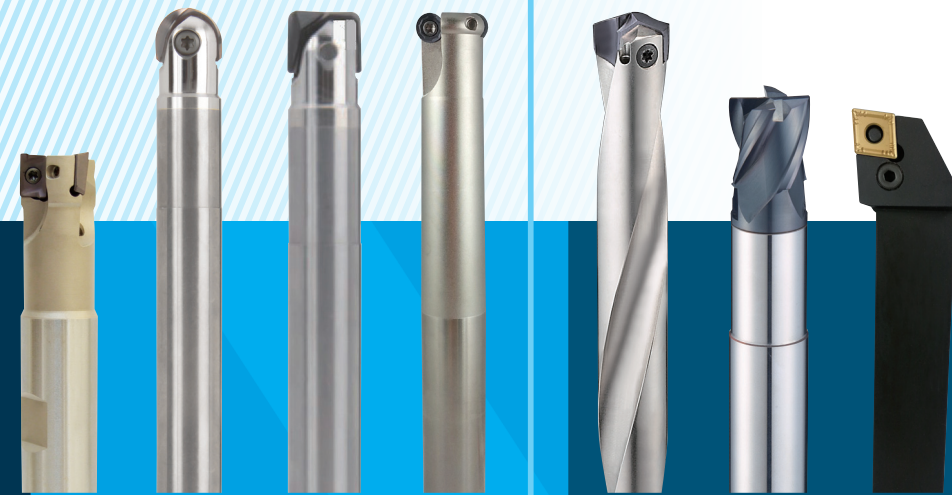


# INDEXABLE TOOLS

INDEXABLE TOOLS

*Drilling*



*Milling*



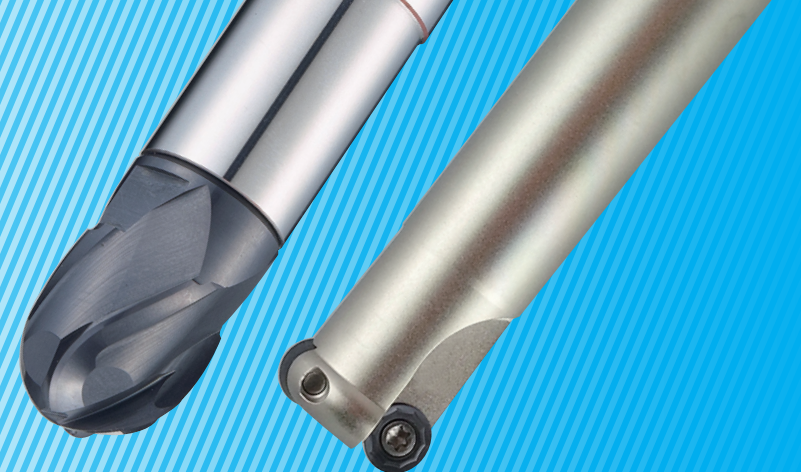
*Turning*

**YG** YG-1 CO., LTD.

**HEAD OFFICE**

211, Sewolcheon-ro, Bupyeong-gu, Incheon, Korea  
PHONE : +82-32-526-0909, FAX : +82-32-526-4373  
[Http://www.yg1.kr](http://www.yg1.kr)  
E-mail: [yg1@yg1.kr](mailto:yg1@yg1.kr)

Tool specifications are subject to change without notice.



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**p01**

## Milling

- Carbide Grades
- PVD Coating Grades
- Milling Insert Designation System (ISO)
- \* i-HF mill
- \* i-HS mill
- \* i-HR mill
- \* i-Xmill
- \* Modular type

**p45**

## Drilling

- \* i-Dream Drill
- \* i-HW Drill



**p57**

## Turning

- Turning Insert Designation System (ISO)
- \* Turning Insert



# YG-1, the leading Global Company in cutting tool industry since 1982

Since founded in 1982, YG-1 has been growing as a leading global manufacturer in the cutting tool industry. YG-1 operates its global business through 9 overseas production sites and 30 sales subsidiaries providing premium cutting tools to 75 countries. YG-1 will continuously do its best to maximize customer satisfaction through the integrated management of the global business network combined with logistic centers in key areas.



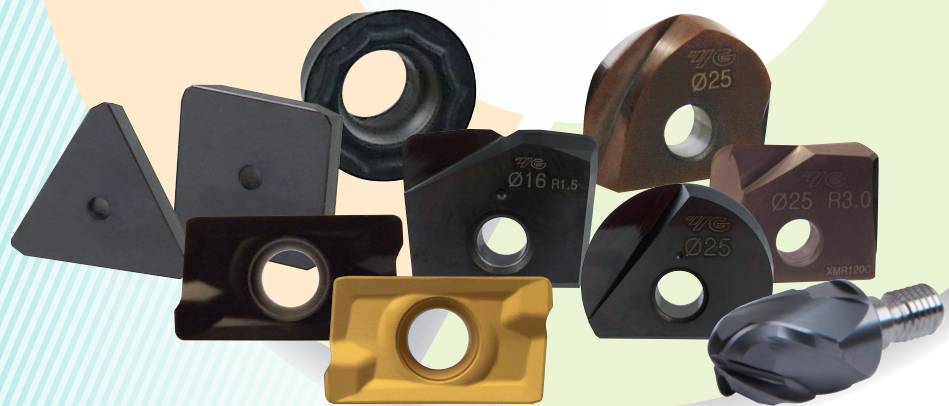
### GLOBAL COMPANY

|   |   |   |
|---|---|---|
| YG-1 TOOL(U.S.A)<br>PHONE : +1 800 765 8665<br>FAX : +1 866 941 8665<br>E-mail : heatherlee@yg1usa.com                                | YG-1 HONG KONG LTD.(HONG KONG)<br>PHONE : +852 2439 9018<br>FAX : +852 2439 9020<br>E-mail : enquiry@yghk.com.hk                | YG-1 VIETNAM CO., LTD.(VIETNAM)<br>PHONE : +84 4 3795 7233<br>FAX : +84 4 3795 7232<br>E-mail : yg1vietnam@yg1.co.kr                  |
| REGAL CUTTING TOOLS INC.(U.S.A)<br>PHONE : +1 815 389 3461<br>FAX : +1 815 389 9858<br>E-mail : customerservice@regalcuttingtools.com | YG CUTTING TOOL CORP. PVT. LTD.(INDIA)<br>PHONE : +91 80 4354 3600<br>FAX : +91 80 4354 3613<br>E-mail : marketing@yg1india.com | YG-1 AUSTRALIA PTY. LTD.(AUSTRALIA)<br>PHONE : +61 3 9558 0177<br>FAX : +61 3 9558 2778<br>E-mail : ygone@yg1.kr                      |
| YG-1 LATIN AMERICA(BRAZIL)<br>PHONE : +55 11 4496 2170<br>FAX : +55 11 4591 1438<br>E-mail : walter.campos@yg1.com.br                 | YG-1 INDUSTRIES INDIA PVT.LTD.(INDIA)<br>PHONE : +91 22 2580 6241<br>FAX : +91 22 2580 3576<br>E-mail : thanesales@yg1india.com | YG-1 EUROPE(FRANCE)<br>PHONE : +33 172 84 4070<br>FAX : +33 172 84 4086<br>E-mail : yg1@yg1.eu  |
| YG-1 CANADA INC.(CANADA)<br>PHONE : +1 905 335 2500<br>FAX : +1 905 335 4003<br>E-mail : reception@yg1.ca                             | PT.YGI TOOLS (INDONESIA)<br>PHONE : +62 21 4585 8141<br>FAX : +62 21 4587 7412<br>E-mail : ygitools@gmail.com                   | YG-1 DEUTSCHLAND GmbH(GERMANY)<br>PHONE : +49 6173 9667 0<br>FAX : +49 6173 9667 29<br>E-mail : info@yg-1.de                          |
| MINICUT INTERNATIONAL INC.(CANADA)<br>PHONE : +1 514-352-6464<br>FAX : +1 514-352-6644<br>E-mail : international@minicut.com          | YG-1 JAPAN CO., LTD.(JAPAN)<br>PHONE : +81 6 6305 9897<br>FAX : +81 6 6305 9898<br>E-mail : Toyokazu-kitaoka@yg1.jp             | YG-1 POLAND Sp. z o.o.(POLAND)<br>PHONE : +48 22 622 2586<br>FAX : +48 22 622 2587<br>E-mail : info@yg-1.pl                           |
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| NEW CENTURY TOOL CO., LTD.(CHINA)<br>PHONE : +86 532 8676 9779<br>FAX : +86 532 8676 9105<br>E-mail : qnct@qnct.cn                    | YG-1 (M) SDN BHD(MALAYSIA)<br>PHONE : +603 5569 4834<br>FAX : +603 5569 4814<br>E-mail : enquiries@yg-1.com.my                  | TEKNO TAKIM San. Tic. AS.(TURKEY)<br>PHONE : +90 212 671 1590<br>FAX : +90 212 671 1595<br>E-mail : info@teknotakim.com               |
| QINGDAO YG-1 TOOL CO.,LTD.(CHINA)<br>PHONE : +86 532 8519 7366<br>FAX : +86 532 8519 7959<br>E-mail : qyg1@qyg1.com                   | YG-1 TOOLS ASIA PTE. LTD.(SINGAPORE)<br>PHONE : +65 6842 0468<br>FAX : +65 6842 0482<br>E-mail : ctang@yg1.co.kr                | CLARKSON OSBORN INTERNATIONAL LTD.(U.K)<br>PHONE : +44 114 276 8622<br>FAX : +44 114 275 4012<br>E-mail : sales@clarkson-osborn.co.uk |
| YG-1 SHANGHAI CO.,LTD.(CHINA)<br>PHONE : +86 21 6383 1661<br>FAX : +86 21 6383 1771<br>E-mail : enquiry@yg-1china.com                 | YG-1 THAILAND CO., LTD.(THAILAND)<br>PHONE : +662 732 0186-7<br>FAX : +662 732 0188<br>E-mail : info@yg1.co.th                  | EUROPA TOOLS CO., LTD.(U.K)<br>PHONE : +44 24 7664 1282<br>FAX : +44 24 7664 1390<br>E-mail : sales@europatool.co.uk                  |

# INDEXABLE TOOLS

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## Milling



*Carbide Grades*

*PVD Coating Grades*

*Milling Insert Designation System (ISO)*

- \* *i-HF mill*
- \* *i-HS mill*
- \* *i-HR mill*
- \* *i-Xmill*
- \* *Modular type*





# YGP30 Cutting Performance

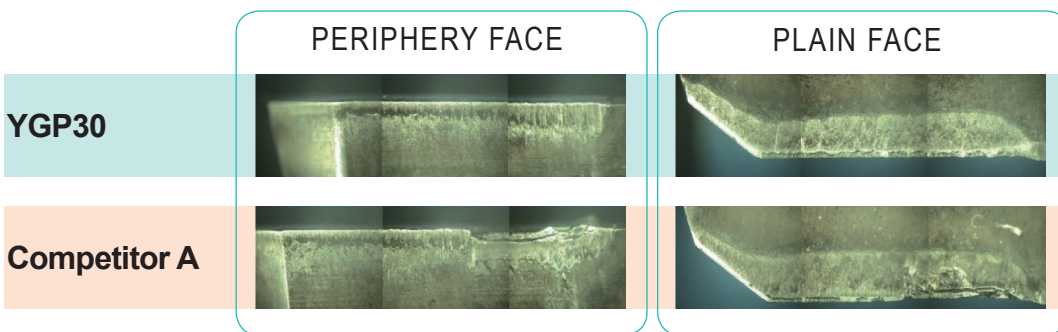
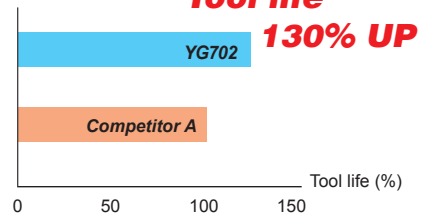
## WEAR RESISTANCE TEST

### TEST I

#### TEST CONDITION

|       |              |             |                |
|-------|--------------|-------------|----------------|
| Vc    | 160m/min     | Work piece  | SCM440(HRc 30) |
| Feed  | 0.15mm/tooth | Coolant     | Dry cut        |
| Depth | 4mm          | Designation | SPCN1203EDTR   |
|       |              | Cutter      | Ø125           |

#### RESULT

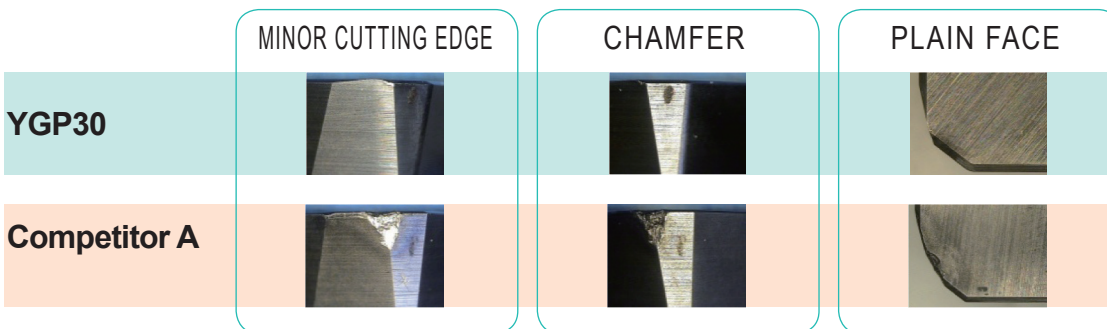
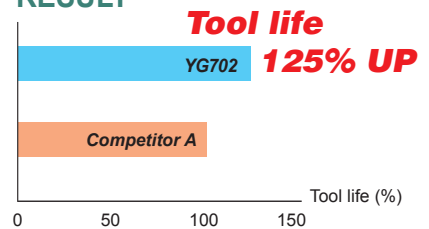


### TEST II

#### TEST CONDITION

|       |              |             |              |
|-------|--------------|-------------|--------------|
| Vc    | 150m/min     | Work piece  | SKD61(HRc50) |
| Feed  | 0.035m/tooth | Coolant     | Dry cut      |
| Depth | 0.35mm       | Designation | SPCN1203EDTR |
|       |              | Cutter      | 120mm, z=8   |

#### RESULT



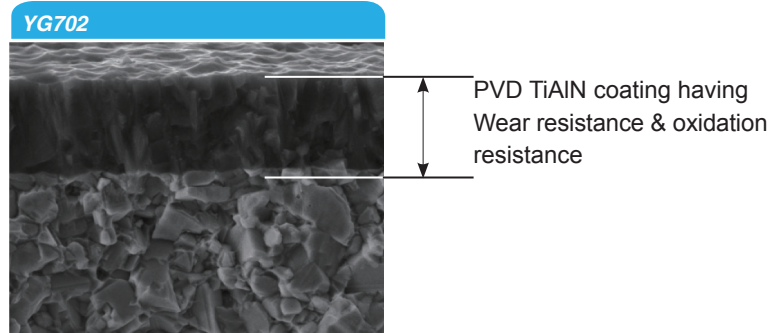
# PVD Coating grade for milling

## YG501 (PVD GRADE FOR CAST IRON MILLING)

- ▣ Suitable for machining cast iron

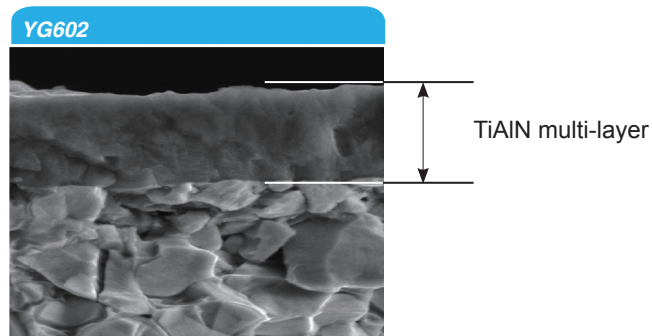
## YG702 (PVD GRADE FOR STEEL MILLING)

- ▣ TiAlN coating having high hardness & thermal resistance
- ▣ Excellent wear resistance & chipping resistance for steel machining



## YG602 (PVD GRADE FOR STAINLESS STEEL MILLING)

- ▣ Universal grade can cover steel, stainless steel and cast iron
- ▣ PVD grade having optimal thermal resistance & strength
- ▣ Excellent cutting performance due to the tough carbide



## PVD COATING GRADE FOR MILLING

| Work piece                  | Grade          | ISO    | Work piece                         | Coating layer                                  | Milling | Recommended Cutting Speed Vc (m/min) |
|-----------------------------|----------------|--------|------------------------------------|--|---------|--------------------------------------|
| <b>P</b><br>Steel           | YA702<br>YG702 | P20~30 | General machining of steel         | TiAlN (PVD)                                    | ○       | 200 (50~300)                         |
|                             | YG602<br>YA703 | P30~40 | Medium-Roughing of steel           | TiAlN (PVD)                                    | ○       | 130 (100~160)                        |
| <b>M</b><br>Stainless Steel | YA702<br>YA703 | M20~30 | Medium-Roughing of stainless steel | TiAlN (PVD)                                    | ○       | 130 (60~200)                         |
|                             | YG602          | M20~30 | Roughing of stainless steel        | TiAlN (PVD)                                    | ○       | 130 (60~200)                         |
| <b>K</b><br>Cast Iron       | YG501          | K05~15 | High speed cutting of cast iron    | TiAlN (PVD)                                    | ○       | 300 (150~400)                        |
|                             | YA102          | K10~20 | High speed cutting of cast iron    | TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN (CVD) | ○       | 200 (150~250)                        |
|                             | YG602          | K10~25 | High speed cutting of cast iron    | TiAlN (PVD)                                    | ○       | 200 (150~250)                        |
|                             | YA503          | K20~35 | Medium-Roughing of cast iron       | TiAlN (PVD)                                    | ○       | 140 (80~200)                         |

## CHARACTERISTICS OF MILLING GRADE

| Grade                   | ISO                        | Features & Application   |
|-------------------------|----------------------------|--|
| YA702<br>YG702<br>YA703 | P20~40                     | * Steel machining grade<br>* Comprehensive TiAlN coating grade having excellent wear resistance & chipping resistance<br>* Excellent cutting performance due to enhanced coating film adhesion |
| YA702<br>YA703          | M20~30                     | * Steel & Stainless Steel machining grade<br>* Excellent cutting performance for the high feed machining due to the toughest carbide   |
| YG602                   | P30~40<br>M20~30<br>K10~20 | * Universal grade can cover steel, stainless steel and cast iron<br>* Tough carbide substrate provides excellent cutting performance<br>* TiAlN PVD Coating applied grade                      |
| YG501                   | K05~15                     | * Suitable for the milling finishing operation due to the excellent wear resistance<br>* TiAlN PVD Coating applied grade   |
| YA102                   | K10~25                     | * Suitable for the medium cutting of cast iron due to the excellent wear resistance<br>* TiCN + Al <sub>2</sub> O <sub>3</sub> CVD Coating   |
| YA503                   | K20~35                     | * Excellent combination of carbide and coating provides excellent wear resistance and oxidation resistance<br>* TiAlN PVD Coating  |

