



YG
i-Xmill

**COATED EXCHANGEABLE CARBIDE INSERTS
WITH CARBIDE & STEEL HOLDERS
FOR VARIOUS MATERIALS**

For General Purpose, Pre-Hardened Steels,
High-Hardened Steels, Stainless Steels and Graphite
High Precision Cutting and Wear Resistance

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Note The new address above has currently been updated since Korean new postal standard was valid from 2014.
Be noticed that the physical Headquarter location is NOT changed.

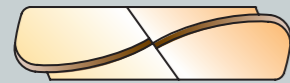


Search 'YG-1' on social media outlets

YEEI181001006

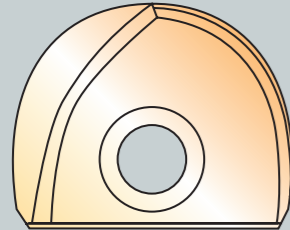
FEATURES AND BENEFITS

i-Xmill BALL INSERT



1. Helical end gash ("S" gash) geometry

- Low milling torque
- Prevents chattering
- Improves chip ejection
- Prolong tool life



2. Polished cutting edges

- Better wear resistance and tool life
- Improves repeatability in performance
- Improves surface roughness on work-piece
- Improves coating

3. Special coating

- Combine high hardness with high thermal stability against oxidation
- Superior wear resistance
- Faster feeds and speeds

i-Xmill CORNER RADIUS INSERT

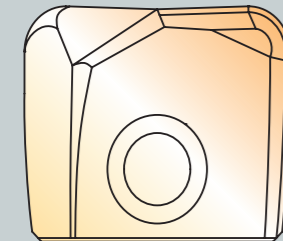


1. The optimized tool geometry achieves better reliability and reduces vibration and cutting load.

2. Corner radius insert can be used with the ball holder, but for a better precision in cutting. It is recommended to use the corner radius holder.

3. The various and wide cutting range allows machining in both roughing and finishing.

4. Special coating makes high hardness with high thermal stability against oxidation.



i-Xmill CARBIDE HOLDER

1. As rigid as a solid carbide end mill for stable machining with reduced vibration and enhanced finish
2. Allows a high quality of finishing even when machining the deeper part of a mold
3. Longer tool life than a steel holder
4. Shrink Fit Holding system can be applied
5. Upon request, the broken holder is able to be regenerated
6. Your carbide holder can be regenerated as YG-1 type upon request

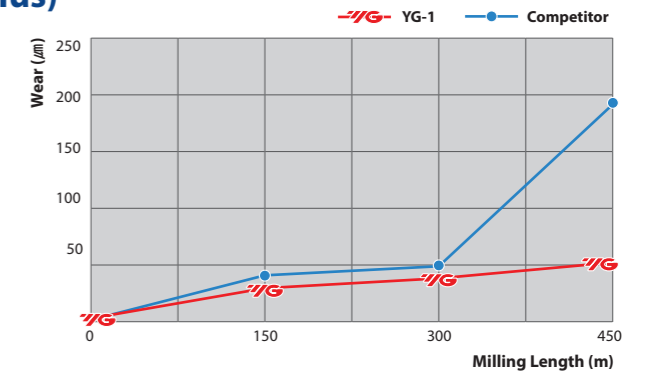
i-Xmill STEEL HOLDER

1. Premium alloy steel with excellent strength
2. Precise shank tolerance (h6)
3. Nickel plated, to prevent corrosion and improve lubricity

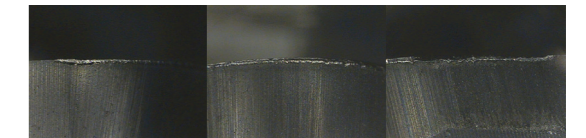
CASE STUDY

▶ TEST- I for General Purpose (Corner Radius)

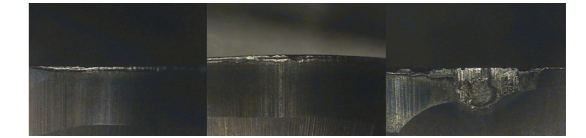
| | |
|----------------|---|
| Tools | i-Xmill Corner Radius (XMR110A16020) |
| Size(mm) | Ø16 x R2.0 |
| Work Material | - DIN: 40CrMnNiMo8-6-4 (1.2738) - AISI: P20+Ni - KS: KP4M (Mold steels HRC35) |
| Cutting Speed | 280 m/min. |
| RPM | 5,570 rev./min. |
| Feed | 2,230 mm/min. |
| Feed per tooth | 0.2 mm/tooth |
| Milling Method | Side Cutting |
| Milling Depth | Axial: 3.0 mm Radial: 0.2 mm |
| Coolant | Oil Mist |
| Overhang | 70 mm |
| Machine | Machining Center |



i-Xmill (Total milling length 450m)

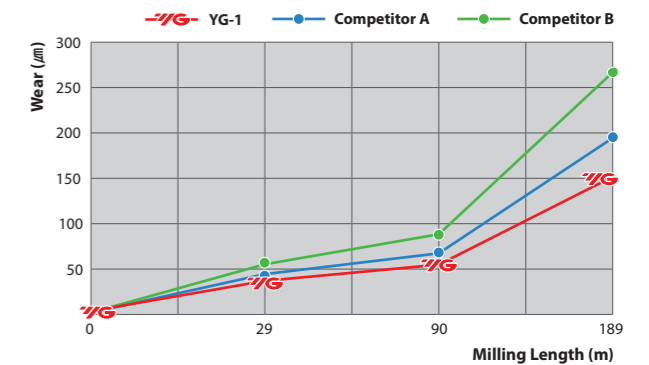


Competitor (Total milling length 450m)

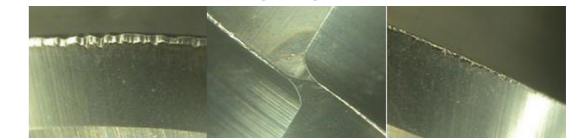


▶ TEST- II for Pre-Hardened Steels (Ball)

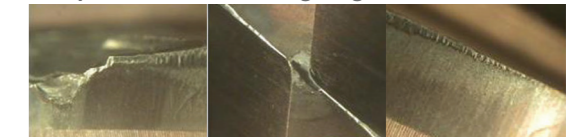
| | |
|----------------|---|
| Tools | i-Xmill Ball (XMB120C160) |
| Size(mm) | Ø16 x R8.0 |
| Work Material | - DIN : X40GrMoV51 (1.2344) - AISI : H13 - JIS: SKD61 (HRC50) |
| Cutting Speed | 80.42 m/min. |
| RPM | 1,600 rev./min. |
| Feed | 390 mm/min. |
| Feed per tooth | 0.12 mm/tooth |
| Milling Method | Side Cutting |
| Milling Depth | Axial: 0.8 mm Radial: 1.6 mm |
| Coolant | Oil Mist |
| Overhang | YG-1, Competitor B: 48 mm Competitor A: 56 mm |
| Machine | Machining Center |



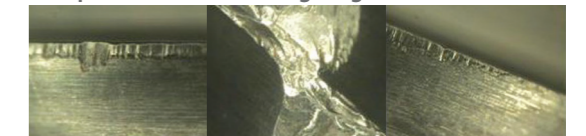
i-Xmill (Total milling length 189m)



Competitor A (Total milling length 189m)



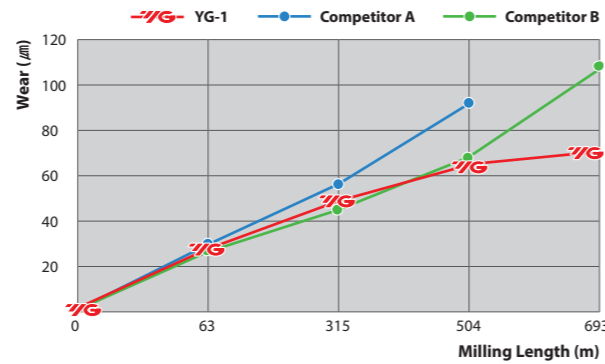
Competitor B (Total milling length 189m)



CASE STUDY

▶ TEST- III for High Hardened Steels (Ball)

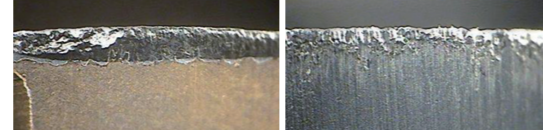
| | |
|----------------|---|
| Tools | i-Xmill Ball (XMB260T160) |
| Size(mm) | Ø16 x R8.0 |
| Work Material | - DIN: X155CrVMo12-1 (1.2379) - AISI: D2 - JIS: SKD11 (HRC60) |
| Cutting Speed | 70.02 m/min. |
| RPM | 1,393 rev./min. |
| Feed | 613 mm/min. |
| Feed per tooth | 0.22 mm/tooth |
| Milling Method | Profile Cutting |
| Milling Depth | Axial: 0.1 mm Radial: 0.3 mm |
| Coolant | Oil Mist |
| Machine | Machining Center |



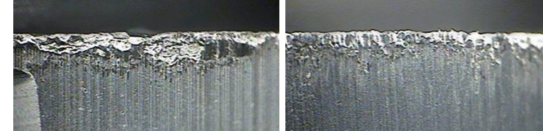
i-Xmill (Total milling length 693m)



Competitor A (Total milling length 504m)

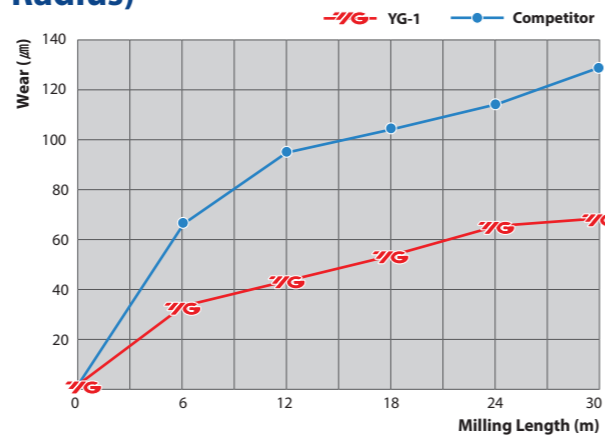


Competitor B (Total milling length 693m)

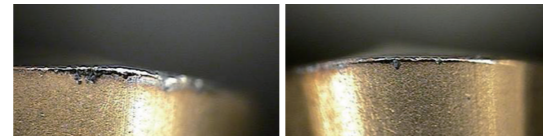


▶ TEST-IV for High Hardened Steels (Corner Radius)

