MOLDINO
The Edge To Innovation

# TD4N type

## Radius Mill TD4N

## *Lineup expanded with insert for high-hardness materials*

MOLDINO Tool Engineering, Ltd.
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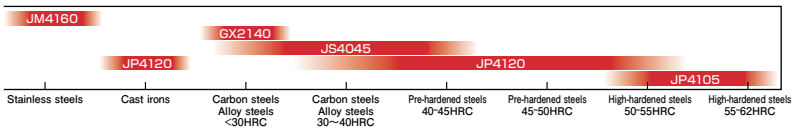
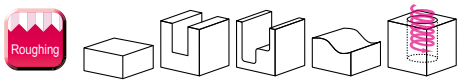
# Technology



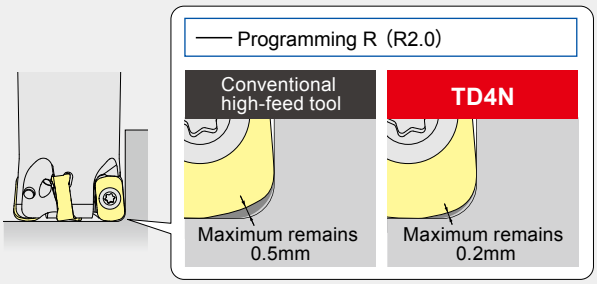

Applications




## Features 01 Reduces uncut remnants on work pieces

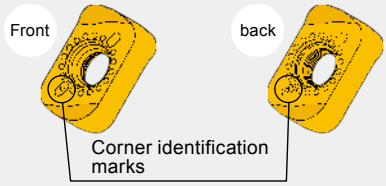
**The cutting edge shape was reviewed for TD4N so that uncut remnants are reduced. This enables the load on the next process to be reduced by up to 40%compared to conventional products.**

・Since it is difficult to create tool shape definitions in CAM for the complicated cutting edge shapes of high-feed tools, in many cases the tools are used with the definition for a simple R radius tool. The differences between this definition and the actual tool shape result in uncut remnants that cannot be checked on CAM and become more work for the next process.

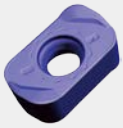



## Features 02 Economical 4-corner inserts with chip breakers for various applications

・By making it possible to use both the front and back sides of inserts, 4 corners can be used. The inserts are provided with a large rake angle which exhibits an excellent cutting force reduction effect even when compared to general positive-shape inserts.

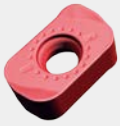



### Features of insert breaker



#### C breaker

Corresponds to our general high-feed-type inserts (EDNW, EPNW, WDNW, SDNW), and is resistant to chip jamming, vibrations, and crater wear.

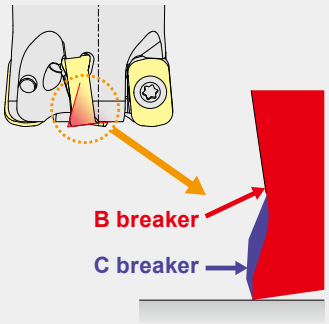


#### B breaker

Enables reduced cutting force when cutting work materials such as stainless steels, etc. that require free-cutting performance.

Magnified view of cutting edge cross section

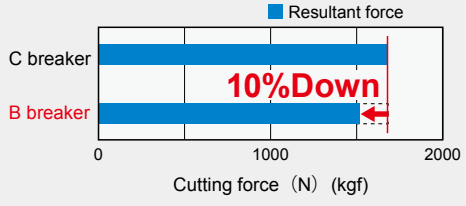
Positive rake angle



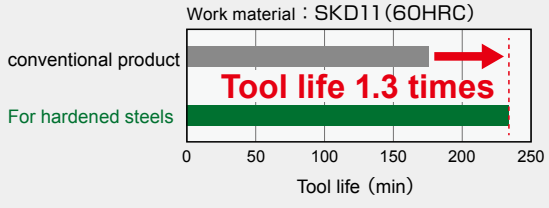

### NEW Features of insert for high-hardness materials

High-precision G-class insert suppresses dispersion in tool life.
Employs JP4105, a grade for high-hardness materials which provides long service life for machining 50HRC or harder matrials.