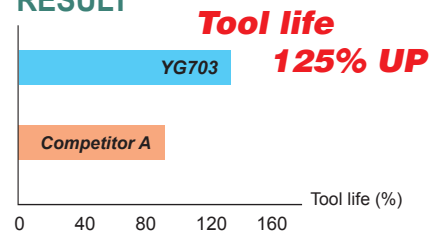
## PVD YG702 CUTTING PERFORMANCE

### WEAR RESISTANCE TEST

#### TEST CONDITION

|       |              |             |                |
|-------|--------------|-------------|----------------|
| Vc    | 250m/min     | Work piece  | SCM440(HRc 30) |
| Feed  | 0.15mm/tooth | Coolant     | Dry cut        |
| Depth | 4mm          | Designation | SPCN1203EDTR   |
|       |              | Cutter      | Ø125           |

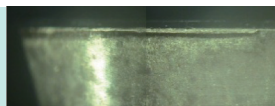
#### RESULT



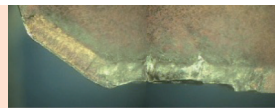
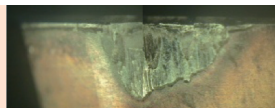
#### PERIPHERY FACE

#### PLAIN FACE

YG702

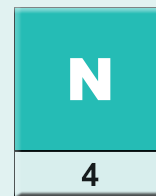
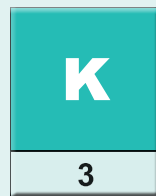
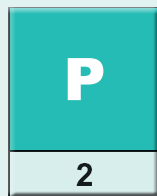
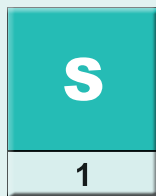


Competitor A



# Milling Insert Designation System (ISO)

| 1. INSERT SHAPE |          |          |                | 2. RELIEF ANGLE |          |          |          | 4. CROSS SECTION SHAPE |          |                |
|-----------------|----------|----------|----------------|-----------------|----------|----------|----------|------------------------|----------|----------------|
|                 |          |          |                |                 |          |          |          |                        |          |                |
| <b>A</b>        | <b>B</b> | <b>C</b> | <b>H</b>       |                 |          |          |          | <b>A</b>               | <b>F</b> | <b>G</b>       |
|                 |          |          |                | 5°              | 7°       | 15°      | 20°      |                        |          |                |
| <b>L</b>        | <b>O</b> | <b>P</b> | <b>R</b>       | <b>B</b>        | <b>C</b> | <b>D</b> | <b>E</b> | <b>M</b>               | <b>N</b> | <b>R</b>       |
|                 |          |          | <b>special</b> | 25°             | 30°      | 0°       | 11°      |                        |          | <b>special</b> |
| <b>S</b>        | <b>T</b> | <b>W</b> | <b>X</b>       | <b>F</b>        | <b>G</b> | <b>N</b> | <b>P</b> | <b>T</b>               | <b>W</b> | <b>X</b>       |

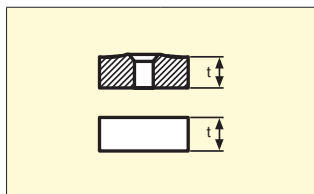


## 3. TOLERANCE

|   | Tolerance (mm) |         |         | I.C. size (mm) |       |      |        |       |      |   |
|---|----------------|---------|---------|----------------|-------|------|--------|-------|------|---|
|   | m              | t       | I.C.    | 6.35           | 9.525 | 12.7 | 15.875 | 19.05 | 25.4 |   |
| A | ± 0.005        | ± 0.025 | ± 0.025 | ●              | ●     | ●    | ●      | ●     | ●    |   |
| C | ± 0.013        | ± 0.025 | ± 0.025 | ●              | ●     | ●    | ●      | ●     | ●    |   |
| E | ± 0.025        | ± 0.025 | ± 0.025 | ●              | ●     | ●    | ●      | ●     | ●    |   |
| F | ± 0.005        | ± 0.025 | ± 0.013 | ●              | ●     | ●    | ●      | ●     | ●    |   |
| G | ± 0.025        | ± 0.13  | ± 0.025 | ●              | ●     | ●    | ●      | ●     | ●    |   |
| H | ± 0.013        | ± 0.025 | ± 0.013 | ●              | ●     | ●    | ●      | ●     | ●    |   |
| K | ± 0.013        | ± 0.025 | ± 0.05  | ●              | ●     |      |        |       |      |   |
|   |                |         | ± 0.08  |                |       | ●    |        |       |      |   |
|   |                |         | ± 0.10  |                |       |      |        | ●     | ●    |   |
|   |                |         | ± 0.13  |                |       |      |        |       |      | ● |
| M | ± 0.13         | ± 0.13  | ± 0.05  | ●              | ●     |      |        |       |      |   |
|   |                |         | ± 0.08  |                |       | ●    |        |       |      |   |
|   |                |         | ± 0.10  |                |       |      |        | ●     | ●    |   |
|   |                |         | ± 0.13  |                |       |      |        |       |      | ● |

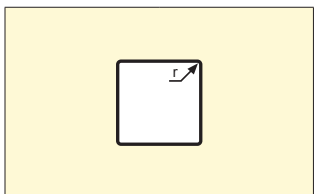


### 6. THICKNESS (MM)



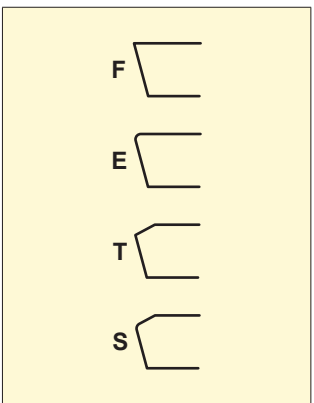
| R  | Thickness |
|----|-----------|
| 02 | 2.38      |
| 03 | 3.18      |
| T3 | 3.97      |
| 04 | 4.76      |
| 06 | 6.35      |

### 7. NOSE R (MM)

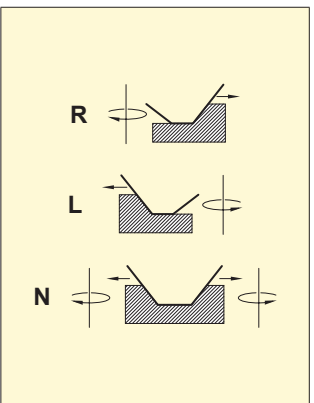


| t  | Thickness |
|----|-----------|
| 02 | 0.2       |
| 04 | 0.4       |
| 08 | 0.8       |
| 10 | 1.0       |
| 12 | 1.2       |

### 8. EDGE PREPARATION (MM)



### 9. CUTTING DIRECTION



**12**  
5

**03**  
6

**08**  
**ED**  
7

**T**  
8

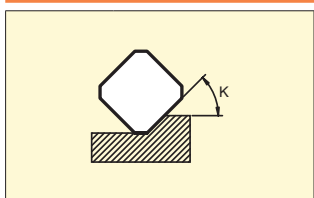
**R**  
9

**C/B**  
10

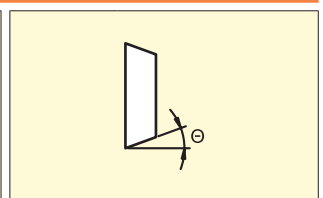
### 5. CUTTING EDGE LENGTH (MM)

| I.C.     | C  | S  | R  | T  | H  | O  |
|----------|----|----|----|----|----|----|
| <b>L</b> |    |    |    |    |    |    |
| 5.56     |    |    |    | 09 |    |    |
| 6.35     | 06 | 06 | 06 | 11 |    |    |
| 7.94     | 08 |    |    | 13 |    |    |
| 9.525    | 09 | 09 | 09 | 16 |    |    |
| 12.7     | 12 | 12 | 12 | 22 | 05 | 05 |
| 15.875   | 16 | 15 | 15 | 27 | 09 |    |
| 17.94    |    |    |    |    |    | 07 |
| 19.05    | 19 | 19 | 19 | 33 | 10 |    |
| 25.4     | 25 | 25 | 25 |    |    |    |

### 7. LEAD ANGLE & RELIEF ANGLE OF MINOR CUTTING EDGE



| Lead Angle |         |
|------------|---------|
| A          | 45°     |
| D          | 60°     |
| E          | 75°     |
| F          | 85°     |
| P          | 90°     |
| Z          | Special |



| Relief Angle of minor cutting edge |         |
|------------------------------------|---------|
| B                                  | 5°      |
| C                                  | 7°      |
| D                                  | 15°     |
| E                                  | 20°     |
| F                                  | 25°     |
| G                                  | 30°     |
| N                                  | 0°      |
| P                                  | 11°     |
| Z                                  | Special |

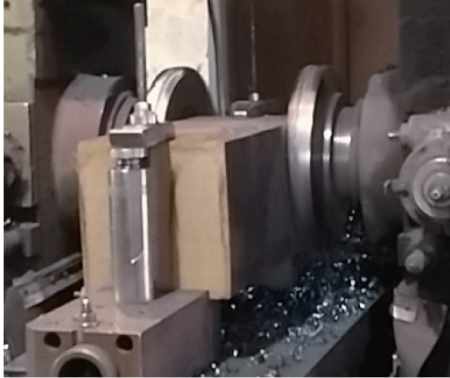
### 10. CHIP BREAKER

|     |                            |
|-----|----------------------------|
| HAM | For steel medium machining |
| HAA | For aluminum machining     |



## Application Example

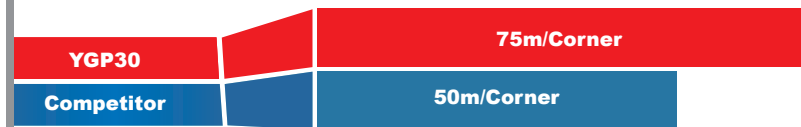
### Machining situation



**Work piece**

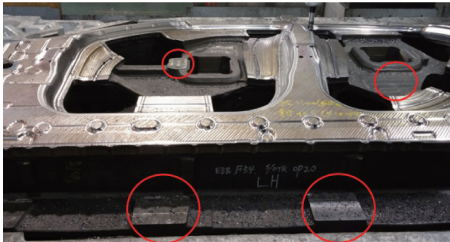
- JIS : SCM415
- DIN : 1.7335 (13CrMo44)
- AISI : A182-F11;12

| Work piece         |            | Oil Pressure Braker(SCM415) |
|--------------------|------------|-----------------------------|
| Cutting Conditions | Speed (vc) | 180 m/min                   |
|                    | Feed (fz)  | 0.2 mm/tooth                |
|                    | Depth (ap) | ap = 8mm                    |
|                    | Coolant    | Dry                         |
|                    | Insert     | SPCN1504EDTR(YGP30)         |
|                    | Cutter     | Ø400 (Z=20)                 |



**150% longer tool life than competitor !**

### Machining situation

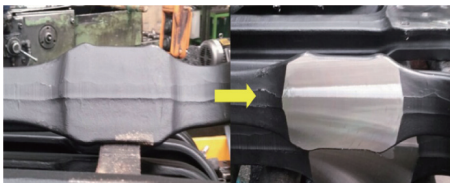


| Work piece         |            | Mold steel                    |
|--------------------|------------|-------------------------------|
| Cutting Conditions | Speed (vc) | 180 m/min                     |
|                    | Feed (fz)  | 0.2-0.25 mm/tooth             |
|                    | Depth (ap) | 5mm(Roughing), 1mm(Finishing) |
|                    | Coolant    | Dry                           |
|                    | Insert     | TPCN2204PDTR (YGP30)          |
|                    | Cutter     | Ø50 (Z=3)                     |



**200% longer tool life than competitor !**

### Machining situation



| Work piece         |            | S45C Forged steel    |
|--------------------|------------|----------------------|
| Cutting Conditions | Speed (vc) | 200 m/min            |
|                    | Feed (fz)  | 0.25 mm/tooth        |
|                    | Depth (ap) | 3mm                  |
|                    | Coolant    | Dry                  |
|                    | Insert     | SPCN1504EDTR (YGP30) |
|                    | Cutter     | Ø210 (Z=12)          |



**150% longer tool life than competitor !**

**Work piece**

- JIS : S45C
- DIN : 1.1191 (C45E)
- AISI : 1045

## Machining situation



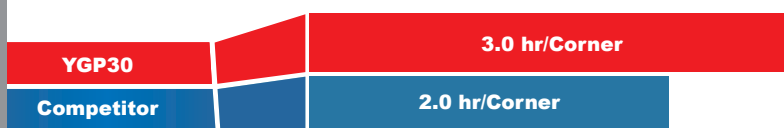
## Work piece

- JIS : SKD61
- DIN : 1.2344 (x40 CrMoV51)
- AISI : H13

## Work piece

## SKD61(HRc50)

|                    |            |                      |
|--------------------|------------|----------------------|
| Cutting Conditions | Speed (vc) | 120 m/min            |
|                    | Feed (fz)  | 0.1 mm/tooth         |
|                    | Depth (ap) | 8mm                  |
|                    | Coolant    | Dry                  |
|                    | Insert     | SPCN1203EDTR (YGP30) |
|                    | Cutter     | Ø120 (Z=8)           |



**150% longer tool life than competitor !**

## Series

| SPCN | Continuous |                 | Minor Intermittent |   | Heavy Intermittent |   |  |
|------|------------|-----------------|--------------------|---|--------------------|---|--|
|      | P          | Steel           | ⊕                  | ⊕ | ⊕                  | ⊕ |  |
|      | M          | Stainless Steel |                    | ⊕ |                    |   |  |
|      | K          | Cast Iron       |                    | ⊕ | ●                  |   |  |
|      | N          | Non Ferrous     |                    |   |                    |   |  |
|      | S          | Heat Resistant  |                    | ⊕ |                    |   |  |

| SHAPE | DESIGNATION  | EDP No.    |       | Grade       |       |       |         |    | Dimension |        |      |     |
|-------|--------------|------------|-------|-------------|-------|-------|---------|----|-----------|--------|------|-----|
|       |              |            |       | PVD Coating |       |       | Carbide |    |           |        |      |     |
|       |              |            |       | A2          | A3    | A4    | A1      | C1 | I         | D      | S    | Θ   |
| ISO   | Designation  | Grade Code | YG702 | YG602       | YG501 | YGP30 | YGK10   |    |           |        |      |     |
|       | SPCN1203EDTR | A20S1A1A0  | □□    | ⊙           | ⊙     | ⊙     | ●       |    | -         | 12.7   | 3.18 | 11° |
|       | SPCN1203EDER | A20S1A3A0  | □□    | ⊙           | ⊙     | ⊙     | ○       |    | -         | 12.7   | 3.18 | 11° |
|       | SPCN1203EDSR | A20S1A4A0  | □□    | ⊙           | ⊙     | ⊙     | ○       |    | -         | 12.7   | 3.18 | 11° |
|       | SPCN1504EDTR | A20S1A2A0  | □□    | ⊙           | ⊙     | ⊙     | ●       |    | -         | 15.875 | 4.76 | 11° |
|       | SPCN1504EDER | A20S1B3A0  | □□    | ⊙           | ⊙     | ⊙     | ○       |    | -         | 15.875 | 4.76 | 11° |
|       | SPCN1504EDSR | A20S1B4A0  | □□    | ⊙           | ⊙     | ⊙     | ○       |    | -         | 15.875 | 4.76 | 11° |
|       | SPCN1203EDTL | A20S1A6A0  | □□    | ⊙           | ⊙     | ⊙     | ○       |    | -         | 12.7   | 3.18 | 11° |
|       | SPCN1203EDEL | A20S1A7A0  | □□    | ⊙           | ⊙     | ⊙     | ○       |    | -         | 12.7   | 3.18 | 11° |
|       | SPCN1203EDSL | A20S1A8A0  | □□    | ⊙           | ⊙     | ⊙     | ○       |    | -         | 12.7   | 3.18 | 11° |
|       | SPCN1504EDTL | A20S1B6A0  | □□    | ⊙           | ⊙     | ⊙     | ○       |    | -         | 15.875 | 4.76 | 11° |
|       | SPCN1504EDEL | A20S1B7A0  | □□    | ⊙           | ⊙     | ⊙     | ○       |    | -         | 15.875 | 4.76 | 11° |
|       | SPCN1504EDSL | A20S1B8A0  | □□    | ⊙           | ⊙     | ⊙     | ○       |    | -         | 15.875 | 4.76 | 11° |

\* EDP No of each selected item is a combination of "Designation" & "Grade Code" in EDP No. column.

For example, EDP No of SPCN1203EDTR YGP30 is A20S1A1A0A1.

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ⊙ : Will be launched by end of 2014

|      |                |                    |                    |  |  |  |
|------|----------------|--------------------|--------------------|--|--|--|
| SECN | Continuous     | Minor Intermittent | Heavy Intermittent |  |  |  |
|      | P              | Steel              |                    |  |  |  |
|      | M              | Stainless Steel    |                    |  |  |  |
|      | K              | Cast Iron          |                    |  |  |  |
|      | N              | Non Ferrous        |                    |  |  |  |
| S    | Heat Resistant |                    |                    |  |  |  |

| SHAPE | DESIGNATION  | EDP No.   |    | Grade       |             |            |         |    | Dimension |        |      |     |
|-------|--------------|-----------|----|-------------|-------------|------------|---------|----|-----------|--------|------|-----|
|       |              |           |    | PVD Coating |             |            | Carbide |    |           |        |      |     |
|       |              |           |    | ISO         | Designation | Grade Code | A2      | A3 | A4        | A1     | C1   | l   |
|       | SECN1203AFFN | A20S5A9AD | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 12.7   | 3.18 | 20° |
|       | SECN1203AFTN | A20S5AAA0 | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 12.7   | 3.18 | 20° |
|       | SECN1203AFEN | A20S5ABA0 | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 12.7   | 3.18 | 20° |
|       | SECN1203AFSN | A20S5ACA0 | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 12.7   | 3.18 | 20° |
|       | SECN1504AFFN | A20S5B9AD | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 15.875 | 4.76 | 20° |
|       | SECN1504AFTN | A20S5BAA0 | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 15.875 | 4.76 | 20° |
|       | SECN1504AFEN | A20S5BBA0 | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 15.875 | 4.76 | 20° |
|       | SECN1504AFSN | A20S5BCA0 | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 15.875 | 4.76 | 20° |

\* EDP No of each selected item is a combination of "Designation" & "Grade Code" in EDP No. column.