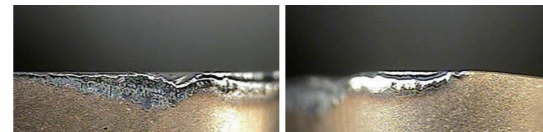
| | |
|----------------|---|
| Tools | i-Xmill Corner Radius (XMR260T25010) |
| Size(mm) | Ø25 x R1.0 |
| Work Material | - DIN: X155CrVMo12-1 (1.2379) - AISI: D2 - JIS: SKD11 (HRC60) |
| Cutting Speed | 80.11 m/min. |
| RPM | 1,020 rev./min. |
| Feed | 310 mm/min. |
| Feed per tooth | 0.15 mm/tooth |
| Milling Depth | Axial: 0.4 mm Radial: 0.2 mm |
| Milling Length | 30 m |
| Milling Method | Down & Side Cutting |
| Coolant | Oil mist |



i-Xmill (Total milling length 30m)



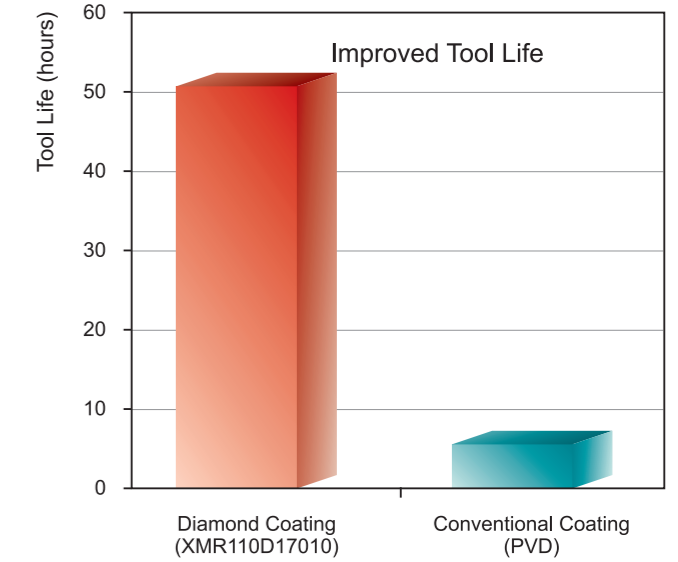
Competitor (Total milling length 30m)



CASE STUDY

▶ TEST- V for Graphite (Corner Radius)

| | |
|----------------|--------------------------------------|
| Tools | i-Xmill Corner Radius (XMR110D17010) |
| Size(mm) | Ø17 x R1.0 |
| Work Material | Graphite |
| Cutting Speed | 320 m/min. |
| RPM | 6,000 rev./min. |
| Feed | 2,800 mm/min. |
| Feed per tooth | 0.23 mm/tooth |
| Milling Depth | Axial : 0.2 mm |
| Coolant | Air |



Coating properties

This coating generation features a good crystalline structure. It protects tools perfectly against abrasive wear and is unsurpassed in graphite cutting

Features

1. High Abrasive wear resistance
2. Good Coefficient of friction
3. High Precision

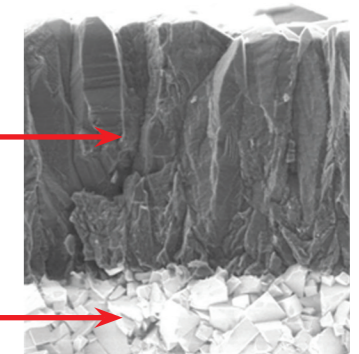
Benefits

i-Xmill with diamond coating shows excellent performance in graphite cutting at high speed allowing an improved surface finish

Applications

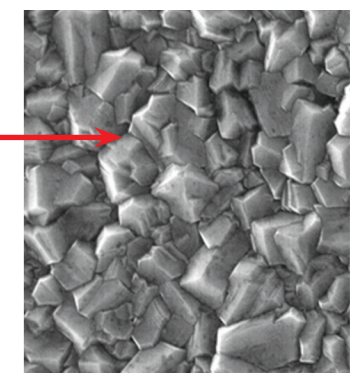
1. Precision-structured graphite electrodes
2. Ceramics (greens, sintered) Dental, Machinery

Diamond layer



Base material

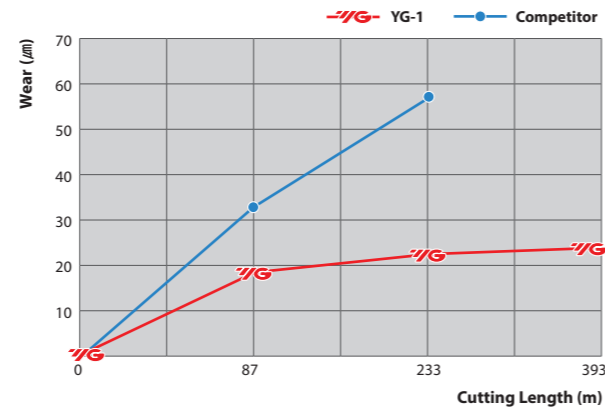
Crystalline structure



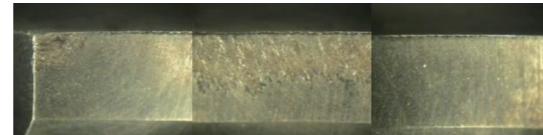
CASE STUDY

▶ TEST-VI for Stainless Steels (Ball)

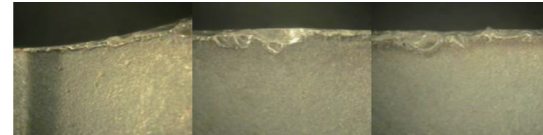
| | |
|----------------|--|
| Tools | i-Xmill Ball (XMB130A160) |
| Size(mm) | Ø16 x R8.0 |
| Work Material | - DIN: X5CrNi1810 (X4CrNi18-10) - WR: 1.4301 - JIS: SUS304 |
| Cutting Speed | 119.9 m/min. |
| RPM | 2,385 rev./min. |
| Feed | 688 mm/min. |
| Cutting Depth | Axial: 0.3 mm Radial: 3.2 mm |
| Milling Length | 393 m |
| Milling Method | Profiling Cutting |
| Coolant | Wet cut |



i-Xmill (Total milling length 393m)

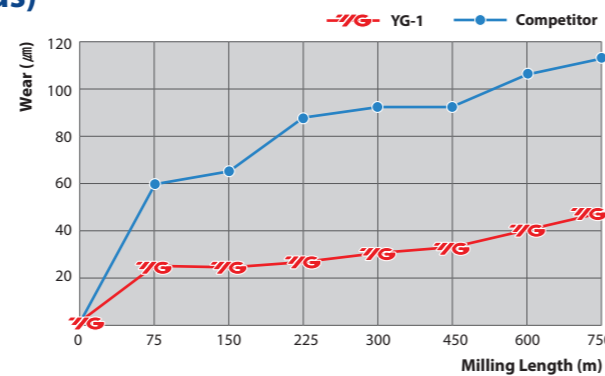


Competitor (Total milling length 233m)



▶ TEST-VII for Stainless Steels (Corner Radius)

| | |
|----------------|--|
| Tools | i-Xmill Corner Radius (XMR130A16020) |
| Size(mm) | Ø16 x R2.0 |
| Work Material | - DIN: X5CrNi1810 (X4CrNi18-10) - WR: 1.4301 - JIS: SUS304 |
| Cutting Speed | 129.99 m/min. |
| RPM | 2,586 rev./min. |
| Feed | 647 mm/min. |
| Feed per tooth | 0.13 mm/tooth |
| Milling Depth | Axial: 0.4 mm Radial: 0.4 mm |
| Milling Length | 750 m |
| Milling Method | Down & Side Cutting |
| Coolant | Wet cut |



i-Xmill (Total milling length 750m)



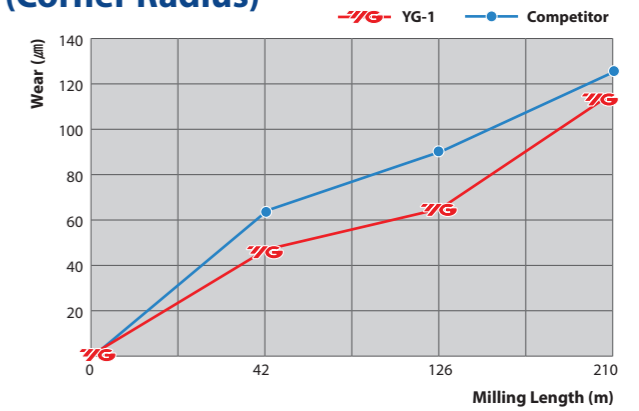
Competitor (Total milling length 750m)



CASE STUDY

▶ TEST-VIII for General Purpose - High Feed (Corner Radius)

| | |
|----------------|---|
| Tools | i-Xmill Corner Radius (XMF110V16015) |
| Size(mm) | Ø16 x R1.5 |
| Work Material | - DIN: X40GrMoV51 (1.2344) - AISI: H13 - JIS: SKD61 |
| Cutting Speed | 174.97 m/min. |
| RPM | 3,481 rev./min. |
| Feed | 6,962 mm/min. |
| Feed per tooth | 1.0 mm/tooth |
| Milling Depth | Axial: 0.6 mm Radial: 7.0 mm |
| Milling Length | 210 m |
| Milling Method | Down & Side Cutting |
| Coolant | Oil Mist |



i-Xmill (Total milling length 210m)

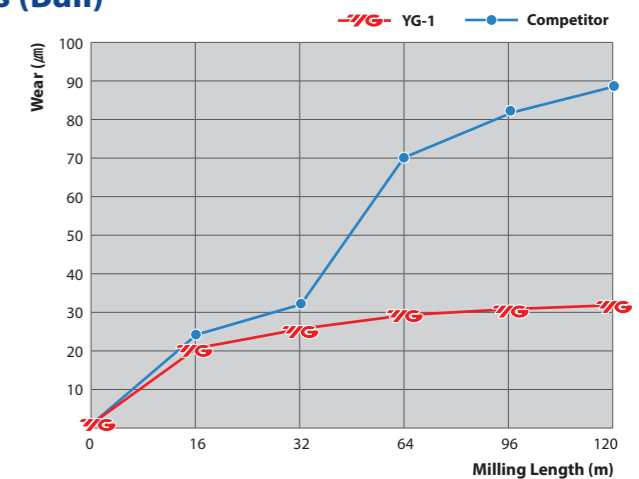


Competitor (Total milling length 210m)

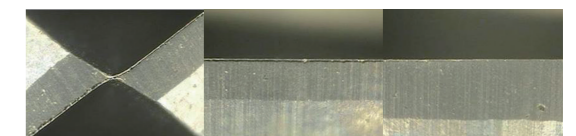


▶ TEST-IX for General Purpose - Full Radius (Ball)