Comparison of cutting force

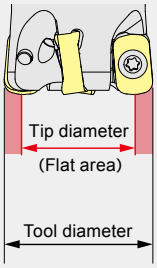



Tool life comparison with conventional products

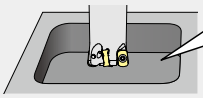


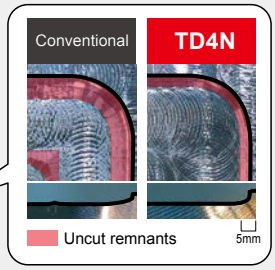
## Features 03 Large tip diameter for excellent handling

- Compared to conventional high-feed tools, TD4N has a large tip diameter, which suppresses the generation of uncut remnants which easily occur on the bottom surface of machined areas. In addition, since the cutting width (*a*e) can be set to a large value, this is also effective for improving machining efficiency.




Photograph of machined surface at corner (viewed from above)

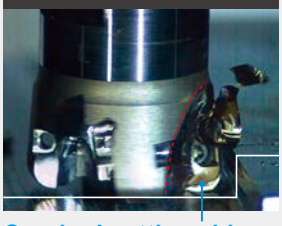





## Features 04 Excellent chip discharge characteristics

- Reduces the occurrence of sudden problems due to jamming of cutting chips. In addition, good chip removal makes it possible to further improve cutting performance.

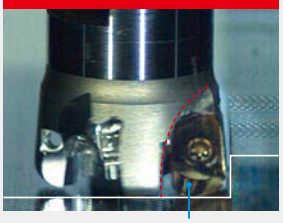
Tool with small chip pockets



If cutting chips are not discharged well, jamming of the cutting chips between the tool and wall occur, which can become the cause of sudden damage such as chipping, etc.

**Crushed cutting chips**

**TD4N**



Good chip discharge characteristics are achieved by providing large chip pockets and controlling the chip discharge direction.

**Cutting chips which were discharged well**

## Features 05 Lineup of insert grades

**PVD Technology** Grade for machining high-hardness materials **JP4105**

- Employs an ultra-fine cemented carbide substrate and the new "AJ Coating" to improve wear resistance.
- Excellent wear resistance when machining high hardness materials of 50HRC or higher.

**PVD Technology** Grade for machining pre-hardened or hardened materials **JP4120**

- Employs a fine carbide substrate with an excellent balance between wear resistance and toughness and the new "AJ Coating" to provide improved wear resistance and chipping resistance.
- Highly versatile with excellent wear resistance and chipping resistance when machining steel materials with hardnesses of 30 to 50 HRC.

**PVD Technology** Grade for machining stainless-steel materials **JM4160**

- Employs a carbide substrate with high toughness and the new "AJ Coating" to improve wear resistance and chipping resistance when machining stainless-steel materials.
- Reduces the welding to work material that occurs when machining stainless steel materials.

**PVD Technology** General purpose for steel **JS4045**

- JS4045 adopts heat resistant layer, reduces the crater wear by high-speed cutting.
- JS4045 adopts heat resistant substrate, reduces the wear and improves tool life.
- Improves tool life on dry cutting.

**CVD Technology** General purpose for steel **GX2140**

- Smooth surfaced α-$Al_2O_3$ layer with improved chipping / welding resistance brings less sudden-tool-edge-chipping.
- Machining efficiency is improved for high-speed,high-feed-rate rough machining by using the layer with fine columnar structure.

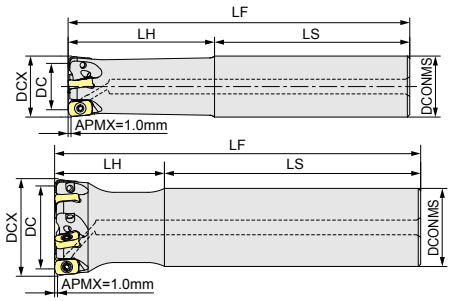
# Line Up

## Shank type TD4N20○○□(32)-○

Numeric figure in a circle ○ and Alphabetical character comes in a square □.

Fig.1 (Standard type)

Fig.2 (Undercut type)

