | Right-hand | |
| LNGU130824PNEL-R | ★ | | | G | Strong cutting edge, RE1 2.4 | Left-hand | |
| LNGU130830PNER-R | ★ | | | G | Strong cutting edge, RE1 3.0 | Right-hand | |
| LNGU130830PNEL-R | ● | | | G | Strong cutting edge, RE1 3.0 | Left-hand | |
| LNGU130840PNER-R | ★ | | | G | Strong cutting edge, RE1 4.0 | Right-hand | |
| LNGU130840PNEL-R | ★ | | | G | Strong cutting edge, RE1 4.0 | Left-hand | |
| LNGU130850PNER-R | ★ | | | G | Strong cutting edge, RE1 5.0 | Right-hand | |
| LNGU130850PNEL-R | ★ | | | G | Strong cutting edge, RE1 5.0 | Left-hand | |

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(10 inserts in one case.)

24 Vc

● : Inventory maintained. ★ : Inventory maintained in Japan.

## MP1200 SERIES – INSERTS

| Order number | MP1220 | MP1230 | MP1240 | Class | Specifications | Note | Geometry |
|---|---|---|---|---|---|---|---|
| **Multi-Functional milling** | | | | | | | |
| JOMW06T215ZZSR-FT | ● | ● | ● | M | IC 6.35 | 1st recommendation | AJX |
| JOMW080320ZZSR-FT | ● | ● | ● | M | IC 8 | 1st recommendation | |
| JDMW09T320ZDSR-FT | ● | ● | ● | M | IC 9.525 | 1st recommendation | |
| JDMW120420ZDSR-FT | ● | ● | ● | M | IC 12 | 1st recommendation | |
| JDMW140520ZDSR-FT | ● | ● | ● | M | IC 14 | 1st recommendation | |
| JDMT120420ZDSR-ST | ● | ● | | M | IC 12, Strong cutting edge | Interrupted cutting | |
| JDMT140520ZDSR-ST | ★ | ● | | M | IC 14, Strong cutting edge | Interrupted cutting | |
| JOMT06T216ZZER-JL | ● | ● | ● | M | IC 6.35 | Difficult-to-cut materials | |
| JOMT080322ZZER-JL | ● | ● | ● | M | IC 8 | Difficult-to-cut materials | |
| JDMT09T323ZDER-JL | ● | ● | ● | M | IC 9.525 | Difficult-to-cut materials | |
| JDMT120423ZDER-JL | ● | ● | ● | M | IC 12 | Difficult-to-cut materials | |
| JDMT140523ZDER-JL | ● | ● | ● | M | IC 14 | Difficult-to-cut materials | |
| JOMT06T215ZZSR-JM | ● | ● | ● | M | IC 6.35, Low resistance | General cutting | |
| JOMT080320ZZSR-JM | ● | ● | ● | M | IC 8, Low resistance | General cutting | |
| JDMT09T320ZDSR-JM | ● | ● | ● | M | IC 9.525, Low resistance | General cutting | |
| JDMT120420ZDSR-JM | ● | ● | ● | M | IC 12, Low resistance | General cutting | |
| JDMT140520ZDSR-JM | ● | ● | ● | M | IC 14, Low resistance | General cutting | |
| QOGT0830R-G1 | ★ | | | G | *APMX 7.4, Low resistance | General cutting | AQX |
| QOGT1035R-G1 | ★ | | | G | *APMX 9.2, Low resistance | General cutting | |
| QOGT1342R-G1 | ★ | | | G | *APMX 11.5, Low resistance | General cutting | |
| QOGT1651R-G1 | ★ | | | G | *APMX 14.5, Low resistance | General cutting | |
| QOGT1856R-G1 | ★ | | | G | *APMX 16, Low resistance | General cutting | |
| QOGT2062R-G1 | ★ | | | G | *APMX 18, Low resistance | General cutting | |
| QOGT2576R-G1 | ★ | | | G | *APMX 23, Low resistance | General cutting | |
| QOMT0830R-M2 | ● | ● | ★ | M | *APMX 7.4 | General cutting | |
| QOMT1035R-M2 | ● | ● | ● | M | *APMX 9.2 | General cutting | |
| QOMT1342R-M2 | ● | ● | ● | M | *APMX 11.5 | General cutting | |
| QOMT1651R-M2 | ● | ● | ● | M | *APMX 14.5 | General cutting | |
| QOMT1856R-M2 | ★ | ★ | ★ | M | *APMX 16 | General cutting | |
| QOMT2062R-M2 | ★ | ★ | ★ | M | *APMX 18 | General cutting | |
| QOMT2576R-M2 | ★ | ★ | ★ | M | *APMX 23 | General cutting | |
| RPHT1040M0E4-L | ● | ● | ● | H | IC 10, Low resistance, High precision | Titanium alloys, Stainless steel | ARP |
| RPMT1040M0E8-L1 | ● | ● | ★ | M | IC10, General 8 corner | Titanium alloys, Stainless steel | |
| RPMT1040M0E4-L2 | ● | ● | ● | M | IC 10, Low resistance, High rigidity | Titanium alloys, Stainless steel | |
| RPHT1040M0E4-M | ● | ● | ● | H | IC10, General, High precision | General cutting | |
| RPMT1040M0E8-M1 | ● | ● | ● | M | IC10, General 8 corner | General cutting | |
| RPMT1040M0E4-M2 | ● | ● | ● | M | IC10, General, High rigidity | General cutting | |
| RPHT1040M0E4-R | ★ | ● | ● | H | IC10, Strong cutting edge, High precision | Interrupted cutting | |
| RPMT1040M0E8-R1 | ★ | ● | ● | M | IC10, General 8 corner | Interrupted cutting | |
| RPMT1040M0E4-R2 | ★ | ● | ● | M | IC10, Strong cutting edge | Interrupted cutting | |
| RPHT1248M0E4-L | ● | ● | ★ | H | IC 12, Low resistance, High precision | Titanium alloys, Stainless steel | |
| RPMT1248M0E8-L1 | ● | ● | ● | M | IC12, General 8 corner | Titanium alloys, Stainless steel | |
| RPMT1248M0E4-L2 | ● | ● | ● | M | IC 12, Low resistance, High rigidity | Titanium alloys, Stainless steel | |
| RPHT1248M0E4-M | ● | ● | ● | H | IC12, General, High precision | General cutting | |
| RPMT1248M0E8-M1 | ● | ● | ● | M | IC12, General 8 corner | General cutting | |
| RPMT1248M0E4-M2 | ● | ● | ● | M | IC12, General, High rigidity | General cutting | |
| RPHT1248M0E4-R | ★ | ● | ● | H | IC12, Strong cutting edge, High precision | Interrupted cutting | |
| RPMT1248M0E8-R1 | ★ | ● | ● | M | IC12, General 8 corner | Interrupted cutting | |
| RPMT1248M0E4-R2 | ★ | ● | ● | M | IC12, Strong cutting edge | Interrupted cutting | |



(10 inserts in one case.)
* This is the short edge type APMX.

● : Inventory maintained. ★ : Inventory maintained in Japan.

## MP1200 SERIES – INSERTS

| Order number | MP1220 | MP1230 | MP1240 | Class | Specifications | Note | Geometry |
|---|---|---|---|---|---|---|---|
| **Multi-Functional milling** | | | | | | | |
| XDGX175004PDER-GM | ● | | | G | Strong cutting edge, RE0.4 | High speed cutting | **AXD4000 AXD4000A** |
| XDGX175008PDER-GM | ● | | | G | Strong cutting edge, RE0.8 | High speed cutting | |
| XDGX175012PDER-GM | ● | | | G | Strong cutting edge, RE1.2 | High speed cutting | |
| XDGX175016PDER-GM | ● | | | G | Strong cutting edge, RE1.6 | High speed cutting |  |
| XDGX175020PDER-GM | ● | | | G | Strong cutting edge, RE2.0 | High speed cutting | |
| XDGX175024PDER-GM | ● | | | G | Strong cutting edge, RE2.4 | High speed cutting | |
| XDGX175030PDER-GM | ● | | | G | Strong cutting edge, RE3.0 | High speed cutting | |
| XDGX175032PDER-GM | ● | | | G | Strong cutting edge, RE3.2 | High speed cutting | |
| XDGX175040PDER-GM | ★ | | | G | Strong cutting edge, RE4.0 | High speed cutting | |
| XDGX175050PDER-GM | ● | | | G | Strong cutting edge, RE5.0 | High speed cutting | |
| XDGX227008PDER-GLA | ★ | | | G | Low resistance, RE0.8 | Dimensions after machining will be RE | **AXD7000** |
| XDGX227016PDER-GLA | ★ | | | G | Low resistance, RE1.6 | Dimensions after machining will be RE |  |
| RPMT08T2M0E-JS | ● | | | M | IC 8, Low resistance | High feed cutting | **BRP** |
| RPMT10T3M0E-JS | ★ | | | M | IC 10, Low resistance | High feed cutting | |
| RPMT1204M0E-JS | ★ | | | M | IC 12, Low resistance | High feed cutting | |
| RPMT1606M0E-JS | ● | | | M | IC 16, Low resistance | High feed cutting |  |
| RPMW10T3M0E | ★ | | | M | IC 10 | General cutting | |
| RPMW1204M0E | ● | | | M | IC 12 | General cutting | |
| RPMW1606M0E | ● | | | M | IC 16 | General cutting | |
| XDGT1550PDER-G04 | ★ | ★ | | G | RE0.4 | General cutting | **BXD4000** |
| XDGT1550PDER-G08 | ★ | ★ | | G | RE0.8 | General cutting | |
| XDGT1550PDER-G12 | ★ | ★ | | G | RE1.2 | General cutting | |
| XDGT1550PDER-G16 | ★ | ★ | | G | RE1.6 | General cutting |  |
| XDGT1550PDER-G20 | ★ | ★ | | G | RE2.0 | General cutting | |
| XDGT1550PDER-G30 | ★ | ★ | | G | RE3.0 | General cutting | |
| XDGT1550PDER-G32 | ★ | ★ | | G | RE3.2 | General cutting | |
| XDGT1550PDER-G40 | ★ | ★ | | G | RE4.0 | General cutting | |
| XDGT1550PDER-G50 | ★ | ★ | | G | RE5.0 | General cutting | |
| LOGU0904020PNER-L | ● | ● | ● | G | Low resistance, RE0.2 | Stable – General cutting | **VPX200** |
| LOGU0904040PNER-L | ● | ● | ● | G | Low resistance, RE0.4 | Stable – General cutting | |
| LOGU0904080PNER-L | ● | ● | ● | G | Low resistance, RE0.8 | Stable – General cutting | |
| LOGU0904100PNER-L | ● | ● | ★ | G | Low resistance, RE1.0 | Stable – General cutting | |
| LOGU0904120PNER-L | ★ | ★ | ★ | G | Low resistance, RE1.2 | Stable – General cutting |  |
| LOGU0904160PNER-L | ● | ● | ● | G | Low resistance, RE1.6 | Stable – General cutting | |
| LOGU0904020PNER-M | ● | ● | ● | G | RE0.2 | General – Unstable cutting | |
| LOGU0904040PNER-M | ● | ● | ● | G | RE0.4 | General – Unstable cutting | |
| LOGU0904080PNER-M | ● | ● | ● | G | RE0.8 | General – Unstable cutting | |
| LOGU0904100PNER-M | ● | ● | ● | G | RE1.0 | General – Unstable cutting | |
| LOGU0904120PNER-M | ● | ● | ● | G | RE1.2 | General – Unstable cutting | |
| LOGU0904160PNER-M | ● | ● | ● | G | RE1.6 | General – Unstable cutting | |

2/3

(10 inserts in one case.)



● : Inventory maintained. ★ : Inventory maintained in Japan.

## MP1200 SERIES – INSERTS

| Order number | MP1220 | MP1230 | MP1240 | Class | Specifications | Note | Geometry |
|---|---|---|---|---|---|---|---|
| **Multi-Functional milling** | | | | | | | |
| LOGU1207020PNER-L | ★ | ★ | ★ | G | Low resistance, RE0.2 | Stable – General cutting | **VPX300** |
| LOGU1207040PNER-L | ● | ● | ★ | G | Low resistance, RE0.4 | Stable – General cutting |  |
| LOGU1207080PNER-L | ● | ● | ● | G | Low resistance, RE0.8 | Stable – General cutting | |
| LOGU1207100PNER-L | ★ | ★ | ★ | G | Low resistance, RE1.0 | Stable – General cutting | |
| LOGU1207120PNER-L | ★ | ● | ★ | G | Low resistance, RE1.2 | Stable – General cutting | |
| LOGU1207160PNER-L | ★ | ★ | ★ | G | Low resistance, RE1.6 | Stable – General cutting | |
| LOGU1207200PNER-L | ★ | ● | ● | G | Low resistance, RE2.0 | Stable – General cutting | |
| LOGU1207240PNER-L | ★ | ★ | ★ | G | Low resistance, RE2.4 | Stable – General cutting | |
| LOGU1207300PNER-L | ★ | ★ | ★ | G | Low resistance, RE3.0 | Stable – General cutting | |
| LOGU1207320PNER-L | ★ | ★ | ★ | G | Low resistance, RE3.2 | Stable – General cutting | |
| LOGU1207020PNER-M | ● | ● | ★ | G | RE0.2 | General – Unstable cutting | |
| LOGU1207040PNER-M | ● | ● | ● | G | RE0.4 | General – Unstable cutting | |
| LOGU1207080PNER-M | ● | ● | ● | G | RE0.8 | General – Unstable cutting | |
| LOGU1207100PNER-M | ● | ● | ● | G | RE1.0 | General – Unstable cutting | |
| LOGU1207120PNER-M | ● | ● | ● | G | RE1.2 | General – Unstable cutting | |
| LOGU1207160PNER-M | ★ | ● | ● | G | RE1.6 | General – Unstable cutting | |
| LOGU1207200PNER-M | ● | ● | ● | G | RE2.0 | General – Unstable cutting | |
| LOGU1207240PNER-M | ● | ● | ★ | G | RE2.4 | General – Unstable cutting | |
| LOGU1207300PNER-M | ● | ● | ★ | G | RE3.0 | General – Unstable cutting | |
| LOGU1207320PNER-M | ● | ● | ● | G | RE3.2 | General – Unstable cutting | |
| JOMU090512ZZER-L | ● | ● | ● | M | Low resistance | Stable cutting, Titanium alloys | **WJX09** |
| JOMU090512ZZER-M | ● | ● | ● | M | General | General cutting |  |
| JOMU090512ZZER-R | ● | ● | ● | M | Strong cutting edge | Unstable cutting | |
| JOMU140715ZZER-L | ● | ● | ● | M | Low resistance | Stable cutting, Titanium alloys | **WJX14** |
| JOMU140715ZZER-M | ● | ● | ● | M | General | General cutting |  |
| JOMU140715ZZER-R | ● | ● | ● | M | Strong cutting edge | Unstable cutting | |

3/3

(10 inserts in one case.)