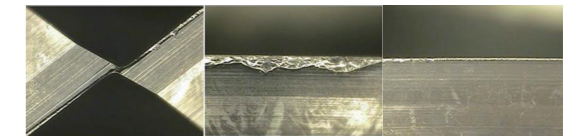
| | |
|----------------|---|
| Tools | i-Xmill Ball (XMM110V160) |
| Size(mm) | Ø16 x R8.0 |
| Work Material | - DIN: C45 - WR: 1.0503 - JIS: S45C (HRC25) |
| Cutting Speed | 200.0 m/min. |
| RPM | 3,979 rev./min. |
| Feed | 1,990 mm/min. |
| Feed per tooth | 0.25 mm/tooth |
| Milling Depth | Axial: 0.5 mm Radial: 2.0 mm |
| Milling Length | 120 m |
| Milling Method | Profiling Cutting |
| Coolant | Oil mist |



i-Xmill (Total milling length 120m)



Competitor (Total milling length 120m)



SELECTION GUIDE

i-Xmill
COATED EXCHANGEABLE CARBIDE INSERTS
WITH CARBIDE & STEEL HOLDERS

◎ : Excellent ○ : Good

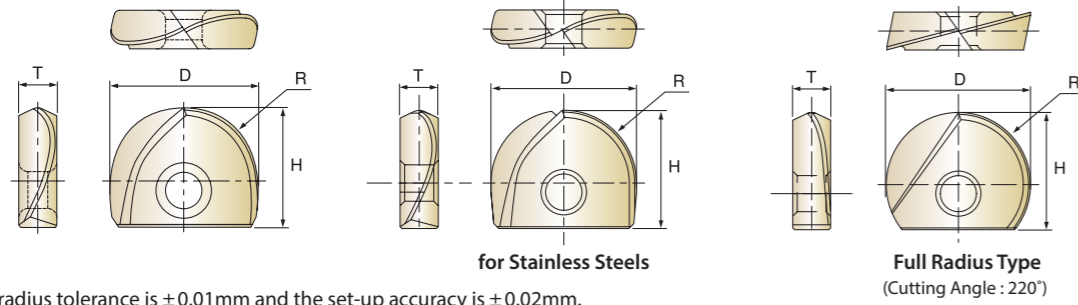
| ITEM | MODEL | DESCRIPTION | SIZE | | PAGE |
|--------------------------------|-------|--|-------|-------|------------------------|
| | | | Min. | Max. | |
| XMB110A | | For General Purpose | Ø8.0 | Ø33.0 | 10 |
| XMB120C | | For Pre-Hardened Steels | Ø8.0 | Ø33.0 | |
| XMB260T | | For High Hardened Steels | Ø8.0 | Ø33.0 | |
| XMB130A | | For Stainless Steels | Ø8.0 | Ø33.0 | |
| XMM110V | | For General Purpose - Full Radius | Ø8.0 | Ø33.0 | |
| XMB110D | | For Graphite | Ø8.0 | Ø33.0 | |
| XMR110A | | For General Purpose & Stainless Steels | Ø8.0 | Ø33.0 | 11 14 |
| XMR120C | | For Pre-Hardened Steels | Ø8.0 | Ø33.0 | |
| XMR260T | | For High Hardened Steels | Ø8.0 | Ø33.0 | |
| XMF110V | | For General Purpose - High Feed | Ø8.0 | Ø33.0 | |
| XMR110D | | For Graphite | Ø8.0 | Ø33.0 | |
| ZBC | | Carbide Holder - Straight Neck | Ø8.0 | Ø33.0 | 15 |
| ZRC | | Carbide Holder - Straight Neck | Ø8.0 | Ø33.0 | 16 |
| ZBT | | Steel Holder - Taper Neck | Ø8.0 | Ø33.0 | 17 |
| ZBS | | Steel Holder - Straight Neck | Ø12.0 | Ø33.0 | 18 |
| ZRT | | Steel Holder - Taper Neck | Ø8.0 | Ø13.0 | 19 |
| ZRS | | Steel Holder - Straight Neck | Ø12.0 | Ø33.0 | |
| RECOMMENDED CUTTING CONDITIONS | | | | | 20 |

Insert

Holder

| P | | | | | | | | | M | K | N | |
|---------------|--------|--------------|--------|-------------|--------|-----------------|----------|----------------------|------------------|-----------|----------|----------|
| Carbon Steels | | Alloy Steels | | Tool Steels | | Hardened Steels | | High Hardened Steels | Stainless Steels | Cast Iron | Aluminum | Graphite |
| ~HRC35 | HRC35~ | ~HRC35 | HRC35~ | ~HRC35 | HRC35~ | HRC40~45 | HRC45~55 | HRC55~ | ~HRC28 | ~HRC35 | ~HRC8 | |
| ◎ | ○ | ◎ | ○ | ◎ | ○ | ○ | | | | | | |
| ○ | ◎ | ○ | ◎ | ○ | ◎ | ◎ | ○ | ○ | | ◎ | | |
| | ○ | | ○ | | ○ | ○ | ◎ | ◎ | | ○ | | |
| ○ | | ○ | | ○ | | | | | ◎ | | ○ | |
| ◎ | ○ | ◎ | ○ | ◎ | ○ | | | | | | | |
| | | | | | | | | | | | ○ | ◎ |
| ◎ | ○ | ◎ | ○ | ◎ | ○ | ○ | | | ◎ | | | |
| ○ | ◎ | ○ | ◎ | ○ | ◎ | ◎ | ○ | ○ | | ◎ | | |
| | ○ | | ○ | | ○ | ○ | ◎ | ◎ | | ○ | | |
| ◎ | ○ | ◎ | ○ | ◎ | ○ | | | | | | | |
| | | | | | | | | | | | ○ | ◎ |

BALL INSERTS



● The ball radius tolerance is $\pm 0.01\text{mm}$ and the set-up accuracy is $\pm 0.02\text{mm}$.

| Ball Type | Continuous | | Minor Intermittent | | Heavy Intermittent | | Unit : mm |
|-----------|------------------|---|--------------------|---|--------------------|---|-----------|
| | P | M | K | N | S | | |
| | Steels | ● | ● | ● | ● | ● | |
| | Stainless Steels | | | | ● | | |
| | Cast Iron | | | ● | | | |
| | Non Ferrous | | ● | | ● | ● | |
| | Heat Resistant | | | ● | | | |

| SHAPE | SPECIFICATION | EDP NO. | GRADE | | | | | | DIMENSIONS | | | | |
|-------|---------------|--|-------------|---------------------|-------------------------|--------------------------|----------------------|--------------------------------------|--------------|----|-------|------|-----|
| | | | PVD | | | | | Diamond | D | R | H | T | |
| | | | XMB110A | XMB120C | XMB260T | XMB130A | XMM110V | XMB110D | | | | | |
| | Diameter | Grade | Designation | for General Purpose | for Pre-Hardened Steels | for High Hardened Steels | for Stainless Steels | for General Purpose Full Radius Type | for Graphite | | | | |
| | Ø8 | XMB110A XMB120C XMB260T XMB130A XMM110V XMB110D | 080 | ● | ● | ● | ● | ● | ● | 8 | R4.0 | 8 | 2.4 |
| | Ø10 | | 100 | ● | ● | ● | ● | ● | ● | 10 | R5.0 | 9.5 | 2.7 |
| | Ø11 | | 110 | ● | ● | ● | ● | ● | ○ | 11 | R5.5 | 10 | 2.7 |
| | Ø12 | | 120 | ● | ● | ● | ● | ● | ● | 12 | R6.0 | 11 | 3.2 |
| | Ø13 | | 130 | ● | ● | ● | ● | ● | ○ | 13 | R6.5 | 11.5 | 3.2 |
| | Ø16 | | 160 | ● | ● | ● | ● | ● | ● | 16 | R8 | 13 | 4.2 |
| | Ø17 | | 170 | ● | ● | ● | ● | ● | ○ | 17 | R8.5 | 13.5 | 4.2 |
| | Ø20 | | 200 | ● | ● | ● | ● | ● | ● | 20 | R10 | 16 | 5.2 |
| | Ø21 | | 210 | ● | ● | ● | ● | ● | ○ | 21 | R10.5 | 16.5 | 5.2 |
| | Ø25 | | 250 | ● | ● | ● | ● | ● | ● | 25 | R12.5 | 19.5 | 6.2 |
| | Ø26 | | 260 | ● | ● | ● | ● | ● | ○ | 26 | R13 | 20 | 6.2 |
| | Ø30 | | 300 | ● | ● | ● | ● | ● | ● | 30 | R15 | 23.5 | 7.2 |
| | Ø32 | | 320 | ● | ● | ● | ● | ● | ● | 32 | R16 | 24.5 | 7.2 |
| | Ø33 | | 330 | ● | ● | ● | ● | ● | ○ | 33 | R16.5 | 25 | 7.2 |

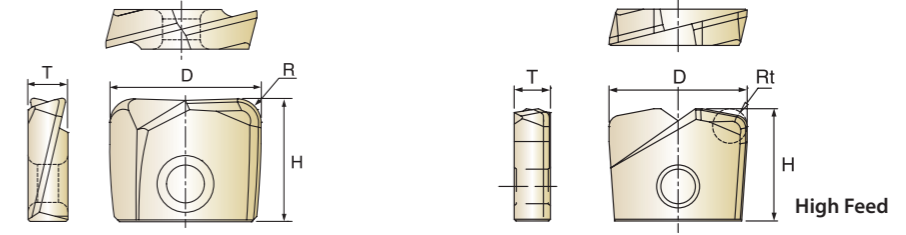
* EDP No. of each selected items is a combination of "Grade" and "Designation"

For example, EDP No. of Grade XMB110A, designation 080 therefore the insert EDP No. to order is: XMB110A 080

* Stock situation is subject to change without prior notice

* ●: Stock item ○: Order made item

CORNER RADIUS INSERTS



● The corner radius tolerance is $\pm 0.015\text{mm}$ and the set-up accuracy is $\pm 0.02\text{mm}$.