For example, EDP No of SECN1203AFFN YGP30 is A20S5A9A0A1

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ⊙ : Will be launched by end of 2014

|      |                |                    |                    |  |  |  |
|------|----------------|--------------------|--------------------|--|--|--|
| SDCN | Continuous     | Minor Intermittent | Heavy Intermittent |  |  |  |
|      | P              | Steel              |                    |  |  |  |
|      | M              | Stainless Steel    |                    |  |  |  |
|      | K              | Cast Iron          |                    |  |  |  |
|      | N              | Non Ferrous        |                    |  |  |  |
| S    | Heat Resistant |                    |                    |  |  |  |

| SHAPE | DESIGNATION  | EDP No.   |    | Grade       |             |            |         |    | Dimension |        |      |     |
|-------|--------------|-----------|----|-------------|-------------|------------|---------|----|-----------|--------|------|-----|
|       |              |           |    | PVD Coating |             |            | Carbide |    |           |        |      |     |
|       |              |           |    | ISO         | Designation | Grade Code | A2      | A3 | A4        | A1     | C1   | l   |
|       | SDCN1203AEEN | A20S6ADA0 | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 12.7   | 3.18 | 15° |
|       | SDCN1203AESN | A20S6AEA0 | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 12.7   | 3.18 | 15° |
|       | SDCN1203AEFN | A20S6AFA0 | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 12.7   | 3.18 | 15° |
|       | SDCN1203AETN | A20S6AGA0 | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 12.7   | 3.18 | 15° |
|       | SDCN1504AEEN | A20S6BDA0 | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 15.875 | 4.76 | 15° |
|       | SDCN1504AESN | A20S6BEA0 | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 15.875 | 4.76 | 15° |
|       | SDCN1504AEFN | A20S6BFA0 | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 15.875 | 4.76 | 15° |
|       | SDCN1504AETN | A20S6BGA0 | □□ | ⊙           | ⊙           | ⊙          | ○       |    | -         | 15.875 | 4.76 | 15° |

\* EDP No of each selected item is a combination of "Designation" & "Grade Code" in EDP No. column.

For example, EDP No of SDCN1203AEEN YGP30 is A20S6ADA0A1.

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ⊙ : Will be launched by end of 2014

|             |            |                    |                    |  |  |  |  |  |
|-------------|------------|--------------------|--------------------|--|--|--|--|--|
| <b>TPCN</b> | Continuous | Minor Intermittent | Heavy Intermittent |  |  |  |  |  |
|             | <b>P</b>   | Steel              |                    |  |  |  |  |  |
|             | <b>M</b>   | Stainless Steel    |                    |  |  |  |  |  |
|             | <b>K</b>   | Cast Iron          |                    |  |  |  |  |  |
|             | <b>N</b>   | Non Ferrous        |                    |  |  |  |  |  |
|             | <b>S</b>   | Heat Resistant     |                    |  |  |  |  |  |

| SHAPE | DESIGNATION  | EDP No.   |    | Grade       |             |            |         |    | Dimension |       |      |     |
|-------|--------------|-----------|----|-------------|-------------|------------|---------|----|-----------|-------|------|-----|
|       |              |           |    | PVD Coating |             |            | Carbide |    |           |       |      |     |
|       |              |           |    | ISO         | Designation | Grade Code | A2      | A3 | A4        | A1    | C1   | I   |
|       | TPCN1603PPTR | A20T1A1A0 | □□ | ○           | ○           | ○          | ●       |    | 16.4      | 9.525 | 3.18 | 11° |
|       | TPCN1603PDTR | A20T1A2A0 | □□ | ○           | ○           | ○          | ●       |    | 16.4      | 9.525 | 3.18 | 11° |
|       | TPCN1603PDSR | A20T1A3A0 | □□ | ○           | ○           | ○          | ○       |    | 16.4      | 9.525 | 3.18 | 11° |
|       | TPCN1603PDER | A20T1A4A0 | □□ | ○           | ○           | ○          | ○       |    | 16.4      | 9.525 | 3.18 | 11° |
|       | TPCN2204PDTR | A20T1B2A0 | □□ | ○           | ○           | ○          | ●       |    | 22.1      | 12.7  | 4.76 | 11° |
|       | TPCN2204PDSR | A20T1B3A0 | □□ | ○           | ○           | ○          | ○       |    | 22.1      | 12.7  | 4.76 | 11° |
|       | TPCN2204PDER | A20T1B4A0 | □□ | ○           | ○           | ○          | ○       |    | 22.1      | 12.7  | 4.76 | 11° |
|       | TPCN1603PPTL | A20T1A5A0 | □□ | ○           | ○           | ○          | ○       |    | 16.4      | 9.525 | 3.18 | 11° |
|       | TPCN1603PDTL | A20T1A6A0 | □□ | ○           | ○           | ○          | ○       |    | 16.4      | 9.525 | 3.18 | 11° |
|       | TPCN1603PDSL | A20T1A7A0 | □□ | ○           | ○           | ○          | ○       |    | 16.4      | 9.525 | 3.18 | 11° |
|       | TPCN1603PDEL | A20T1A8A0 | □□ | ○           | ○           | ○          | ○       |    | 16.4      | 9.525 | 3.18 | 11° |
|       | TPCN2204PDTL | A20T1B6A0 | □□ | ○           | ○           | ○          | ○       |    | 22.1      | 12.7  | 4.76 | 11° |
|       | TPCN2204PDSL | A20T1B7A0 | □□ | ○           | ○           | ○          | ○       |    | 22.1      | 12.7  | 4.76 | 11° |
|       | TPCN2204PDEL | A20T1B8A0 | □□ | ○           | ○           | ○          | ○       |    | 22.1      | 12.7  | 4.76 | 11° |

\* EDP No of each selected item is a combination of "Designation" & "Grade Code" in EDP No. column.

For example, EDP No of TPCN1603PPTR YGP30 is A20T1A1A0A1.

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ○ : Will be launched by end of 2014

|             |            |                    |                    |  |  |  |  |  |
|-------------|------------|--------------------|--------------------|--|--|--|--|--|
| <b>TECN</b> | Continuous | Minor Intermittent | Heavy Intermittent |  |  |  |  |  |
|             | <b>P</b>   | Steel              |                    |  |  |  |  |  |
|             | <b>M</b>   | Stainless Steel    |                    |  |  |  |  |  |
|             | <b>K</b>   | Cast Iron          |                    |  |  |  |  |  |
|             | <b>N</b>   | Non Ferrous        |                    |  |  |  |  |  |
|             | <b>S</b>   | Heat Resistant     |                    |  |  |  |  |  |

| SHAPE | DESIGNATION | EDP No.   |    | Grade       |             |            |         |    | Dimension |       |      |     |
|-------|-------------|-----------|----|-------------|-------------|------------|---------|----|-----------|-------|------|-----|
|       |             |           |    | PVD Coating |             |            | Carbide |    |           |       |      |     |
|       |             |           |    | ISO         | Designation | Grade Code | A2      | A3 | A4        | A1    | C1   | I   |
|       | TECN32TR    | A20T5C9A0 | □□ | ○           | ○           | ○          | ○       |    | 16.5      | 9.525 | 3.18 | 20° |
|       | TECN43TR    | A20T5D9A0 | □□ | ○           | ○           | ○          | ○       |    | 22.1      | 12.7  | 4.76 | 20° |

\* EDP No of each selected item is a combination of "Designation" & "Grade Code" in EDP No. column.

For example, EDP No of TECN32TR YGP30 is A20T5C9A0A1.

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ○ : Will be launched by end of 2014



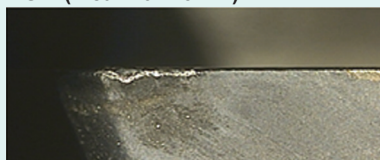
## Grade Range Map For Milling

|                               | High Speed | Finishing to Light |       | Medium | Rough to Heavy |       |
|-------------------------------|------------|--------------------|-------|--------|----------------|-------|
|                               | -          | 01                 | 10    | 20     | 30             | 40    |
| <b>P</b><br>Steel             |            |                    |       | YA702  |                | YA703 |
| <b>M</b><br>Stainless Steel   |            |                    | YA702 |        | YA703          |       |
| <b>K</b><br>Cast Iron         |            |                    | YA102 |        |                |       |
| <b>K</b><br>Ductile Cast Iron |            |                    |       | YA503  |                |       |

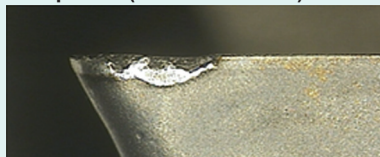
## Recommended Cutting Conditions by Work Material

|        |       | <b>P</b>  |          | <b>M</b>   |          | <b>K</b>        |          |           |          |                   |          |
|--------|-------|-----------|----------|------------|----------|-----------------|----------|-----------|----------|-------------------|----------|
|        |       | Low Alloy |          | High Alloy |          | Stainless Steel |          | Cast Iron |          | Ductile Cast Iron |          |
|        |       | Vc(m/min) | fz(mm/t) | Vc(m/min)  | fz(mm/t) | Vc(m/min)       | fz(mm/t) | Vc(m/min) | fz(mm/t) | Vc(m/min)         | fz(mm/t) |
| Coated | YA702 | 80~300    | 0.1~0.4  | 80~230     | 0.07~0.3 | 70~200          | 0.1~0.25 |           |          |                   |          |
|        | YA703 | 80~240    | 0.1~0.3  |            |          | 70~250          | 0.1~0.3  |           |          |                   |          |
|        | YA102 |           |          |            |          |                 |          | 80~250    | 0.1~0.3  | 80~180            | 0.1~0.25 |
|        | YA503 |           |          |            |          |                 |          | 80~200    | 0.1~0.25 | 80~230            | 0.1~0.3  |

YG-1 (Wear : 0.113mm)



Competitor (Wear : 0.230mm)



### CUTTING CONDITION

**Tools :**

YG1 : APKT103504PDER YA702  
ZHS20090AP10F3E

Competitor : 2Corner Insert  
Ø20 Indexable Endmill

**Workpiece :** Alloy Tool steel (X40CrMoV5-1-HRc 50)

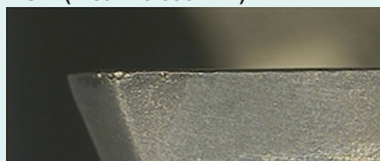
**Vc :** 80 m/min.

**fz :** 0.18 mm/tooth

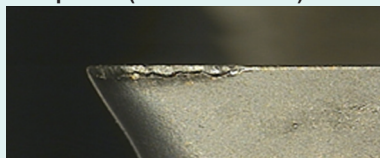
**Depth :** ap=1mm, ae=10mm

**Coolant :** Oil Mist

YG-1 (Wear : 0.090 mm)



Competitor (Wear : 0.159mm)



### CUTTING CONDITION

**Tools :**

YG1 : APKT103504PDER YA702  
ZHS20090AP10F3E

Competitor : 2Corner Insert  
Ø20 Indexable Endmill

**Workpiece :** High Grade Alloy mold steel (KP4-HRc 30)

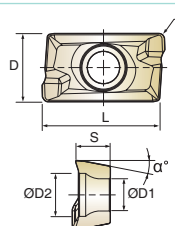
**Vc :** 140 m/min.

**fz :** 0.15 mm/tooth


**Depth :** ap=1mm, ae=8mm

**Coolant :** Wet

| Insert | ● Continuous |                 | ◐ Minor Intermittent |   | ◑ Heavy Intermittent |   |   |
|--------|--------------|-----------------|----------------------|---|----------------------|---|---|
|        | P            | Steel           | ◐                    | ◐ |                      |   |   |
|        | M            | Stainless Steel | ◐                    | ◑ |                      |   |   |
|        | K            | Cast Iron       |                      |   | ◐                    | ● |   |
|        | N            | Non Ferrous     |                      |   |                      |   | ◐ |
|        | S            | Heat Resistant  |                      |   |                      |   |   |




## APKT10

| SHAPE   | DESIGNATION        | EDP No.    | Grade |       |       |       |         | Dimension |      |     |     |     |     |
|---|--------------------|------------|-------|-------|-------|-------|---------|-----------|------|-----|-----|-----|-----|
|   |                    |            | PVD   |       |       | CVD   | Carbide | D         | L    | S   | r   | ØD1 | ØD2 |
|   |                    |            | YA702 | YA703 | YA503 | YA102 | YAK10   |           |      |     |     |     |     |
|  | APKT103504PDER-HAM | XZM1P00001 | ●     |       |       |       |         | 6.7       | 10.5 | 3.5 | 0.4 | 2.8 | 3.9 |
|   | APKT103504PDER-HAM | XZM1C00001 |       |       |       | ●     |         | 6.7       | 10.5 | 3.5 | 0.4 | 2.8 | 3.9 |
|   | APKT103504PDER-HAM | XZM1P00005 |       |       | ●     |       |         | 6.7       | 10.5 | 3.5 | 0.4 | 2.8 | 3.9 |
|   | APKT103504PDER-HAM | XZM1P00007 |       | ●     |       |       |         | 6.7       | 10.5 | 3.5 | 0.4 | 2.8 | 3.9 |
|   | APKT103508PDER-HAM | XZM1P00009 |       | ○     |       |       |         | 6.7       | 10.5 | 3.5 | 0.8 | 2.8 | 3.9 |

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ○ : Will be launched by end of 2014


## APKT11

| SHAPE   | DESIGNATION        | EDP No.    | Grade |       |       |       |         | Dimension |      |     |     |     |     |
|---|--------------------|------------|-------|-------|-------|-------|---------|-----------|------|-----|-----|-----|-----|
|   |                    |            | PVD   |       |       | CVD   | Carbide | D         | L    | S   | r   | ØD1 | ØD2 |
|   |                    |            | YA702 | YA703 | YA503 | YA102 | YAK10   |           |      |     |     |     |     |
|  | APKT113504PDER-HAM | XZM1P00003 | ●     |       |       |       |         | 6.2       | 10.8 | 3.5 | 0.4 | 2.8 | 3.8 |
|   | APKT113508PDER-HAM | XZM1P00004 | ●     |       |       |       |         | 6.2       | 10.8 | 3.5 | 0.8 | 2.8 | 3.8 |

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ○ : Will be launched by end of 2014

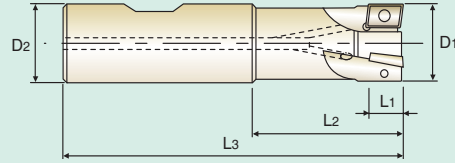
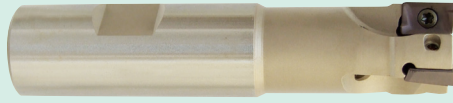
## APKT16

| SHAPE   | DESIGNATION        | EDP No.     | Grade |       |       |       |         | Dimension |      |     |     |     |     |
|---|--------------------|-------------|-------|-------|-------|-------|---------|-----------|------|-----|-----|-----|-----|
|   |                    |             | PVD   |       |       | CVD   | Carbide | D         | L    | S   | r   | ØD1 | ØD2 |
|   |                    |             | YA702 | YA703 | YA503 | YA102 | YAK10   |           |      |     |     |     |     |
|  | APKT160408PDER-HAM | XZM1P00002  | ●     |       |       |       |         | 9.5       | 16.3 | 5.3 | 0.8 | 4.5 | 6.0 |
|   | APKT160408PDER-HAM | XZM1C00002  |       |       |       | ●     |         | 9.5       | 16.3 | 5.3 | 0.8 | 4.5 | 6.0 |
|   | APKT160408PDER-HAM | XZM1P00006  |       |       | ●     |       |         | 9.5       | 16.3 | 5.3 | 0.8 | 4.5 | 6.0 |
|   | APKT160408PDER-HAM | XZM1P00008  |       | ●     |       |       |         | 9.5       | 16.3 | 5.3 | 0.8 | 4.5 | 6.0 |
|   | APKT160412PDER-HAM | XZM1P00010  |       | ○     |       |       |         | 9.5       | 16.3 | 5.3 | 1.2 | 4.5 | 6.0 |
|   | APKT160404PDFR-HAA | C08A1E4A3B1 |       |       |       |       | ○       | 9.5       | 16.3 | 5.3 | 0.4 | 4.5 | 6.0 |
|   | APKT160408PDFR-HAA | C08A1A4A3B1 |       |       |       |       | ○       | 9.5       | 16.3 | 5.3 | 0.8 | 4.5 | 6.0 |

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ○ : Will be launched by end of 2014

## Shank Type



## ZHS - APKT10

| DESIGNATION     | EDP No.         | Stock | Dimension |    |    |    |     |   |            | Shank Type     | Insert    | Parts     |  |
|-----------------|-----------------|-------|-----------|----|----|----|-----|---|------------|----------------|-----------|-----------|--|
|                 |                 |       | D1        | D2 | L1 | L2 | L3  | Z | Wrench No. |                |           | Screw No. |  |
| ZHS16085AP10F2E | ZHS16085AP10F2E | ●     | 16        | 16 | 10 | 37 | 85  | 2 | Flat       | APKT103504PDER | TXME30T08 | TWWT08    |  |
| ZHS20090AP10F3E | ZHS20090AP10F3E | ●     | 20        | 20 | 10 | 40 | 90  | 3 |            |                |           |           |  |
| ZHS16085AP10P2E | ZHS16085AP10P2E | ●     | 16        | 16 | 10 | 37 | 85  | 2 | Plain      |                |           |           |  |
| ZHS16100AP10P2E | ZHS16100AP10P2E | ●     | 16        | 16 | 10 | 37 | 100 | 2 |            |                |           |           |  |
| ZHS16150AP10P2E | ZHS16150AP10P2E | ●     | 16        | 16 | 10 | 37 | 150 | 2 |            |                |           |           |  |
| ZHS16170AP10P2E | ZHS16170AP10P2E | ●     | 16        | 16 | 10 | 37 | 170 | 2 |            |                |           |           |  |
| ZHS20090AP10P3E | ZHS20090AP10P3E | ●     | 20        | 20 | 10 | 40 | 90  | 3 |            |                |           |           |  |
| ZHS20150AP10P3E | ZHS20150AP10P3E | ●     | 20        | 20 | 10 | 40 | 150 | 3 |            |                |           |           |  |
| ZHS20170AP10P3E | ZHS20170AP10P3E | ●     | 20        | 20 | 10 | 40 | 170 | 3 |            |                |           |           |  |

\* Stock situation is subject to change without notice.