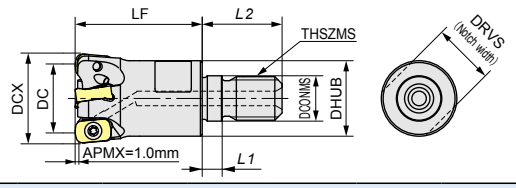



With air hole

| Type | | Item Code | Stock | No.of Flutes | Size (mm) DCX | DC | LF | LH | LS | DCONMS | Shape | Recommended insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shank type | Regular | TD4N2016S-2 | ● | 2 | 16 | 10 | 100 | 30 | 70 | 16 | Fig.1 | ENMU0603ER-B/C ENGU0603ER-C |
| | | TD4N2020S-3 | ● | 3 | 20 | 14 | 130 | 50 | 80 | 20 | | |
| | | TD4N2025S-4 | ● | 4 | 25 | 19 | 140 | 60 | 80 | 25 | | |
| | | TD4N2032S-5 | ● | 5 | 32 | 26 | 150 | 70 | 80 | 32 | | |
| | | TD4N2040S32-6 | ● | 6 | 40 | 34 | 150 | 45 | 105 | 32 | Fig.2 | |
| | Long | TD4N2016L-2 | ● | 2 | 16 | 10 | 150 | 50 | 100 | 16 | Fig.1 | |
| | | TD4N2018L-2 | ● | 2 | 18 | 12 | 150 | 25 | 125 | 16 | Fig.2 | |
| | | TD4N2020L-3 | ● | 3 | 20 | 14 | 160 | 80 | 80 | 20 | Fig.1 | |
| | | TD4N2022L-3 | ● | 3 | 22 | 16 | 160 | 30 | 130 | 20 | Fig.2 | |
| | | TD4N2025L-4 | ● | 4 | 25 | 19 | 180 | 100 | 80 | 25 | Fig.1 | |
| | | TD4N2028L-4 | ● | 4 | 28 | 22 | 180 | 35 | 145 | 25 | Fig.2 | |
| | | TD4N2032L-5 | ● | 5 | 32 | 26 | 200 | 120 | 80 | 32 | Fig.1 | |
| | | TD4N2035L-5 | ● | 5 | 35 | 29 | 200 | 40 | 160 | 32 | Fig.2 | |
| | | TD4N2040L32-6 | ● | 6 | 40 | 34 | 220 | 45 | 175 | 32 | Fig.2 | |

## Modular type TD4N20○○M-○

Numeric figure comes in a circle ○.




With air hole

| Item Code | Stock | No.of Flutes | Size (mm) DCX | DC | LF | L1 | L2 | DCONMS | DHUB | THSZMS | DRVS | Recommended insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TD4N2016M-2 | ● | 2 | 16 | 10 | 25 | 5.5 | 17 | 8.5 | 12.8 | M8 | 10 | ENMU0603ER-B/C ENGU0603ER-C |
| ※TD4N2018M-2 | ● | 2 | 18 | 12 | 25 | 5.5 | 17 | 8.5 | 12.8 | M8 | 10 | |
| TD4N2020M-3 | ● | 3 | 20 | 14 | 30 | 5.5 | 19 | 10.5 | 17.8 | M10 | 15 | |
| ※TD4N2022M-3 | ● | 3 | 22 | 16 | 30 | 5.5 | 19 | 10.5 | 17.8 | M10 | 15 | |
| TD4N2025M-4 | ● | 4 | 25 | 19 | 35 | 5.5 | 22 | 12.5 | 20.8 | M12 | 17 | |
| ※TD4N2028M-4 | ● | 4 | 28 | 22 | 35 | 5.5 | 22 | 12.5 | 20.8 | M12 | 17 | |
| TD4N2032M-5 | ● | 5 | 32 | 26 | 40 | 6 | 23 | 17 | 28.8 | M16 | 22 | |
| ※TD4N2035M-5 | ● | 5 | 35 | 29 | 40 | 6 | 23 | 17 | 28.8 | M16 | 22 | |
| ※TD4N2040M-6 | ● | 6 | 40 | 34 | 40 | 6 | 23 | 17 | 28.8 | M16 | 22 | |
| ※TD4N2042M-6 | ● | 6 | 42 | 36 | 40 | 6 | 23 | 17 | 28.8 | M16 | 22 | |

【Note】 When ※ and carbide shank are used together as a set, there is no interference.
Do not apply lubricants to the threaded section or end surface sections in contact with the dedicated shank/arbor for modular mills.

## Parts

| Parts | Clamp screw | | Screw Driver | Screw anti-seizure agent |
|---|---|---|---|---|
| Shape |  | Fastening torque (N・m) |  |  |
| Item Code | 250-141 | 1.1 | 104-T8 | P-37 |

【Note】
The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.

● : Stocked Items.