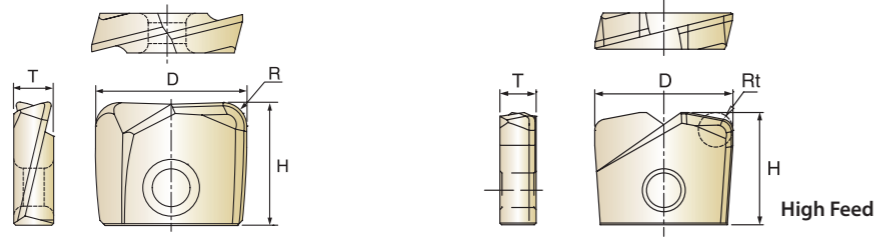
● Corner radius insert can be used with the ball holder, but for a better precision in cutting. It is recommended to use the corner radius holder.

| Corner Radius Type | Continuous | | Minor Intermittent | | Heavy Intermittent | | Unit : mm |
|--------------------|------------------|---|--------------------|---|--------------------|---|-----------|
| | P | M | K | N | S | | |
| | Steels | ● | ● | ● | ● | | |
| | Stainless Steels | | | | ● | | |
| | Cast Iron | | | | ● | | |
| | Non Ferrous | | ● | | ● | ● | |
| | Heat Resistant | | | ● | | | |

| SHAPE | SPECIFICATION | EDP NO. | GRADE | | | | | DIMENSIONS | | | | | |
|-------|------------------------|---|-------------|--|-------------------------|--------------------------|-------------------------------|--------------|--------|------|------|---------|-----|
| | | | PVD | | | | Diamond | D | R (Rt) | H | T | ap Max. | |
| | | | XMR110A | XMR120C | XMR260T | XMF110V | XMR110D | | | | | | |
| | Diameter with Corner-R | Grade | Designation | for General Purpose & Stainless Steels | for Pre-Hardened Steels | for High Hardened Steels | for General Purpose High Feed | for Graphite | | | | | |
| | Ø8 R0.3 | XMR110A XMR120C XMR260T XMF110V XMR110D | 080 03 | ● | ● | ● | - | ○ | 8 | R0.3 | 8 | 2.4 | 0.4 |
| | Ø8 R0.5 | | 080 05 | ● | ● | ● | - | ○ | R0.5 | | | | |
| | Ø8 R0.8 | | 080 08 | - | - | - | ● | - | R0.8 | | | | |
| | Ø8 R1.0 | | 080 10 | ● | ● | ● | - | ○ | R1.0 | | | | |
| | * Ø8 R2.0 | | 080 20 | ● | ● | ● | - | ○ | R2.0 | | | | |
| | Ø10 R0.3 | | 100 03 | ● | ● | ● | - | ○ | R0.3 | 10 | 9.5 | 2.7 | 0.5 |
| | Ø10 R0.5 | | 100 05 | ● | ● | ● | - | ○ | R0.5 | | | | |
| | Ø10 R1.0 | | 100 10 | ● | ● | ● | ● | ○ | R1.0 | | | | |
| | Ø10 R1.5 | | 100 15 | ● | ● | ● | - | ○ | R1.5 | | | | |
| | Ø10 R2.0 | | 100 20 | ● | ● | ● | - | ○ | R2.0 | | | | |
| | * Ø10 R3.0 | | 100 30 | ○ | ○ | ○ | - | ○ | R3.0 | | | | |
| | Ø11 R0.3 | | 110 03 | ● | ● | ● | - | ○ | R0.3 | 11 | 9.5 | 2.7 | 0.5 |
| | Ø11 R0.5 | | 110 05 | ● | ● | ● | - | ○ | R0.5 | | | | |
| | Ø11 R1.0 | | 110 10 | ● | ● | ● | ● | ○ | R1.0 | | | | |
| | Ø11 R1.5 | | 110 15 | ● | ● | ● | - | ○ | R1.5 | | | | |
| | Ø11 R2.0 | | 110 20 | ● | ● | ● | - | ○ | R2.0 | | | | |
| | * Ø11 R3.0 | | 110 30 | ○ | ○ | ○ | - | ○ | R3.0 | | | | |
| | Ø12 R0.3 | | 120 03 | ● | ● | ● | - | ○ | R0.3 | 12 | 11 | 3.2 | 0.6 |
| | Ø12 R0.5 | | 120 05 | ● | ● | ● | - | ○ | R0.5 | | | | |
| | Ø12 R1.0 | | 120 10 | ● | ● | ● | ● | ○ | R1.0 | | | | |
| | Ø12 R1.5 | | 120 15 | ● | ● | ● | - | ○ | R1.5 | | | | |
| | Ø12 R2.0 | | 120 20 | ● | ● | ● | - | ○ | R2.0 | | | | |
| | Ø12 R3.0 | | 120 30 | ● | ● | ● | - | ○ | R3.0 | | | | |
| | Ø13 R0.3 | | 130 03 | ● | ● | ● | - | ○ | R0.3 | 13 | 11.2 | 3.2 | 0.6 |
| | Ø13 R0.5 | | 130 05 | ● | ● | ● | - | ○ | R0.5 | | | | |
| | Ø13 R1.0 | | 130 10 | ● | ● | ● | ● | ○ | R1.0 | | | | |
| | Ø13 R1.5 | | 130 15 | ● | ● | ● | - | ○ | R1.5 | | | | |
| | Ø13 R2.0 | | 130 20 | ● | ● | ● | - | ○ | R2.0 | | | | |
| | Ø13 R3.0 | | 130 30 | ○ | ○ | ○ | - | ○ | R3.0 | | | | |

* Recommend to use in Ball Type Holder due to large R value

CORNER RADIUS INSERTS

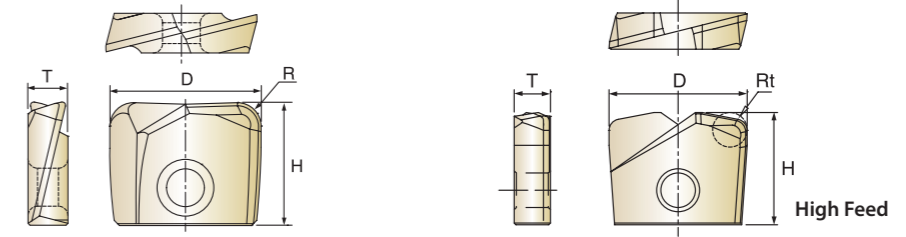


- The corner radius tolerance is $\pm 0.015\text{mm}$ and the set-up accuracy is $\pm 0.02\text{mm}$.
- Corner radius insert can be used with the ball holder, but for a better precision in cutting. It is recommended to use the corner radius holder.

| Corner Radius Type | Continuous | | Minor Intermittent | | Heavy Intermittent | | Unit : mm |
|--------------------|------------------|--------|--------------------|---|--------------------|---|-----------|
| | P | Steels | ● | ● | ● | ● | |
| M | Stainless Steels | ● | | | | | |
| K | Cast Iron | | ● | | | | |
| N | Non Ferrous | ● | | ● | ● | | |
| S | Heat Resistant | | | ● | | | |

| SHAPE | SPECIFICATION | EDP NO. | GRADE | | | | | DIMENSIONS | | | | | | |
|----------|---------------|---------|---------|---------|---------|---------|---------|------------|--------|-----|-----|---------|-----------|---------|
| | | | PVD | | | | Diamond | D | R (Rt) | H | T | ap Max. | High Feed | |
| | | | XMR110A | XMR120C | XMR260T | XMF110V | | | | | | | | XMR110D |
| | Ø16 R0.3 | 160 03 | ● | ● | ● | - | ○ | 16 | R0.3 | 13 | 4.2 | 0.8 | | |
| | Ø16 R0.5 | | 160 05 | ● | ● | ● | - | | ○ | | | | | R0.5 |
| | Ø16 R1.0 | | 160 10 | ● | ● | ● | - | | ○ | | | | | R1.0 |
| | Ø16 R1.5 | | 160 15 | ● | ● | ● | ● | | ○ | | | | | R1.5 |
| | Ø16 R2.0 | | 160 20 | ● | ● | ● | - | | ○ | | | | | R2.0 |
| | Ø16 R3.0 | | 160 30 | ● | ● | ● | - | | ○ | | | | | R3.0 |
| | Ø17 R0.3 | 170 03 | ● | ● | ● | - | ○ | 17 | R0.3 | 13 | 4.2 | 0.8 | | |
| | Ø17 R0.5 | | 170 05 | ● | ● | ● | - | | ○ | | | | | R0.5 |
| | Ø17 R1.0 | | 170 10 | ● | ● | ● | - | | ○ | | | | | R1.0 |
| | Ø17 R1.5 | 170 15 | ● | ● | ● | ● | ○ | R1.5 | 16 | 5.2 | 1.0 | | | |
| | Ø17 R2.0 | 170 20 | ● | ● | ● | - | ○ | R2.0 | | | | | | |
| | Ø17 R3.0 | 170 30 | ● | ● | ● | - | ○ | R3.0 | | | | | | |
| | Ø20 R0.3 | 200 03 | ● | ● | ● | - | ○ | 20 | R0.3 | 16 | 5.2 | 1.0 | | |
| | Ø20 R0.5 | | 200 05 | ● | ● | ● | - | | ○ | | | | | R0.5 |
| | Ø20 R1.0 | | 200 10 | ● | ● | ● | - | | ○ | | | | | R1.0 |
| | Ø20 R1.5 | 200 15 | ● | ● | ● | - | ○ | R1.5 | 16 | 5.2 | 1.0 | | | |
| | Ø20 R2.0 | 200 20 | ● | ● | ● | ● | ○ | R2.0 | | | | | | |
| | Ø20 R3.0 | 200 30 | ● | ● | ● | - | ○ | R3.0 | | | | | | |
| | Ø21 R0.3 | 210 03 | ● | ● | ● | - | ○ | 21 | R0.3 | 16 | 5.2 | 1.0 | | |
| | Ø21 R0.5 | | 210 05 | ● | ● | ● | - | | ○ | | | | | R0.5 |
| | Ø21 R1.0 | | 210 10 | ● | ● | ● | - | | ○ | | | | | R1.0 |
| Ø21 R1.5 | 210 15 | | ● | ● | ● | - | ○ | | R1.5 | | | | | |
| Ø21 R2.0 | 210 20 | | ● | ● | ● | ● | ○ | | R2.0 | | | | | |
| Ø21 R3.0 | 210 30 | | ● | ● | ● | - | ○ | | R3.0 | | | | | |

CORNER RADIUS INSERTS

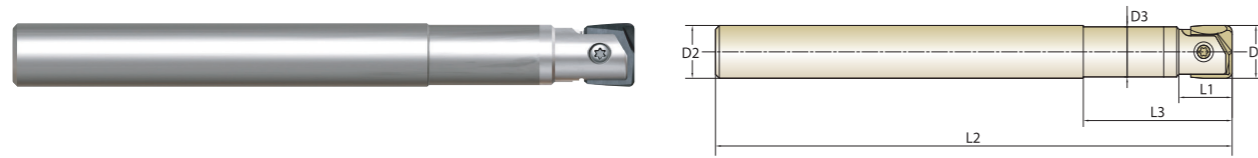


- The corner radius tolerance is $\pm 0.015\text{mm}$ and the set-up accuracy is $\pm 0.02\text{mm}$.
- Corner radius insert can be used with the ball holder, but for a better precision in cutting. It is recommended to use the corner radius holder.