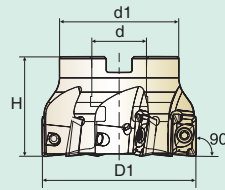
## ZHS - APKT16

| DESIGNATION     | EDP No.          | Stock | Dimension |    |    |    |     |   |            | Shank Type     | Insert    | Parts     |  |
|-----------------|------------------|-------|-----------|----|----|----|-----|---|------------|----------------|-----------|-----------|--|
|                 |                  |       | D1        | D2 | L1 | L2 | L3  | Z | Wrench No. |                |           | Screw No. |  |
| ZHS25100AP16F2B | ZHS25 100AP16F2B | ●     | 25        | 20 | 16 | 40 | 100 | 2 | Flat       | APKT160408PDER | TXME40T15 | TWWT15    |  |
| ZHS25100AP16F2E | ZHS25100AP16F2E  | ●     | 25        | 25 | 16 | 40 | 100 | 2 |            |                |           |           |  |
| ZHS25200AP16F2E | ZHS25200AP16F2E  | ●     | 25        | 25 | 16 | 50 | 200 | 2 |            |                |           |           |  |
| ZHS32110AP16F3B | ZHS32110AP16F3B  | ●     | 32        | 25 | 16 | 50 | 110 | 3 | Plain      |                |           |           |  |
| ZHS32110AP16F3E | ZHS32110AP16F3E  | ●     | 32        | 32 | 16 | 50 | 110 | 3 |            |                |           |           |  |
| ZHS25100AP16P2B | ZHS25100AP16P2B  | ●     | 25        | 20 | 16 | 40 | 100 | 2 |            |                |           |           |  |
| ZHS25150AP16P2B | ZHS25150AP16P2B  | ●     | 25        | 20 | 16 | 40 | 150 | 2 |            |                |           |           |  |
| ZHS25100AP16P2E | ZHS25100AP16P2E  | ●     | 25        | 25 | 16 | 40 | 100 | 2 |            |                |           |           |  |
| ZHS25170AP16P2E | ZHS25170AP16P2E  | ●     | 25        | 25 | 16 | 50 | 170 | 2 |            |                |           |           |  |
| ZHS25200AP16P2E | ZHS25200AP16P2E  | ●     | 25        | 25 | 16 | 50 | 200 | 2 |            |                |           |           |  |
| ZHS26210AP16P2B | ZHS26210AP16P2B  | ●     | 26        | 25 | 16 | 40 | 210 | 2 |            |                |           |           |  |
| ZHS32110AP16P3B | ZHS32110AP16P3B  | ●     | 32        | 25 | 16 | 50 | 110 | 3 |            |                |           |           |  |
| ZHS32150AP16P3B | ZHS32150AP16P3B  | ●     | 32        | 25 | 16 | 40 | 150 | 3 |            |                |           |           |  |
| ZHS32110AP16P3E | ZHS32110AP16P3E  | ●     | 32        | 32 | 16 | 50 | 110 | 3 |            |                |           |           |  |
| ZHS32160AP16P3E | ZHS32160AP16P3E  | ●     | 32        | 32 | 16 | 50 | 160 | 3 |            |                |           |           |  |
| ZHS32180AP16P3E | ZHS32180AP16P3E  | ●     | 32        | 32 | 16 | 50 | 180 | 3 |            |                |           |           |  |

\* Stock situation is subject to change without notice.



## Shell Type



i-HF mill

i-HS mill

i-HR mill

i-Xmill

Modular type

i-Dream Drill

i-HW Drill

Turning Insert

## CHS - APKT10

| DESIGNATION  | EDP No.      | Stock | Dimension |    |    |    |   | Insert         | Parts      |           |
|--------------|--------------|-------|-----------|----|----|----|---|----------------|------------|-----------|
|              |              |       | D1        | d  | H  | d1 | Z |                | Wrench No. | Screw No. |
| CHS040AP1004 | CHS040AP1004 | ●     | 40        | 16 | 40 | 34 | 4 | APKT103504PDER | TXME30T08  | TWWT08    |
| CHS050AP1007 | CHS050AP1007 | ●     | 50        | 22 | 40 | 42 | 7 |                |            |           |

\* Stock situation is subject to change without notice.

## CHS - APKT16

| DESIGNATION  | EDP No.      | Stock | Dimension |    |    |    |   | Insert          | Parts      |           |
|--------------|--------------|-------|-----------|----|----|----|---|-----------------|------------|-----------|
|              |              |       | D1        | d  | H  | d1 | Z |                 | Wrench No. | Screw No. |
| CHS063AP1606 | CHS063AP1606 | ●     | 63        | 22 | 40 | 48 | 6 | APAKT160408PDER | TXME40T15  | TWWT15    |
| CHS080AP1607 | CHS080AP1607 | ●     | 80        | 27 | 50 | 57 | 7 |                 |            |           |
| CHS050AP1605 | CHS050AP1605 | ●     | 50        | 22 | 40 | 42 | 5 |                 |            |           |

\* Stock situation is subject to change without notice.



## SET PROMOTION

| SET No.  | Holder          |       | Shank | Insert             |       |
|----------|-----------------|-------|-------|--------------------|-------|
|          | EDP No.         |       |       | ISO - Grade        |       |
| ISET0009 | ZHS16085AP10F2E | Flat  | Flat  | APKT103504PDER-HAM | YA702 |
| ISET0010 | ZHS20090AP10F3E |       |       |                    |       |
| ISET0011 | ZHS25100AP16F2B |       |       | APKT160408PDER-HAM | YA702 |
| ISET0012 | ZHS32110AP16F3B |       |       |                    |       |
| ISET0013 | ZHS16085AP10P2E | Plain | Plain | APKT103504PDER-HAM | YA702 |
| ISET0014 | ZHS20090AP10P3E |       |       |                    |       |
| ISET0015 | ZHS25100AP16P2B |       |       | APKT160408PDER-HAM | YA702 |
| ISET0016 | ZHS32110AP16P3B |       |       |                    |       |

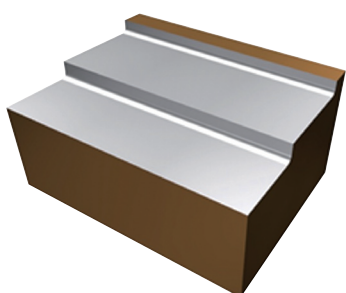
▶ Contents : Milling Insert 20pcs + Holder(including Screws) 1pc + Wrench 1pc

## Recommended Cutting Conditions

| Work piece |                   | Grade | ISO Classification | Recommended Cutting Speed Vc (m/min) |
|------------|-------------------|-------|--------------------|--------------------------------------|
| <b>P</b>   | Steel             | YA702 | P20~30             | 200 (50~300)                         |
|            | Stainless Steel   | YA703 | M20~30             | 150 (50~250)                         |
| <b>K</b>   | Cast Iron         | YA102 | K10~20             | 200 (150~250)                        |
|            |                   | YA503 | K20~30             | 140 (80~200)                         |
|            | Ductile Cast Iron | YA102 | K10~20             | 140 (80~200)                         |
|            |                   | YA503 | K20~30             | 120 (60~180)                         |

## Application Example

### Machining situation



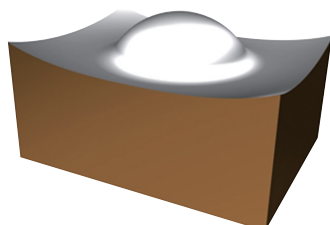
Work piece  
 - JIS : SKD11  
 - DIN : 1.2379 (x155 CrMoV121)  
 - AISI : H13

| Work piece         |            | SKD11               |
|--------------------|------------|---------------------|
| Cutting Conditions | Speed (vc) | 196 m/min           |
|                    | Feed (fz)  | 0.5 mm/tooth        |
|                    | Depth (ap) | ap = 3mm            |
|                    | Coolant    | Dry                 |
|                    | Insert     | RDMT10T30M0 (YA702) |
|                    | Cutter     | Ø25 Shank type(Z=2) |



**130% longer tool life than competitor !**

### Machining situation



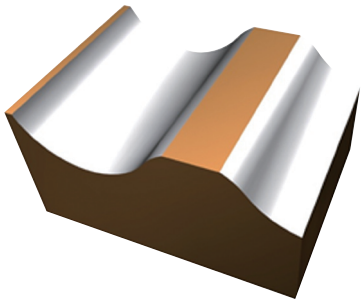
Work piece  
 - JIS : SKD11  
 - DIN : 1.2379 (x155 CrMoV121)  
 - AISI : H13

| Work piece         |            | SKD11               |
|--------------------|------------|---------------------|
| Cutting Conditions | Speed (vc) | 117 m/min           |
|                    | Feed (fz)  | 0.53 mm/tooth       |
|                    | Depth (ap) | 0.3mm               |
|                    | Coolant    | Dry                 |
|                    | Insert     | RDMT10T30M0 (YA702) |
|                    | Cutter     | Ø25 Shank type(Z=2) |



**200% longer tool life than competitor !**

**Machining situation**



**Work piece**

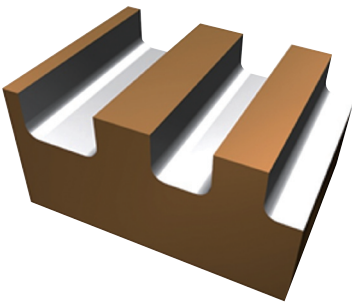
- JIS : SKD11
- DIN : 1.2379 (x155 CrMoV121)
- AISI : H13

| Work piece         |            | SKD11               |
|--------------------|------------|---------------------|
| Cutting Conditions | Speed (vc) | 125 m/min           |
|                    | Feed (fz)  | 0.44 mm/tooth       |
|                    | Depth (ap) | 0.3 -0.5mm          |
|                    | Coolant    | Dry                 |
|                    | Insert     | RDMT10T30M0 (YA702) |
|                    | Cutter     | Ø25 Shank type(Z=2) |

|                   |                     |
|-------------------|---------------------|
| <b>YG-1</b>       | <b>250ea/Corner</b> |
| <b>Competitor</b> | <b>200ea/Corner</b> |

**125% longer tool life than competitor !**

**Machining situation**



**Work piece**

- JIS : SKD11
- DIN : 1.2379 (x155 CrMoV121)
- AISI : H13

| Work piece         |            | SKD11               |
|--------------------|------------|---------------------|
| Cutting Conditions | Speed (vc) | 165 m/min           |
|                    | Feed (fz)  | 0.4 mm/tooth        |
|                    | Depth (ap) | 0.5mm               |
|                    | Coolant    | Dry                 |
|                    | Insert     | RDMT10T30M0 (YA702) |
|                    | Cutter     | Ø25 Shank type(Z=2) |

|                   |                    |
|-------------------|--------------------|
| <b>YG-1</b>       | <b>100m/Corner</b> |
| <b>Competitor</b> | <b>72m/Corner</b>  |

**140% longer tool life than competitor !**

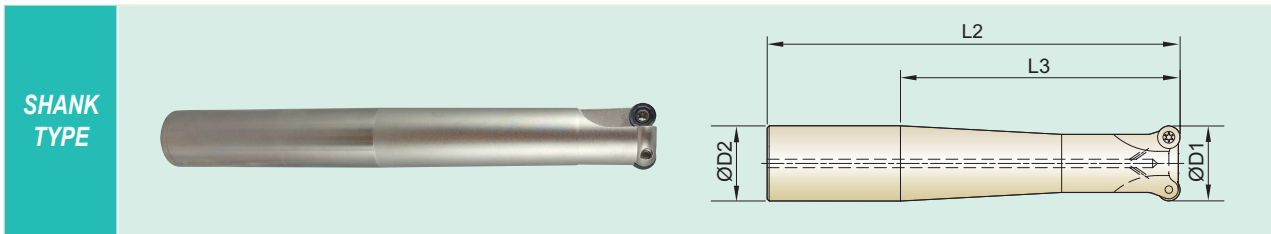
**Series**

| Insert | Continuous |                 | Minor Intermittent |  | Heavy Intermittent |  |  |
|--------|------------|-----------------|--------------------|--|--------------------|--|--|
|        | <b>P</b>   | Steel           | ⊕                  |  |                    |  |  |
|        | <b>M</b>   | Stainless Steel | ⊕                  |  |                    |  |  |
|        | <b>K</b>   | Cast Iron       |                    |  |                    |  |  |
|        | <b>N</b>   | Non Ferrous     |                    |  |                    |  |  |
|        | <b>S</b>   | Heat Resistant  |                    |  |                    |  |  |

| SHAPE | DESIGNATION     | EDP No.   |    | Grade |             |            |         |    | Dimension |    |      |     |
|-------|-----------------|-----------|----|-------|-------------|------------|---------|----|-----------|----|------|-----|
|       |                 |           |    | PVD   |             | CVD        | Carbide |    |           |    |      |     |
|       |                 |           |    | ISO   | Designation | Grade Code | A7      | A8 |           |    | D    | S   |
|       | RDMT10T30M0-HAM | C08R1A1A2 | □□ | ◎     |             |            |         |    |           | 10 | 3.97 | 4.4 |

- \* EDP No of each selected item should be a combination of "Designation EDP No." & "Grade EDP No.". For example, EDP No of RDMT10T30M0-HAM YA702 is C08R1A1A2A7
- \* Stock situation is subject to change without notice.
- \* ● : Stock item ○ : Order made item ◎ : Will be launched by end of 2014

## ZHR - RDMT10

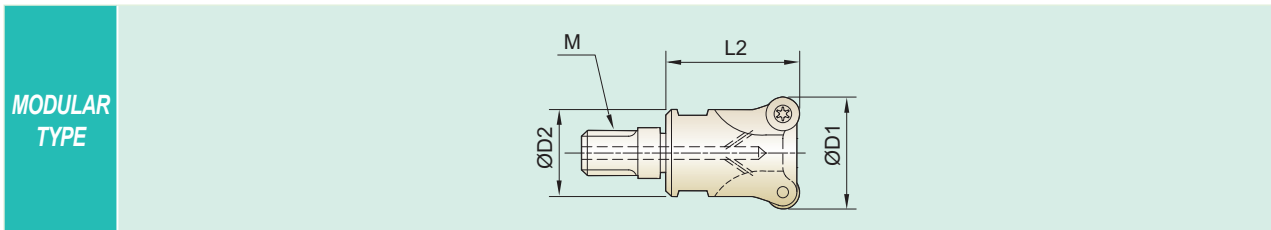


| DESIGNATION     | EDP No.         | Stock | Dimension |    |     |     |   | Insert     | Parts      |           |
|-----------------|-----------------|-------|-----------|----|-----|-----|---|------------|------------|-----------|
|                 |                 |       | D1        | D2 | L3  | L2  | Z |            | Wrench No. | Screw No. |
| ZHR20115RD10F2E | ZHR20115RD10F2E | ◎     | 20        | 20 | 60  | 115 | 2 | RDMT10T3M0 | T15DR      | T0408PHA  |
| ZHR20155RD10F2E | ZHR20155RD10F2E | ◎     | 20        | 20 | 100 | 155 | 2 | RDMT10T3M0 |            |           |
| ZHR25107RD10F3B | ZHR25107RD10F3B | ◎     | 25        | 20 | 35  | 107 | 3 | RDMT10T3M0 |            |           |
| ZHR25180RD10F2E | ZHR25180RD10F2E | ◎     | 25        | 25 | 70  | 180 | 2 | RDMT10T3M0 |            |           |

\* Stock situation is subject to change without notice

\* ● : Stock item ○ : Order made item ◎ : Will be launched by end of 2014

## MHR - RDMT10

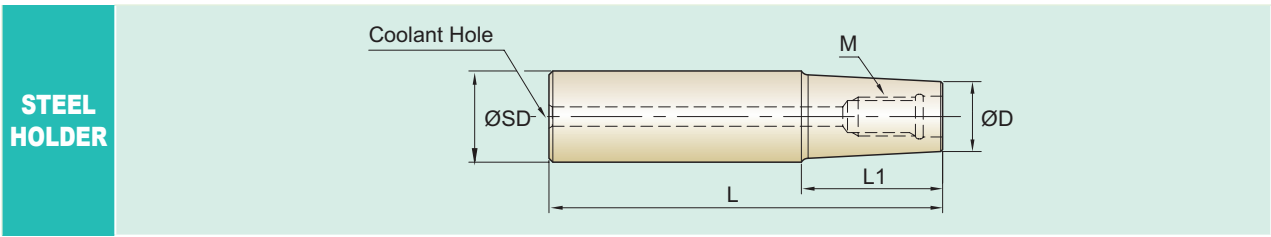


| DESIGNATION | EDP No.    | Stock | Dimension |      |    |    |   | Modular Holder | Insert     | Parts      |           |
|-------------|------------|-------|-----------|------|----|----|---|----------------|------------|------------|-----------|
|             |            |       | D1        | D2   | L2 | M  | Z |                |            | Wrench No. | Screw No. |
| MHR20RD102  | MHR20RD102 | ◎     | 20        | 17.7 | 30 | 10 | 2 | ZMT2001250     | RDMT10T3M0 | T15DR      | T0408PHA  |
| MHR25RD103  | MHR25RD103 | ◎     | 25        | 20.7 | 35 | 12 | 3 | ZMT2501320     |            |            |           |
| MHR32RD104  | MHR32RD104 | ◎     | 32        | 28.7 | 42 | 16 | 4 | ZMT3001320     |            |            |           |
| MHR35RD104  | MHR35RD104 | ◎     | 35        | 28.7 | 42 | 16 | 4 |                |            |            |           |
| MHR35RD105  | MHR35RD105 | ◎     | 35        | 28.7 | 42 | 16 | 5 |                |            |            |           |
| MHR42RD105  | MHR42RD105 | ◎     | 42        | 28.7 | 42 | 16 | 5 |                |            |            |           |
| MHR42RD106  | MHR42RD106 | ◎     | 42        | 28.7 | 42 | 16 | 6 |                |            |            |           |

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ◎ : Will be launched by end of 2014

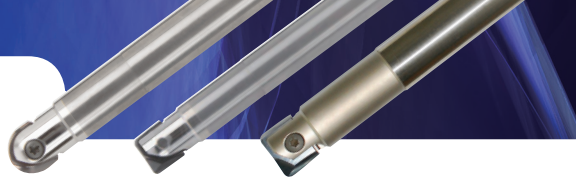
M I L L I N G



| DESIGNATION | EDP No.    | Stock | Mill Dia.                      | Shank Dia. | Overall Length | Neck Length | Neck Dia. | Thread Size | Coolant Hole |
|-------------|------------|-------|--------------------------------|------------|----------------|-------------|-----------|-------------|--------------|
|             |            |       |                                | SD         | L              | L1          | D         | M           |              |
| ZMT2001250  | ZMT2001250 | ◎     | 20.0                           | 25.0       | 170.0          | 100.0       | 19.0      | M10         | Ø5           |
| ZMT2001320  | ZMT2001320 | ◎     | 25.0                           | 32.0       | 200.0          | 110.0       | 24.0      | M12         | Ø5           |
| ZMT3001320  | ZMT3001320 | ◎     | (30.0)<br>32.0<br>35.0<br>42.0 | 32.0       | 200.0          | 110.0       | 29.0      | M16         | Ø6           |