# Insert

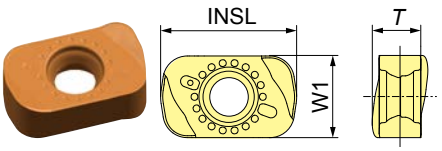


Fig.1 ENMU0603ER-B

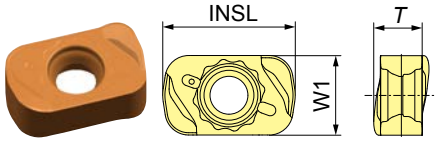


Fig.2 ENMU0603ER-C

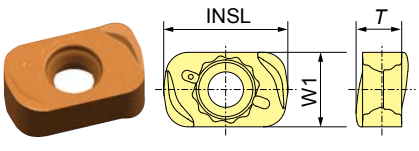


Fig.3 ENGU0603ER-C

| | | | | | | |
|---|---|---|---|---|---|---|
| P | Carbon steels | | ■ | | ■ | ■ |
| M | SUS, etc. | | | ■ | | |
| K | FC・FCD Cast irons | | ■ | | ⊔ | ⊔ |
| H | Hardened steels | ■ | ⊔ | | | |

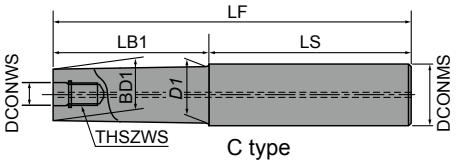
■:General cutting, First recommendation
⊔:General cutting, Second recommendation

| Item code | Tolerance class | AJ Coating | | | JS Coating | GX Coating | Size (mm) | | | Shape |
|---|---|---|---|---|---|---|---|---|---|---|
| | | JP4105 | JP4120 | JM4160 | JS4045 | GX2140 | INSL | W1 | *T* | |
| ENMU0603ER-B | M | | ● | ● | ● | ● | 10 | 6 | 3.7 | Fig.1 |
| ENMU0603ER-C | M | | ● | ● | ● | ● | 10 | 6 | 3.7 | Fig.2 |
| ENGU0603ER-C | G | ★ | | | | | 10 | 6 | 3.7 | Fig.3 |

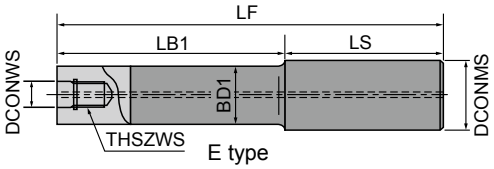
【Note】 Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.

# The Shanks for Modular Mill

## Carbide shank



C type



E type

| Item code | Stock | Size (mm) | | | | | | | | Type | Cutter body | With/ without air hole |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DCONWS | THSZWS | LF | LB1 | LS | BD1 | DCONMS | *D1* | | | |
| ASC16-8.5-95-30Z | ● | 8.5 | M8 | 95 | 30 | 65 | 14.5 | 16 | 15.5 | C | φ16 | ○ |
| ASC16-8.5-120-55Z | ● | | | 120 | 55 | 65 | | | | | | |
| ASC16-8.5-140-75Z | ● | | | 140 | 75 | 65 | | | | | | |
| ASC16-8.5-160-95Z | ● | | | 160 | 95 | 65 | | | | | | |
| ASC16-8.5-160-30Z | ● | | | 160 | 30 | 130 | | | | | | |
| ASC20-10.5-120-50Z | ● | 10.5 | M10 | 120 | 50 | 70 | 18.5 | 20 | 19.5 | C | φ20 | ○ |
| ASC20-10.5-170-90Z | ● | | | 170 | 90 | 80 | | | | | | |
| ASC20-10.5-220-120Z | ● | | | 220 | 120 | 100 | | | | | | |
| ASC20-10.5-270-150Z | ● | | | 270 | 150 | 120 | | | | | | |
| ASC20-10.5-220-50Z | ● | 10.5 | M10 | 220 | 50 | 170 | 18.5 | 20 | 19.5 | C | φ20 | ○ |
| ASC20-10.5-270-50Z | ● | | | 270 | | 220 | | | | | | |
| ASC25-12.5-145-65 | ● | 12.5 | M12 | 145 | 65 | 80 | 23 | 25 | - | E | φ25 | ○ |
| ASC25-12.5-215-115 | ● | | | 215 | 115 | 100 | | | | | | |
| ASC25-12.5-265-145 | ● | | | 265 | 145 | 120 | | | | | | |
| ASC25-12.5-315-195 | ● | | | 315 | 195 | 120 | | | | | | |
| ASC25-12.5-265-65 | ● | 12.5 | M12 | 265 | 65 | 200 | 23 | 25 | - | E | φ25 | ○ |
| ASC25-12.5-315-65 | ● | | | 315 | | 250 | | | | | | |
| ASC32-17-160-80 | ● | 17 | M16 | 160 | 80 | 80 | 28 | 32 | - | E | φ32 〈φ40〉 〈φ42〉 | ○ |
| ASC32-17-210-110 | ● | | | 210 | 110 | 100 | | | | | | |
| ASC32-17-260-140 | ● | | | 260 | 140 | 120 | | | | | | |
| ASC32-17-310-190 | ● | | | 310 | 190 | 120 | | | | | | |
| ASC32-17-360-240 | ● | | | 360 | 240 | 120 | | | | | | |
| ASC32-17-260-80 | ● | 17 | M16 | 260 | 80 | 180 | 28 | 32 | - | E | φ30 φ32 〈φ40〉 〈φ42〉 | ○ |
| ASC32-17-310-80 | ● | | | 310 | | 230 | | | | | | |
| ASC32-17-360-80 | ● | | | 360 | | 280 | | | | | | |