| Corner Radius Type | Continuous | | Minor Intermittent | | Heavy Intermittent | | Unit : mm |
|--------------------|------------------|--------|--------------------|---|--------------------|---|-----------|
| | P | Steels | ● | ● | ● | ● | |
| M | Stainless Steels | ● | | | | | |
| K | Cast Iron | | ● | | | | |
| N | Non Ferrous | ● | | ● | ● | | |
| S | Heat Resistant | | | ● | | | |

| SHAPE | SPECIFICATION | EDP NO. | GRADE | | | | | DIMENSIONS | | | | | | |
|-------|---------------|---------|---------|---------|---------|---------|---------|------------|--------|------|------|---------|-----------|---------|
| | | | PVD | | | | Diamond | D | R (Rt) | H | T | ap Max. | High Feed | |
| | | | XMR110A | XMR120C | XMR260T | XMF110V | | | | | | | | XMR110D |
| | Ø25 R0.3 | 250 03 | ● | ● | ● | - | ○ | 25 | R0.3 | 19.5 | 6.2 | 1.25 | | |
| | Ø25 R0.5 | | 250 05 | ● | ● | ● | - | | ○ | | | | | R0.5 |
| | Ø25 R1.0 | | 250 10 | ● | ● | ● | - | | ○ | | | | | R1.0 |
| | Ø25 R1.5 | | 250 15 | ● | ● | ● | - | | ○ | | | | | R1.5 |
| | Ø25 R2.0 | | 250 20 | ● | ● | ● | - | | ○ | | | | | R2.0 |
| | Ø25 R2.5 | | 250 25 | - | - | - | ● | | - | | | | | R2.5 |
| | Ø25 R3.0 | 250 30 | ● | ● | ● | - | ○ | R3.0 | 19.5 | 6.2 | 1.25 | | | |
| | Ø26 R0.3 | 260 03 | ● | ● | ● | - | ○ | R0.3 | | | | | | |
| | Ø26 R0.5 | 260 05 | ● | ● | ● | - | ○ | R0.5 | | | | | | |
| | Ø26 R1.0 | 260 10 | ● | ● | ● | - | ○ | R1.0 | 16 | 5.2 | 1.0 | | | |
| | Ø26 R1.5 | 260 15 | ● | ● | ● | - | ○ | R1.5 | | | | | | |
| | Ø26 R2.0 | 260 20 | ● | ● | ● | - | ○ | R2.0 | | | | | | |
| | Ø26 R2.5 | 260 25 | - | - | - | ● | - | R2.5 | 16 | 5.2 | 1.0 | | | |
| | Ø26 R3.0 | 260 30 | ● | ● | ● | - | ○ | R3.0 | | | | | | |
| | Ø30 R0.3 | 300 03 | ● | ● | ● | - | ○ | R0.3 | | | | | 23.5 | 7.2 |
| | Ø30 R0.5 | 300 05 | ● | ● | ● | - | ○ | R0.5 | | | | | | |
| | Ø30 R1.0 | 300 10 | ● | ● | ● | - | ○ | R1.0 | | | | | | |
| | Ø30 R1.5 | 300 15 | ● | ● | ● | - | ○ | R1.5 | | | | | | |
| | Ø30 R2.0 | 300 20 | ● | ● | ● | - | ○ | R2.0 | | | | | | |
| | Ø30 R3.0 | 300 30 | ● | ● | ● | ● | ○ | R3.0 | | | | | | |

CARBIDE CORNER RADIUS HOLDER



STRAIGHT NECK

Unit : mm

| EDP No. | Stock | Mill Diameter | Shank Diameter | Neck Diameter | Length of Cut | Length Below Shank | Overall Length | Length Type | Wrench No. | Screw No. |
|------------|-------|---------------|----------------|---------------|---------------|--------------------|----------------|-------------|------------|-----------|
| | | D1 | D2 | D3 | L1 | L3 | L2 | | | |
| ZRC0801080 | ● | 8 | 8 | 7.7 | 12 | 25 | 130 | Regular | TWFT07 | TX2507T07 |
| ZRC0802080 | ● | | | | | 40 | | | | |
| ZRC0803080 | ● | | | | | 65 | | | | |
| ZRC1001100 | ● | 10.0 | 10 | 9.7 | 15 | 30 | 140 | Regular | TWFT08 | TX3010T08 |
| ZRC1002100 | ● | | | | | 50 | | | | |
| ZRC1003100 | ● | | | | | 75 | | | | |
| ZRC1201120 | ● | 12, 13 | 12 | 11.7 | 17 | 35 | 150 | Regular | TWFT10 | TX3512T10 |
| ZRC1202120 | ● | | | | | 60 | | | | |
| ZRC1203120 | ● | | | | | 85 | | | | |
| ZRC1601160 | ● | 16, 17 | 16 | 15.7 | 20 | 50 | 200 | Long | TWFT15 | TX4016T15 |
| ZRC1602160 | ● | | | | | 80 | | | | |
| ZRC1603160 | ● | | | | | 120 | | | | |
| ZRC1604160 | ● | 20, 21 | 20 | 19.7 | 25 | 80 | 250 | Regular | ▲TWBT20 | TX5020T20 |
| ZRC2001200 | ● | | | | | 60 | | | | |
| ZRC2002200 | ● | | | | | 80 | | | | |
| ZRC2003200 | ● | 25, 26 | 25 | 24.7 | 30 | 100 | 300 | Long | ▲TWBT25 | TX6025T25 |
| ZRC2004200 | ● | | | | | 150 | | | | |
| ZRC2501250 | ● | | | | | 75 | | | | |
| ZRC2502250 | ● | 30, 32, 33 | 32 | 29.7 | 40 | 120 | 300 | Regular | ▲TWBT30 | TX8030T30 |
| ZRC2503250 | ● | | | | | 190 | | | | |
| ZRC3001320 | ● | | | | | 90 | | | | |
| ZRC3002320 | ● | 30, 32, 33 | 32 | 29.7 | 40 | 150 | 300 | Long | ▲TWBT30 | TX8030T30 |
| ZRC3003320 | ● | | | | | 190 | | | | |

- * Stock situation is subject to change without prior notice
- * Your carbide holder can be regenerated as YG-1 type upon request
- * ●: Stock item ○: Order made item
- * ▲ Required to use T-HANDLE (TWH600)

STEEL BALL HOLDER



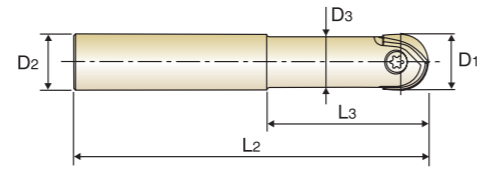
TAPER NECK

Unit : mm

| EDP No. | Stock | Mill Diameter | Shank Diameter | Neck Diameter | Length of Cut | Length Below Shank | Overall Length | Interference Angle | Length Type | Wrench No. | Screw No. |
|------------|-------|---------------|----------------|---------------|---------------|--------------------|----------------|--------------------|-------------|------------|-----------|
| | | D1 | D2 | D3 | L1 | L3 | L2 | θ° | | | |
| ZBT0801120 | ● | 8 | 12 | 7.2 | 12 | 35 | 90 | 4° 43' | Short | TWFT07 | TX2508T07 |
| ZBT0802120 | ● | | | | 25 | 55 | 110 | 3° 37' | Regular | | |
| ZBT1001120 | ● | 10, 11 | 12 | 9 | 15 | 35 | 90 | 2° 51' | Short | TWFT08 | TX3010T08 |
| ZBT1002120 | ● | | | | 30 | 55 | 110 | 2° 17' | Regular | | |
| ZBT1201160 | ● | 12, 13 | 16 | 10.5 | 17 | 55 | 110 | 3° 23' | Short | TWFT10 | TX3512T10 |
| ZBT1601200 | ● | 16, 17 | 20 | 14.5 | 20 | 65 | 125 | 2° 51' | Short | TWFT15 | TX4016T15 |
| ZBT1604200 | ○ | | | | | 115 | 200 | 1° 22' | Regular | | |
| ZBT2001250 | ● | 20, 21 | 25 | 18 | 25 | 75 | 145 | 3° 26' | Short | ▲TWBT20 | TX5020T20 |
| ZBT2004250 | ○ | | | | | 115 | 200 | 1° 55' | Regular | | |
| ZBT2005250 | ○ | | | | | 160 | 250 | 1° 17' | Long | | |
| ZBT2501320 | ● | 25, 26 | 32 | 22.5 | 30 | 90 | 170 | 4° 03' | Short | ▲TWBT25 | TX6025T25 |
| ZBT2504320 | ○ | | | | | 160 | 250 | 1° 53' | Regular | | |
| ZBT2505320 | ○ | | | | | 190 | 300 | 1° 32' | Long | | |
| ZBT3001320 | ● | 30, 32, 33 | 32 | 27 | 40 | 110 | 195 | 1° 38' | Short | ▲TWBT30 | TX8030T30 |
| ZBT3004320 | ○ | | | | | 160 | 250 | 0° 58' | Regular | | |
| ZBT3005320 | ○ | | | | | 190 | 300 | 0° 46' | Long | | |

- * Stock situation is subject to change without prior notice
- * ●: Stock item ○: Order made item
- * ▲ Required to use T-HANDLE (TWH600)

STEEL BALL HOLDER



STRAIGHT NECK

Unit : mm

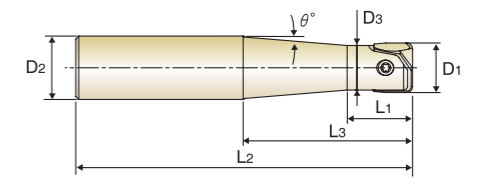
| EDP No. | Stock | Mill Diameter | Shank Diameter | Neck Diameter | Length Below Shank | Overall Length | Length Type | Wrench No. | Screw No. |
|------------|-------|---------------|----------------|---------------|--------------------|----------------|-------------|------------|-----------|
| | | D1 | D2 | D3 | L3 | L2 | | | |
| ZBS1201120 | ● | 12, 13 | 12 | 10.5 | 35 | 90 | Short | TWFT10 | TX3512T10 |
| ZBS1202120 | ● | | | | 55 | 110 | Regular | | |
| ZBS120001P | ○ | | | | 40 | 150 | Long | | |
| ZBS1601160 | ● | 16, 17 | 16 | 14.5 | 35 | 95 | Short | TWFT15 | TX4016T15 |
| ZBS1602160 | ● | | | | 65 | 125 | Regular | | |
| ZBS160001P | ○ | | | | 60 | 200 | Long | | |
| ZBS2001200 | ● | 20, 21 | 20 | 18 | 40 | 110 | Short | ▲TWBT20 | TX5020T20 |
| ZBS2002200 | ● | | | | 75 | 145 | Regular | | |
| ZBS200001P | ○ | | | | 80 | 200 | Long | | |
| ZBS200002P | ○ | | | | 60 | 200 | Long | | |
| ZBS2501250 | ● | 25, 26 | 25 | 22.5 | 45 | 125 | Short | ▲TWBT25 | TX6025T25 |
| ZBS2502250 | ● | | | | 90 | 170 | Regular | | |
| ZBS2503250 | ○ | | | | 100 | 250 | Long | | |
| ZBS250001P | ○ | | | | 90 | 200 | Long | | |
| ZBS250002P | ○ | | | | 60 | 200 | Long | | |
| ZBS3001320 | ● | 30, 32, 33 | 32 | 27 | 55 | 140 | Short | ▲TWBT30 | TX8030T30 |
| ZBS3002320 | ● | | | | 110 | 195 | Regular | | |
| ZBS3004320 | ○ | | | | 150 | 350 | Long | | |
| ZBS300001P | ○ | | | | 100 | 250 | Long | | |