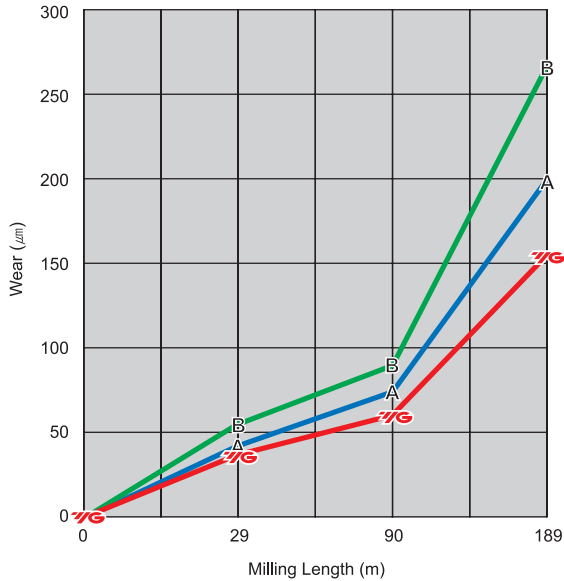
\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ◎ : Will be launched by end of 2014

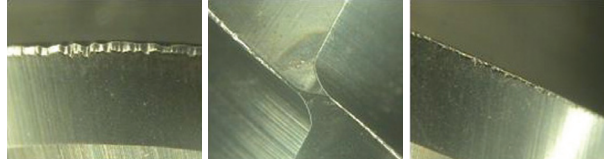


## TEST I - BALL

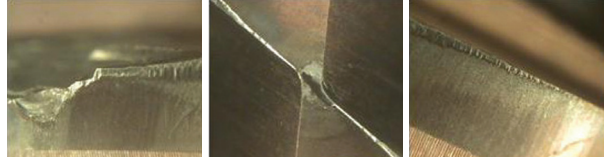
— YG-1  
— A Competitor A  
— B Competitor B



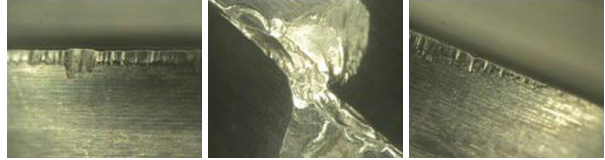
**YG-1 i-Xmill (Total Milling Length 189m)**



**Competitor A (Total Milling Length 189m)**



**Competitor B (Total Milling Length 189m)**



### CUTTING CONDITION

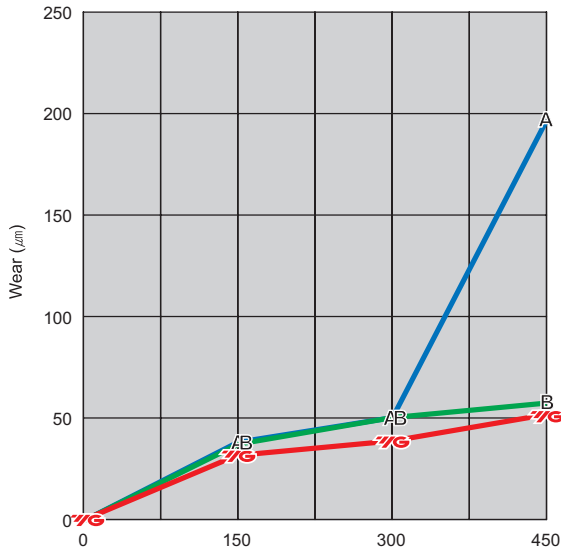
**Tools :** i-Xmill Ball (XMB120C160)  
**Size :** Ø16 × R8.0  
**Work Material :** JIS : SKD61 (HRC50),  
 DIN : X40GrMoV51(1.2344)  
 AISI : H13

**Cutting Speed :** 80.42 m/min.  
**R.P.M :** 1,600 rev./min.  
**Feed :** 390 mm/min.  
**Feed per tooth :** 0.12 mm/tooth  
**Milling Method :** Side Cutting

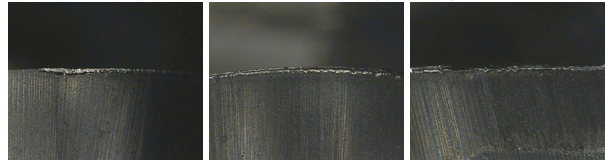
**Milling Depth :** Axial : 0.8 mm  
 Radial : 1.6 mm  
**Coolant :** Oil Mist  
**Overhang :** YG-1, Competitor B : 48 mm  
 Competitor A : 56 mm  
**Machine :** Machining Center

## TEST II - CORNER RADIUS

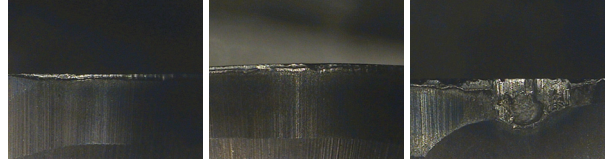
— YG-1  
— A Competitor A  
— B Competitor B



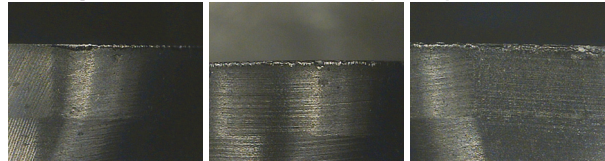
**YG-1 i-Xmill (Total Milling Length 450m)**



**Competitor A (Total Milling Length 450m)**



**Competitor B (Total Milling Length 450m)**



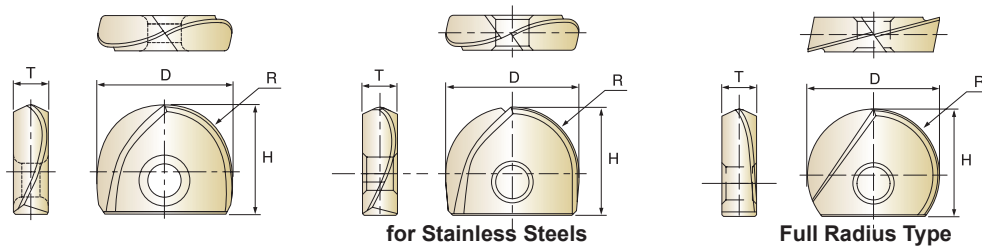
### CUTTING CONDITION

**Tools :** i-Xmill Corner Radius (XMR110A16020)  
**Size :** Ø16 x R2.0  
**Work Material :** KS : KP4M (Mold steels HRC35)  
 DIN : 40CrMnNiMo8-6-4(1.2738)  
 AISI : P20+Ni

**Cutting Speed :** 280 m/min.  
**R.P.M :** 5,570 rev./min.  
**Feed :** 2,230 mm/min.  
**Feed per tooth :** 0.2 mm/tooth  
**Milling Method :** Side Cutting

**Milling Depth :** Axial : 3.0mm  
 Radial : 0.2mm  
**Coolant :** Oil Mist  
**Overhang :** 70mm  
**Machine :** Machining Center

# XMB



• 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 |   |   |   |   |
|-----------|-----------------|--------------------|--------------------|---|---|---|---|
|           | <b>P</b>        | Steel              | ●                  | ● | ● | ● | ● |
| <b>M</b>  | Stainless Steel |                    |                    |   |   | ● |   |
| <b>K</b>  | Cast Iron       |                    | ●                  |   |   |   |   |
| <b>N</b>  | Non Ferrous     | ●                  |                    | ● |   |   | ● |
| <b>S</b>  | Heat Resistant  |                    | ●                  |   |   |   |   |

| SHAPE | SPECIFICATION | EDP No.    |             | Grade               |                     |              |                          |                      |                                      | Dimension |       |      |     |
|-------|---------------|------------|-------------|---------------------|---------------------|--------------|--------------------------|----------------------|--------------------------------------|-----------|-------|------|-----|
|       |               |            |             | PVD                 |                     |              |                          |                      |                                      |           |       |      |     |
|       |               |            |             | XMB110A             | XMB120C             | XMB110D      | XMB260T                  | XMB130A              | XMM110V                              | D         | R     | H    | T   |
|       | Diameter      | Grade Code | Designation | for General Purpose | for Hardened Steels | for Graphite | for High Hardened Steels | for Stainless Steels | for General Purpose Full Radius Type |           |       |      |     |
|       | Ø8            | □□□□□□     | 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  |     |

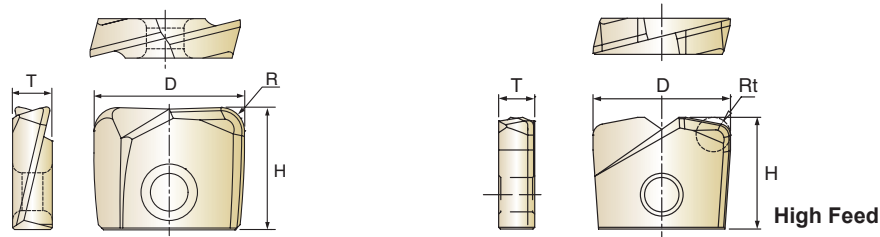
\* EDP No of each selected item should be a combination of "Designation EDP No." & "Grade EDP No."

For example, EDP No of Designatin 080, Grade XMB110A is XMB110A 080

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item

**XMR**



- The corner radius tolerance is  $\pm 0.015\text{mm}$  and the set-up accuracy is  $\pm 0.02\text{mm}$ .
- XMR insert is interchangeable with XMB holder, but take XMR holder for better precision cutting with XMR insert.

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


| SHAPE | SPECIFICATION          | EDP No.    | Grade       |  |                     |              |                          | Dimension                     |   |   |   |             |                   |  |
|-------|------------------------|------------|-------------|--|---------------------|--------------|--------------------------|-------------------------------|---|---|---|-------------|-------------------|--|
|       |                        |            | PVD         |  |                     |              |                          | D                             | R | H | T | Rt (theory) | ap <sub>max</sub> |  |
|       |                        |            | XMR110A     | XMR120C                                | XMR110D             | XMR260T      | XMF110V                  |                               |   |   |   |             |                   |  |
|       | Diameter with Corner-R | Grade Code | Designation | for General Purpose & Stainless Steels | for Hardened Steels | for Graphite | for High Hardened Steels | for General Purpose High Feed |   |   |   |             |                   |  |

|          |          |        |        |   |   |   |   |      |      |      |      |      |      |     |
|----------|----------|--------|--------|---|---|---|---|------|------|------|------|------|------|-----|
|          | Ø8 R0.3  | □□□□□□ | 080 03 | ● | ● | ○ | ○ | ●    | 8    | R0.3 | 8    | 2.4  | R0.8 | 0.4 |
|          | Ø8 R0.5  | □□□□□□ | 080 05 | ● | ● | ○ | ○ | ●    |      | R0.5 |      |      |      |     |
|          | Ø8 R1.0  | □□□□□□ | 080 10 | ● | ● | ○ | ○ | ●    |      | R1.0 |      |      |      |     |
|          | Ø8 R2.0  | □□□□□□ | 080 20 | ● | ● | ○ | ○ | ●    |      | R2.0 |      |      |      |     |
|          | Ø10 R0.3 | □□□□□□ | 100 03 | ● | ● | ○ | ○ | ●    | 10   | R0.3 | 9.5  | 2.7  | R1.0 | 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 | 11   | 9.5  | 2.7  | R1.0 | 0.5 |
|          | Ø10 R3.0 | □□□□□□ | 100 30 | ● | ● | ○ | ○ | ●    | R3.0 |      |      |      |      |     |
|          | Ø11 R0.3 | □□□□□□ | 110 03 | ● | ● | ○ | ○ | ●    | R0.3 |      |      |      |      |     |
|          | Ø11 R0.5 | □□□□□□ | 110 05 | ● | ● | ○ | ○ | ●    | R0.5 |      |      |      |      |     |
|          | Ø11 R1.0 | □□□□□□ | 110 10 | ● | ● | ○ | ○ | ●    | R1.0 | 12   | 11   | 3.2  | R1.0 | 0.6 |
|          | 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 | 13   | 11.2 | 3.2  | R1.0 | 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 | 13   | 11.2 | 3.2  | R1.0 | 0.6  |     |
| Ø12 R3.0 | □□□□□□   | 120 30 | ●      | ● | ○ | ○ | ● | R3.0 |      |      |      |      |      |     |
| Ø13 R0.3 | □□□□□□   | 130 03 | ●      | ● | ○ | ○ | ● | R0.3 |      |      |      |      |      |     |
| Ø13 R0.5 | □□□□□□   | 130 05 | ●      | ● | ○ | ○ | ● | R0.5 |      |      |      |      |      |     |
| Ø13 R1.0 | □□□□□□   | 130 10 | ●      | ● | ○ | ○ | ● | R1.0 | 13   | 11.2 | 3.2  | R1.0 | 0.6  |     |
| Ø13 R1.5 | □□□□□□   | 130 15 | ●      | ● | ○ | ○ | ● | R1.5 |      |      |      |      |      |     |
| Ø13 R2.0 | □□□□□□   | 130 20 | ●      | ● | ○ | ○ | ● | R2.0 |      |      |      |      |      |     |
| Ø13 R3.0 | □□□□□□   | 130 30 | ●      | ● | ○ | ○ | ● | R3.0 |      |      |      |      |      |     |

M I L L I N G



# XMR

| SHAPE   | SPECIFICATION | EDP No.     |  | Grade               |              |                          |                               |         | Dimension |      |     |             |                   |     |
|---|---------------|-------------|--|---------------------|--------------|--------------------------|-------------------------------|---------|-----------|------|-----|-------------|-------------------|-----|
|   |               |             |  | PVD                 |              |                          |                               |         |           |      |     |             |                   |     |
|   |               |             |  | XMR110A             | XMR120C      | XMR110D                  | XMR260T                       | XMF110V | High Feed |      |     |             |                   |     |
| Diameter with Corner-R  | Grade Code    | Designation | for General Purpose & Stainless Steels | for Hardened Steels | for Graphite | for High Hardened Steels | for General Purpose High Feed | D       | R         | H    | T   | Rt (theory) | ap <sub>max</sub> |     |
|  | Ø16 R0.3      | □□□□□□      | 160 03                                 | ●                   | ●            | ○                        | ○                             | ●       | 16        | R0.3 | 13  | 4.2         | R1.5              | 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         | R1.5              | 0.8 |
|   | Ø17 R0.5      | □□□□□□      | 170 05                                 | ●                   | ●            | ○                        | ○                             | ●       |           | R0.5 |     |             |                   |     |
|   | Ø17 R1.0      | □□□□□□      | 170 10                                 | ●                   | ●            | ○                        | ○                             | ●       |           | R1.0 |     |             |                   |     |
|   | Ø17 R1.5      | □□□□□□      | 170 15                                 | ●                   | ●            | ○                        | ○                             | ●       |           | R1.5 |     |             |                   |     |
|   | 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         | R2.0              | 1.0 |
|   | Ø20 R0.5      | □□□□□□      | 200 05                                 | ●                   | ●            | ○                        | ○                             | ●       |           | R0.5 |     |             |                   |     |
|   | Ø20 R1.0      | □□□□□□      | 200 10                                 | ●                   | ●            | ○                        | ○                             | ●       |           | R1.0 |     |             |                   |     |
|   | Ø20 R1.5      | □□□□□□      | 200 15                                 | ●                   | ●            | ○                        | ○                             | ●       |           | R1.5 |     |             |                   |     |
|   | 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         | R2.0              | 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    |           |      |     |             |                   |     |
| Ø25 R0.3  | □□□□□□        | 250 03      | ●                                      | ●                   | ○            | ○                        | ●                             | 25      | R0.3      | 19.5 | 6.2 | R2.5        | 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 R3.0  | □□□□□□        | 250 30      | ●                                      | ●                   | ○            | ○                        | ●                             |         | R3.0      |      |     |             |                   |     |


\* EDP No of each selected item should be a combination of "Designation EDP No." & "Grade EDP No."

For example, EDP No of Designatin 160 03, Grade XMR110A is XMR110A 160 03

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item

**XMR**

| SHAPE   | SPECIFICATION | EDP No.     |  | Grade               |              |                          |                               |         | Dimension |      |      |             |                   |      |
|---|---------------|-------------|--|---------------------|--------------|--------------------------|-------------------------------|---------|-----------|------|------|-------------|-------------------|------|
|   |               |             |  | PVD                 |              |                          |                               |         |           |      |      |             |                   |      |
|   |               |             |  | XMR110A             | XMR120C      | XMR110D                  | XMR260T                       | XMF110V | High Feed |      |      |             |                   |      |
| Diameter with Corner-R  | Grade Code    | Designation | for General Purpose & Stainless Steels | for Hardened Steels | for Graphite | for High Hardened Steels | for General Purpose High Feed | D       | R         | H    | T    | Rt (theory) | ap <sub>max</sub> |      |
|  | Ø26 R0.3      | □□□□□□      | 260 03                                 | ●                   | ●            | ○                        | ○                             | ●       | 26        | R0.3 | 19.5 | 6.2         | R2.5              | 1.25 |
|   | Ø26 R0.5      | □□□□□□      | 260 05                                 | ●                   | ●            | ○                        | ○                             | ●       |           | R0.5 |      |             |                   |      |
|   | Ø26 R1.0      | □□□□□□      | 260 10                                 | ●                   | ●            | ○                        | ○                             | ●       |           | R1.0 |      |             |                   |      |
|   | Ø26 R1.5      | □□□□□□      | 260 15                                 | ●                   | ●            | ○                        | ○                             | ●       |           | R1.5 |      |             |                   |      |
|   | Ø26 R2.0      | □□□□□□      | 260 20                                 | ●                   | ●            | ○                        | ○                             | ●       |           | R2.0 |      |             |                   |      |
|   | Ø26 R3.0      | □□□□□□      | 260 30                                 | ●                   | ●            | ○                        | ○                             | ●       | R3.0      |      |      |             |                   |      |
|   | Ø30 R0.3      | □□□□□□      | 300 03                                 | ●                   | ●            | ○                        | ○                             | ●       | 30        | R0.3 | 23.5 | 7.2         | R3.0              | 1.6  |
|   | 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      |      |      |             |                   |      |
|   | Ø32 R0.3      | □□□□□□      | 320 03                                 | ●                   | ●            | ○                        | ○                             | ●       | 32        | R0.3 | 23.5 | 7.2         | R3.2              | 1.6  |
|   | Ø32 R0.5      | □□□□□□      | 320 05                                 | ●                   | ●            | ○                        | ○                             | ●       |           | R0.5 |      |             |                   |      |
|   | Ø32 R1.0      | □□□□□□      | 320 10                                 | ●                   | ●            | ○                        | ○                             | ●       |           | R1.0 |      |             |                   |      |
| Ø32 R1.5  | □□□□□□        | 320 15      | ●                                      | ●                   | ○            | ○                        | ●                             | R1.5    |           |      |      |             |                   |      |
| Ø32 R2.0  | □□□□□□        | 320 20      | ●                                      | ●                   | ○            | ○                        | ●                             | R2.0    |           |      |      |             |                   |      |
| Ø32 R3.0  | □□□□□□        | 320 30      | ●                                      | ●                   | ○            | ○                        | ●                             | R3.0    |           |      |      |             |                   |      |
| Ø33 R0.3  | □□□□□□        | 330 03      | ●                                      | ●                   | ○            | ○                        | ●                             | 33      | R0.3      | 23.5 | 7.2  | R3.2        | 1.6               |      |
| Ø33 R0.5  | □□□□□□        | 330 05      | ●                                      | ●                   | ○            | ○                        | ●                             |         | R0.5      |      |      |             |                   |      |
| Ø33 R1.0  | □□□□□□        | 330 10      | ●                                      | ●                   | ○            | ○                        | ●                             |         | R1.0      |      |      |             |                   |      |
| Ø33 R1.5  | □□□□□□        | 330 15      | ●                                      | ●                   | ○            | ○                        | ●                             |         | R1.5      |      |      |             |                   |      |
| Ø33 R2.0  | □□□□□□        | 330 20      | ●                                      | ●                   | ○            | ○                        | ●                             |         | R2.0      |      |      |             |                   |      |
| Ø33 R3.0  | □□□□□□        | 330 30      | ●                                      | ●                   | ○            | ○                        | ●                             | R3.0    |           |      |      |             |                   |      |

\* EDP No of each selected item should be a combination of "Designation EDP No." & "Grade EDP No."