【Note】 ① Commercial milling chucks or shrink-fit holders can be used. ② For the φ40, φ42 size, it is recommended that the protrusion length be 200mm or less.
③ Types for the dedicated arbor (HSK-A63) and for steel shanks are standard stock items.

★ : Stocked Items of New products. ● : Stocked Items.

# Recommended Cutting Conditions

※ Red indicates primary recommended insert grade.

| Work material | Recommended inserts grade | Tool dia. DCX / Overhang | φ16(2 flutes) ～3DCX | φ16(2 flutes) 4DCX～7DCX | φ20(3 flutes) ～3DCX | φ20(3 flutes) 4DCX～7DCX | φ25(4 flutes) ～3DCX | φ25(4 flutes) 4DCX～7DCX | φ32(5 flutes) ～3DCX | φ32(5 flutes) 4DCX～7DCX | φ40(6 flutes) ～3DCX | φ40(6 flutes) 4DCX～7DCX |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steels Alloy steels <30HRC | ※ GX2140 JS4045 | *n* (min-1) | 3380 | 2990 | 2710 | 2390 | 2170 | 1910 | 1690 | 1490 | 1350 | 1190 |
| | | *Vc*(m/min) | 170 | 150 | 170 | 150 | 170 | 150 | 170 | 150 | 170 | 150 |
| | | *Vf*(mm/min) | 6760 | 4780 | 8130 | 5730 | 10410 | 9160 | 10140 | 8940 | 9720 | 8560 |
| | | *fz*(mm/t) | 1 | 0.8 | 1 | 0.8 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 |
| | | *ap*(mm) | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 |
| | | *ae*(mm) | 10 | 10 | 14 | 14 | 19 | 19 | 22 | 22 | 28 | 28 |
| | | *Q* (cm3/min) | 41 | 29 | 68 | 48 | 158 | 104 | 112 | 98 | 136 | 120 |
| Alloy steels Tool steels 30 ～ 40HRC | JP4120 JS4045 | *n* (min-1) | 2990 | 2590 | 2390 | 2070 | 1910 | 1660 | 1490 | 1290 | 1190 | 1040 |
| | | *Vc*(m/min) | 150 | 130 | 150 | 130 | 150 | 130 | 150 | 130 | 150 | 130 |
| | | *Vf*(mm/min) | 5980 | 4140 | 7170 | 4960 | 7640 | 6640 | 7450 | 6450 | 7140 | 6240 |
| | | *fz*(mm/t) | 1 | 0.8 | 1 | 0.8 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | *ap*(mm) | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 |
| | | *ae*(mm) | 10 | 10 | 14 | 14 | 19 | 19 | 22 | 22 | 28 | 28 |
| | | *Q* (cm3/min) | 36 | 25 | 60 | 42 | 116 | 76 | 82 | 71 | 100 | 87 |
| Pre-Hardened steels Alloy steels 40 ～ 50HRC | JP4120 JS4045 | *n* (min-1) | 1990 | 1790 | 1590 | 1430 | 1270 | 1150 | 1000 | 900 | 800 | 720 |
| | | *Vc*(m/min) | 100 | 90 | 100 | 90 | 100 | 90 | 100 | 90 | 100 | 90 |
| | | *Vf*(mm/min) | 3980 | 2860 | 4770 | 3430 | 5080 | 3680 | 5000 | 3600 | 4800 | 3450 |
| | | *fz*(mm/t) | 1 | 0.8 | 1 | 0.8 | 1 | 0.8 | 1 | 0.8 | 1 | 0.8 |
| | | *ap*(mm) | 0.6 | 0.5 | 0.6 | 0.5 | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| | | *ae*(mm) | 10 | 10 | 14 | 14 | 19 | 19 | 22 | 22 | 28 | 28 |
| | | *Q* (cm3/min) | 24 | 14 | 40 | 24 | 58 | 35 | 55 | 40 | 67 | 48 |
| Stainless steels SUS | JM4160 | *n* (min-1) | 1990 | 1790 | 1590 | 1430 | 1270 | 1150 | 1000 | 900 | 800 | 720 |