* Stock situation is subject to change without prior notice

* ●: Stock item ○: Order made item

* ▲ Required to use T-HANDLE (TWH600)

STEEL CORNER RADIUS HOLDER



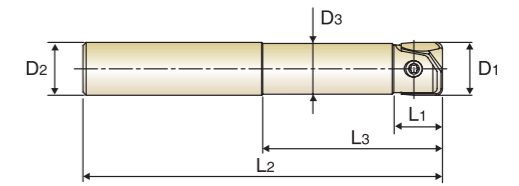
TAPER NECK

Unit : mm

| EDP No. | Stock | Mill Diameter | Shank Diameter | Neck Diameter | Length of Cut | Length Below Shank | Overall Length | Interference Angle | Length Type | Wrench No. | Screw No. |
|------------|-------|---------------|----------------|---------------|---------------|--------------------|----------------|--------------------|-------------|------------|-----------|
| | | D1 | D2 | D3 | L1 | L3 | L2 | θ° | | | |
| ZRT0801120 | ● | 8 | 12 | 6.7 | 10.0 | 22 | 100 | 9° | Regular | TWFT07 | TX2508T07 |
| ZRT0802120 | ● | | | | | 50 | 130 | 2° 43' | Long | | |
| ZRT1001120 | ● | 10, 11 | 12 | 8.6 | 13.0 | 25 | 100 | 4° 45' | Regular | TWFT08 | TX3010T08 |
| ZRT1002120 | ● | | | | | 50 | 150 | 1° 32' | Long | | |
| ZRT1202160 | ● | 12, 13 | 16 | 10.2 | 15.0 | 60 | 160 | 2° 32' | Long | TWFT10 | TX3512T10 |

* Stock situation is subject to change without prior notice

* ●: Stock item ○: Order made item



STRAIGHT NECK

Unit : mm

| EDP No. | Stock | Mill Diameter | Shank Diameter | Neck Diameter | Length of Cut | Length Below Shank | Overall Length | Length Type | Wrench No. | Screw No. |
|------------|-------|---------------|----------------|---------------|---------------|--------------------|----------------|--------------|------------|-----------|
| | | D1 | D2 | D3 | L1 | L3 | L2 | | | |
| ZRS1201120 | ● | 12, 13 | 12 | 11 | 13 | 30 | 110 | Regular | TWFT10 | TX3512T10 |
| ZRS1601160 | ● | 16, 17 | 16 | 15 | 15 | 50 | 130 | Regular | TWFT15 | TX4016T15 |
| ZRS1602160 | ● | | | | | 65 | 165 | Intermediate | | |
| ZRS1603160 | ○ | | | | | 65 | 200 | Long | | |
| ZRS2001200 | ● | 20, 21 | 20 | 19 | 18 | 60 | 140 | Regular | ▲TWBT20 | TX5020T20 |
| ZRS2002200 | ● | | | | | 80 | 180 | Intermediate | | |
| ZRS2003200 | ○ | | | | | 80 | 250 | Long | | |
| ZRS2501250 | ● | 25, 26 | 25 | 24 | 23 | 70 | 150 | Regular | ▲TWBT25 | TX6025T25 |
| ZRS2502250 | ● | | | | | 90 | 200 | Intermediate | | |
| ZRS2503250 | ○ | | | | | 90 | 300 | Long | | |
| ZRS3001320 | ● | 30, 32, 33 | 32 | 29 | 27 | 80 | 160 | Regular | ▲TWBT30 | TX8030T30 |
| ZRS3002320 | ● | | | | | 100 | 220 | Intermediate | | |
| ZRS3003320 | ○ | | | | | 100 | 350 | Long | | |

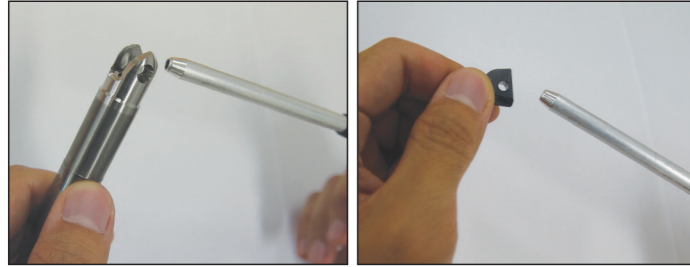
* Stock situation is subject to change without prior notice

* ●: Stock item ○: Order made item

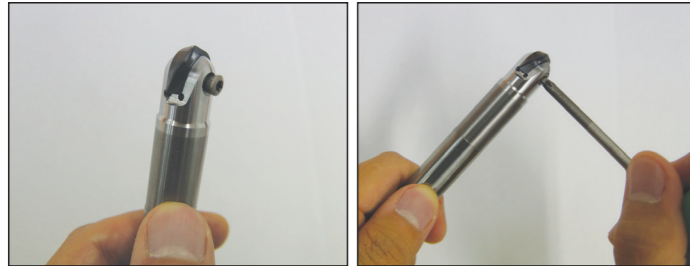
* ▲ Required to use T-HANDLE (TWH600)

TECHNICAL GUIDE

ASSEMBLY OF *i-Xmill*



▲ Make sure to clean the insert and insert seat



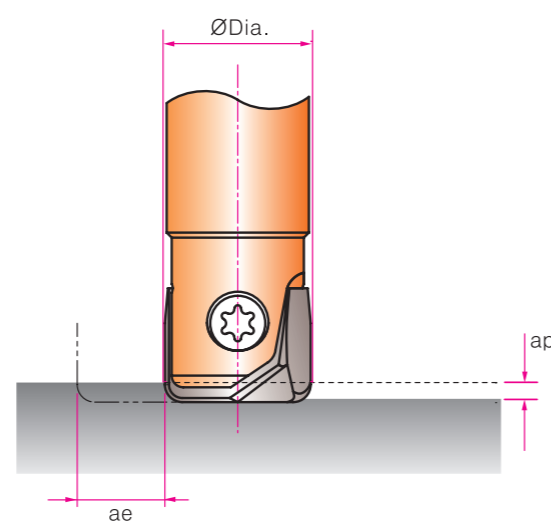
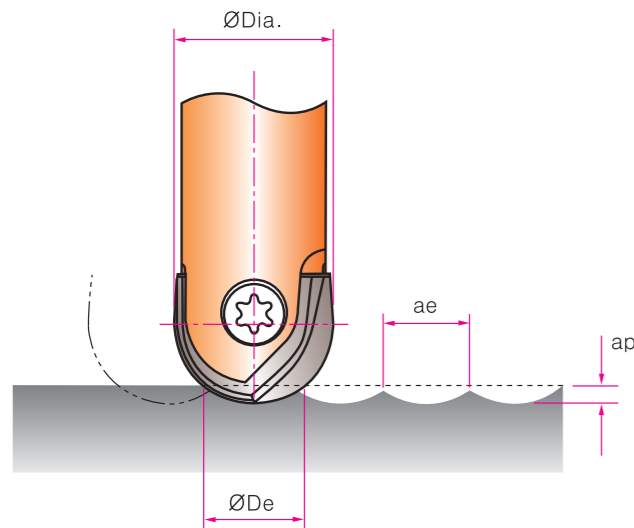
▲ Slide the insert into the slot of the holder
Tighten the screw using anti-seize compound

| Size [ØD] | Clamping Torque [N·m] |
|---------------|--------------------------|
| Ø8 | 1.0 |
| Ø10, Ø11 | 1.5 |
| Ø12, Ø13 | 2.5 |
| Ø16, Ø17 | 3.5 |
| Ø20, Ø21 | 5.0 |
| Ø25, Ø26 | 6.0 |
| Ø30, Ø32, Ø33 | 6.5 |

- * When the screw is worn out, please replace it with a new one
- * Please tighten up the screw with recommended torque (Please refer to the table)
- * Don't press down the insert when the screw is tightened



CUTTING CONDITIONS



RPM = revolution per minute (rev./min.)
Vc = surface meter per minute (M/min.)
Dia. = diameter of insert (mm)
Vf = feed speed (mm/min.)
f = feed per revolution (mm/rev.)
De = effective tool diameter (mm)
ap = axial depth of cut (mm)
ae = radial depth of cut (mm)

$$Vc [M/min.] = \frac{(RPM) \cdot (\pi) \cdot (Dia.)}{1000}$$

$$Vf [mm/min.] = (RPM) \cdot (f)$$

$$RPM [rev./min.] = \frac{(Vc) \cdot (1000)}{(\pi) \cdot (Dia.)}$$

$$De [mm] = 2 \sqrt{(ap) \cdot (Dia. - ap)}$$

RPM = rev./min. Vc = m/min.
 FEED = mm/min. Fz = mm/tooth

BALL CUTTING CONDITIONS

| WORK MATERIALS | P | | | | | | | | |
|--|------------------------------------|------------|-----------|---------|-------------|------------------------------------|-----------|---------|-----------|
| | NON-ALLOYED STEELS ALLOY STEELS | | | | FULL RADIUS | NON-ALLOYED STEELS ALLOY STEELS | | | |
| HARDNESS | HB | ~280 | | | | ~280 | | | |
| | HRc | ~30 | | | | ~30 | | | |
| STRENGTH | N/mm ² | ~1000 | | | | ~1000 | | | |
| <i>i-Xmill</i> Type | | XMB110A | | | | XMM110V | | | |
| Cutting Conditions Roughing~Finishing | | RPM | FEED | Vc | Fz | RPM | FEED | Vc | Fz |
| 8 | | 6370~12730 | 2550~5090 | 160~320 | 0.20~0.20 | 6370~12730 | 2550~5090 | 160~320 | 0.20~0.20 |
| 10, 11 | | 5090~11460 | 2040~4580 | 160~360 | 0.20~0.20 | 5090~11460 | 2040~4580 | 160~360 | 0.20~0.20 |
| 12, 13 | | 4240~10080 | 1700~4030 | 160~380 | 0.20~0.20 | 4240~10080 | 1700~4030 | 160~380 | 0.20~0.20 |
| 16, 17 | | 3180~9550 | 1590~5730 | 160~480 | 0.25~0.30 | 3180~9550 | 1590~5730 | 160~480 | 0.25~0.30 |
| 20, 21 | | 2550~9230 | 1270~7380 | 160~580 | 0.25~0.40 | 2550~9230 | 1270~7380 | 160~580 | 0.25~0.40 |
| 25, 26 | | 2040~7640 | 1020~7640 | 160~600 | 0.25~0.50 | 2040~7640 | 1020~7640 | 160~600 | 0.25~0.50 |
| 30, 32, 33 | | 1700~7430 | 850~8910 | 160~700 | 0.25~0.60 | 1700~7430 | 850~8910 | 160~700 | 0.25~0.60 |