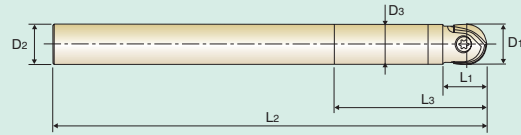
For example, EDP No of Designatin 260 03, Grade XMR110A is XMR110A 260 03

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item

MILLING

**CARBIDE BALL HOLDER**

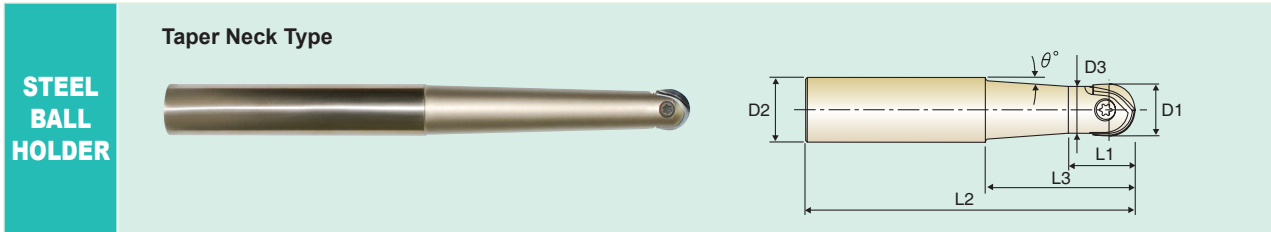


- Corner-Radius insert is applicable on the carbide ball holder.
- Carbide holder for Corner-Radius insert is available upon customer's request.

| 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             |             |            |           |     |
| ZBC0801080 | ●     | 8             | 8              | 7.7           | 12            | 25                 | 130            | Regular     | TWFT07     | TX2508T07 |     |
| ZBC0802080 | ●     |               |                |               |               | 40                 |                |             |            |           |     |
| ZBC0803080 | ●     |               |                |               |               | 65                 |                |             |            |           |     |
| ZBC0804080 | ○     |               |                |               |               | 60                 | 150            |             |            |           |     |
| ZBC0805080 | ○     |               |                |               |               | 60                 | 200            |             |            |           |     |
| ZBC0806080 | ○     |               |                |               |               | 25                 | 80             |             |            |           |     |
| ZBC1001100 | ●     | 10,11         | 10             | 9.7           | 15            | 30                 | 140            | Regular     | TWFT08     | TX3010T08 |     |
| ZBC1002100 | ●     |               |                |               |               | 50                 |                |             |            |           |     |
| ZBC1003100 | ●     |               |                |               |               | 75                 |                |             |            |           |     |
| ZBC1004100 | ○     |               |                |               |               | 60                 | 180            |             |            |           |     |
| ZBC1005100 | ○     |               |                |               |               | 60                 | 200            |             |            |           |     |
| ZBC1006100 | ○     |               |                |               |               | 30                 | 80             |             |            |           |     |
| ZBC120001P | ○     | 12, 13        | 12             | 11.7          | 17            | 40                 | 200            | Long        | TWFT10     | TX3512T10 |     |
| ZBC1201120 | ●     |               |                |               |               | 35                 |                |             |            |           |     |
| ZBC1202120 | ●     |               |                |               |               | 60                 |                |             |            |           | 150 |
| ZBC1203120 | ●     |               |                |               |               | 85                 |                |             |            |           |     |
| ZBC1204120 | ○     |               |                |               |               | 60                 | 250            |             |            |           |     |
| ZBC1205120 | ○     |               |                |               |               | 35                 | 100            |             |            |           |     |
| ZBC160001P | ○     | 16, 17        | 16             | 15.7          | 20            | 50                 | 150            | Regular     | TWFT15     | TX4016T15 |     |
| ZBC1601160 | ●     |               |                |               |               | 50                 |                |             |            |           |     |
| ZBC1602160 | ●     |               |                |               |               | 80                 |                |             |            |           | 200 |
| ZBC1603160 | ●     |               |                |               |               | 120                |                |             |            |           |     |
| ZBC1604160 | ●     |               |                |               |               | 80                 | 250            |             |            |           |     |
| ZBC1605160 | ○     |               |                |               |               | 50                 | 120            |             |            |           |     |
| ZBC200002P | ○     | 20, 21        | 20             | 19.7          | 25            | 60                 | 150            | Regular     | TWBT20     | TX5020T20 |     |
| ZBC2001200 | ●     |               |                |               |               | 60                 |                |             |            |           | 200 |
| ZBC2002200 | ●     |               |                |               |               | 80                 |                |             |            |           |     |
| ZBC2003200 | ●     |               |                |               |               | 100                | 250            |             |            |           |     |
| ZBC2004200 | ●     |               |                |               |               | 150                | 300            |             |            |           |     |
| ZBC2005200 | ○     |               |                |               |               | 100                |                |             |            |           |     |
| ZBC250001P | ○     | 25, 26        | 25             | 24.7          | 30            | 75                 | 150            | Regular     | TWBT25     | TX6025T25 |     |
| ZBC2501250 | ●     |               |                |               |               | 75                 |                |             |            |           | 200 |
| ZBC2502250 | ●     |               |                |               |               | 30                 |                |             |            |           | 250 |
| ZBC2503250 | ●     |               |                |               |               | 30                 | 300            |             |            |           |     |
| ZBC2504250 | ○     |               |                |               |               | 120                | 350            |             |            |           |     |
| ZBC2505250 | ○     |               |                |               |               | 60                 | 300            |             |            |           |     |
| ZBC3001320 | ●     | 30, 32, 33    | 32             | 29.7          | 40            | 90                 | 250            | Regular     | TWBT30     | TX8030T30 |     |
| ZBC3002320 | ●     |               |                |               |               | 150                |                |             |            |           | 300 |
| ZBC3003320 | ●     |               |                |               |               | 190                |                |             |            |           | 350 |
| ZBC3004320 | ○     |               |                |               |               | 120                | 350            |             |            |           |     |
| ZBC3005320 | ○     |               |                |               |               | 150                | 400            |             |            |           |     |

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

**ZBT**



| 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      |            |           |
| ZBT1604200 | ○     | 20, 21        | 25             | 18            | 25            | 115                | 200            | 1° 22'             | Regular     | TWFT15     | TX4016T15 |
| ZBT2001250 | ●     |               |                |               |               |                    |                |                    | 75          |            |           |
| ZBT2004250 | ○     | 20, 21        | 25             | 18            | 25            | 115                | 200            | 1° 55'             | Regular     | ▲TWBT20    | TX5020T20 |
| ZBT2005250 | ○     |               |                |               |               |                    |                |                    | 160         |            |           |
| ZBT2501320 | ●     | 25, 26        | 32             | 22.5          | 30            | 90                 | 170            | 4° 03'             | Short       | ▲TWBT25    | TX6025T25 |
| ZBT2504320 | ○     |               |                |               |               |                    |                |                    | 160         |            |           |
| ZBT2505320 | ○     | 30, 32, 33    | 32             | 27            | 40            | 190                | 300            | 1° 32'             | Long        | ▲TWBT30    | TX8030T30 |
| ZBT3001320 | ●     |               |                |               |               |                    |                |                    | 110         |            |           |
| ZBT3004320 | ○     | 30, 32, 33    | 32             | 27            | 40            | 160                | 250            | 0° 58'             | Regular     | ▲TWBT30    | TX8030T30 |
| ZBT3005320 | ○     |               |                |               |               |                    |                |                    | 190         |            |           |

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item

\* ▲ Required to use T-HANDLE (TWH600)



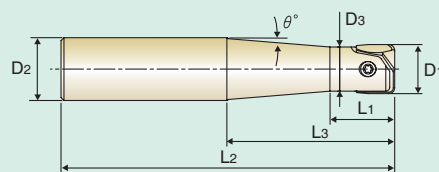
| EDP No.    | Stock | Mill Diameter | Shank Diameter | Neck Diameter | Length Of Cut | Length Below Shank | Overall Length | Length Type | Wrench No. | Screw No. |
|------------|-------|---------------|----------------|---------------|---------------|--------------------|----------------|-------------|------------|-----------|
|            |       | D1            | D2             | D3            | L1            | L3                 | L2             |             |            |           |
| ZBS1201120 | ●     | 12, 13        | 12             | 10.5          | 35            | 25                 | 90             | Short       | TWFT10     | TX3512T10 |
| ZBS1202120 | ●     |               |                |               | 55            | 40                 | 110            | Regular     |            |           |
| ZBS120001P | ○     |               |                |               | 40            | 65                 | 150            | Long        |            |           |
| ZBS1601160 | ●     | 16, 17        | 16             | 14.5          | 35            | 30                 | 95             | Short       | TWFT15     | TX4016T15 |
| ZBS1602160 | ●     |               |                |               | 65            | 50                 | 125            | Regular     |            |           |
| ZBS160001P | ○     |               |                |               | 60            | 75                 | 200            | Long        |            |           |
| ZBS2001200 | ●     | 20, 21        | 20             | 18            | 40            | 35                 | 110            | Short       | ▲TWBT20    | TX5020T20 |
| ZBS2002200 | ●     |               |                |               | 75            | 60                 | 145            | Regular     |            |           |
| ZBS200001P | ○     |               |                |               | 80            | 85                 | 200            | Long        |            |           |
| ZBS200002P | ○     |               |                |               | 60            | 50                 | 200            | Long        |            |           |
| ZBS2501250 | ●     | 25, 26        | 25             | 22.5          | 45            | 80                 | 125            | Short       | ▲TWBT25    | TX6025T25 |
| ZBS2502250 | ●     |               |                |               | 90            | 120                | 170            | Regular     |            |           |
| ZBS2503250 | ○     |               |                |               | 100           | 80                 | 250            | Long        |            |           |
| ZBS250001P | ○     |               |                |               | 90            | 60                 | 200            | Long        |            |           |
| ZBS250002P | ○     |               |                |               | 60            | 80                 | 200            | Long        |            |           |
| ZBS3001320 | ●     | 30, 32, 33    | 32             | 27            | 55            | 100                | 140            | Short       | ▲TWBT30    | TX8030T30 |
| ZBS3002320 | ●     |               |                |               | 110           | 150                | 195            | Regular     |            |           |
| ZBS3004320 | ○     |               |                |               | 150           | 75                 | 350            | Long        |            |           |
| ZBS300001P | ○     |               |                |               | 100           | 120                | 250            | Long        |            |           |

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

## ZRT

### STEEL CORNER RADIUS HOLDER

#### Taper Neck Type



| 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 |

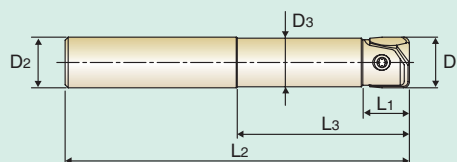
\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item

## ZRS

### STEEL CORNER RADIUS HOLDER

#### Straight Neck Type



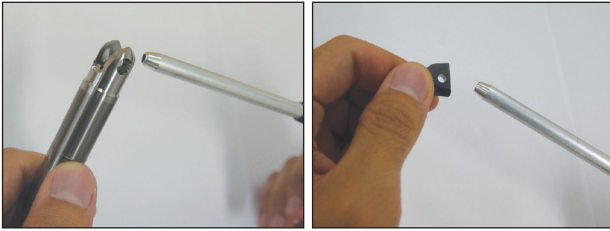
| EDP No.    | Stock | Mill Diameter | Shank Diameter | Neck Diameter | Length Of Cut | Length Below Shank | Overall Length | Length Type  | Wrench No. | Screw No. |
|------------|-------|---------------|----------------|---------------|---------------|--------------------|----------------|--------------|------------|-----------|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

\* Stock situation is subject to change without notice.

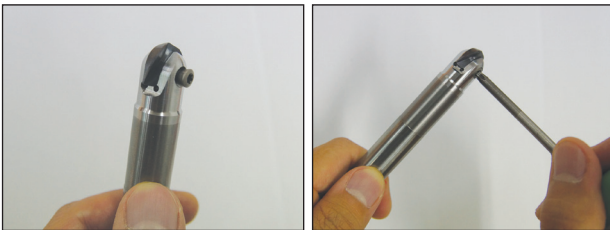
\* ● : Stock item ○ : Order made item

\* ▲ Required to use T-HANDLE (TWH600)

## 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<br>( $\varnothing D$ )                      | CLAMPING<br>TORQUE<br>[N · m] |
|--|-------------------------------|
| $\varnothing 8$                                  | 1.0                           |
| $\varnothing 10$                                 | 1.5                           |
| $\varnothing 12, \varnothing 13$                 | 2.5                           |
| $\varnothing 16, \varnothing 17$                 | 3.5                           |
| $\varnothing 20, \varnothing 21$                 | 5.0                           |
| $\varnothing 25, \varnothing 26$                 | 6.0                           |
| $\varnothing 30, \varnothing 32, \varnothing 33$ | 6.5                           |

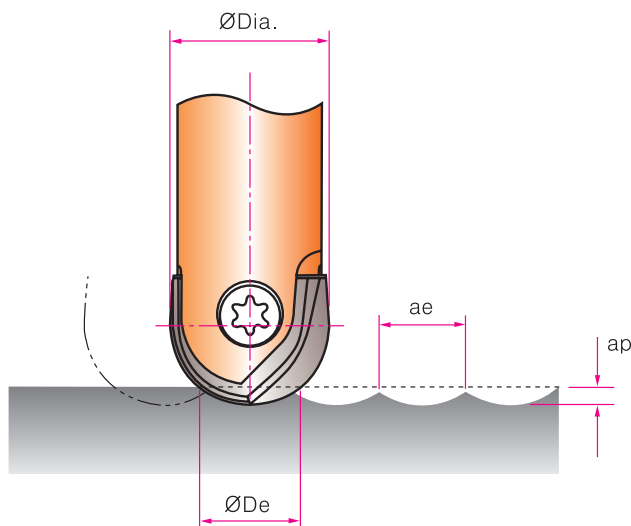
\* When the screw is worn out, please change the new screw.

\* Please tighten up the screw with recommended torque.  
(Please refer to the table)

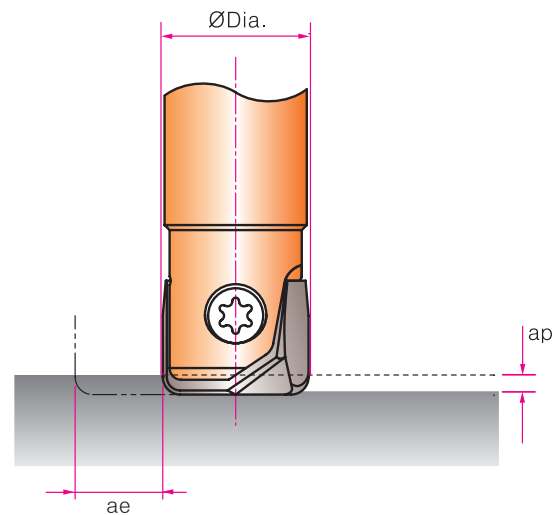
\* Don't press down the insert, when the screw is tightened.