| | | *Vc*(m/min) | 100 | 90 | 100 | 90 | 100 | 90 | 100 | 90 | 100 | 90 |
| | | *Vf*(mm/min) | 3980 | 2860 | 4770 | 3430 | 5080 | 3680 | 5000 | 3600 | 4800 | 3450 |
| | | *fz*(mm/t) | 1 | 0.8 | 1 | 0.8 | 1 | 0.8 | 1 | 0.8 | 1 | 0.8 |
| | | *ap*(mm) | 0.6 | 0.5 | 0.6 | 0.5 | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| | | *ae*(mm) | 10 | 10 | 14 | 14 | 19 | 19 | 22 | 22 | 28 | 28 |
| | | *Q* (cm3/min) | 24 | 14 | 40 | 24 | 58 | 35 | 55 | 40 | 67 | 48 |
| Cast irons FC FCD | JP4120 GX2140 | *n* (min-1) | 3980 | 3580 | 3180 | 2870 | 2550 | 2290 | 1990 | 1790 | 1590 | 1430 |
| | | *Vc*(m/min) | 200 | 180 | 200 | 180 | 200 | 180 | 200 | 180 | 200 | 180 |
| | | *Vf*(mm/min) | 9550 | 7160 | 11440 | 8610 | 12240 | 9160 | 11940 | 8950 | 11440 | 8580 |
| | | *fz*(mm/t) | 1.2 | 1 | 1.2 | 1 | 1.2 | 1 | 1.2 | 1 | 1.2 | 1 |
| | | *ap*(mm) | 0.8 | 0.6 | 0.8 | 0.6 | 0.8 | 0.6 | 0.8 | 0.6 | 0.8 | 0.6 |
| | | *ae*(mm) | 10 | 10 | 14 | 14 | 19 | 19 | 22 | 22 | 28 | 28 |
| | | *Q* (cm3/min) | 76 | 43 | 128 | 72 | 186 | 104 | 210 | 118 | 256 | 144 |
| High-hardened steels 50 ～ 55HRC | JP4105 JP4120 | *n* (min-1) | 1590 | 1390 | 1270 | 1110 | 1020 | 890 | 800 | 700 | 640 | 560 |
| | | *Vc*(m/min) | 80 | 70 | 80 | 70 | 80 | 70 | 80 | 70 | 80 | 70 |
| | | *Vf*(mm/min) | 1270 | 890 | 1530 | 1070 | 1630 | 1140 | 1590 | 1110 | 1530 | 1070 |
| | | *fz*(mm/t) | 0.4 | 0.32 | 0.4 | 0.32 | 0.4 | 0.32 | 0.4 | 0.32 | 0.4 | 0.32 |
| | | *ap*(mm) | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 |
| | | *ae*(mm) | 10 | 10 | 14 | 14 | 19 | 19 | 24 | 24 | 30 | 30 |
| | | *Q* (cm3/min) | 4 | 2 | 6 | 3 | 9 | 5 | 11 | 6 | 14 | 7 |
| High-hardened steels 55 ～ 62HRC | JP4105 | *n* (min-1) | 1190 | 1190 | 950 | 950 | 760 | 760 | 600 | 600 | 480 | 480 |
| | | *Vc*(m/min) | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| | | *Vf*(mm/min) | 720 | 570 | 860 | 690 | 920 | 730 | 900 | 720 | 860 | 690 |
| | | *fz*(mm/t) | 0.3 | 0.24 | 0.3 | 0.24 | 0.3 | 0.24 | 0.3 | 0.24 | 0.3 | 0.24 |
| | | *ap*(mm) | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 |
| | | *ae*(mm) | 10 | 10 | 14 | 14 | 19 | 19 | 24 | 24 | 30 | 30 |
| | | *Q* (cm3/min) | 2 | 1 | 4 | 2 | 5 | 3 | 6 | 4 | 8 | 4 |

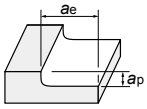
【Note】

① Use the appropriate coolant for the work material and machining shape.

②Conditions are for general guidance on shoulder face milling. In actual machining conditions please adjust the parameters according to your actual machine and work-piece conditions. Especially when the chip discharge or vibration is a problem in Slotting or near machining, please adjust the cutting conditions as follows.