| WORK MATERIALS | P | | | | | | | | |
|--|---------------------------------------|------------|-----------|---------|---------------------------------|------------------|-----------|---------|-----------|
| | ALLOY STEELS HEAT RESISTANT STEELS | | | | DIE TOOL STEELS PRE-HARDENED | | | | |
| HARDNESS | HB | 280~380 | | | | 380~480 | | | |
| | HRc | 30~40 | | | | 40~50 | | | |
| STRENGTH | N/mm ² | 1000~1250 | | | | 1250~1500 | | | |
| <i>i-Xmill</i> Type | | XMB110A | | | | XMB110A, XMB120C | | | |
| Cutting Conditions Roughing~Finishing | | RPM | FEED | Vc | Fz | RPM | FEED | Vc | Fz |
| 8 | | 4770~11140 | 1910~4460 | 120~280 | 0.20~0.20 | 3980~8750 | 1190~3500 | 100~220 | 0.15~0.20 |
| 10, 11 | | 3820~9550 | 1530~3820 | 120~300 | 0.20~0.20 | 3180~8280 | 950~3310 | 100~260 | 0.15~0.20 |
| 12, 13 | | 3180~9280 | 1270~3710 | 120~350 | 0.20~0.20 | 2650~7430 | 800~2970 | 100~280 | 0.15~0.20 |
| 16, 17 | | 2390~7560 | 1190~4540 | 120~380 | 0.25~0.30 | 1990~6960 | 800~4180 | 100~350 | 0.20~0.30 |
| 20, 21 | | 1910~6680 | 950~5350 | 120~420 | 0.25~0.40 | 1590~6370 | 640~5090 | 100~400 | 0.20~0.40 |
| 25, 26 | | 1530~6110 | 760~6110 | 120~480 | 0.25~0.50 | 1270~5730 | 510~5730 | 100~450 | 0.20~0.50 |
| 30, 32, 33 | | 1270~5840 | 640~7000 | 120~550 | 0.25~0.60 | 1060~5310 | 420~6370 | 100~500 | 0.20~0.60 |

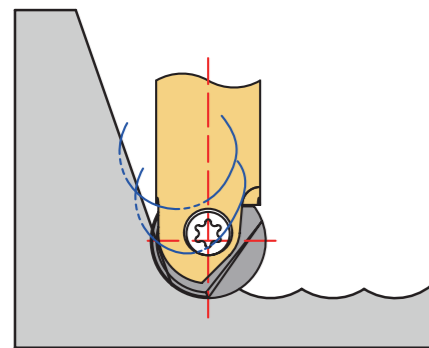
| WORK MATERIALS | P | | | | | | | | |
|--|-------------------|-----------|----------|--------|----------------------|-----------|----------|--------|-----------|
| | HARDENED STEELS | | | | HIGH HARDENED STEELS | | | | |
| HARDNESS | HB | 420~550 | | | | 550~740 | | | |
| | HRc | 45~55 | | | | 55~65 | | | |
| STRENGTH | N/mm ² | 1500~ | | | | 1500~ | | | |
| <i>i-Xmill</i> Type | | XMB120C | | | | XMB260T | | | |
| Cutting Conditions Roughing~Finishing | | RPM | FEED | Vc | Fz | RPM | FEED | Vc | Fz |
| 8 | | 3180~7160 | 640~2860 | 80~180 | 0.10~0.20 | 3180~7160 | 640~2150 | 80~180 | 0.10~0.15 |
| 10, 11 | | 2550~6370 | 510~2550 | 80~200 | 0.10~0.20 | 2550~6370 | 510~1910 | 80~200 | 0.10~0.15 |
| 12, 13 | | 2120~5840 | 420~2330 | 80~220 | 0.10~0.20 | 2120~5840 | 420~1750 | 80~220 | 0.10~0.15 |
| 16, 17 | | 1590~5170 | 480~3100 | 80~260 | 0.15~0.30 | 1590~5170 | 480~2590 | 80~260 | 0.15~0.25 |
| 20, 21 | | 1270~5090 | 380~4070 | 80~320 | 0.15~0.40 | 1270~5090 | 380~2550 | 80~320 | 0.15~0.25 |
| 25, 26 | | 1020~4580 | 310~4580 | 80~360 | 0.15~0.50 | 1020~4580 | 310~2290 | 80~360 | 0.15~0.25 |
| 30, 32, 33 | | 850~4240 | 250~5090 | 80~400 | 0.15~0.60 | 850~4240 | 250~2550 | 80~400 | 0.15~0.30 |

BALL CUTTING CONDITIONS

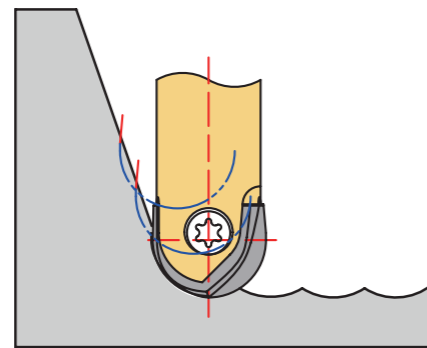
RPM = rev./min. Vc = m/min.
FEED = mm/min. Fz = mm/tooth

| WORK MATERIALS | M | | | | N | | | |
|---------------------------------------|------------------|----------|--------|-----------|-------------|-----------|---------|-----------|
| | STAINLESS STEELS | | | | GRAPHITE | | | |
| <i>i-Xmill</i> Type | XMB130A | | | | XMB110D | | | |
| Cutting Conditions Roughing~Finishing | RPM | FEED | Vc | Fz | RPM | FEED | Vc | Fz |
| 8 | 3580~5170 | 720~1290 | 90~130 | 0.10~0.12 | 11940~15920 | 4770~6370 | 300~400 | 0.20~0.20 |
| 10, 11 | 2860~4140 | 720~1240 | 90~130 | 0.13~0.15 | 9550~12730 | 3820~5090 | 300~400 | 0.20~0.20 |
| 12, 13 | 2390~3450 | 720~1380 | 90~130 | 0.15~0.20 | 7960~10610 | 3180~4240 | 300~400 | 0.20~0.20 |
| 16, 17 | 1790~2590 | 540~1030 | 90~130 | 0.15~0.20 | 5970~7960 | 2980~4770 | 300~400 | 0.25~0.30 |
| 20, 21 | 1430~2070 | 430~830 | 90~130 | 0.15~0.20 | 4770~7640 | 2860~5350 | 300~480 | 0.30~0.35 |
| 25, 26 | 1150~1660 | 460~830 | 90~130 | 0.20~0.25 | 3820~7130 | 2670~5700 | 300~560 | 0.35~0.40 |
| 30, 32, 33 | 950~1380 | 380~690 | 90~130 | 0.20~0.25 | 3180~6900 | 2550~6900 | 300~650 | 0.40~0.50 |

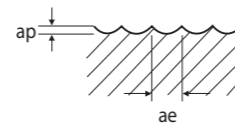
| WORK MATERIALS | K | | | |
|---------------------------------------|------------|-----------|---------|-----------|
| | CAST IRON | | | |
| <i>i-Xmill</i> Type | XMB120C | | | |
| Cutting Conditions Roughing~Finishing | RPM | FEED | Vc | Fz |
| 8 | 6370~12730 | 3820~5090 | 160~320 | 0.30~0.20 |
| 10, 11 | 5090~11460 | 3060~6880 | 160~360 | 0.30~0.30 |
| 12, 13 | 4240~10610 | 2550~6370 | 160~400 | 0.30~0.30 |
| 16, 17 | 3180~9950 | 2230~5970 | 160~500 | 0.35~0.30 |
| 20, 21 | 2550~8750 | 1780~7000 | 160~550 | 0.35~0.40 |
| 25, 26 | 2040~7890 | 1430~7890 | 160~620 | 0.35~0.50 |
| 30, 32, 33 | 1700~7640 | 1190~9170 | 160~720 | 0.35~0.60 |



Full Radius Type



Ball Radius Type



ae: Roughing - 0.1 x D
Finishing - Under Ø12 : 0.25mm
Under Ø20 : 0.30mm
From Ø20 : 0.40mm

ap: Roughing - Under Ø16 : 0.025 x D
From Ø16 : 0.05 x D
Finishing - Under Ø16 : 0.1mm

- ▶ When the length of overhang exceed 4xD, we recommend to use carbide shank holder. (Feed 20% down)
- ▶ Recommend to reduce the feed rate to 70~85% when you use long(long & intermediate Type Holder) tools.