## CUTTING CONDITION



**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)



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

$$Vf \text{ [mm/min]} = (\text{RPM}) \cdot (f)$$

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

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

## i-Xmill Ball

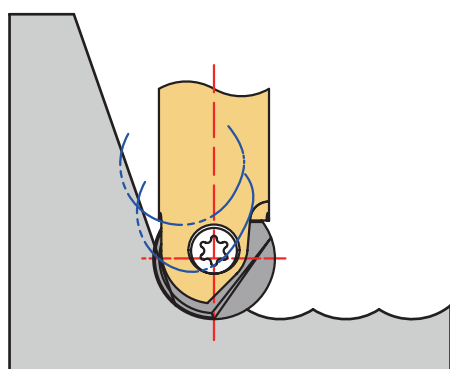
| WORK MATERIAL                           |                   | NON-ALLOYED STEELS<br>ALLOY STEELS<br>CAST IRON |                      |               |              | ALLOY STEELS<br>HEAT RESISTANT STEELS |                      |               |              |
|---|-------------------|---|----------------------|---------------|--------------|---------------------------------------|----------------------|---------------|--------------|
| HARDNESS                                | HB                | ~280  |                      |               |              | 280~380                               |                      |               |              |
|   | HRc               |   |                      |               |              |                                       |                      |               |              |
| STRENGTH                                | N/mm <sup>2</sup> | ~1000   |                      |               |              | 1000~1250                             |                      |               |              |
| i-Xmill TYPE                            |                   | XMB110A   |                      |               |              | XMB110A                               |                      |               |              |
| CUTTING CONDITION<br>Roughing~Finishing |                   | RPM<br>[rev/min]                                | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] | RPM<br>[rev/min]                      | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] |
| 8                                       |                   | 6370~12730                                      | 2550~5090            | 160~320       | 0.20~0.20    | 4770~11140                            | 1910~4460            | 120~280       | 0.20~0.20    |
| 10, 11                                  |                   | 5090~11460                                      | 2040~4580            | 160~360       | 0.20~0.20    | 3820~9550                             | 1530~3820            | 120~300       | 0.20~0.20    |
| 12, 13                                  |                   | 4240~10080                                      | 1700~4030            | 160~380       | 0.20~0.20    | 3180~9280                             | 1270~3710            | 120~350       | 0.20~0.20    |
| 16, 17                                  |                   | 3180~9550                                       | 1590~5730            | 160~480       | 0.25~0.30    | 2390~7560                             | 1190~4540            | 120~380       | 0.25~0.30    |
| 20, 21                                  |                   | 2550~9230                                       | 1270~7380            | 160~580       | 0.25~0.40    | 1910~6680                             | 950~5350             | 120~420       | 0.25~0.40    |
| 25, 26                                  |                   | 2040~7640                                       | 1020~7640            | 160~600       | 0.25~0.50    | 1530~6110                             | 760~6110             | 120~480       | 0.25~0.50    |
| 30, 32, 33                              |                   | 1700~7430                                       | 850~8910             | 160~700       | 0.25~0.60    | 1270~5840                             | 640~7000             | 120~550       | 0.25~0.60    |

| WORK MATERIAL                           |                   | DIE TOOL STEELS<br>PRE-HARDENED |                      |               |              | HARDENED STEELS  |                      |               |              |
|---|-------------------|---------------------------------|----------------------|---------------|--------------|------------------|----------------------|---------------|--------------|
| HARDNESS                                | HB                | 380~480                         |                      |               |              | 420~550          |                      |               |              |
|   | HRc               |                                 |                      |               |              |                  |                      |               |              |
| STRENGTH                                | N/mm <sup>2</sup> | 1250~1500                       |                      |               |              | 1500~            |                      |               |              |
| i-Xmill TYPE                            |                   | XMB110A, XMB120A                |                      |               |              | XMB120A          |                      |               |              |
| CUTTING CONDITION<br>Roughing~Finishing |                   | RPM<br>[rev/min]                | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] | RPM<br>[rev/min] | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] |
| 8                                       |                   | 3980~8750                       | 1190~3500            | 100~220       | 0.15~0.20    | 3180~7160        | 640~2860             | 80~180        | 0.10~0.20    |
| 10, 11                                  |                   | 3180~8280                       | 950~3310             | 100~260       | 0.15~0.20    | 2550~6370        | 510~2550             | 80~200        | 0.10~0.20    |
| 12, 13                                  |                   | 2650~7430                       | 800~2970             | 100~280       | 0.15~0.20    | 2120~5840        | 420~2330             | 80~220        | 0.10~0.20    |
| 16, 17                                  |                   | 1990~6960                       | 800~4180             | 100~350       | 0.20~0.30    | 1590~5170        | 480~3100             | 80~260        | 0.15~0.30    |
| 20, 21                                  |                   | 1590~6370                       | 640~5090             | 100~400       | 0.20~0.40    | 1270~5090        | 380~4070             | 80~320        | 0.15~0.40    |
| 25, 26                                  |                   | 1270~5730                       | 510~5730             | 100~450       | 0.20~0.50    | 1020~4580        | 310~4580             | 80~360        | 0.15~0.50    |
| 30, 32, 33                              |                   | 1060~5310                       | 420~6370             | 100~500       | 0.20~0.60    | 850~4240         | 250~5090             | 80~400        | 0.15~0.60    |

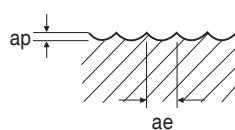
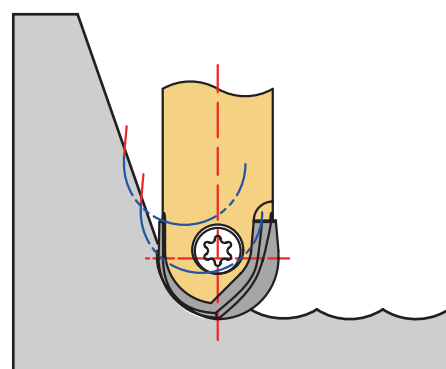
| WORK MATERIAL                           |                   | GRAPHITE         |                      |               |              | STAINLESS STEELS |                      |               |              |
|---|-------------------|------------------|----------------------|---------------|--------------|------------------|----------------------|---------------|--------------|
| HARDNESS                                | HB                |                  |                      |               |              |                  |                      |               |              |
|   | HRc               |                  |                      |               |              |                  |                      |               |              |
| STRENGTH                                | N/mm <sup>2</sup> |                  |                      |               |              |                  |                      |               |              |
| i-Xmill TYPE                            |                   | XMB110D          |                      |               |              | XMB110A          |                      |               |              |
| CUTTING CONDITION<br>Roughing~Finishing |                   | RPM<br>[rev/min] | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] | RPM<br>[rev/min] | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] |
| 8                                       |                   | 11940~15920      | 4770~6370            | 300~400       | 0.20~0.20    | 3580~5170        | 720~1290             | 90~130        | 0.10~0.12    |
| 10, 11                                  |                   | 9550~12730       | 3820~5090            | 300~400       | 0.20~0.20    | 2860~4140        | 720~1240             | 90~130        | 0.13~0.15    |
| 12, 13                                  |                   | 7960~10610       | 3180~4240            | 300~400       | 0.20~0.20    | 2390~3450        | 720~1380             | 90~130        | 0.15~0.20    |
| 16, 17                                  |                   | 5970~7960        | 2980~4770            | 300~400       | 0.25~0.30    | 1790~2590        | 540~1030             | 90~130        | 0.15~0.20    |
| 20, 21                                  |                   | 4770~7640        | 2860~5350            | 300~480       | 0.30~0.35    | 1430~2070        | 430~830              | 90~130        | 0.15~0.20    |
| 25, 26                                  |                   | 3820~7130        | 2670~5700            | 300~560       | 0.35~0.40    | 1150~1660        | 460~830              | 90~130        | 0.20~0.25    |
| 30, 32, 33                              |                   | 3180~6900        | 2550~6900            | 300~650       | 0.40~0.50    | 950~1380         | 380~690              | 90~130        | 0.20~0.25    |



| WORK MATERIAL                           |                   | HIGH HARDENED STEELS |                      |               |              | FULL RADIUS TYPE |                      |               |              |
|---|-------------------|----------------------|----------------------|---------------|--------------|------------------|----------------------|---------------|--------------|
| HARDNESS                                | HB                | 550~740              |                      |               |              | ~280             |                      |               |              |
|   | HRC               | 55~65                |                      |               |              | ~30              |                      |               |              |
| STRENGTH                                | N/mm <sup>2</sup> | 1500~                |                      |               |              | ~1000            |                      |               |              |
| i-Xmill TYPE                            |                   | XMB260T              |                      |               |              | XMM110V          |                      |               |              |
| CUTTING CONDITION<br>Roughing~Finishing |                   | RPM<br>[rev/min]     | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] | RPM<br>[rev/min] | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] |
| 8                                       |                   | 3180~7160            | 640~2150             | 80~180        | 0.10~0.15    | 6370~12730       | 2550~5090            | 160~320       | 0.20~0.20    |
| 10, 11                                  |                   | 2550~6370            | 510~1910             | 80~200        | 0.10~0.15    | 5090~11460       | 2040~4580            | 160~360       | 0.20~0.20    |
| 12, 13                                  |                   | 2120~5840            | 420~1750             | 80~220        | 0.10~0.15    | 4240~10080       | 1700~4030            | 160~380       | 0.20~0.20    |
| 16, 17                                  |                   | 1590~5170            | 480~2590             | 80~260        | 0.15~0.25    | 3180~9550        | 1590~5730            | 160~480       | 0.25~0.30    |
| 20, 21                                  |                   | 1270~5090            | 380~2550             | 80~320        | 0.15~0.25    | 2550~9230        | 1270~7380            | 160~580       | 0.25~0.40    |
| 25, 26                                  |                   | 1020~4580            | 310~2290             | 80~360        | 0.15~0.25    | 2040~7640        | 1020~7640            | 160~600       | 0.25~0.50    |
| 30, 32, 33                              |                   | 850~4240             | 250~2550             | 80~400        | 0.15~0.30    | 1700~7430        | 850~8910             | 160~700       | 0.25~0.60    |



Full Radius Type



ae : Roughing - 0.1 x D  
 Finishing - Under  $\varnothing 12$  : 0.25mm  
 Under  $\varnothing 20$  : 0.30mm  
 From  $\varnothing 20$  : 0.40mm

ap : Roughing - Under  $\varnothing 16$  : 0.025 x D  
 From  $\varnothing 16$  : 0.05 x D  
 Finishing - Under  $\varnothing 16$  : 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.

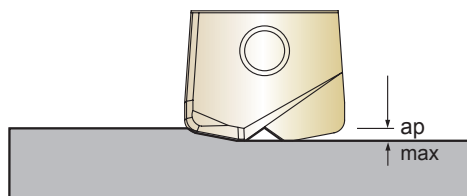
## i-Xmill Corner Radius

| WORK MATERIAL                           |                   | NON-ALLOYED STEELS<br>ALLOY STEELS<br>CAST IRON |                      |               |              | NON-ALLOYED STEELS<br>ALLOY STEELS<br>CAST IRON |                      |               |              |
|---|-------------------|---|----------------------|---------------|--------------|---|----------------------|---------------|--------------|
| HARDNESS                                | HB                | ~280  |                      |               |              | ~280  |                      |               |              |
|   | HRc               | ~30   |                      |               |              | ~30   |                      |               |              |
| STRENGTH                                | N/mm <sup>2</sup> | ~1000   |                      |               |              | ~1000   |                      |               |              |
| i-Xmill TYPE                            |                   | XMR110A   |                      |               |              | XMF110V   |                      |               |              |
| CUTTING CONDITION<br>Roughing~Finishing |                   | RPM<br>[rev/min]                                | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] | RPM<br>[rev/min]                                | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] |
| 8                                       |                   | 6370~11940                                      | 2550~3580            | 160~300       | 0.20~0.15    | 5970~7960                                       | 7160~6370            | 150~200       | 0.60~0.40    |
| 10, 11                                  |                   | 5090~9550                                       | 2040~2860            | 160~300       | 0.20~0.15    | 4770~6370                                       | 7160~6370            | 150~200       | 0.75~0.50    |
| 12, 13                                  |                   | 4240~7960                                       | 1700~2390            | 160~300       | 0.20~0.15    | 3980~5310                                       | 7160~6370            | 150~200       | 0.90~0.60    |
| 16, 17                                  |                   | 3180~5970                                       | 1590~2390            | 160~300       | 0.25~0.20    | 2980~3980                                       | 7160~6370            | 150~200       | 1.20~0.80    |
| 20, 21                                  |                   | 2550~4770                                       | 1270~1910            | 160~300       | 0.25~0.20    | 2390~3180                                       | 7160~6370            | 150~200       | 1.50~1.00    |
| 25, 26                                  |                   | 2040~3820                                       | 1020~1530            | 160~300       | 0.25~0.20    | 1910~2550                                       | 7640~7640            | 150~200       | 2.00~1.50    |
| 30, 32, 33                              |                   | 1700~3180                                       | 850~1270             | 160~300       | 0.25~0.20    | 1590~2120                                       | 7320~7640            | 150~200       | 2.30~1.80    |

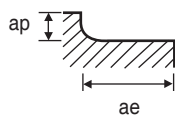
| WORK MATERIAL                           |                   | ALLOY STEELS<br>HEAT RESISTANT STEELS |                      |               |              | DIE TOOL STEELS<br>PRE-HARDENED |                      |               |              |
|---|-------------------|---------------------------------------|----------------------|---------------|--------------|---------------------------------|----------------------|---------------|--------------|
| HARDNESS                                | HB                |                                       |                      |               |              | 380~480                         |                      |               |              |
|   | HRc               | 30~40                                 |                      |               |              | 40~50                           |                      |               |              |
| STRENGTH                                | N/mm <sup>2</sup> | 1000~1250                             |                      |               |              | 1250~1500                       |                      |               |              |
| i-Xmill TYPE                            |                   | XMR110A                               |                      |               |              | XMR110A, XMR120A                |                      |               |              |
| CUTTING CONDITION<br>Roughing~Finishing |                   | RPM<br>[rev/min]                      | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] | RPM<br>[rev/min]                | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] |
| 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 MATERIAL                           |                   | HARDENED STEELS  |                      |               |              | GRAPHITE         |                      |               |              |
|---|-------------------|------------------|----------------------|---------------|--------------|------------------|----------------------|---------------|--------------|
| HARDNESS                                | HB                | 420~550          |                      |               |              |                  |                      |               |              |
|   | HRc               | 45~55            |                      |               |              |                  |                      |               |              |
| STRENGTH                                | N/mm <sup>2</sup> | 1500~            |                      |               |              |                  |                      |               |              |
| i-Xmill TYPE                            |                   | XMR120A          |                      |               |              | XMR110D          |                      |               |              |
| CUTTING CONDITION<br>Roughing~Finishing |                   | RPM<br>[rev/min] | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] | RPM<br>[rev/min] | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] |
| 8                                       |                   | 3180~8750        | 640~880              | 80~220        | 0.10~0.05    | 11940~15920      | 4770~6370            | 300~400       | 0.20~0.20    |
| 10, 11                                  |                   | 2550~7000        | 510~700              | 80~220        | 0.10~0.05    | 9550~12730       | 3820~5090            | 300~400       | 0.20~0.20    |
| 12, 13                                  |                   | 2120~5840        | 420~580              | 80~220        | 0.10~0.05    | 7960~10610       | 3180~4240            | 300~400       | 0.20~0.20    |
| 16, 17                                  |                   | 1590~4380        | 420~530              | 80~220        | 0.15~0.06    | 5970~7960        | 2390~3180            | 300~400       | 0.20~0.20    |
| 20, 21                                  |                   | 1270~3500        | 380~420              | 80~220        | 0.15~0.06    | 4770~6370        | 2390~3180            | 300~400       | 0.25~0.25    |
| 25, 26                                  |                   | 1020~2800        | 310~340              | 80~220        | 0.15~0.06    | 3820~5090        | 1910~2550            | 300~400       | 0.25~0.25    |
| 30, 32, 33                              |                   | 850~2330         | 250~280              | 80~220        | 0.15~0.06    | 3180~4240        | 1590~2120            | 300~400       | 0.25~0.25    |

| WORK MATERIAL                           |                   | STAINLESS STEELS |                      |               |              | HIGH HARDENED STEELS |                      |               |              |
|---|-------------------|------------------|----------------------|---------------|--------------|----------------------|----------------------|---------------|--------------|
| HARDNESS                                | HB                |                  |                      |               |              | 55 0~740             |                      |               |              |
|   | HRC               |                  |                      |               |              | 55~65                |                      |               |              |
| STRENGTH                                | N/mm <sup>2</sup> |                  |                      |               |              | 1500~                |                      |               |              |
| i-Xmill TYPE                            |                   | XMR110A          |                      |               |              | XMR260T              |                      |               |              |
| CUTTING CONDITION<br>Roughing~Finishing |                   | RPM<br>[rev/min] | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] | RPM<br>[rev/min]     | Feed(Vf)<br>[mm/min] | Vc<br>[m/min] | fz<br>[mm/t] |
| 8                                       |                   | 3580~5170        | 720~1030             | 90~130        | 0.10~0.10    | 3180~8750            | 640~880              | 80~220        | 0.10~0.05    |
| 10, 11                                  |                   | 2860~4140        | 630~910              | 90~130        | 0.11~0.11    | 2550~7000            | 510~700              | 80~220        | 0.10~0.05    |
| 12, 13                                  |                   | 2390~3450        | 550~790              | 90~130        | 0.12~0.11    | 2120~5840            | 420~580              | 80~220        | 0.10~0.05    |
| 16, 17                                  |                   | 1790~2590        | 450~650              | 90~130        | 0.13~0.13    | 1590~4380            | 480~530              | 80~220        | 0.15~0.06    |
| 20, 21                                  |                   | 1430~2070        | 360~520              | 90~130        | 0.13~0.13    | 1270~3500            | 380~420              | 80~220        | 0.15~0.06    |
| 25, 26                                  |                   | 1150~1660        | 290~410              | 90~130        | 0.13~0.12    | 1020~2800            | 310~340              | 80~220        | 0.15~0.06    |
| 30, 32, 33                              |                   | 950~1380         | 240~340              | 90~130        | 0.13~0.12    | 850~2330             | 250~280              | 80~220        | 0.15~0.06    |



High Feed

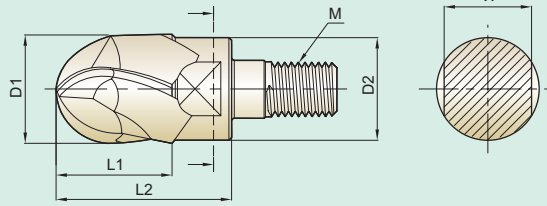


ae : Roughing - 0.1 x D  
 Finishing - 0.2mm  
 ap : Roughing - Under Ø16 : 0.025 x D  
 From Ø16 : 0.05 x D  
 Finishing - Under Ø16 : 0.1mm  
 From Ø16 : 0.2mm

- ▶ When the length of overhang exceed 4 x D, 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.