· Reduce depth of cut (*ap*) to 50 to 70%.

· Reduce number of revolution(*n*) and feed rate(*Vf*) to 50 to 70%.




③ Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.

④ GX2140 should be used for dry cutting.

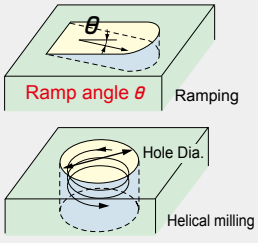
⑤ To prevent tool damage due to chip clogging, always use a chip removal method such as an air blower, etc.

⑥ Ensure to exchange the insert at the correct time to ensure safety of the tool-body.

⑦ The following equation can be used to determine the metal removal rate per unit time *Q*:

$Q(cm^3/min) = ap(mm) \times ae(mm) \times Vf(mm/min) \div 1000$

## Regarding ramping and helical milling diameter




(mm)

| Tool dia. DCX | φ16 | φ18 | φ20 | φ22 | φ25 | φ28 | φ32 | φ35 | φ40 | φ42 |
|---|---|---|---|---|---|---|---|---|---|---|
| Maximum ramp angle θ | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.6 | 0.5 | 0.5 | 0.3 | 0.3 |
| Hole Dia. | 24～30 | 28～34 | 32～38 | 36～42 | 42～48 | 48～54 | 56～62 | 62～68 | 72～78 | 76～82 |

Cutting depth per rotation should be set to *ap* = 1 mm or less.

【Note】① It is recommended that the tool be used while performing sufficient chip removal and checking that there are no abnormal vibrations.

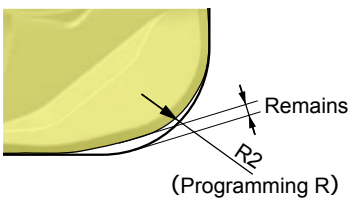
② The ramp angle *θ* should be set within the ranges listed above. Use at ramp angles of 0.5˚ or less is recommended.

③ For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

## Points requiring care when creating the machining program

・In CAM, define the tool shape as an R2.0 radius shape.

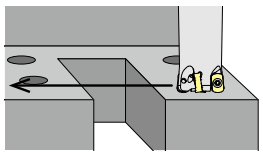
| | Programming R (mm) | Remains (mm) | Over Cut (mm) |
|---|---|---|---|
| | R3.0 | 0 | 0.4 |
| Recommended | R2.0 | 0.2 | 0 |
| | R1.5 | 0.3 | 0 |

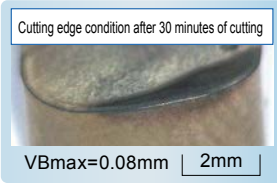


# Field data

## 01 Shortened machining time

Interrupted machining





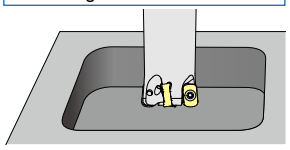

【Work material】
Pre-hardened steels (40HRC)
【Tool】
TD4N2032S-5(φ32-5 flutes)
ENMU0603ER-B(JP4120)

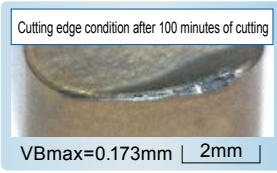
【Cutting conditions】
*Vc*=100m/min
*Vf*=9000mm/min(*fz*=1.8mm/t)
*ap*×*ae*=0.6×20mm
Air-blow

**●90-minute machining time shortened to approx. 30 minutes.**

## 02 Improved tool life

Pocketing



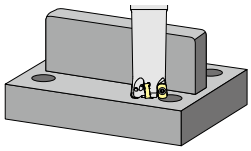


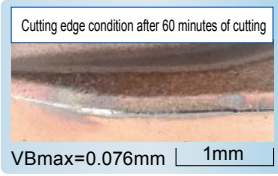

【Work material】
Carbon steels
【Tool】
TD4N2020S-3(φ20-3 flutes)
ENMU0603ER-B(JP4120)

【Cutting conditions】
*Vc*=140m/min
*Vf*=5000mm/min(*fz*=0.75mm/t)
*ap*×*ae*=0.8×10mm
Emulsion oil

**●Completed machining with normal wear without large chipping.**

Hardened steels machining





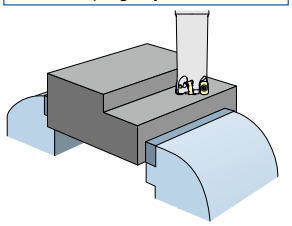

【Work material】
High-hardened steels(60HRC)
【Tool】
TD4N2025M-4(φ25-4 flutes)
ENGU0603ER-C (JP4105)