25 Vc



● : Inventory maintained. ★ : Inventory maintained in Japan.

## MP1200 SERIES – INSERTS

| Order number | MP1220 | MP1230 | MP1240 | Class | Specifications | Note | Geometry |
|---|---|---|---|---|---|---|---|
| **Deep Shoulder milling** | | | | | | | |
| JPMX140412-JM | ★ | ★ | | M | Straight cutting edge | Bottom cutting edge | SPX  |
| JPMX190412-JM | ● | ★ | | M | Straight cutting edge | Bottom cutting edge | |
| JPMX140412-WH | ★ | ★ | | M | Wavy cutting edge | Bottom cutting edge | |
| JPMX190412-WH | ★ | ★ | | M | Wavy cutting edge | Bottom cutting edge | |
| SPMX120408-JM | ★ | ★ | | M | Straight cutting edge | Peripheral cutting edge | SPX  |
| SPMX120408-WH | ★ | ★ | | M | Wavy cutting edge | Peripheral cutting edge | |

1/1

(10 inserts in one case.)

33 Vc

● : Inventory maintained. ★ : Inventory maintained in Japan.

## MP1200 SERIES – INSERTS

| Order number | MP1220 | MP1230 | MP1240 | Class | Specifications | Note | Geometry |
|---|---|---|---|---|---|---|---|
| **Copying** | | | | | | | |
| SRG16C | ★ | | | G | Reinforced edge, CEMR 8 | Inner | **SRM2** |
| SRG16E | ★ | | | G | Reinforced edge, CEMR 8 | Outer | |
| SRG20C | ● | | | G | Reinforced edge, CEMR 10 | Inner |  |
| SRG20E | ● | | | G | Reinforced edge, CEMR 10 | Outer | |
| SRG25C | ★ | | | G | Reinforced edge, CEMR 12.5 | Inner | |
| SRG25E | ★ | | | G | Reinforced edge, CEMR 12.5 | Outer | |
| SRG30C | ★ | | | G | Reinforced edge, CEMR 15 | Inner | |
| SRG30E | ★ | | | G | Reinforced edge, CEMR 15 | Outer | |
| SRG32C | ★ | | | G | Reinforced edge, CEMR 16 | Inner | |
| SRG32E | ★ | | | G | Reinforced edge, CEMR 16 | Outer | |
| SRM16C-M | ● | | | M | Low resistance, CEMR 8 | Inner | **SRM2** |
| SRM16E-M | ● | | | M | Low resistance, CEMR 8 | Outer | |
| SRM20C-M | ★ | | | M | Low resistance, CEMR 10 | Inner |  |
| SRM20E-M | ★ | | | M | Low resistance, CEMR 10 | Outer | |
| SRM25C-M | ★ | | | M | Low resistance, CEMR 12.5 | Inner | |
| SRM25E-M | ★ | | | M | Low resistance, CEMR 12.5 | Outer | |
| SRM30C-M | ★ | | | M | Low resistance, CEMR 15 | Inner | |
| SRM30E-M | ★ | | | M | Low resistance, CEMR 15 | Outer | |
| SRM32C-M | ● | | | M | Low resistance, CEMR 16 | Inner | |
| SRM32E-M | ● | | | M | Low resistance, CEMR 16 | Outer | |
| | | | | | | | 1/1 |

(10 inserts in one case.)

38 Vc



● : Inventory maintained. ★ : Inventory maintained in Japan.

## MP1200 SERIES – INSERTS

| Order number | MP1220 | MP1230 | MP1240 | Class | Specifications | Note | Geometry |
|---|---|---|---|---|---|---|---|
| **Spot milling** | | | | | | | |
| JPMT060204-E | ● | | | M | Parallelogram | General cutting | **CBJP**  |
| MPMT090308 | ★ | | | M | Rhombic geometry | General cutting | **CBMP**  |
| **Vertical feed milling** | | | | | | | |
| TPEW1303ZPER2 | ★ | | | E | IC 7.94 | General cutting | **PMF**  |
| CPMT1205ZPEN-M2 | ★ | | | M | IC 12.7 | General cutting | **PMR** |
| CPMT1205ZPEN-M3 | ★ | | | M | IC 12.7 | General cutting |  |

1/1

(10 inserts in one case.)

39 Vc

● : Inventory maintained. ★ : Inventory maintained in Japan.

# FACE MILLING

## RECOMMENDED CUTTING CONDITIONS

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| | **WSX445** | | | | | | | |
| P | Mild steel | ≤180HB | Dry | ● ◐ ✲ | — | 250 (200 – 300) | 240 (190 – 290) | — |
| | | | Wet | ● ◐ ✲ | — | 150 (100 – 200) | 150 (100 – 200) | — |
| | Carbon steel<br>Alloy steel | 180 – 350HB | Dry | ● ◐ ✲ | — | 220 (170 – 270) | 200 (150 – 250) | — |
| | | | Wet | ● ◐ ✲ | — | 120 ( 80 – 160) | 120 ( 80 – 160) | — |
| | Alloy tool steel | ≤350HB<br>Annealing | Dry | ● ◐ ✲ | — | 220 (170 – 270) | 200 (150 – 250) | — |
| | | | Wet | ● ◐ ✲ | — | 120 ( 80 – 160) | 120 ( 80 – 160) | — |
| | Pre-hardened steel | 35 – 45HRC | Dry | ● ◐ ✲ | — | 140 (100 – 180) | 120 ( 90 – 150) | — |
| | | | Wet | ● ◐ ✲ | — | 100 ( 80 – 120) | 100 ( 80 – 120) | — |
| M | Austenitic stainless steel | ≤200HB | Dry | ● ◐ ✲ | — | — | 200 (150 – 250) | 200 (150 – 250) |
| | | | Wet | ● ◐ ✲ | — | — | 130 ( 80 – 180) | 130 ( 80 – 180) |
| | | >200HB | Dry | ● ◐ ✲ | — | — | 170 (120 – 220) | 170 (120 – 220) |
| | | | Wet | ● ◐ ✲ | — | — | 100 ( 80 – 150) | 100 ( 80 – 150) |
| | Duplex stainless steel | ≤280HB | Dry | ● ◐ ✲ | — | — | 160 (110 – 210) | 160 (110 – 210) |
| | | | Wet | ● ◐ ✲ | — | — | 100 ( 80 – 150) | 100 ( 80 – 150) |
| | Precipitation hardening stainless steel | <450HB | Dry | ● ◐ ✲ | — | — | 150 (100 – 200) | 150 (100 – 200) |
| | | | Wet | ● ◐ ✲ | — | — | 90 ( 50 – 140) | 90 ( 50 – 140) |
| S | Titanium alloys | – | Wet | ● ◐ ✲ | — | 50 ( 40 – 60) | 50 ( 40 – 60) | 50 ( 40 – 60) |
| | Heat resistant alloys | – | Wet | ● ◐ ✲ | — | 40 ( 20 – 50) | 40 ( 20 – 50) | 40 ( 20 – 50) |
| | **ASX445** | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● ◐ ✲ | — | 250 (200 – 300) | 240 (190 – 290) | — |
| | Carbon steel<br>Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ ✲ | — | 220 (170 – 270) | 200 (150 – 230) | — |
| | | 280 – 350HB | | ● ◐ ✲ | — | 140 (100 – 180) | 120 ( 90 – 150) | — |
| M | Stainless steel | ≤270HB | Dry, Wet | ● ◐ ✲ | — | — | 220 (170 – 270) | 200 (150 – 250) |
| S | Titanium alloys | — | Wet | ● ◐ ✲ | — | 50 ( 40 – 60) | 45 ( 30 – 55) | 45 ( 30 – 55) |
| | Heat resistant alloys | — | Wet | ● ◐ ✲ | — | 40 ( 20 – 50) | 35 ( 15 – 45) | 35 ( 15 – 45) |
| | **AHX440S** | | | | | | | |
| P | Mild steel | ≤180HB | Dry | ● ◐ ✲ | — | 250 (200 – 300) | 240 (190 – 290) | — |
| | Carbon steel<br>Alloy steel | 180 – 280HB | Dry | ● ◐ ✲ | — | 220 (170 – 270) | 200 (150 – 250) | — |
| | | 280 – 350HB | | ● ◐ ✲ | — | 140 (100 – 180) | 120 ( 90 – 150) | — |
| | Alloy tool steel | ≤350HB Annealing | Dry | ● ◐ ✲ | — | 140 (100 – 180) | 120 ( 90 – 150) | — |
| | Pre-hardened steel | 35 – 45HRC | Dry | ● ◐ ✲ | — | 140 (100 – 180) | 120 ( 90 – 150) | — |
| M | Austenitic stainless steel | ≤200HB | Dry | ● ◐ ✲ | — | — | 200 (150 – 250) | 180 (120 – 230) |
| | | >200HB | | ● ◐ ✲ | — | — | 150 (100 – 200) | 130 ( 80 – 180) |
| | Ferritic and martensitic stainless steel | ≤200HB | Dry | ● ◐ ✲ | — | 200 (150 – 250) | 200 (150 – 250) | 180 (120 – 230) |
| | | >200HB | | ● ◐ ✲ | — | 150 (100 – 200) | 150 (100 – 200) | 130 ( 80 – 180) |
| | Duplex stainless steel | ≤280HB | Dry | ● ◐ ✲ | — | — | 140 (100 – 180) | 120 ( 80 – 160) |
| | Precipitation hardening stainless steel | <450HB | Dry | ● ◐ ✲ | — | — | 130 (100 – 160) | 110 ( 80 – 140) |
| | Austenitic stainless steel | ≤200HB | Wet | ● ◐ ✲ | — | — | 125 (100 – 150) | 100 ( 80 – 140) |
| | | >200HB | | ● ◐ ✲ | — | — | 100 ( 75 – 125) | 80 ( 55 – 105) |
| | Ferritic and martensitic stainless steel | ≤200HB | Wet | ● ◐ ✲ | — | 125 (100 – 150) | 125 (100 – 150) | 100 ( 80 – 140) |
| | | >200HB | | ● ◐ ✲ | — | 100 ( 75 – 125) | 100 ( 75 – 125) | 80 ( 55 – 105) |
| | Duplex stainless steel | ≤280HB | Wet | ● ◐ ✲ | — | — | 80 ( 60 – 100) | 60 ( 40 – 80) |
| | Precipitation hardening stainless steel | <450HB | Wet | ● ◐ ✲ | — | — | 70 ( 50 – 90) | 50 ( 30 – 70) |
| P | Mild steel | ≤180HB | Wiper | ● ◐ | — | 250 (200 – 300) | — | — |
| | Carbon steel<br>Alloy steel | 180 – 280HB | Wiper | ● ◐ | — | 220 (170 – 270) | — | — |
| | | 280 – 350HB | | ● ◐ | — | 140 (100 – 180) | — | — |
| | Alloy tool steel | ≤350HB Annealing | Wiper | ● ◐ | — | 140 (100 – 180) | — | — |
| | Pre-hardened steel | 35 – 45HRC | Wiper | ● ◐ | — | 140 (100 – 180) | — | — |





Cutting conditions : ● : Stable cutting ◐ : General cutting ✲ : Unstable cutting

## FACE MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| | **AHX475S** | | | | | | | |
| P | Mild steel | ≤180HB | Dry | ● ◐ ✣ | — | 150 (100 – 200) | 130 ( 80 – 180) | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry | ● ◐ ✣ | — | 130 ( 80 – 180) | 110 ( 60 – 160) | — |
| P | Carbon steel Alloy steel | 280 – 350HB | Dry | ● ◐ ✣ | — | 100 ( 50 – 150) | 80 ( 30 – 120) | — |
| P | Alloy tool steel | ≤350HB Annealing | Dry | ● ◐ ✣ | — | 100 ( 50 – 150) | 80 ( 30 – 120) | — |
| P | Pre-hardened steel | 35 – 45HRC | Dry | ● ◐ ✣ | — | 100 ( 70 – 130) | 80 ( 50 – 110) | — |
| | **AHX640S** | | | | | | | |
| P | Mild steel | ≤180HB | Dry | ● ◐ ✣ | — | 250 (200 – 300) | 220 (170 – 270) | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry | ● ◐ ✣ | — | 220 (170 – 270) | 190 (140 – 240) | — |
| P | Carbon steel Alloy steel | 280 – 350HB | Dry | ● ◐ ✣ | — | 140 (100 – 180) | 110 ( 70 – 150) | — |
| P | Alloy tool steel | ≤350HB Annealing | Dry | ● ◐ ✣ | — | 140 (100 – 180) | 110 ( 70 – 150) | — |
| P | Pre-hardened steel | 35 – 45HRC | Dry | ● ◐ ✣ | — | 140 (100 – 180) | 110 ( 70 – 150) | — |
| S | Titanium alloys | — | Wet | ● ◐ ✣ | — | 60 ( 50 – 70) | 40 ( 20 – 50) | 40 ( 20 – 50) |
| S | Heat resistant alloys | — | Wet | ● ◐ ✣ | — | 60 ( 50 – 70) | 40 ( 20 – 50) | 40 ( 20 – 50) |
| P | Mild steel | ≤180HB | Wiper | ● | — | 250 (200 – 300) | — | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Wiper | ● | — | 220 (170 – 270) | — | — |
| P | Carbon steel Alloy steel | 280 – 350HB | Wiper | ● | — | 140 (100 – 180) | — | — |



Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

# SHOULDER MILLING

## RECOMMENDED CUTTING CONDITIONS

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **WWX200** | | | | | | | | |
| P | Mild steel | ≤180HB | Dry | ● | 0.5DC≥ | 240 (200 – 280) | — | — |
| | | | | ● | 0.8DC≥ | 220 (180 – 260) | — | — |
| | | | | ● | DC | 200 (160 – 240) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 230 (190 – 270) | — |
| | | | | ◐ | 0.8DC≥ | — | 210 (170 – 250) | — |
| | | | | ◐ | DC | — | 190 (150 – 230) | — |
| | | | | ✣ | 0.5DC≥ | — | 210 (170 – 250) | — |
| | | | | ✣ | 0.8DC≥ | — | 190 (150 – 230) | — |
| | | | | ✣ | DC | — | 170 (130 – 210) | — |
| | Carbon steel<br>Alloy steel | 180 – 280HB | Dry | ● | 0.5DC≥ | 210 (170 – 250) | — | — |
| | | | | ● | 0.8DC≥ | 190 (150 – 230) | — | — |
| | | | | ● | DC | 170 (130 – 210) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 200 (160 – 240) | — |
| | | | | ◐ | 0.8DC≥ | — | 180 (140 – 220) | — |
| | | | | ◐ | DC | — | 160 (120 – 200) | — |
| | | | | ✣ | 0.5DC≥ | — | 180 (140 – 220) | — |
| | | | | ✣ | 0.8DC≥ | — | 160 (120 – 200) | — |
| | | | | ✣ | DC | — | 140 (100 – 180) | — |
| | | 280 – 350HB | | ● | 0.5DC≥ | 200 (160 – 240) | — | — |
| | | | | ● | 0.8DC≥ | 180 (140 – 220) | — | — |
| | | | | ● | DC | 170 (130 – 210) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 190 (150 – 230) | — |
| | | | | ◐ | 0.8DC≥ | — | 170 (130 – 210) | — |
| | | | | ◐ | DC | — | 150 (110 – 190) | — |
| | | | | ✣ | 0.5DC≥ | — | 170 (130 – 210) | — |
| | | | | ✣ | 0.8DC≥ | — | 150 (110 – 190) | — |
| | | | | ✣ | DC | — | 130 ( 90 – 170) | — |
| | Alloy tool steel | ≤350HB<br>Annealing | Dry | ● | 0.5DC≥ | 200 (160 – 240) | — | — |
| | | | | ● | 0.8DC≥ | 180 (140 – 220) | — | — |
| | | | | ● | DC | 170 (130 – 210) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 190 (150 – 230) | — |
| | | | | ◐ | 0.8DC≥ | — | 170 (130 – 210) | — |
| | | | | ◐ | DC | — | 150 (110 – 190) | — |
| | | | | ✣ | 0.5DC≥ | — | 170 (130 – 210) | — |
| | | | | ✣ | 0.8DC≥ | — | 150 (110 – 190) | — |
| | | | | ✣ | DC | — | 130 ( 90 – 170) | — |
| | Pre-hardened steel | 35 – 45HRC | Dry | ● | 0.5DC≥ | 140 (120 – 160) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 120 (100 – 140) | — |
| | | | | ✣ | 0.5DC≥ | — | 110 ( 90 – 130) | — |





Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## SHOULDER MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **WWX200** | | | | | | | | |
| M | Austenitic stainless steel | ≤200HB | Dry | ● | 0.5DC≥ | — | 180 (160 – 200) | — |
| | | | | ● | 0.8DC≥ | — | 160 (140 – 180) | — |
| | | | | ◐ | 0.5DC≥ | — | 170 (150 – 190) | — |
| | | | | ◐ | 0.8DC≥ | — | 150 (130 – 170) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 150 (130 – 170) |
| | | | | ✣ | 0.8DC≥ | — | — | 130 (110 – 150) |
| | | >200HB | | ● | 0.5DC≥ | — | 170 (150 – 190) | — |
| | | | | ● | 0.8DC≥ | — | 150 (130 – 170) | — |
| | | | | ◐ | 0.5DC≥ | — | 160 (140 – 180) | — |
| | | | | ◐ | 0.8DC≥ | — | 140 (120 – 160) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 140 (120 – 160) |
| | | | | ✣ | 0.8DC≥ | — | — | 120 (100 – 140) |
| | Ferritic and martensitic stainless steel | ≤200HB | Dry | ● | 0.5DC≥ | 180 (160 – 200) | 180 (160 – 200) | — |
| | | | | ● | 0.8DC≥ | 160 (140 – 180) | 160 (140 – 180) | — |
| | | | | ◐ | 0.5DC≥ | — | 170 (150 – 190) | — |
| | | | | ◐ | 0.8DC≥ | — | 150 (130 – 170) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 150 (130 – 170) |
| | | | | ✣ | 0.8DC≥ | — | — | 130 (110 – 150) |
| | Duplex stainless steel | ≤280HB | Dry | ● | 0.5DC≥ | — | 160 (140 – 180) | — |
| | | | | ● | 0.8DC≥ | — | 140 (120 – 160) | — |
| | | | | ◐ | 0.5DC≥ | — | 150 (130 – 170) | — |
| | | | | ◐ | 0.8DC≥ | — | 130 (110 – 150) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 130 (110 – 150) |
| | | | | ✣ | 0.8DC≥ | — | — | 110 ( 90 – 130) |
| | Precipitation hardening stainless steel | <450HB | Dry | ● | 0.5DC≥ | — | 140 (120 – 160) | — |
| | | | | ◐ | 0.5DC≥ | — | 130 (110 – 150) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 110 ( 90 – 130) |



Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## SHOULDER MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| | **WWX200** | | | | | | | |
| P | Mild steel | ≤180HB | Wet | ● | 0.5DC≥ | 150 (140 – 160) | — | — |
| | | | | ● | 0.8DC≥ | 130 (120 – 140) | — | — |
| | | | | ● | DC | 120 (110 – 130) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 140 (130 – 150) | — |
| | | | | ◐ | 0.8DC≥ | — | 120 (110 – 130) | — |
| | | | | ◐ | DC | — | 110 (100 – 120) | — |
| | | | | ✣ | 0.5DC≥ | — | 120 (110 – 130) | — |
| | | | | ✣ | 0.8DC≥ | — | 100 ( 90 – 110) | — |
| | | | | ✣ | DC | — | 90 ( 80 – 100) | — |
| | Carbon steel<br>Alloy steel | 180 – 280HB | Wet | ● | 0.5DC≥ | 150 (140 – 160) | — | — |
| | | | | ● | 0.8DC≥ | 130 (120 – 140) | — | — |
| | | | | ● | DC | 120 (110 – 130) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 140 (130 – 150) | — |
| | | | | ◐ | 0.8DC≥ | — | 120 (110 – 130) | — |
| | | | | ◐ | DC | — | 110 (100 – 120) | — |
| | | | | ✣ | 0.5DC≥ | — | 120 (110 – 130) | — |
| | | | | ✣ | 0.8DC≥ | — | 90 ( 80 – 100) | — |
| | | | | ✣ | DC | — | 80 ( 70 – 90) | — |
| | | ——— | | ● | 0.5DC≥ | 140 (130 – 150) | — | — |
| | | | | ● | 0.8DC≥ | 120 (110 – 130) | — | — |
| | | | | ● | DC | 110 (100 – 120) | — | — |
| | | 280 – 350HB | | ◐ | 0.5DC≥ | — | 130 (120 – 140) | — |
| | | | | ◐ | 0.8DC≥ | — | 110 (100 – 120) | — |
| | | | | ◐ | DC | — | 100 ( 90 – 110) | — |
| | | | | ✣ | 0.5DC≥ | — | 110 (100 – 120) | — |
| | | | | ✣ | 0.8DC≥ | — | 90 ( 80 – 100) | — |
| | | | | ✣ | DC | — | 80 ( 70 – 90) | — |
| | Alloy tool steel | ≤350HB<br>Annealing | Wet | ● | 0.5DC≥ | 140 (130 – 150) | — | — |
| | | | | ● | 0.8DC≥ | 120 (110 – 130) | — | — |
| | | | | ● | DC | 110 (100 – 120) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 130 (120 – 140) | — |
| | | | | ◐ | 0.8DC≥ | — | 110 (100 – 120) | — |
| | | | | ◐ | DC | — | 100 ( 90 – 110) | — |
| | | | | ✣ | 0.5DC≥ | — | 110 (100 – 120) | — |
| | | | | ✣ | 0.8DC≥ | — | 90 ( 80 – 100) | — |
| | | | | ✣ | DC | — | 80 ( 70 – 90) | — |
| | Pre-hardened steel | 35 – 45HRC | Wet | ● | 0.5DC≥ | 110 (100 – 120) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 100 ( 90 – 110) | — |
| | | | | ✣ | 0.5DC≥ | — | 80 ( 70 – 90) | — |





Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## SHOULDER MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **WWX200** | | | | | | | | |
| M | Austenitic stainless steel | ≤200HB | Wet | ● | 0.5DC≥ | — | 130 (120 – 140) | — |
| | | | | ● | 0.8DC≥ | — | 110 (100 – 120) | — |
| | | | | ◐ | 0.5DC≥ | — | 120 (110 – 130) | — |
| | | | | ◐ | 0.8DC≥ | — | 100 ( 90 – 110) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 100 ( 90 – 110) |
| | | | | ✣ | 0.8DC≥ | — | — | 80 ( 70 – 90) |
| | | >200HB | | ● | 0.5DC≥ | — | 130 (120 – 140) | — |
| | | | | ● | 0.8DC≥ | — | 110 (100 – 120) | — |
| | | | | ◐ | 0.5DC≥ | — | 120 (110 – 130) | — |
| | | | | ◐ | 0.8DC≥ | — | 100 ( 90 – 110) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 100 ( 90 – 110) |
| | | | | ✣ | 0.8DC≥ | — | — | 80 ( 70 – 90) |
| | Ferritic and martensitic stainless steel | ≤200HB | Wet | ● | 0.5DC≥ | 130 (120 – 140) | 130 (120 – 140) | — |
| | | | | ● | 0.8DC≥ | 110 (100 – 120) | 110 (100 – 120) | — |
| | | | | ◐ | 0.5DC≥ | — | 120 (110 – 130) | — |
| | | | | ◐ | 0.8DC≥ | — | 100 ( 90 – 110) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 100 ( 90 – 110) |
| | | | | ✣ | 0.8DC≥ | — | — | 80 ( 70 – 90) |
| | Duplex stainless steel | ≤280HB | Wet | ● | 0.5DC≥ | — | 120 (110 – 130) | — |
| | | | | ● | 0.8DC≥ | — | 100 ( 90 – 110) | — |
| | | | | ◐ | 0.5DC≥ | — | 110 (100 – 120) | — |
| | | | | ◐ | 0.8DC≥ | — | 90 ( 80 – 100) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 90 ( 80 – 100) |
| | | | | ✣ | 0.8DC≥ | — | — | 70 ( 60 – 80) |
| | Precipitation hardening stainless steel | <450HB | Wet | ● | 0.5DC≥ | — | 120 (110 – 130) | — |
| | | | | ◐ | 0.5DC≥ | — | 110 (100 – 120) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 90 ( 80 – 100) |
| S | Titanium alloys | — | Wet | ● | 0.5DC≥ | 80 ( 60 – 100) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 70 ( 50 – 90) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 60 ( 40 – 80) |
| | Heat resistant alloys | — | Wet | ● | 0.5DC≥ | 60 ( 50 – 70) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 50 ( 30 – 60) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 40 ( 20 – 40) |

4/9

Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## SHOULDER MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| | **WWX400** | | | | | | | |
| P | Mild steel | ≤180HB | Dry | ● | 0.5DC≥ | 240 (200 – 280) | — | — |
| | | | | ● | 0.8DC≥ | 220 (180 – 260) | — | — |
| | | | | ● | DC | 200 (160 – 240) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 230 (190 – 270) | — |
| | | | | ◐ | 0.8DC≥ | — | 210 (170 – 250) | — |
| | | | | ◐ | DC | — | 190 (150 – 230) | — |
| | | | | ✣ | 0.5DC≥ | — | 210 (170 – 250) | — |
| | | | | ✣ | 0.8DC≥ | — | 190 (150 – 230) | — |
| | | | | ✣ | DC | — | 170 (130 – 210) | — |
| | Carbon steel<br>Alloy steel | 180 – 280HB | Dry | ● | 0.5DC≥ | 210 (170 – 250) | — | — |
| | | | | ● | 0.8DC≥ | 190 (150 – 230) | — | — |
| | | | | ● | DC | 170 (130 – 210) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 200 (160 – 240) | — |
| | | | | ◐ | 0.8DC≥ | — | 180 (140 – 220) | — |
| | | | | ◐ | DC | — | 160 (120 – 200) | — |
| | | | | ✣ | 0.5DC≥ | — | 180 (140 – 220) | — |
| | | | | ✣ | 0.8DC≥ | — | 160 (120 – 200) | — |
| | | | | ✣ | DC | — | 140 (100 – 180) | — |
| | | 280 – 350HB | | ● | 0.5DC≥ | 200 (160 – 240) | — | — |
| | | | | ● | 0.8DC≥ | 180 (140 – 220) | — | — |
| | | | | ● | DC | 160 (120 – 200) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 190 (150 – 230) | — |
| | | | | ◐ | 0.8DC≥ | — | 170 (130 – 210) | — |
| | | | | ◐ | DC | — | 150 (110 – 190) | — |
| | | | | ✣ | 0.5DC≥ | — | 170 (130 – 210) | — |
| | | | | ✣ | 0.8DC≥ | — | 150 (110 – 190) | — |
| | | | | ✣ | DC | — | 130 ( 90 – 170) | — |
| | Alloy tool steel | ≤350HB<br>Annealing | Dry | ● | 0.5DC≥ | 200 (160 – 240) | — | — |
| | | | | ● | 0.8DC≥ | 180 (140 – 220) | — | — |
| | | | | ● | DC | 160 (120 – 200) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 190 (150 – 230) | — |
| | | | | ◐ | 0.8DC≥ | — | 170 (130 – 210) | — |
| | | | | ◐ | DC | — | 150 (110 – 190) | — |
| | | | | ✣ | 0.5DC≥ | — | 170 (130 – 210) | — |
| | | | | ✣ | 0.8DC≥ | — | 150 (110 – 190) | — |
| | | | | ✣ | DC | — | 130 ( 90 – 170) | — |
| | Pre-hardened steel | 35 – 45HRC | Dry | ● | 0.5DC≥ | 140 (120 – 160) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 120 (100 – 140) | — |
| | | | | ✣ | 0.5DC≥ | — | 110 ( 90 – 130) | — |





Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## SHOULDER MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **WWX400** | | | | | | | | |
| M | Austenitic stainless steel | ≤200HB | Dry | ● | 0.5DC≥ | — | 180 (160 – 200) | — |
| | | | | ● | 0.8DC≥ | — | 160 (140 – 180) | — |
| | | | | ◐ | 0.5DC≥ | — | 170 (150 – 190) | — |
| | | | | ◐ | 0.8DC≥ | — | 150 (130 – 170) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 150 (130 – 170) |
| | | | | ✣ | 0.8DC≥ | — | — | 130 (110 – 150) |
| | | >200HB | | ● | 0.5DC≥ | — | 170 (150 – 190) | — |
| | | | | ● | 0.8DC≥ | — | 150 (130 – 170) | — |
| | | | | ◐ | 0.5DC≥ | — | 160 (140 – 180) | — |
| | | | | ◐ | 0.8DC≥ | — | 140 (120 – 160) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 140 (120 – 160) |
| | | | | ✣ | 0.8DC≥ | — | — | 120 (100 – 140) |
| | Ferritic and martensitic stainless steel | ≤200HB | Dry | ● | 0.5DC≥ | 180 (160 – 200) | 180 (160 – 200) | — |
| | | | | ● | 0.8DC≥ | 160 (140 – 180) | 160 (140 – 180) | — |
| | | | | ◐ | 0.5DC≥ | — | 170 (150 – 190) | — |
| | | | | ◐ | 0.8DC≥ | — | 150 (130 – 170) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 150 (130 – 170) |
| | | | | ✣ | 0.8DC≥ | — | — | 130 (110 – 150) |
| | Duplex stainless steel | ≤280HB | Dry | ● | 0.5DC≥ | — | 160 (140 – 180) | — |
| | | | | ● | 0.8DC≥ | — | 140 (120 – 160) | — |
| | | | | ◐ | 0.5DC≥ | — | 150 (130 – 170) | — |
| | | | | ◐ | 0.8DC≥ | — | 130 (110 – 150) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 130 (110 – 150) |
| | | | | ✣ | 0.8DC≥ | — | — | 110 ( 90 – 130) |
| | Precipitation hardening stainless steel | <450HB | Dry | ● | 0.5DC≥ | — | 140 (120 – 160) | — |
| | | | | ◐ | 0.5DC≥ | — | 130 (110 – 150) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 110 ( 90 – 130) |



Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## SHOULDER MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **WWX400** | | | | | | | | |
| P | Mild steel | ≤180HB | Wet | ● | 0.5DC≥ | 150 (140 – 160) | — | — |
| | | | | ● | 0.8DC≥ | 130 (120 – 140) | — | — |
| | | | | ● | DC | 120 (110 – 130) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 140 (130 – 150) | — |
| | | | | ◐ | 0.8DC≥ | — | 120 (110 – 130) | — |
| | | | | ◐ | DC | — | 110 (100 – 120) | — |
| | | | | ✣ | 0.5DC≥ | — | 120 (110 – 130) | — |
| | | | | ✣ | 0.8DC≥ | — | 100 ( 90 – 110) | — |
| | | | | ✣ | DC | — | 90 ( 80 – 100) | — |
| | Carbon steel<br>Alloy steel | 180 – 280HB | Wet | ● | 0.5DC≥ | 150 (140 – 160) | — | — |
| | | | | ● | 0.8DC≥ | 130 (120 – 140) | — | — |
| | | | | ● | DC | 120 (110 – 130) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 140 (130 – 150) | — |
| | | | | ◐ | 0.8DC≥ | — | 120 (110 – 130) | — |
| | | | | ◐ | DC | — | 110 (100 – 120) | — |
| | | | | ✣ | 0.5DC≥ | — | 120 (110 – 130) | — |
| | | | | ✣ | 0.8DC≥ | — | 100 ( 90 – 110) | — |
| | | | | ✣ | DC | — | 90 ( 80 – 100) | — |
| | | 280 – 350HB | | ● | 0.5DC≥ | 140 (130 – 150) | — | — |
| | | | | ● | 0.8DC≥ | 120 (110 – 130) | — | — |
| | | | | ● | DC | 110 (100 – 120) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 130 (120 – 140) | — |
| | | | | ◐ | 0.8DC≥ | — | 110 (100 – 120) | — |
| | | | | ◐ | DC | — | 100 ( 90 – 110) | — |
| | | | | ✣ | 0.5DC≥ | — | 110 (100 – 120) | — |
| | | | | ✣ | 0.8DC≥ | — | 90 ( 80 – 100) | — |
| | | | | ✣ | DC | — | 80 ( 70 – 90) | — |
| | Alloy tool steel | ≤350HB<br>Annealing | Wet | ● | 0.5DC≥ | 140 (130 – 150) | — | — |
| | | | | ● | 0.8DC≥ | 120 (110 – 130) | — | — |
| | | | | ● | DC | 110 (100 – 120) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 130 (120 – 140) | — |
| | | | | ◐ | 0.8DC≥ | — | 110 (100 – 120) | — |
| | | | | ◐ | DC | — | 100 ( 90 – 110) | — |
| | | | | ✣ | 0.5DC≥ | — | 110 (100 – 120) | — |
| | | | | ✣ | 0.8DC≥ | — | 90 ( 80 – 100) | — |
| | | | | ✣ | DC | — | 80 ( 70 – 90) | — |
| | Pre-hardened steel | 35 – 45HRC | Wet | ● | 0.5DC≥ | 110 (100 – 120) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 100 ( 90 – 110) | — |
| | | | | ✣ | 0.5DC≥ | — | 80 ( 70 – 90) | — |

7/9



Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## SHOULDER MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **WWX400** | | | | | | | | |
| M | Austenitic stainless steel | ≤200HB | Wet | ● | 0.5DC≥ | — | 130 (120 – 140) | — |
| | | | | ● | 0.8DC≥ | — | 110 (100 – 120) | — |
| | | | | ◐ | 0.5DC≥ | — | 120 (110 – 130) | — |
| | | | | ◐ | 0.8DC≥ | — | 100 ( 90 – 110) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 100 ( 90 – 110) |
| | | | | ✣ | 0.8DC≥ | — | — | 80 ( 70 – 90) |
| | | >200HB | | ● | 0.5DC≥ | — | 130 (120 – 140) | — |
| | | | | ● | 0.8DC≥ | — | 110 (100 – 120) | — |
| | | | | ◐ | 0.5DC≥ | — | 120 (110 – 130) | — |
| | | | | ◐ | 0.8DC≥ | — | 100 ( 90 – 110) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 100 ( 90 – 110) |
| | | | | ✣ | 0.8DC≥ | — | — | 80 ( 70 – 90) |
| | Ferritic and martensitic stainless steel | ≤200HB | Wet | ● | 0.5DC≥ | 130 (120 – 140) | 130 (120 – 140) | — |
| | | | | ● | 0.8DC≥ | 110 (100 – 120) | 110 (100 – 120) | — |
| | | | | ◐ | 0.5DC≥ | — | 120 (110 – 130) | — |
| | | | | ◐ | 0.8DC≥ | — | 100 ( 90 – 110) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 100 ( 90 – 110) |
| | | | | ✣ | 0.8DC≥ | — | — | 80 ( 70 – 90) |
| | Duplex stainless steel | ≤280HB | Wet | ● | 0.5DC≥ | — | 120 (110 – 130) | — |
| | | | | ● | 0.8DC≥ | — | 100 ( 90 – 110) | — |
| | | | | ◐ | 0.5DC≥ | — | 110 (100 – 120) | — |
| | | | | ◐ | 0.8DC≥ | — | 90 ( 80 – 100) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 90 ( 80 – 100) |
| | | | | ✣ | 0.8DC≥ | — | — | 70 ( 60 – 80) |
| | Precipitation hardening stainless steel | <450HB | Wet | ● | 0.5DC≥ | — | 120 (110 – 130) | — |
| | | | | ◐ | 0.5DC≥ | — | 110 (100 – 120) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 90 ( 80 – 100) |
| S | Titanium alloys | — | Wet | ● | 0.5DC≥ | 80 ( 60 – 100) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 70 ( 50 – 90) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 60 ( 40 – 80) |
| | Heat resistant alloys | — | Wet | ● | 0.5DC≥ | 60 ( 50 – 70) | — | — |
| | | | | ◐ | 0.5DC≥ | — | 50 ( 30 – 60) | — |
| | | | | ✣ | 0.5DC≥ | — | — | 40 ( 20 – 40) |
| **VOX400** | | | | | | | | |
| K | Gray cast iron | ≤200MPa | Dry, Wet | ● ◐ | — | 250 (200 – 300) | — | — |
| | | ≤350MPa | | ● ◐ | — | 200 (150 – 300) | — | — |
| | Ductile cast iron | ≤450MPa | Dry, Wet | ● ◐ | — | 170 (150 – 200) | — | — |
| | | ≤800MPa | | ● ◐ | — | 150 (100 – 200) | — | — |

8/9

Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## SHOULDER MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| | **ASX300** | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● ◐ ✣ | — | 250 (200 – 300) | 240 (190 – 290) | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ ✣ | — | 220 (170 – 270) | 180 (150 – 230) | — |
| P | Carbon steel Alloy steel | 280 – 350HB | Dry, Wet | ● ◐ ✣ | — | 140 (100 – 180) | 120 ( 90 – 150) | — |
| M | Stainless steel | — | Dry, Wet | ● ◐ ✣ | — | — | 220 (170 – 270) | 200 (150 – 250) |
| S | Titanium alloys | — | Wet | ● ◐ ✣ | — | 50 ( 40 – 60) | 45 ( 30 – 55) | 45 ( 30 – 55) |
| S | Heat resistant alloys | — | Wet | ● ◐ ✣ | — | 40 ( 20 – 50) | 30 ( 15 – 45) | 30 ( 15 – 45) |
| | **ASX400** | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● ◐ ✣ | — | 250 (200 – 300) | 240 (190 – 290) | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ ✣ | — | 220 (170 – 270) | 180 (150 – 230) | — |
| P | Carbon steel Alloy steel | 280 – 350HB | Dry, Wet | ● ◐ ✣ | — | 140 (100 – 180) | 120 ( 90 – 150) | — |
| M | Stainless steel | ≤270HB | Dry, Wet | ● ◐ ✣ | — | — | 220 (170 – 270) | 200 (150 – 250) |
| S | Titanium alloys | — | Wet | ● | — | 50 ( 40 – 60) | — | — |
| S | Titanium alloys | — | Wet | ◐ ✣ | — | — | 45 ( 30 – 55) | 45 ( 30 – 55) |
| S | Heat resistant alloys | — | Wet | ● | — | 40 ( 20 – 50) | — | — |
| S | Heat resistant alloys | — | Wet | ◐ ✣ | — | — | 35 ( 15 – 45) | 35 ( 15 – 45) |

9/9

# SIDE CUTTER

## RECOMMENDED CUTTING CONDITIONS

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| | **DCV4** | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Shoulder | ● ◐ | — | 150 (130 – 180) | — | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Shoulder | ● ◐ | — | 150 (130 – 180) | — | — |
| P | Mild steel | ≤180HB | Dry, Centre cut | ● ◐ | — | 150 (130 – 180) | — | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Centre cut | ● ◐ | — | 150 (130 – 180) | — | — |

1/1



Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

# MULTI-FUNCTIONAL MILLING

## RECOMMENDED CUTTING CONDITIONS

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **VPX200** | | | | | | | | |
| P | Mild steel | ≤180HB | Dry | ● ◐ | ≤0.25DC | 230 (180 – 270) | — | — |
| | | | | ● ◐ | 0.25–0.5DC | 220 (170 – 260) | — | — |
| | | | | ● ◐ | 0.5–0.75DC | 180 (140 – 210) | — | — |
| | | | | ● ◐ | DC | 180 (140 – 210) | — | — |
| | | | | ✣ | ≤0.25DC | — | 200 (150 – 240) | — |
| | | | | ✣ | 0.25–0.5DC | — | 190 (140 – 230) | — |
| | | | | ✣ | 0.5–0.75DC | — | 150 (110 – 180) | — |
| | | | | ✣ | DC | — | 150 (110 – 180) | — |
| | Carbon steel<br>Alloy steel | 180 – 280HB | Dry | ● ◐ | ≤0.25DC | 180 (140 – 210) | — | — |
| | | | | ● ◐ | 0.25–0.5DC | 170 (130 – 200) | — | — |
| | | | | ● ◐ | 0.5–0.75DC | 140 (110 – 160) | — | — |
| | | | | ● ◐ | DC | 140 (110 – 160) | — | — |
| | | | | ✣ | ≤0.25DC | — | 150 (110 – 180) | — |
| | | | | ✣ | 0.25–0.5DC | — | 140 (100 – 170) | — |
| | | | | ✣ | 0.5–0.75DC | — | 110 ( 80 – 130) | — |
| | | | | ✣ | DC | — | 110 ( 80 – 130) | — |
| | | 280 – 350HB | | ● ◐ | ≤0.25DC | 180 (140 – 210) | — | — |
| | | | | ● ◐ | 0.25–0.5DC | 170 (130 – 200) | — | — |
| | | | | ● ◐ | 0.5–0.75DC | 140 (110 – 160) | — | — |
| | | | | ● ◐ | DC | 140 (110 – 160) | — | — |
| | | | | ✣ | ≤0.25DC | — | 150 (110 – 180) | — |
| | | | | ✣ | 0.25–0.5DC | — | 140 (100 – 170) | — |
| | | | | ✣ | 0.5–0.75DC | — | 110 ( 80 – 130) | — |
| | | | | ✣ | DC | — | 110 ( 80 – 130) | — |
| | Alloy tool steel | ≤350HB<br>Annealing | Dry | ● ◐ | ≤0.25DC | 180 (140 – 210) | — | — |
| | | | | ● ◐ | 0.25–0.5DC | 170 (130 – 200) | — | — |
| | | | | ● ◐ | 0.5–0.75DC | 140 (110 – 160) | — | — |
| | | | | ● ◐ | DC | 140 (110 – 160) | — | — |
| | | | | ✣ | ≤0.25DC | — | 150 (110 – 180) | — |
| | | | | ✣ | 0.25–0.5DC | — | 140 (100 – 170) | — |
| | | | | ✣ | 0.5–0.75DC | — | 110 ( 80 – 130) | — |
| | | | | ✣ | DC | — | 110 ( 80 – 130) | — |
| | Pre-hardened steel | 35 – 45HRC | Dry | ● ◐ | ≤0.25DC | 120 ( 90 – 140) | — | — |
| | | | | ● ◐ | 0.25–0.5DC | 110 ( 80 – 130) | — | — |
| | | | | ● ◐ | 0.5–0.75DC | 100 ( 70 – 120) | — | — |
| | | | | ● ◐ | DC | 100 ( 70 – 120) | — | — |
| | | | | ✣ | ≤0.25DC | — | 100 ( 80 – 120) | — |
| | | | | ✣ | 0.25–0.5DC | — | 90 ( 70 – 110) | — |
| | | | | ✣ | 0.5–0.75DC | — | 80 ( 60 – 100) | — |
| | | | | ✣ | DC | — | 80 ( 60 – 100) | — |



Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## MULTI-FUNCTIONAL MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| | **VPX200** | | | | | | | |
| M | Austenitic stainless steel | ≤200HB | Dry | ● ◐ ✣ | ≤0.25DC | — | 180 (140 – 210) | 180 (140 – 210) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 170 (130 – 200) | 170 (130 – 200) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 140 (110 – 160) | 140 (110 – 160) |
| | | | | ● ◐ ✣ | DC | — | 140 (110 – 160) | 140 (110 – 160) |
| | | >200HB | | ● ◐ ✣ | ≤0.25DC | — | 150 (110 – 180) | 150 (110 – 180) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 140 (100 – 160) | 140 (100 – 160) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 110 ( 80 – 130) | 110 ( 80 – 130) |
| | | | | ● ◐ ✣ | DC | — | 110 ( 80 – 130) | 110 ( 80 – 130) |
| | Ferritic and martensitic stainless steel | ≤200HB | Dry | ● ◐ ✣ | ≤0.25DC | 180 (140 – 210) | 180 (140 – 210) | — |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 170 (130 – 200) | 170 (130 – 200) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 140 (110 – 160) | 140 (110 – 160) | — |
| | | | | ● ◐ ✣ | DC | 140 (110 – 160) | 140 (110 – 160) | — |
| | Duplex stainless steel | ≤280HB | Dry | ● ◐ ✣ | ≤0.25DC | — | 140 (110 – 170) | 140 (110 – 170) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 130 ( 90 – 150) | 130 ( 90 – 150) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 100 ( 70 – 120) | 100 ( 70 – 120) |
| | | | | ● ◐ ✣ | DC | — | 100 ( 70 – 120) | 100 ( 70 – 120) |
| | Precipitation hardening stainless steel | <450HB | Dry | ● ◐ ✣ | ≤0.25DC | — | 130 (100 – 160) | 130 (100 – 160) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 120 ( 80 – 140) | 120 ( 80 – 140) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 90 ( 60 – 110) | 90 ( 60 – 110) |
| | | | | ● ◐ ✣ | DC | — | 90 ( 60 – 110) | 90 ( 60 – 110) |
| P | Mild steel | ≤180HB | Wet | ● ◐ ✣ | ≤0.25DC | 140 (100 – 190) | 140 (100 – 190) | — |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 130 ( 90 – 180) | 130 ( 90 – 180) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | | | | ● ◐ ✣ | DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | Carbon steel Alloy steel | 180 – 280HB | Wet | ● ◐ ✣ | ≤0.25DC | 120 ( 90 – 140) | 120 ( 90 – 140) | — |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 110 ( 80 – 130) | 110 ( 80 – 130) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | | | | ● ◐ ✣ | DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | | 280 – 350HB | | ● ◐ ✣ | ≤0.25DC | 120 ( 90 – 140) | 120 ( 90 – 140) | — |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 110 ( 80 – 130) | 110 ( 80 – 130) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | | | | ● ◐ ✣ | DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | Alloy tool steel | ≤350HB Annealing | Wet | ● ◐ ✣ | ≤0.25DC | 120 ( 90 – 140) | 120 ( 90 – 140) | — |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 110 ( 80 – 130) | 110 ( 80 – 130) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | | | | ● ◐ ✣ | DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | Pre-hardened steel | 35 – 45HRC | Wet | ● ◐ ✣ | ≤0.25DC | 100 ( 80 – 120) | 100 ( 80 – 120) | — |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 90 ( 70 – 110) | 90 ( 70 – 110) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 80 ( 60 – 100) | 80 ( 60 – 100) | — |
| | | | | ● ◐ ✣ | DC | 80 ( 60 – 100) | 80 ( 60 – 100) | — |





Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## MULTI-FUNCTIONAL MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **VPX200** | | | | | | | | |
| M | Austenitic stainless steel | ≤200HB | Wet | ● ◐ ✣ | ≤0.25DC | — | 120 (100 – 150) | 120 (100 – 150) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 110 ( 90 – 140) | 110 ( 90 – 140) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● ◐ ✣ | DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | >200HB | | ● ◐ ✣ | ≤0.25DC | — | 100 ( 80 – 130) | 100 ( 80 – 130) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 90 ( 70 – 110) | 90 ( 70 – 110) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | | | | ● ◐ ✣ | DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | Ferritic and martensitic stainless steel | ≤200HB | Wet | ● ◐ ✣ | ≤0.25DC | 120 (100 – 150) | 120 (100 – 150) | — |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 110 ( 90 – 140) | 110 ( 90 – 140) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 90 ( 70 – 120) | 90 ( 70 – 120) | — |
| | | | | ● ◐ ✣ | DC | 90 ( 70 – 120) | 90 ( 70 – 120) | — |
| | Duplex stainless steel | ≤280HB | Wet | ● ◐ ✣ | ≤0.25DC | — | 100 ( 80 – 130) | 100 ( 80 – 130) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | | | | ● ◐ ✣ | DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | Precipitation hardening stainless steel | <450HB | Wet | ● ◐ ✣ | ≤0.25DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 80 ( 60 – 110) | 80 ( 60 – 110) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 60 ( 40 – 90) | 60 ( 40 – 90) |
| | | | | ● ◐ ✣ | DC | — | 60 ( 40 – 90) | 60 ( 40 – 90) |
| S | Titanium alloys | Ti – 6Al – 4V,etc. | Wet | ● ◐ | ≤0.25DC | 50 ( 40 – 70) | 50 ( 40 – 70) | — |
| | | | | ● ◐ | 0.25–0.5DC | 50 ( 40 – 70) | 50 ( 40 – 70) | — |
| | | | | ● ◐ | 0.5–0.75DC | 50 ( 40 – 70) | 50 ( 40 – 70) | — |
| | | | | ● ◐ | DC | 50 ( 40 – 70) | 50 ( 40 – 70) | — |
| | | | | ✣ | ≤0.25DC | — | 40 ( 30 – 60) | 40 ( 30 – 60) |
| | | | | ✣ | 0.25–0.5DC | — | 40 ( 30 – 60) | 40 ( 30 – 60) |
| | | | | ✣ | 0.5–0.75DC | — | 40 ( 30 – 60) | 40 ( 30 – 60) |
| | | | | ✣ | DC | — | 40 ( 30 – 60) | 40 ( 30 – 60) |
| | | Ti-5553,etc. | | ● ◐ ✣ | ≤0.25DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ● ◐ ✣ | DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | Heat resistant alloys | — | Wet | ● ◐ | ≤0.25DC | 40 ( 30 – 60) | — | — |
| | | | | ● ◐ | 0.25–0.5DC | 40 ( 30 – 60) | — | — |
| | | | | ● ◐ | 0.5–0.75DC | 40 ( 30 – 60) | — | — |
| | | | | ● ◐ | DC | 40 ( 30 – 60) | — | — |
| | | | | ✣ | ≤0.25DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ✣ | 0.25–0.5DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ✣ | 0.5–0.75DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ✣ | DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |



Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## MULTI-FUNCTIONAL MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **VPX300** | | | | | | | | |
| P | Mild steel | ≤180HB | Dry | ● | ≤0.25DC | 230 (180 – 270) | — | — |
| | | | | ● | 0.25–0.5DC | 220 (170 – 260) | — | — |
| | | | | ● | 0.5–0.75DC | 180 (140 – 210) | — | — |
| | | | | ● | DC | 180 (140 – 210) | — | — |
| | | | | ✣ | ≤0.25DC | — | 200 (150 – 240) | — |
| | | | | ✣ | 0.25–0.5DC | — | 190 (170 – 260) | — |
| | | | | ✣ | 0.5–0.75DC | — | 150 (110 – 180) | — |
| | | | | ✣ | DC | — | 150 (110 – 180) | — |
| | Carbon steel<br>Alloy steel | 180 – 280HB | Dry | ● | ≤0.25DC | 180 (140 – 210) | — | — |
| | | | | ● | 0.25–0.5DC | 170 (130 – 200) | — | — |
| | | | | ● | 0.5–0.75DC | 140 (110 – 160) | — | — |
| | | | | ● | DC | 140 (110 – 160) | — | — |
| | | | | ✣ | ≤0.25DC | — | 150 (110 – 180) | — |
| | | | | ✣ | 0.25–0.5DC | — | 140 (100 – 170) | — |
| | | | | ✣ | 0.5–0.75DC | — | 110 ( 80 – 130) | — |
| | | | | ✣ | DC | — | 110 ( 80 – 130) | — |
| | | 280 – 350HB | | ● | ≤0.25DC | 180 (140 – 210) | — | — |
| | | | | ● | 0.25–0.5DC | 170 (130 – 200) | — | — |
| | | | | ● | 0.5–0.75DC | 140 (110 – 160) | — | — |
| | | | | ● | DC | 140 (110 – 160) | — | — |
| | | | | ✣ | ≤0.25DC | — | 150 (110 – 180) | — |
| | | | | ✣ | 0.25–0.5DC | — | 140 (100 – 170) | — |
| | | | | ✣ | 0.5–0.75DC | — | 110 ( 80 – 130) | — |
| | | | | ✣ | DC | — | 110 ( 80 – 130) | — |
| | Alloy tool steel | ≤350HB<br>Annealing | Dry | ● | ≤0.25DC | 180 (140 – 210) | — | — |
| | | | | ● | 0.25–0.5DC | 170 (130 – 200) | — | — |
| | | | | ● | 0.5–0.75DC | 140 (110 – 160) | — | — |
| | | | | ● | DC | 140 (110 – 160) | — | — |
| | | | | ✣ | ≤0.25DC | — | 150 (110 – 180) | — |
| | | | | ✣ | 0.25–0.5DC | — | 140 (100 – 170) | — |
| | | | | ✣ | 0.5–0.75DC | — | 110 ( 80 – 130) | — |
| | | | | ✣ | DC | — | 110 ( 80 – 130) | — |
| | Pre-hardened steel | 35 – 45HRC | Dry | ● | ≤0.25DC | 120 ( 90 – 140) | — | — |
| | | | | ● | 0.25–0.5DC | 110 ( 80 – 130) | — | — |
| | | | | ● | 0.5–0.75DC | 100 ( 70 – 120) | — | — |
| | | | | ● | DC | 100 ( 70 – 120) | — | — |
| | | | | ✣ | ≤0.25DC | — | 100 ( 80 – 120) | — |
| | | | | ✣ | 0.25–0.5DC | — | 90 ( 70 – 110) | — |
| | | | | ✣ | 0.5–0.75DC | — | 80 ( 60 – 100) | — |
| | | | | ✣ | DC | — | 80 ( 60 – 100) | — |





Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## MULTI-FUNCTIONAL MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **VPX300** | | | | | | | | |
| M | Austenitic stainless steel | ≤200HB | Dry | ● ◐ ✣ | ≤0.25DC | — | 180 (140 – 210) | 180 (140 – 210) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 170 (130 – 200) | 170 (130 – 200) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 140 (110 – 160) | 140 (110 – 160) |
| | | | | ● ◐ ✣ | DC | — | 140 (110 – 160) | 140 (110 – 160) |
| | | >200HB | | ● ◐ ✣ | ≤0.25DC | — | 150 (110 – 180) | 150 (110 – 180) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 140 (100 – 160) | 140 (100 – 160) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 110 ( 80 – 130) | 110 ( 80 – 130) |
| | | | | ● ◐ ✣ | DC | — | 110 ( 80 – 130) | 110 ( 80 – 130) |
| | Ferritic and martensitic stainless steel | ≤200HB | Dry | ● ◐ ✣ | ≤0.25DC | 180 (140 – 210) | 180 (140 – 210) | — |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 170 (130 – 200) | 170 (130 – 200) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 140 (110 – 160) | 140 (110 – 160) | — |
| | | | | ● ◐ ✣ | DC | 140 (110 – 160) | 140 (110 – 160) | — |
| | Duplex stainless steel | ≤280HB | Dry | ● ◐ ✣ | ≤0.25DC | — | 140 (110 – 170) | 140 (110 – 170) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 130 ( 90 – 150) | 130 ( 90 – 150) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 100 ( 70 – 120) | 100 ( 70 – 120) |
| | | | | ● ◐ ✣ | DC | — | 100 ( 70 – 120) | 100 ( 70 – 120) |
| | Precipitation hardening stainless steel | <450HB | Dry | ● ◐ ✣ | ≤0.25DC | — | 130 (100 – 160) | 130 (100 – 160) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 120 ( 80 – 140) | 120 ( 80 – 140) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 90 ( 60 – 110) | 90 ( 60 – 110) |
| | | | | ● ◐ ✣ | DC | — | 90 ( 60 – 110) | 90 ( 60 – 110) |
| P | Mild steel | ≤180HB | Wet | ● ◐ ✣ | ≤0.25DC | 140 (100 – 190) | 140 (100 – 190) | — |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 130 ( 90 – 180) | 130 ( 90 – 180) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | | | | ● ◐ ✣ | DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | Carbon steel<br>Alloy steel | 180 – 280HB | | ● ◐ ✣ | ≤0.25DC | 120 ( 90 – 140) | 120 ( 90 – 140) | — |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 110 ( 80 – 130) | 110 ( 80 – 130) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | | | | ● ◐ ✣ | DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | | 280 – 350HB | | ● ◐ ✣ | ≤0.25DC | 120 ( 90 – 140) | 120 ( 90 – 140) | |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 110 ( 80 – 130) | 110 ( 80 – 130) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | | | | ● ◐ ✣ | DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | Alloy tool steel | ≤350HB<br>Annealing | Wet | ● ◐ ✣ | ≤0.25DC | 120 ( 90 – 140) | 120 ( 90 – 140) | — |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 110 ( 80 – 130) | 110 ( 80 – 130) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | | | | ● ◐ ✣ | DC | 100 ( 70 – 120) | 100 ( 70 – 120) | — |
| | Pre-hardened steel | 35 – 45HRC | Wet | ● ◐ ✣ | ≤0.25DC | 100 ( 80 – 120) | 100 ( 80 – 120) | — |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 90 ( 70 – 110) | 90 ( 70 – 110) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 80 ( 60 – 100) | 80 ( 60 – 100) | — |
| | | | | ● ◐ ✣ | DC | 80 ( 60 – 100) | 80 ( 60 – 100) | — |