CORNER RADIUS CUTTING CONDITIONS

RPM = rev./min. Vc = m/min.
FEED = mm/min. Fz = mm/tooth

| WORK MATERIALS | P | | | | | | | | |
|---------------------------------------|---------------------------------|-----------|---------|-----------|-----------|---|---------|-----------|-----|
| | NON-ALLOYED STEELS ALLOY STEELS | | | | | HIGH FEED NON-ALLOYED STEELS ALLOY STEELS | | | |
| HARDNESS | HB | ~280 | | | ~280 | | | | |
| | HRc | ~30 | | | ~30 | | | | |
| STRENGTH | N/mm ² | ~1000 | | | ~1000 | | | | |
| <i>i-Xmill</i> Type | XMR110A | | | | | XMF110V | | | |
| Cutting Conditions Roughing~Finishing | RPM | FEED | Vc | Fz | RPM | FEED | Vc | Fz | ap |
| 8 | 6370~11940 | 2550~3580 | 160~300 | 0.20~0.15 | 5970~7960 | 7160~6370 | 150~200 | 0.60~0.40 | 0.4 |
| 10, 11 | 5090~9550 | 2040~2860 | 160~300 | 0.20~0.15 | 4770~6370 | 7160~6370 | 150~200 | 0.75~0.50 | 0.5 |
| 12, 13 | 4240~7960 | 1700~2390 | 160~300 | 0.20~0.15 | 3980~5310 | 7160~6370 | 150~200 | 0.90~0.60 | 0.6 |
| 16, 17 | 3180~5970 | 1590~2390 | 160~300 | 0.25~0.20 | 2980~3980 | 7160~6370 | 150~200 | 1.20~0.80 | 0.8 |
| 20, 21 | 2550~4770 | 1270~1910 | 160~300 | 0.25~0.20 | 2390~3180 | 7160~6370 | 150~200 | 1.50~1.00 | 1.0 |
| 25, 26 | 2040~3820 | 1020~1530 | 160~300 | 0.25~0.20 | 1910~2550 | 7640~7640 | 150~200 | 2.00~1.50 | 1.3 |
| 30, 32, 33 | 1700~3180 | 850~1270 | 160~300 | 0.25~0.20 | 1590~2120 | 7320~7640 | 150~200 | 2.30~1.80 | 1.6 |

| WORK MATERIALS | P | | | | | | | | |
|---------------------------------------|------------------------------------|-----------|---------|-----------|------------|------------------------------|---------|-----------|--|
| | ALLOY STEELS HEAT RESISTANT STEELS | | | | | DIE TOOL STEELS PRE-HARDENED | | | |
| HARDNESS | HB | 30~40 | | | 380~480 | | | | |
| | HRc | 1000~1250 | | | 40~50 | | | | |
| STRENGTH | N/mm ² | 1000~1250 | | | 1250~1500 | | | | |
| <i>i-Xmill</i> Type | XMR110A | | | | | XMR110A, XMR120C | | | |
| Cutting Conditions Roughing~Finishing | RPM | FEED | Vc | Fz | RPM | FEED | Vc | Fz | |
| 8 | 4770~11140 | 1910~3340 | 120~280 | 0.20~0.15 | 3980~11140 | 990~1340 | 100~280 | 0.12~0.06 | |
| 10, 11 | 3820~8910 | 1530~2670 | 120~280 | 0.20~0.15 | 3180~8910 | 800~1070 | 100~280 | 0.13~0.06 | |
| 12, 13 | 3180~7430 | 1270~2230 | 120~280 | 0.20~0.15 | 2650~7430 | 660~890 | 100~280 | 0.12~0.06 | |
| 16, 17 | 2390~5570 | 1190~2230 | 120~280 | 0.25~0.20 | 1990~5570 | 600~840 | 100~280 | 0.15~0.08 | |
| 20, 21 | 1910~4460 | 950~1780 | 120~280 | 0.25~0.20 | 1590~4460 | 480~670 | 100~280 | 0.15~0.08 | |
| 25, 26 | 1530~3570 | 760~1430 | 120~280 | 0.25~0.20 | 1270~3570 | 380~530 | 100~280 | 0.15~0.07 | |
| 30, 32, 33 | 1270~2970 | 640~1190 | 120~280 | 0.25~0.20 | 1060~2970 | 320~450 | 100~280 | 0.15~0.08 | |

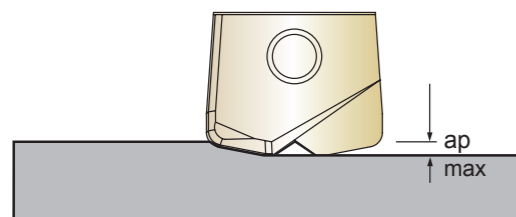
| WORK MATERIALS | P | | | | | | | | |
|---------------------------------------|-------------------|---------|--------|-----------|-----------|----------------------|--------|-----------|--|
| | HARDENED STEELS | | | | | HIGH HARDENED STEELS | | | |
| HARDNESS | HB | 420~550 | | | 550~740 | | | | |
| | HRc | 45~55 | | | 55~65 | | | | |
| STRENGTH | N/mm ² | 1500~ | | | 1500~ | | | | |
| <i>i-Xmill</i> Type | XMR120C | | | | | XMR260T | | | |
| Cutting Conditions Roughing~Finishing | RPM | FEED | Vc | Fz | RPM | FEED | Vc | Fz | |
| 8 | 3180~8750 | 640~880 | 80~220 | 0.10~0.05 | 3180~8750 | 640~880 | 80~220 | 0.10~0.05 | |
| 10, 11 | 2550~7000 | 510~700 | 80~220 | 0.10~0.05 | 2550~7000 | 510~700 | 80~220 | 0.10~0.05 | |
| 12, 13 | 2120~5840 | 420~580 | 80~220 | 0.10~0.05 | 2120~5840 | 420~580 | 80~220 | 0.10~0.05 | |
| 16, 17 | 1590~4380 | 420~530 | 80~220 | 0.15~0.06 | 1590~4380 | 480~530 | 80~220 | 0.15~0.06 | |
| 20, 21 | 1270~3500 | 380~420 | 80~220 | 0.15~0.06 | 1270~3500 | 380~420 | 80~220 | 0.15~0.06 | |
| 25, 26 | 1020~2800 | 310~340 | 80~220 | 0.15~0.06 | 1020~2800 | 310~340 | 80~220 | 0.15~0.06 | |
| 30, 32, 33 | 850~2330 | 250~280 | 80~220 | 0.15~0.06 | 850~2330 | 250~280 | 80~220 | 0.15~0.06 | |

CORNER RADIUS CUTTING CONDITIONS

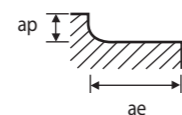
RPM = rev./min. Vc = m/min.
FEED = mm/min. Fz = mm/tooth

| WORK MATERIALS | M | | | | N | | | |
|--|------------------|----------|--------|-----------|-------------|-----------|---------|-----------|
| | STAINLESS STEELS | | | | GRAPHITE | | | |
| <i>i-Xmill</i> Type | XMR110A | | | | XMR110D | | | |
| Cutting Conditions Roughing~Finishing | RPM | FEED | Vc | Fz | RPM | FEED | Vc | Fz |
| 8 | 3580~5170 | 720~1030 | 90~130 | 0.10~0.10 | 11940~15920 | 4770~6370 | 300~400 | 0.20~0.20 |
| 10, 11 | 2860~4140 | 630~910 | 90~130 | 0.11~0.11 | 9550~12730 | 3820~5090 | 300~400 | 0.20~0.20 |
| 12, 13 | 2390~3450 | 550~790 | 90~130 | 0.12~0.11 | 7960~10610 | 3180~4240 | 300~400 | 0.20~0.20 |
| 16, 17 | 1790~2590 | 450~650 | 90~130 | 0.13~0.13 | 5970~7960 | 2390~3180 | 300~400 | 0.20~0.20 |
| 20, 21 | 1430~2070 | 360~520 | 90~130 | 0.13~0.13 | 4770~6370 | 2390~3180 | 300~400 | 0.25~0.25 |
| 25, 26 | 1150~1660 | 290~410 | 90~130 | 0.13~0.12 | 3820~5090 | 1910~2550 | 300~400 | 0.25~0.25 |
| 30, 32, 33 | 950~1380 | 240~340 | 90~130 | 0.13~0.12 | 3180~4240 | 1590~2120 | 300~400 | 0.25~0.25 |

| WORK MATERIALS | K | | | |
|--|------------|-----------|---------|-----------|
| | CAST IRON | | | |
| <i>i-Xmill</i> Type | XMR120C | | | |
| Cutting Conditions Roughing~Finishing | RPM | FEED | Vc | Fz |
| 8 | 6370~15120 | 3820~6050 | 160~380 | 0.30~0.20 |
| 10, 11 | 5090~12100 | 3060~4840 | 160~380 | 0.30~0.20 |
| 12, 13 | 4240~10080 | 2550~4030 | 160~380 | 0.30~0.20 |
| 16, 17 | 3180~7560 | 2230~4540 | 160~380 | 0.35~0.30 |
| 20, 21 | 2550~6050 | 1780~3630 | 160~380 | 0.35~0.30 |
| 25, 26 | 2040~4840 | 1430~2900 | 160~380 | 0.35~0.30 |
| 30, 32, 33 | 1700~4030 | 1190~2420 | 160~380 | 0.35~0.30 |



High Feed



ae: Roughing - 0.1 x D
Finishing - 0.2mm

ap: Roughing - Under Ø16 : 0.025 x D
From Ø16 : 0.05 x D
Finishing - Under Ø16 : 0.1mm
From Ø16 : 0.2mm

- ▶ When the length of overhang exceed 4xD, we recommend to use carbide shank holder. (Feed 20% down)
- ▶ Recommend to reduce the feed rate to 70~85% when you use long(long & intermediate Type Holder) tools.

TROUBLE SHOOTING GUIDE

| SPECIFIC PROBLEM | CAUSE | SOLUTION |
|--|---|--|
| Breakage | Feed rate too high | Reduce feed rate |
| | Depth of cut too large | Reduce depth of cut |
| | Tool overhang too long | Shorten tool overhang |
| | Rapid cutting edge wear | Reduce RPM, Replace / Regrind ASAP |
| Wear and burning | Cutting speed too high | Reduce cutting speed and increase coolant oil supply |
| | Hard material | Use higher grade tool material, add surface treatment (Coating) |
| Vibration during cutting process | Non-optimum combination of feed and speed | Adjust the cutting speed or feed rate |
| | Poor toolholder rigidity | Replace with shorter/more rigid toolholder (chuck) Use carbide holder Tighten up the screw with recommended torque |
| | Adjustment defect of the work material | Make sure that work material is fixed properly |
| | Tool overhang too long | Shorten tool overhang |
| Cutting edge defects | Feed rate too high | Reduce feed rate |
| | Vibration | Reduce RPM Use the carbide holder Tighten up the screw with recommended torque |
| | Work material is not fixed properly | Make sure that work material is fixed properly |
| | Depth of cut too large | Reduce depth of cut |
| | Tool overhang too long | Shorten tool overhang |
| | Not enough rigidity of the machine | Use better machine |
| Bad cutting property | Too much wear of the cutting edges | Replace / Regrind ASAP |
| | The insert is not adapted | Replace by adapted insert |
| Chip removal defects | Lower pressure or smaller amount of coolant oil | Increase the pressure and amount of coolant oil |
| | Smaller chip pocket | Reduce feed rate |
| | Higher wear of cutting edges | Replace / Regrind ASAP |
| | Depth of cut too large | Reduce depth of cut |
| Burr on the surface | Feed rate too high | Reduce feed rate |
| | Too much wear of the cutting edges | Replace / Regrind ASAP |
| Defect of the finished dimensions | Defect of machine and chuck | Repair the machine or chuck Change the screw for new one |
| | Defect of the machine and rigidity of the chuck | Replace the machine of chuck Use the carbide holder Tighten up the screw with recommended torque |
| Build up edge | Insufficient matching of the materials and tools or coolant oil | Spray the metal cutting oil in order from dry, soluble oil to non-soluble oil |
| | | During the alloyed steel cutting, active non-soluble oil type is appropriate |



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