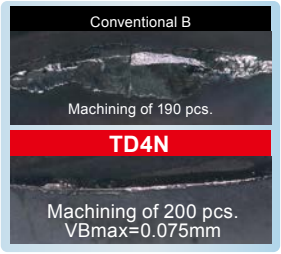
【Cutting conditions】
*Vc*=80m/min
*Vf*=1220mm/min(*fz*=0.3mm/t)
*ap*×*ae*=0.2×15mm
Air-blow

**●Even after 60 minutes machining, wear is small and possible to use continuously.**

## 03 High-performance machining when clamp rigidity is weak.

Low clamp rigidity






【Work material】
Mild steels
【Tool】
TD4N2032S-5(φ32-5 flutes)
ENMU0603ER-C (JS4045)

【Cutting conditions】
*Vc*=200m/min
*Vf*=8000mm/min(*fz*=0.8mm/t)
*ap*×*ae*=0.5×20mm
Emulsion oil

**●Even after machining 200 pcs., wear is small and good.**

## High-feed tools lineup

| Type | Feature: Economical (No. of corners) | Feature: High accuracy (Less uncut remnants) | Feature: Supports for high-hardened steel | Feature: Efficiency (No. of Flutes) | Holder: Tool dia. (mm) | Insert: No. of corners | Insert: Shape | Insert: Inscribed circle code | Programming R (mm) | APMX (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| TD4N | ◎ | ◎ | ○ ~62HRC | ◎ High Efficiency multiflutes | φ16~40 | 4 |  | 06 | 2.0 | 1.0 |
| ASR Multi-Flutes | | ○ | ○ ~62HRC | ◎ High Efficiency multiflutes | φ16~66 | 2 |  | 06 | 2.0 | 1.5 |
| | | | | | | | | 12 | 3.0 | 2.0 |
| ASRF-mini | ◎ | | ○ ~62HRC | ○ General | φ20~63 | 4 |  | 07 | 2.0 | 1.2 |
| ASR | | ○ | ○ ~60HRC | ○ General | φ20~100 | 2 |  | 08~15 | 3.0 | 2.0 |
| ASRT | ○ | ○ | ○ ~62HRC | ○ General | φ25~100 | 3 |  | 09~14 | | |
| ASRF | ◎ | | ○ ~60HRC | ○ General | φ32~100 | 4 |  | 12 | 4.5 | |
| TD6N | ◎ | ○ | ~50HRC | ○ General | φ50~125 | 6 |  | 14 | 3.0 | 1.5 |
| | | | | | | | | 14 | | 3.0 |
| TR4F | ◎ | | ○ ~60HRC | ○ General | φ32~125 | 4 |  | 12 | | 1.2 |
| | | | | | | | | 15 | | 2.0 |

※ Various other tools for roughing are also available.
※ For more information on tool specifications, please refer to our general catalog or visit our website. (http://www.moldino.com)

MOLDINO

The Edge To Innovation

The diagrams and table data are examples of test results, and are not guaranteed values.
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## ⚠ Attentions on Safety

### 1. Attentions regarding handling

(1) When removing the tool from the case (package), be careful not to drop it on your foot or drop it onto the tips of your bare fingers.
(2) When actually setting the inserts, be careful not to touch the cutting flute directly with your bare hands.

### 2. Attentions regarding mounting

(1) When preparing for use, be sure that the inserts are firmly mounted in place and that they are firmly mounted on the arbor, etc.
(2) If abnormal chattering occurs during use, stop the machine immediately and remove the cause of the chattering.

### 3. Attentions during use

(1) Before use, confirm the dimensions and direction of rotation of the tool and milling work material.
(2) The numerical values in the standard cutting conditions table should be used as criteria when starting new work. The cutting conditions should be adjusted as appropriate when the cutting depth is large, the rigidity of the machine being used is low, or according to the conditions of the work material.
(3) The inserts are made of a hard material. During use, they may break and fly off. In addition, cutting chips may also fly off. Since there is a danger of injury to workers, fire, or eye damage from such flying pieces, a safety cover should be installed and safety equipment such as safety glasses should be worn to create a safe environment for work.
・Do not use where there is a risk of fire or explosion.
・Do not use non-water-soluble cutting oils. Such oils may result in fire.
(4) Do not use the tool for any purpose other than that for which it is intended, and do not modify it.


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