5/8

Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## MULTI-FUNCTIONAL MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **VPX300** | | | | | | | | |
| M | Austenitic stainless steel | ≤200HB | Wet | ● ◐ ✣ | ≤0.25DC | — | 120 (100 – 150) | 120 (100 – 150) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 110 ( 90 – 140) | 110 ( 90 – 140) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● ◐ ✣ | DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | >200HB | | ● ◐ ✣ | ≤0.25DC | — | 100 ( 80 – 130) | 100 ( 80 – 130) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | | | | ● ◐ ✣ | DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | Ferritic and martensitic stainless steel | ≤200HB | Wet | ● ◐ ✣ | ≤0.25DC | 120 (100 – 150) | 120 (100 – 150) | — |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 110 ( 90 – 140) | 110 ( 90 – 140) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 90 ( 70 – 120) | 90 ( 70 – 120) | — |
| | | | | ● ◐ ✣ | DC | 90 ( 70 – 120) | 90 ( 70 – 120) | — |
| | Duplex stainless steel | ≤280HB | Wet | ● ◐ ✣ | ≤0.25DC | — | 100 ( 80 – 130) | 100 ( 80 – 130) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | | | | ● ◐ ✣ | DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | Precipitation hardening stainless steel | <450HB | Wet | ● ◐ ✣ | ≤0.25DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 80 ( 60 – 110) | 80 ( 60 – 110) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 60 ( 40 – 90) | 60 ( 40 – 90) |
| | | | | ● ◐ ✣ | DC | — | 60 ( 40 – 90) | 60 ( 40 – 90) |
| S | Titanium alloys | Ti – 6Al – 4V,etc. | Wet | ● ◐ | ≤0.25DC | 50 ( 40 – 70) | 50 ( 40 – 70) | — |
| | | | | ● ◐ | 0.25–0.5DC | 50 ( 40 – 70) | 50 ( 40 – 70) | — |
| | | | | ● ◐ | 0.5–0.75DC | 50 ( 40 – 70) | 50 ( 40 – 70) | — |
| | | | | ● ◐ | DC | 50 ( 40 – 70) | 50 ( 40 – 70) | — |
| | | | | ✣ | ≤0.25DC | — | 40 ( 30 – 60) | 40 ( 30 – 60) |
| | | | | ✣ | 0.25–0.5DC | — | 40 ( 30 – 60) | 40 ( 30 – 60) |
| | | | | ✣ | 0.5–0.75DC | — | 40 ( 30 – 60) | 40 ( 30 – 60) |
| | | | | ✣ | DC | — | 40 ( 30 – 60) | 40 ( 30 – 60) |
| | | Ti-5553,etc. | | ● ◐ ✣ | ≤0.25DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ● ◐ ✣ | DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | Heat resistant alloys | — | Wet | ● ◐ | ≤0.25DC | 40 ( 30 – 60) | — | — |
| | | | | ● ◐ | 0.25–0.5DC | 40 ( 30 – 60) | — | — |
| | | | | ● ◐ | 0.5–0.75DC | 40 ( 30 – 60) | — | — |
| | | | | ● ◐ | DC | 40 ( 30 – 60) | — | — |
| | | | | ✣ | ≤0.25DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ✣ | 0.25–0.5DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ✣ | 0.5–0.75DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ✣ | DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| **AXD4000** | | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● | — | 200 (150 – 220) | — | — |
| | Carbon steel, Alloy steel | 180 – 280HB | Dry, Wet | ● | — | 200 (150 – 220) | — | — |
| N | Aluminium Alloys | Si<5% | Dry, Wet | ● | — | 1000 (200 – 3000) | — | — |
| | | Si>5% | Dry, Wet | ● | — | 1000 (200 – 3000) | — | — |
| **AXD4000A** | | | | | | | | |
| N | Aluminium Alloys | Si<5% | Dry, Wet | ● | — | 4000 (2000 – 5000) | — | — |
| **AXD7000** | | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● | — | 200 (150 – 220) | — | — |
| | Carbon steel, Alloy steel | 180 – 280HB | Dry, Wet | ● | — | 200 (150 – 220) | — | — |
| S | Titanium alloys | — | Wet | ● | — | 40 ( 30 – 60) | — | — |





Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## MULTI-FUNCTIONAL MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| | **BXD4000** | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● | — | 180 (150 – 200) | — | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● | — | 150 (120 – 200) | — | — |
| P | Carbon steel Alloy steel | 280 – 350HB | Dry, Wet | ● | — | 140 (120 – 160) | — | — |
| M | Stainless steel | ≤270HB | Dry, Wet | ● | — | 140 (120 – 160) | — | — |
| S | Titanium alloys | — | Wet | ● | — | 40 ( 30 – 60) | — | — |
| S | Heat resistant alloys | — | Wet | ● | — | 30 ( 20 – 40) | — | — |
| | **AQX** | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● ◐ ✣ | — | 200 (170 – 240) | 160 (130 – 200) | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ ✣ | — | 180 (140 – 220) | 140 (100 – 180) | — |
| P | Carbon steel Alloy steel | 280 – 350HB | Dry, Wet | ● ◐ ✣ | — | 180 (140 – 220) | 140 (100 – 180) | — |
| M | Austenitic stainless steel | ≤200HB | Dry, Wet | ● ◐ ✣ | — | — | 170 (120 – 200) | 160 (100 – 180) |
| M | Austenitic stainless steel | >200HB | Dry, Wet | ● ◐ ✣ | — | — | 170 (120 – 200) | 160 (100 – 180) |
| M | Ferritic and martensitic stainless steel | ≤200HB | Dry, Wet | ● ◐ ✣ | — | 170 (120 – 200) | 170 (120 – 200) | 160 (100 – 180) |
| M | Ferritic and martensitic stainless steel | >200HB | Dry, Wet | ● ◐ ✣ | — | 170 (120 – 200) | 170 (120 – 200) | 160 (100 – 180) |
| S | Titanium alloys | — | Wet | ● ◐ ✣ | — | 50 ( 30 – 70) | 50 ( 30 – 70) | 50 ( 30 – 70) |
| | **AJX** | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● ◐ ✣ | — | 150 (100 – 200) | 130 ( 80 – 180) | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ ✣ | — | 130 ( 80 – 180) | 110 ( 60 – 160) | — |
| P | Carbon steel Alloy steel | 280 – 350HB | Dry, Wet | ● ◐ ✣ | — | 100 ( 50 – 150) | 80 ( 30 – 130) | — |
| P | Alloy tool steel | ≤350HB Annealing | Dry, Wet | ● ◐ ✣ | — | 100 ( 50 – 150) | 80 ( 30 – 120) | — |
| P | Pre-hardened steel | 35 – 45HRC | Dry, Wet | ● ◐ ✣ | — | 100 ( 70 – 130) | 80 ( 50 – 110) | — |
| M | Stainless steel | ≤270HB | Dry, Wet | ● ◐ ✣ | — | — | 140 (100 – 180) | 120 ( 80 – 160) |
| S | Titanium alloys | — | Wet | ● ◐ ✣ | — | 50 ( 40 – 60) | 45 ( 30 – 55) | 40 ( 30 – 50) |
| S | Heat resistant alloys | — | Wet | ● ◐ ✣ | — | 30 ( 20 – 40) | 25 ( 20 – 35) | 20 ( 15 – 30) |
| | **WJX09** | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● ◐ ✣ | — | 170 (120 – 220) | 160 (110 – 200) | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ ✣ | — | 160 (100 – 220) | 140 ( 90 – 200) | — |
| P | Carbon steel Alloy steel | 280 – 350HB | Dry, Wet | ● ◐ ✣ | — | 160 (100 – 220) | 140 ( 90 – 200) | — |
| P | Alloy tool steel | ≤350HB Annealing | Dry, Wet | ● ◐ ✣ | — | 160 (100 – 220) | 140 ( 90 – 200) | — |
| P | Pre-hardened steel | 35 – 45HRC | Dry, Wet | ● ◐ ✣ | — | 120 ( 80 – 160) | 100 ( 60 – 140) | — |
| M | Austenitic stainless steel | ≤200HB | Dry, Wet | ● ◐ ✣ | — | — | 160 (130 – 200) | 150 (120 – 180) |
| M | Austenitic stainless steel | >200HB | Dry, Wet | ● ◐ ✣ | — | — | 140 (100 – 200) | 130 ( 80 – 180) |
| M | Ferritic and martensitic stainless steel | ≤200HB | Dry, Wet | ● ◐ ✣ | — | 150 (100 – 200) | 150 (100 – 200) | 130 ( 80 – 180) |
| M | Duplex stainless steel | ≤280HB | Dry, Wet | ● ◐ ✣ | — | — | 130 ( 80 – 180) | 110 ( 60 – 160) |
| M | Precipitation hardening stainless steel | <450HB | Dry, Wet | ● ◐ ✣ | — | — | 110 ( 60 – 160) | 90 ( 50 – 130) |
| S | Titanium alloys | — | Wet | ● ◐ ✣ | — | 50 ( 30 – 65) | 40 ( 30 – 60) | 40 ( 30 – 60) |
| S | Heat resistant alloys | — | Wet | ● ◐ ✣ | — | 40 ( 20 – 50) | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | **WJX14** | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● ◐ ✣ | — | 150 (100 – 200) | 140 ( 90 – 180) | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ ✣ | — | 140 ( 80 – 200) | 120 ( 70 – 180) | — |
| P | Carbon steel Alloy steel | 280 – 350HB | Dry, Wet | ● ◐ ✣ | — | 140 ( 80 – 200) | 120 ( 70 – 180) | — |
| P | Alloy tool steel | ≤350HB Annealing | Dry, Wet | ● ◐ ✣ | — | 140 ( 80 – 200) | 120 ( 70 – 180) | — |
| P | Pre-hardened steel | 35 – 45HRC | Dry, Wet | ● ◐ ✣ | — | 110 ( 70 – 150) | 90 ( 50 – 130) | — |
| M | Austenitic stainless steel | ≤200HB | Dry, Wet | ● ◐ ✣ | — | — | 160 (130 – 200) | 150 (120 – 180) |
| M | Austenitic stainless steel | >200HB | Dry, Wet | ● ◐ ✣ | — | — | 140 (100 – 200) | 130 ( 80 – 180) |
| M | Ferritic and martensitic stainless steel | ≤200HB | Dry, Wet | ● ◐ ✣ | — | 150 (100 – 200) | 150 (100 – 200) | 130 ( 80 – 180) |
| M | Duplex stainless steel | ≤280HB | Dry, Wet | ● ◐ ✣ | — | — | 130 ( 80 – 180) | 110 ( 60 – 160) |
| M | Precipitation hardening stainless steel | <450HB | Dry, Wet | ● ◐ ✣ | — | — | 110 ( 60 – 160) | 90 ( 50 – 130) |
| S | Titanium alloys | — | Wet | ● ◐ ✣ | — | 50 ( 30 – 65) | 40 ( 30 – 60) | 40 ( 30 – 60) |
| S | Heat resistant alloys | — | Wet | ● ◐ ✣ | — | 40 ( 20 – 50) | 30 ( 20 – 40) | 30 ( 20 – 40) |



Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## MULTI-FUNCTIONAL MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| | **ARP** | | | | | | | |
| M | Austenitic stainless steel | ≤200HB | Dry | ● ◐ ✣ | — | — | 200 (150 – 250) | 180 (130-230) |
| | | >200HB | | ● ◐ ✣ | — | — | 170 (120 – 220) | 150 (100-200) |
| | Ferritic and martensitic stainless steel | — | Dry | ● ◐ ✣ | — | 200 (150 – 250) | 200 (150 – 250) | 180 (130-230) |
| | Duplex stainless steel | ≤280HB | Dry | ● ◐ ✣ | — | — | 160 (110 – 210) | 140 (90-190) |
| | Precipitation hardening stainless steel | <450HB | Dry | ● ◐ ✣ | — | — | 150 (100 – 200) | 130 (80-180) |
| | Austenitic stainless steel | ≤200HB | Wet | ● ◐ ✣ | — | — | 130 ( 80 – 180) | 110 (60-160) |
| | | >200HB | | ● ◐ ✣ | — | — | 100 ( 80 – 150) | 80 (60-130) |
| | Ferritic and martensitic stainless steel | — | Wet | ● ◐ ✣ | — | 130 ( 80 – 180) | 130 ( 80 – 180) | 110 (60-160) |
| | Duplex stainless steel | ≤280HB | Wet | ● ◐ ✣ | — | — | 100 ( 80 – 150) | 80 (60-130) |
| | Precipitation hardening stainless steel | <450HB | Wet | ● ◐ ✣ | — | — | 90 ( 50 – 140) | 70 (30-120) |
| S | Titanium alloys | — | Wet | ● ◐ ✣ | — | 50 (35-60) | 45 ( 30 – 55) | 40 ( 30 – 50) |
| | Heat resistant alloys | — | Wet | ● ◐ ✣ | — | 40 (20-50) | 35 ( 15 – 45) | 30 ( 15 – 40) |
| | **BRP** | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● ◐ | — | 250 (200 – 300) | — | — |
| | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ | — | 180 (130 – 220) | — | — |
| | | 280 – 350HB | | ● ◐ | — | 160 (110 – 190) | — | — |
| | Pre-hardened steel | 35 – 45HRC | Dry, Wet | ● ◐ | — | 120 ( 80 – 140) | — | — |
| M | Stainless steel | ≤270HB | Dry, Wet | ● ◐ | — | 180 (130 – 220) | — | — |

8/8



Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

# DEEP SHOULDER MILLING

## RECOMMENDED CUTTING CONDITIONS

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **VPX200-L** | | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● | ≤0.25DC | 140 (100 – 190) | — | — |
| | | | | ● | 0.25–0.5DC | 130 ( 90 – 180) | — | — |
| | | | | ● | 0.5–0.75DC | 100 ( 70 – 120) | — | — |
| | | | | ● | DC | 100 ( 70 – 120) | — | — |
| | | | | ✣ | ≤0.25DC | — | 140 (100 – 190) | — |
| | | | | ✣ | 0.25–0.5DC | — | 130 ( 90 – 180) | — |
| | | | | ✣ | 0.5–0.75DC | — | 100 ( 70 – 120) | — |
| | | | | ✣ | DC | — | 100 ( 70 – 120) | — |
| | Carbon steel<br>Alloy steel | 180 – 280HB | Dry, Wet | ● | ≤0.25DC | 120 ( 90 – 140) | — | — |
| | | | | ● | 0.25–0.5DC | 110 ( 80 – 130) | — | — |
| | | | | ● | 0.5–0.75DC | 100 ( 70 – 120) | — | — |
| | | | | ● | DC | 100 ( 70 – 120) | — | — |
| | | | | ✣ | ≤0.25DC | — | 120 ( 90 – 140) | — |
| | | | | ✣ | 0.25–0.5DC | — | 110 ( 80 – 130) | — |
| | | | | ✣ | 0.5–0.75DC | — | 100 ( 70 – 120) | — |
| | | | | ✣ | DC | — | 100 ( 70 – 120) | — |
| | | 280 – 350HB | | ● | ≤0.25DC | 120 ( 90 – 140) | — | — |
| | | | | ● | 0.25–0.5DC | 110 ( 80 – 130) | — | — |
| | | | | ● | 0.5–0.75DC | 100 ( 70 – 120) | — | — |
| | | | | ● | DC | 100 ( 70 – 120) | — | — |
| | | | | ✣ | ≤0.25DC | — | 120 ( 90 – 140) | — |
| | | | | ✣ | 0.25–0.5DC | — | 110 ( 80 – 130) | — |
| | | | | ✣ | 0.5–0.75DC | — | 100 ( 70 – 120) | — |
| | | | | ✣ | DC | — | 100 ( 70 – 120) | — |
| | Alloy tool steel | ≤350HB<br>Annealing | Dry, Wet | ● | ≤0.25DC | 120 ( 90 – 140) | — | — |
| | | | | ● | 0.25–0.5DC | 110 ( 80 – 130) | — | — |
| | | | | ● | 0.5–0.75DC | 100 ( 70 – 120) | — | — |
| | | | | ● | DC | 100 ( 70 – 120) | — | — |
| | | | | ✣ | ≤0.25DC | — | 120 ( 90 – 140) | — |
| | | | | ✣ | 0.25–0.5DC | — | 110 ( 80 – 130) | — |
| | | | | ✣ | 0.5–0.75DC | — | 100 ( 70 – 120) | — |
| | | | | ✣ | DC | — | 100 ( 70 – 120) | — |
| | Pre-hardened steel | 35 – 45HRC | Dry, Wet | ● | ≤0.25DC | 100 ( 80 – 120) | — | — |
| | | | | ● | 0.25–0.5DC | 90 ( 70 – 110) | — | — |
| | | | | ● | 0.5–0.75DC | 80 ( 60 – 100) | — | — |
| | | | | ● | DC | 80 ( 60 – 100) | — | — |
| | | | | ✣ | ≤0.25DC | — | 100 ( 80 – 120) | — |
| | | | | ✣ | 0.25–0.5DC | — | 90 ( 70 – 110) | — |
| | | | | ✣ | 0.5–0.75DC | — | 80 ( 60 – 100) | — |
| | | | | ✣ | DC | — | 80 ( 60 – 100) | — |



Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## DEEP SHOULDER MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **VPX200-L** | | | | | | | | |
| M | Austenitic stainless steel | ≤200HB | Dry, Wet | ● | ≤0.25DC | — | 120 (100 – 150) | 120 (100 – 150) |
| | | | | ● | 0.25–0.5DC | — | 110 ( 90 – 140) | 110 ( 90 – 140) |
| | | | | ● | 0.5–0.75DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● | DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | >200HB | | ● | ≤0.25DC | — | 100 ( 80 – 130) | 100 ( 80 – 130) |
| | | | | ● | 0.25–0.5DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● | 0.5–0.75DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | | | | ● | DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | Ferritic and martensitic stainless steel | — | Dry, Wet | ● | ≤0.25DC | 120 (100 – 150) | 120 (100 – 150) | — |
| | | | | ● | 0.25–0.5DC | 110 ( 90 – 140) | 110 ( 90 – 140) | — |
| | | | | ● | 0.5–0.75DC | 90 ( 70 – 120) | 90 ( 70 – 120) | — |
| | | | | ● | DC | 90 ( 70 – 120) | 90 ( 70 – 120) | — |
| | Duplex stainless steel | ≤280HB | Dry, Wet | ● | ≤0.25DC | — | 100 ( 80 – 130) | 100 ( 80 – 130) |
| | | | | ● | 0.25–0.5DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● | 0.5–0.75DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | | | | ● | DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | Precipitation hardening stainless steel | <450HB | Dry, Wet | ● | ≤0.25DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● | 0.25–0.5DC | — | 80 ( 60 – 110) | 80 ( 60 – 110) |
| | | | | ● | 0.5–0.75DC | — | 60 ( 40 – 90) | 60 ( 40 – 90) |
| | | | | ● | DC | — | 60 ( 40 – 90) | 60 ( 40 – 90) |
| S | Titanium alloys | Ti – 6Al – 4V,etc. | Wet | ● | ≤0.25DC | 50 ( 40 – 70) | 50 ( 40 – 70) | — |
| | | | | ● | 0.25–0.5DC | 50 ( 40 – 70) | 50 ( 40 – 70) | — |
| | | | | ● | 0.5–0.75DC | 50 ( 40 – 70) | 50 ( 40 – 70) | — |
| | | | | ● | DC | 50 ( 40 – 70) | 50 ( 40 – 70) | — |
| | | | | ✤ | ≤0.25DC | — | 50 ( 40 – 70) | 50 ( 40 – 70) |
| | | | | ✤ | 0.25–0.5DC | — | 50 ( 40 – 70) | 50 ( 40 – 70) |
| | | | | ✤ | 0.5–0.75DC | — | 50 ( 40 – 70) | 50 ( 40 – 70) |
| | | | | ✤ | DC | — | 50 ( 40 – 70) | 50 ( 40 – 70) |
| | Titanium alloys | Ti-5553,etc. | Wet | ● | ≤0.25DC | 30 ( 20 – 40) | 30 ( 20 – 40) | — |
| | | | | ● | 0.25–0.5DC | 30 ( 20 – 40) | 30 ( 20 – 40) | — |
| | | | | ● | 0.5–0.75DC | 30 ( 20 – 40) | 30 ( 20 – 40) | — |
| | | | | ● | DC | 30 ( 20 – 40) | 30 ( 20 – 40) | — |
| | | | | ✤ | ≤0.25DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ✤ | 0.25–0.5DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ✤ | 0.5–0.75DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ✤ | DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | Heat resistant alloys | — | Wet | ● | ≤0.25DC | 40 ( 30 – 60) | — | — |
| | | | | ● | 0.25–0.5DC | 40 ( 30 – 60) | — | — |
| | | | | ● | 0.5–0.75DC | 40 ( 30 – 60) | — | — |
| | | | | ● | DC | 40 ( 30 – 60) | — | — |
| | | | | ✤ | ≤0.25DC | — | 40 ( 30 – 60) | 40 ( 30 – 60) |
| | | | | ✤ | 0.25–0.5DC | — | 40 ( 30 – 60) | 40 ( 30 – 60) |
| | | | | ✤ | 0.5–0.75DC | — | 40 ( 30 – 60) | 40 ( 30 – 60) |
| | | | | ✤ | DC | — | 40 ( 30 – 60) | 40 ( 30 – 60) |





Cutting conditions : ● : Stable cutting ◔ : General cutting ✤ : Unstable cutting

## DEEP SHOULDER MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **VPX300-L** | | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● | ≤0.25DC | 140 (100 – 190) | — | — |
| | | | | ● | 0.25–0.5DC | 130 ( 90 – 180) | — | — |
| | | | | ● | 0.5–0.75DC | 100 ( 70 – 120) | — | — |
| | | | | ● | DC | 100 ( 70 – 120) | — | — |
| | | | | ✣ | ≤0.25DC | — | 140 (100 – 190) | — |
| | | | | ✣ | 0.25–0.5DC | — | 130 ( 90 – 180) | — |
| | | | | ✣ | 0.5–0.75DC | — | 100 ( 70 – 120) | — |
| | | | | ✣ | DC | — | 100 ( 70 – 120) | — |
| | Carbon steel<br>Alloy steel | 180 – 280HB | Dry, Wet | ● | ≤0.25DC | 120 ( 90 – 140) | — | — |
| | | | | ● | 0.25–0.5DC | 110 ( 80 – 130) | — | — |
| | | | | ● | 0.5–0.75DC | 100 ( 70 – 120) | — | — |
| | | | | ● | DC | 100 ( 70 – 120) | — | — |
| | | | | ✣ | ≤0.25DC | — | 120 ( 90 – 140) | — |
| | | | | ✣ | 0.25–0.5DC | — | 110 ( 80 – 130) | — |
| | | | | ✣ | 0.5–0.75DC | — | 100 ( 70 – 120) | — |
| | | | | ✣ | DC | — | 100 ( 70 – 120) | — |
| | | 280 – 350HB | | ● | ≤0.25DC | 120 ( 90 – 140) | — | — |
| | | | | ● | 0.25–0.5DC | 110 ( 80 – 130) | — | — |
| | | | | ● | 0.5–0.75DC | 100 ( 70 – 120) | — | — |
| | | | | ● | DC | 100 ( 70 – 120) | — | — |
| | | | | ✣ | ≤0.25DC | — | 120 ( 90 – 140) | — |
| | | | | ✣ | 0.25–0.5DC | — | 110 ( 80 – 130) | — |
| | | | | ✣ | 0.5–0.75DC | — | 100 ( 70 – 120) | — |
| | | | | ✣ | DC | — | 100 ( 70 – 120) | — |
| | Alloy tool steel | ≤350HB<br>Annealing | Dry, Wet | ● | ≤0.25DC | 120 ( 90 – 140) | — | — |
| | | | | ● | 0.25–0.5DC | 110 ( 80 – 130) | — | — |
| | | | | ● | 0.5–0.75DC | 100 ( 70 – 120) | — | — |
| | | | | ● | DC | 100 ( 70 – 120) | — | — |
| | | | | ✣ | ≤0.25DC | — | 120 ( 90 – 140) | — |
| | | | | ✣ | 0.25–0.5DC | — | 110 ( 80 – 130) | — |
| | | | | ✣ | 0.5–0.75DC | — | 100 ( 70 – 120) | — |
| | | | | ✣ | DC | — | 100 ( 70 – 120) | — |
| | Pre-hardened steel | 35 – 45HRC | Dry, Wet | ● | ≤0.25DC | 100 ( 80 – 120) | — | — |
| | | | | ● | 0.25–0.5DC | 90 ( 70 – 110) | — | — |
| | | | | ● | 0.5–0.75DC | 80 ( 60 – 100) | — | — |
| | | | | ● | DC | 80 ( 60 – 100) | — | — |
| | | | | ✣ | ≤0.25DC | — | 100 ( 80 – 120) | — |
| | | | | ✣ | 0.25–0.5DC | — | 90 ( 70 – 110) | — |
| | | | | ✣ | 0.5–0.75DC | — | 80 ( 60 – 100) | — |
| | | | | ✣ | DC | — | 80 ( 60 – 100) | — |



Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## DEEP SHOULDER MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| **VPX300-L** | | | | | | | | |
| M | Austenitic stainless steel | ≤200HB | Dry, Wet | ● ◐ ✣ | ≤0.25DC | — | 120 (100 – 150) | 120 (100 – 150) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 110 ( 90 – 140) | 110 ( 90 – 140) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● ◐ ✣ | DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | >200HB | | ● ◐ ✣ | ≤0.25DC | — | 100 ( 80 – 130) | 100 ( 80 – 130) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | | | | ● ◐ ✣ | DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | Ferritic and martensitic stainless steel | — | Dry, Wet | ● ◐ ✣ | ≤0.25DC | 120 (100 – 150) | 120 (100 – 150) | — |
| | | | | ● ◐ ✣ | 0.25–0.5DC | 110 ( 90 – 140) | 110 ( 90 – 140) | — |
| | | | | ● ◐ ✣ | 0.5–0.75DC | 90 ( 70 – 120) | 90 ( 70 – 120) | — |
| | | | | ● ◐ ✣ | DC | 90 ( 70 – 120) | 90 ( 70 – 120) | — |
| | Duplex stainless steel | ≤280HB | Dry, Wet | ● ◐ ✣ | ≤0.25DC | — | 100 ( 80 – 130) | 100 ( 80 – 130) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | | | | ● ◐ ✣ | DC | — | 70 ( 50 – 100) | 70 ( 50 – 100) |
| | Precipitation hardening stainless steel | <450HB | Dry, Wet | ● ◐ ✣ | ≤0.25DC | — | 90 ( 70 – 120) | 90 ( 70 – 120) |
| | | | | ● ◐ ✣ | 0.25–0.5DC | — | 80 ( 60 – 110) | 80 ( 60 – 110) |
| | | | | ● ◐ ✣ | 0.5–0.75DC | — | 60 ( 40 – 90) | 60 ( 40 – 90) |
| | | | | ● ◐ ✣ | DC | — | 60 ( 40 – 90) | 60 ( 40 – 90) |
| S | Titanium alloys | Ti – 6Al – 4V,etc. | Wet | ● ◐ | ≤0.75DC | 50 ( 40 – 70) | 50 ( 40 – 70) | — |
| | | | | ● ◐ | DC | 50 ( 40 – 70) | 50 ( 40 – 70) | — |
| | | | | ✣ | ≤0.75DC | — | 50 ( 40 – 70) | 50 ( 40 – 70) |
| | | | | ✣ | DC | — | 50 ( 40 – 70) | 50 ( 40 – 70) |
| | | Ti-5553,etc. | Wet | ● ◐ | ≤0.75DC | 30 ( 20 – 40) | 30 ( 20 – 40) | — |
| | | | | ● ◐ | DC | 30 ( 20 – 40) | 30 ( 20 – 40) | — |
| | | | | ✣ | ≤0.75DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | | | | ✣ | DC | — | 30 ( 20 – 40) | 30 ( 20 – 40) |
| | Heat resistant alloys | — | Wet | ● ◐ | ≤0.75DC | 40 ( 30 – 60) | — | — |
| | | | | ● ◐ | DC | 40 ( 30 – 60) | — | — |
| | | | | ✣ | ≤0.75DC | — | 40 ( 30 – 60) | 40 ( 30 – 60) |
| | | | | ✣ | DC | — | 40 ( 30 – 60) | 40 ( 30 – 60) |





Cutting conditions : ● : Stable cutting ◐ : General cutting ✣ : Unstable cutting

## DEEP SHOULDER MILLING

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| | **SPX Shank** | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● ◐ | Shoulder milling | 120 (100 – 140) | — | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ | Shoulder milling | 80 ( 70 – 120) | — | — |
| P | | 280 – 350HB | | ● ◐ | Shoulder milling | 80 ( 70 – 120) | — | — |
| P | Alloy tool steel | ≤350HB Annealing | Dry, Wet | ● ◐ | Shoulder milling | 80 ( 60 – 100) | — | — |
| M | Stainless steel | ≤270HB | Dry, Wet | ● ◐ | Shoulder milling | — | 80 ( 60 – 100) | — |
| S | Titanium alloys | — | Wet | ● ◐ | Shoulder milling | — | 40 ( 35 – 50) | — |
| P | Mild steel | ≤180HB | Dry, Wet | ● ◐ | DC | 60 ( 50 – 120) | — | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ | DC | 60 ( 50 – 100) | — | — |
| P | | 280 – 350HB | | ● ◐ | DC | 60 ( 50 – 100) | — | — |
| P | Alloy tool steel | ≤350HB Annealing | Dry, Wet | ● ◐ | DC | 50 ( 40 – 80) | — | — |
| M | Stainless steel | ≤270HB | Dry, Wet | ● ◐ | DC | — | 40 ( 35 – 80) | — |
| S | Titanium alloys | – | Wet | ● ◐ | DC | — | 35 ( 30 – 50) | — |
| | **SPX Shell** | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● ◐ | ≤0.5DC | 120 (100 – 140) | — | — |
| P | | | | ● ◐ | >0.5DC | 120 (100 – 140) | — | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ | ≤0.5DC | 120 ( 80 – 130) | — | — |
| P | | | | ● ◐ | >0.5DC | 100 ( 80 – 120) | — | — |
| P | | 280 – 350HB | | ● ◐ | ≤0.5DC | 120 ( 80 – 130) | — | — |
| P | | | | ● ◐ | >0.5DC | 100 ( 80 – 120) | — | — |
| P | Alloy tool steel | ≤350HB Annealing | Dry, Wet | ● ◐ | ≤0.5DC | 100 ( 60 – 110) | — | — |
| P | | | | ● ◐ | >0.5DC | 80 ( 60 – 100) | — | — |
| M | Stainless steel | ≤270HB | Dry, Wet | ● ◐ | ≤0.5DC | — | 140 (100 – 150) | — |
| M | | | | ● ◐ | >0.5DC | — | 120 (100 – 140) | — |
| S | Titanium alloys | — | Wet | ● ◐ | ≤0.5DC | — | 45 ( 35 – 50) | — |
| S | | | | ● ◐ | >0.5DC | — | 40 ( 35 – 50) | — |
| P | Mild steel | ≤180HB | Dry, Wet | ● ◐ | DC | 120 (100 – 140) | — | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ | DC | 100 ( 80 – 120) | — | — |
| P | | 280 – 350HB | | ● ◐ | DC | 100 ( 80 – 120) | — | — |
| P | Alloy tool steel | ≤350HB Annealing | Dry, Wet | ● ◐ | DC | 80 ( 60 – 100) | — | — |
| M | Stainless steel | ≤270HB | Dry, Wet | ● ◐ | DC | — | 100 ( 80 – 140) | — |
| S | Titanium alloys | — | Wet | ● ◐ | DC | — | 40 ( 35 – 50) | — |

5/5

Cutting conditions : ● : Stable cutting ◐ : General cutting ✤ : Unstable cutting

# COPYING

## RECOMMENDED CUTTING CONDITIONS

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| | **SRM2** | | | | | | | |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ | DC | 160 (120 – 200) | — | — |
| | | 280 – 350HB | | ● ◐ | DC | 140 (120 – 160) | — | — |
| | Alloy tool steel | ≤350HB Annealing | Dry, Wet | ● ◐ | DC | 140 (120 – 160) | — | — |
| | Pre-hardened steel | 35 – 45HRC | Dry, Wet | ● ◐ | DC | 120 (100 – 160) | — | — |
| M | Stainless steel | ≤270HB | Dry, Wet | ● ◐ | DC | 200 (100 – 250) | — | — |
| S | Titanium alloys | — | Wet | ● ◐ | DC | 50 ( 30 – 60) | — | — |
| | Heat resistant alloys | — | Wet | ● ◐ | DC | 40 ( 30 – 60) | — | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ | Small cutting depth | 200 (160 – 250) | — | — |
| | | 280 – 350HB | | ● ◐ | Small cutting depth | 160 (120 – 200) | — | — |
| | Alloy tool steel | ≤350HB Annealing | Dry, Wet | ● ◐ | Small cutting depth | 160 (120 – 200) | — | — |
| | Pre-hardened steel | 35 – 45HRC | Dry, Wet | ● ◐ | Small cutting depth | 160 (120 – 200) | — | — |
| M | Stainless steel | ≤270HB | Dry, Wet | ● ◐ | Small cutting depth | 200 (100 – 250) | — | — |
| S | Titanium alloys | — | Wet | ● ◐ | Small cutting depth | 50 ( 30 – 60) | — | — |
| | Heat resistant alloys | — | Wet | ● ◐ | Small cutting depth | 40 ( 30 – 60) | — | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ | Large cutting depth | 200 (160 – 250) | — | — |
| | | 280 – 350HB | | ● ◐ | Large cutting depth | 160 (120 – 200) | — | — |
| | Alloy tool steel | ≤350HB Annealing | Dry, Wet | ● ◐ | Large cutting depth | 160 (120 – 200) | — | — |
| | Pre-hardened steel | 35 – 45HRC | Dry, Wet | ● ◐ | Large cutting depth | 160 (120 – 200) | — | — |
| M | Stainless steel | ≤270HB | Dry, Wet | ● ◐ | Large cutting depth | 200 (100 – 250) | — | — |
| S | Titanium alloys | — | Wet | ● ◐ | Large cutting depth | 50 ( 30 – 60) | — | — |
| | Heat resistant alloys | — | Wet | ● ◐ | Large cutting depth | 40 ( 30 – 60) | — | — |

1/1



Cutting conditions : ● : Stable cutting ◐ : General cutting ✤ : Unstable cutting

# SPOT MILLING

## RECOMMENDED CUTTING CONDITIONS

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| | **CBJP** | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● ◐ | — | 180 (100 – 200) | — | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ | — | 180 (100 – 200) | — | — |
| P | Carbon steel Alloy steel | 280 – 350HB | Dry, Wet | ● ◐ | — | 120 ( 80 – 160) | — | — |
| M | Austenitic stainless steel | ≤200HB | Dry, Wet | ● ◐ | — | 150 (100 – 200) | — | — |
| | **CBMP** | | | | | | | |
| P | Mild steel | ≤180HB | Dry, Wet | ● ◐ | — | 180 (100 – 200) | — | — |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ | — | 180 (100 – 200) | — | — |
| P | Carbon steel Alloy steel | 280 – 350HB | Dry, Wet | ● ◐ | — | 120 ( 80 – 160) | — | — |
| M | Austenitic stainless steel | ≤200HB | Dry, Wet | ● ◐ | — | 150 (100 – 200) | — | — |

1/1

# VERTICAL FEED MILLING

## RECOMMENDED CUTTING CONDITIONS

| | Material | Properties | Cutting mode | Cutting conditions | ae | MP1220 Vc | MP1230 Vc | MP1240 Vc |
|---|---|---|---|---|---|---|---|---|
| | **PMF** | | | | | | | |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ | — | 250 (150 – 350) | — | — |
| P | Carbon steel Alloy steel | 280 – 350HB | Dry, Wet | ● ◐ | — | 200 (100 – 300) | — | — |
| | **PMR** | | | | | | | |
| P | Carbon steel Alloy steel | 180 – 280HB | Dry, Wet | ● ◐ | — | 180 (150 – 200) | — | — |
| P | Carbon steel Alloy steel | 280 – 350HB | Dry, Wet | ● ◐ | — | 180 (150 – 200) | — | — |

1/1

Cutting conditions : ● : Stable cutting ◐ : General cutting ✤ : Unstable cutting

# SYMBOLS

**Recommended cutting conditions**

**Completely new products or expansions released in the current Spring or Autumn product launch and are not included in the latest version of the General Catalogue.**

**Products or expansions that have already been introduced in one of the previous Spring or Autumn product launches but are not included in the latest General Catalogue.**

## APPLICATION

**Face milling**

**Chamfer milling**

**Shoulder milling with R**

**Face milling close to a wall**

**Shoulder milling**

**Side milling**

**Slot milling**

**Ramping**

**Pocket milling**

**Slot milling with R**

**Copy milling**

**T-Slot milling**

## MACHINING TYPE


**Roughing**


**Medium cutting**


**Light cutting**


**Pre-finishing**


**Finishing**


**Fine-finishing**

## TOOL MATERIAL


**Ultra micro grain carbide**
Ultra micro grain carbide substrate material.


**Cubic boron nitride**
Mitsubishi Materials' original CBN material.


**Ceramic**
For high speed efficient machining of super alloys due to the excellent high temperature strength property.


**High hardness powder metallurgy HSS**
High hardness powder metallurgy HSS substrate material.


**High grade high alloy HSS**
High grade high alloy HSS substrate material.


**Cobalt high speed steel**
Cobalt high speed steel substrate material.


**High speed steel**
High speed steel substrate material.

# SYMBOLS

## COATING


**SMART MIRACLE coating**
New smooth and dense coating technology for high efficiency milling of difficult to cut materials.


**CRN coating**
Newly developed CrN coating for Copper Electrodes machining.


**Violet coating**
Increased tool life of 2-3 times more than TiN coated products.


**DP coating**
New generation coating suitable for a wide range of materials.


**MIRACLE coating**
The original Miracle (Al,Ti)N coating.
Also suitable for dry cutting.


**(Al, Ti)N coating**
(Al,Ti)N highly versatile application range.


**(Al,Ti,Cr)N multi-layer coating**
For carbon, alloy and hardened steels.


**IMPACT MIRACLE coating**
Single phase nano crystal coating technology has higher film hardness and heat resistance.


**MIRACLE coating**
The original MIRACLE (Al,Ti)N coating.
Also suitable for dry cutting.


**VFR coating**
The (AlCrSi)N/(AlTiSti)N PVD multilayer coating is ideal for machining of extremely hard materials up to 70 HRC.


**DLC coating**
Hardness similar to CVD diamond coating achieved with high adhesion strength.


**Diamond coating**
Suitable for CFRP and CFRP-aluminium materials.


**Diamond coating**
Suitable for graphite machining.


**Diamond coating**
The original CVD diamond coating.


**CVD Diamond coating**
Unique multi-layer micro-grain diamond crystal control technology drastically improves wear resistance and smoothness.

## CUTTING EDGE PROPERTIES

**Sharp corner edge**
Indicates the end mill has a sharp corner edge.

**Gash land**
Indicates the end mill cutting edge has a protective chamfer.


**Rake angle**

**Helix angle**
Indicates the helix angle of the end mill.


**Point angle**
Indicates the drill point angle.

**Roughing flute geometry**

**Variable helix**

**Rounded gash**


**Corner angle**

## WEB THINNING


**X type point geometry**
X web thinning used at the drill point.


**XR type point geometry**
XR web thinning used at the drill point.

**S type point geometry**
Easy cutting geometry.

**N type point geometry**
Effective when the point web is thick.

**Chipbreaker**

# SYMBOLS

## TOLERANCES

**Tolerance of taper angle**
Indicates the tolerance of the taper angle.

**R tolerance**
Indicates the radial tolerance of a ball nose end mill.

**R tolerance**
Indicates the radial tolerance of the corner radius.

**R tolerance**
Indicates the radial tolerance of a cutter with a corner radius.

**Outside diameter tolerance**
Indicates the diameter tolerance of the end mill.

**Peak tolerance**
Indicates the tolerance for the end diameter.


**Shank diameter tolerance**


**Shank diameter tolerance**

**Drill tolerance / diameter**

## COOLANT HOLES

**External coolant**

**Internal coolant**

**Internal coolant**

**Centered, internal coolant hole**

**Radial, internal coolant holes**

**Internal coolant holes**

**Internal coolant holes**

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