## XSEME59 - 3Flute Ball

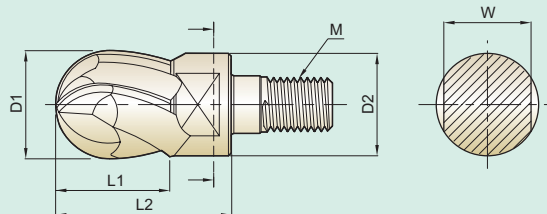


| EDP No.    | Stock | Mill Diameter | Neck Diameter | Length of Cut | Length Below Shank | Wrench Width | Thread |
|------------|-------|---------------|---------------|---------------|--------------------|--------------|--------|
|            |       | D1            | D2            | L1            | L2                 | W            | M      |
| XSEME59100 | ○     | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME59120 | ○     | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME59160 | ○     | 16            | 15            | 16            | 25.5               | 13           | M8     |
| XSEME59200 | ○     | 20            | 19            | 20            | 30                 | 17           | M10    |
| XSEME59250 | ○     | 25            | 24            | 25            | 37                 | 22           | M12    |
| XSEME59300 | ○     | 30            | 29            | 30            | 43                 | 27           | M16    |
| XSEME59320 | ○     | 32            | 31            | 32            | 45                 | 27           | M16    |

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ◎ : Will be launched by end of 2014

## XSEME60 - 4Flute Ball



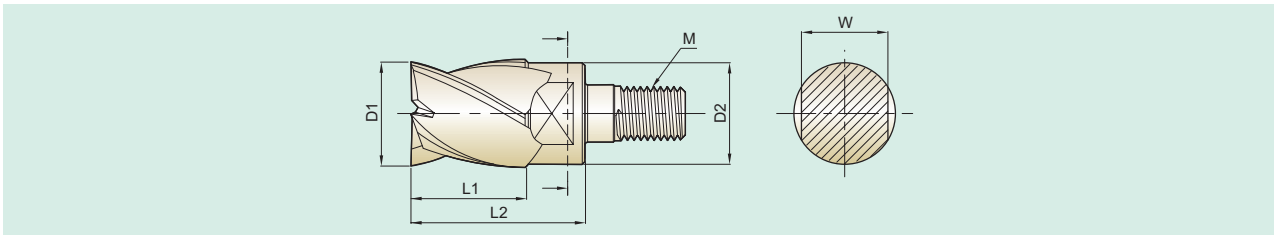
| EDP No.    | Stock | Mill Diameter | Neck Diameter | Length of Cut | Length Below Shank | Wrench Width | Thread |
|------------|-------|---------------|---------------|---------------|--------------------|--------------|--------|
|            |       | D1            | D2            | L1            | L2                 | W            | M      |
| XSEME60100 | ◎     | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME60120 | ◎     | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME60160 | ◎     | 16            | 15            | 16            | 25.5               | 13           | M8     |
| XSEME60200 | ◎     | 20            | 19            | 20            | 30                 | 17           | M10    |
| XSEME60250 | ◎     | 25            | 24            | 25            | 37                 | 22           | M12    |
| XSEME60300 | ◎     | 30            | 29            | 30            | 43                 | 27           | M16    |
| XSEME60320 | ◎     | 32            | 31            | 32            | 45                 | 27           | M16    |

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ◎ : Will be launched by end of 2014

# Modular type

## XSEME36 - 4Flute Square

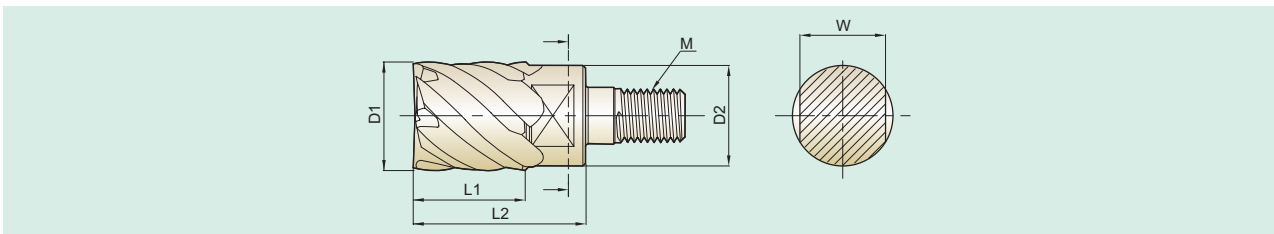


| EDP No.    | Stock | Mill Diameter | Neck Diameter | Length of Cut | Length Below Shank | Wrench Width | Thread |
|------------|-------|---------------|---------------|---------------|--------------------|--------------|--------|
|            |       | D1            | D2            | L1            | L2                 | W            | M      |
| XSEME36100 | ◎     | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME36120 | ◎     | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME36160 | ◎     | 16            | 15            | 16            | 25.5               | 13           | M8     |
| XSEME36200 | ◎     | 20            | 19            | 20            | 30                 | 17           | M10    |
| XSEME36250 | ◎     | 25            | 24            | 25            | 37                 | 22           | M12    |
| XSEME36300 | ◎     | 30            | 29            | 30            | 43                 | 27           | M16    |
| XSEME36320 | ◎     | 32            | 31            | 32            | 45                 | 27           | M16    |

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ◎ : Will be launched by end of 2014

## XSEME75 - 6Flute Square

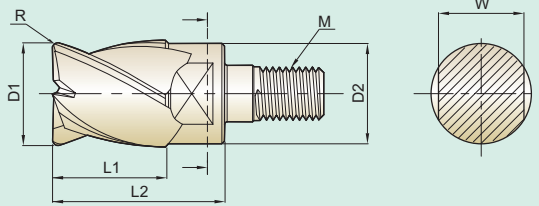


| EDP No.    | Stock | Mill Diameter | Neck Diameter | Length of Cut | Length Below Shank | Wrench Width | Thread |
|------------|-------|---------------|---------------|---------------|--------------------|--------------|--------|
|            |       | D1            | D2            | L1            | L2                 | W            | M      |
| XSEME75100 | ◎     | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME75120 | ◎     | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME75160 | ◎     | 16            | 15            | 16            | 25.5               | 13           | M8     |
| XSEME75200 | ◎     | 20            | 19            | 20            | 30                 | 17           | M10    |
| XSEME75250 | ◎     | 25            | 24            | 25            | 37                 | 22           | M12    |
| XSEME75300 | ◎     | 30            | 29            | 30            | 43                 | 27           | M16    |
| XSEME75320 | ◎     | 32            | 31            | 32            | 45                 | 27           | M16    |

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ◎ : Will be launched by end of 2014

## XSEME01 - 4Flute Corner Radius

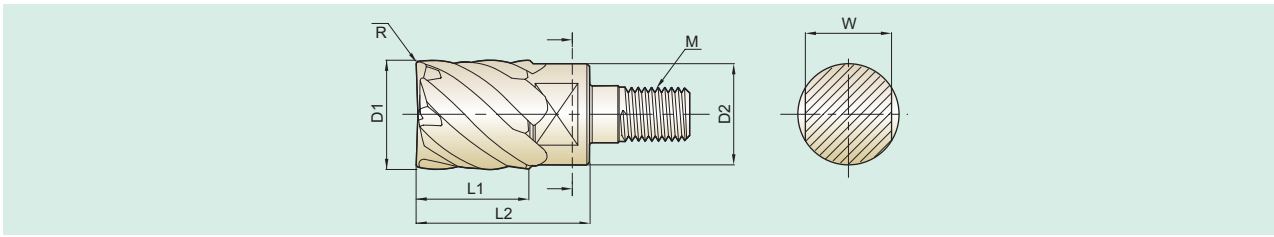


| EDP No.        | Stock | Corner Radius | Mill Diameter | Neck Diameter | Length of Cut | Length Below Shank | Wrench Width | Thread |
|----------------|-------|---------------|---------------|---------------|---------------|--------------------|--------------|--------|
|                |       | R             | D1            | D2            | L1            | L2                 | W            | M      |
| XSEME01100 010 | ◎     | R0.1          | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME01100 020 | ◎     | R0.2          | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME01100 030 | ◎     | R0.3          | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME01100 050 | ◎     | R0.5          | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME01100 100 | ◎     | R1.0          | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME01100 150 | ◎     | R1.5          | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME01100 200 | ◎     | R2.0          | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME01100 250 | ◎     | R2.5          | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME01100 300 | ◎     | R3.0          | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME01100 400 | ◎     | R4.0          | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME01120 010 | ◎     | R0.1          | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME01120 020 | ◎     | R0.2          | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME01120 030 | ◎     | R0.3          | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME01120 050 | ◎     | R0.5          | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME01120 100 | ◎     | R1.0          | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME01120 150 | ◎     | R1.5          | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME01120 200 | ◎     | R2.0          | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME01120 250 | ◎     | R2.5          | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME01120 300 | ◎     | R3.0          | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME01120 400 | ◎     | R4.0          | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME01120 500 | ◎     | R5.0          | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME01160 050 | ◎     | R0.5          | 16            | 15            | 16            | 25.5               | 13           | M8     |
| XSEME01160 100 | ◎     | R1.0          | 16            | 15            | 16            | 25.5               | 13           | M8     |
| XSEME01160 150 | ◎     | R1.5          | 16            | 15            | 16            | 25.5               | 13           | M8     |
| XSEME01160 200 | ◎     | R2.0          | 16            | 15            | 16            | 25.5               | 13           | M8     |
| XSEME01200 050 | ◎     | R0.5          | 20            | 19            | 20            | 30                 | 17           | M10    |
| XSEME01200 100 | ◎     | R1.0          | 20            | 19            | 20            | 30                 | 17           | M10    |
| XSEME01200 150 | ◎     | R1.5          | 20            | 19            | 20            | 30                 | 17           | M10    |
| XSEME01200 200 | ◎     | R2.0          | 20            | 19            | 20            | 30                 | 17           | M10    |
| XSEME01250 050 | ◎     | R0.5          | 25            | 24            | 25            | 37                 | 22           | M12    |
| XSEME01250 100 | ◎     | R1.0          | 25            | 24            | 25            | 37                 | 22           | M12    |
| XSEME01250 150 | ◎     | R1.5          | 25            | 24            | 25            | 37                 | 22           | M12    |
| XSEME01250 200 | ◎     | R2.0          | 25            | 24            | 25            | 37                 | 22           | M12    |
| XSEME01300 050 | ◎     | R0.5          | 30            | 29            | 30            | 43                 | 27           | M16    |
| XSEME01300 100 | ◎     | R1.0          | 30            | 29            | 30            | 43                 | 27           | M16    |
| XSEME01300 150 | ◎     | R1.5          | 30            | 29            | 30            | 43                 | 27           | M16    |
| XSEME01300 200 | ◎     | R2.0          | 30            | 29            | 30            | 43                 | 27           | M16    |
| XSEME01320 050 | ◎     | R0.5          | 32            | 31            | 32            | 45                 | 27           | M16    |
| XSEME01320 100 | ◎     | R1.0          | 32            | 31            | 32            | 45                 | 27           | M16    |
| XSEME01320 150 | ◎     | R1.5          | 32            | 31            | 32            | 45                 | 27           | M16    |
| XSEME01320 200 | ◎     | R2.0          | 32            | 31            | 32            | 45                 | 27           | M16    |

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# Modular type

## XSEME68 - 6Flute Corner Radius



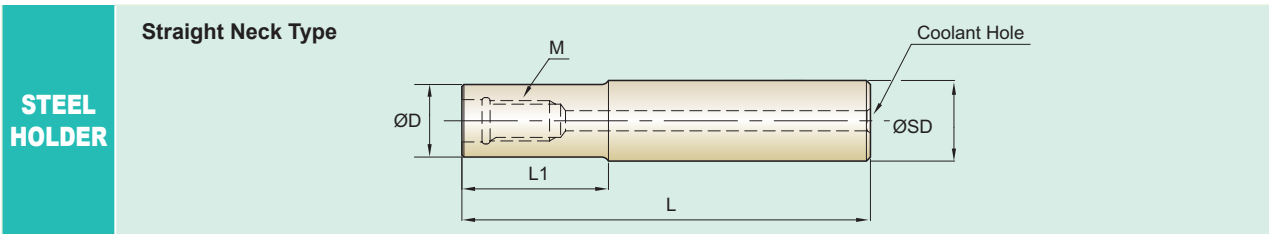
| EDP No.        | Stock | Corner Radius | Mill Diameter | Neck Diameter | Length of Cut | Length Below Shank | Wrench Width | Thread |
|----------------|-------|---------------|---------------|---------------|---------------|--------------------|--------------|--------|
|                |       | R             | D1            | D2            | L1            | L2                 | W            | M      |
| XSEME68100 030 | ◎     | R0.3          | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME68100 050 | ◎     | R0.5          | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME68100 100 | ◎     | R1.0          | 10            | 9             | 10            | 17.5               | 8            | M6     |
| XSEME68120 030 | ◎     | R0.3          | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME68120 050 | ◎     | R0.5          | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME68120 100 | ◎     | R1.0          | 12            | 11            | 12            | 20.5               | 10           | M6     |
| XSEME68160 050 | ◎     | R0.5          | 16            | 15            | 16            | 25.5               | 13           | M8     |
| XSEME68160 100 | ◎     | R1.0          | 16            | 15            | 16            | 25.5               | 13           | M8     |
| XSEME68160 150 | ◎     | R1.5          | 16            | 15            | 16            | 25.5               | 13           | M8     |
| XSEME68160 200 | ◎     | R2.0          | 16            | 15            | 16            | 25.5               | 13           | M8     |
| XSEME68200 050 | ◎     | R0.5          | 20            | 19            | 20            | 30                 | 17           | M10    |
| XSEME68200 100 | ◎     | R1.0          | 20            | 19            | 20            | 30                 | 17           | M10    |
| XSEME68200 150 | ◎     | R1.5          | 20            | 19            | 20            | 30                 | 17           | M10    |
| XSEME68200 200 | ◎     | R2.0          | 20            | 19            | 20            | 30                 | 17           | M10    |
| XSEME68250 050 | ◎     | R0.5          | 25            | 24            | 25            | 37                 | 22           | M12    |
| XSEME68250 100 | ◎     | R1.0          | 25            | 24            | 25            | 37                 | 22           | M12    |
| XSEME68250 150 | ◎     | R1.5          | 25            | 24            | 25            | 37                 | 22           | M12    |
| XSEME68250 200 | ◎     | R2.0          | 25            | 24            | 25            | 37                 | 22           | M12    |
| XSEME68300 050 | ◎     | R0.5          | 30            | 29            | 30            | 43                 | 27           | M16    |
| XSEME68300 100 | ◎     | R1.0          | 30            | 29            | 30            | 43                 | 27           | M16    |
| XSEME68300 150 | ◎     | R1.5          | 30            | 29            | 30            | 43                 | 27           | M16    |
| XSEME68300 200 | ◎     | R2.0          | 30            | 29            | 30            | 43                 | 27           | M16    |
| XSEME68320 050 | ◎     | R0.5          | 32            | 31            | 32            | 45                 | 27           | M16    |
| XSEME68320 100 | ◎     | R1.0          | 32            | 31            | 32            | 45                 | 27           | M16    |
| XSEME68320 150 | ◎     | R1.5          | 32            | 31            | 32            | 45                 | 27           | M16    |
| XSEME68320 200 | ◎     | R2.0          | 32            | 31            | 32            | 45                 | 27           | M16    |

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ◎ : Will be launched by end of 2014



## ZMS

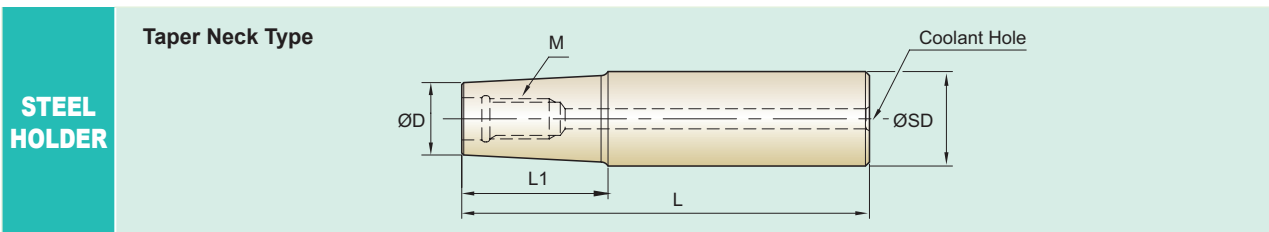


| EDP No.    | Stock | Mill Dia.  | Shank Dia. | Overall Length | Neck Length | Neck Dia. | Thread Size | Coolant Hole |
|------------|-------|------------|------------|----------------|-------------|-----------|-------------|--------------|
|            |       |            | SD         | L              | L1          | D         | M           |              |
| ZMS1001100 | ◎     | 10.0       | 10.0       | 70.0           | 20.0        | 9.0       | M6          | Ø3           |
| ZMS1201120 | ◎     | 12.0       | 12.0       | 90.0           | 30.0        | 11.0      | M6          | Ø3           |
| ZMS1601160 | ◎     | 16.0       | 16.0       | 100.0          | 30.0        | 15.0      | M8          | Ø4           |
| ZMS2001200 | ◎     | 20.0       | 20.0       | 100.0          | 30.0        | 19.0      | M10         | Ø5           |
| ZMS2501250 | ◎     | 25.0       | 25.0       | 115.0          | 40.0        | 24.0      | M12         | Ø5           |
| ZMS3001320 | ◎     | 30.0, 32.0 | 32.0       | 125.0          | 40.0        | 29.0      | M16         | Ø6           |

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ◎ : Will be launched by end of 2014

## ZMT



| EDP No.    | Stock | Mill Dia.  | Shank Dia. | Overall Length | Neck Length | Neck Dia. | Thread Size | Coolant Hole |
|------------|-------|------------|------------|----------------|-------------|-----------|-------------|--------------|
|            |       |            | SD         | L              | L1          | D         | M           |              |
| ZMT1001120 | ◎     | 10.0       | 12.0       | 100.0          | 50.0        | 9.0       | M6          | Ø3           |
| ZMT1201160 | ◎     | 12.0       | 16.0       | 130.0          | 70.0        | 11.0      | M6          | Ø3           |
| ZMT1601200 | ◎     | 16.0       | 20.0       | 150.0          | 90.0        | 15.0      | M8          | Ø4           |
| ZMT2001250 | ◎     | 20.0       | 25.0       | 170.0          | 100.0       | 19.0      | M10         | Ø5           |
| ZMT2501320 | ◎     | 25.0       | 32.0       | 200.0          | 110.0       | 24.0      | M12         | Ø5           |
| ZMT3001320 | ◎     | 30.0, 32.0 | 32.0       | 200.0          | 110.0       | 29.0      | M16         | Ø6           |

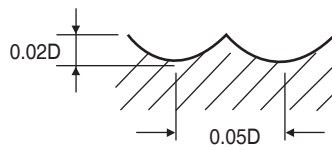
\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ◎ : Will be launched by end of 2014



## XSEME60 - 4Flute Ball

| MATERIAL | NON-ALLOYED STEELS<br>ALLOY STEELS<br>CAST IRON |      |     |       | ALLOY STEELS<br>HEAT RESISTANT STEELS |      |     |       | HARDENED STEELS              |      |     |       |
|----------|---|------|-----|-------|---------------------------------------|------|-----|-------|------------------------------|------|-----|-------|
| HARDNESS | ~ HRc 35  |      |     |       | HRc 35~ HRc 45                        |      |     |       | HRc 45~ HRc 55               |      |     |       |
| STRENGTH | ~ 1100N/mm <sup>2</sup>                         |      |     |       | 1110 ~ 1500N/mm <sup>2</sup>          |      |     |       | 1500 ~ 2000N/mm <sup>2</sup> |      |     |       |
| DIAMETER | RPM   | FEED | Vc  | Fz    | RPM                                   | FEED | Vc  | Fz    | RPM                          | FEED | Vc  | Fz    |
| 10       | 9100  | 5870 | 286 | 0.161 | 7350                                  | 3450 | 231 | 0.117 | 6660                         | 2870 | 209 | 0.108 |
| 12       | 7590  | 5490 | 286 | 0.181 | 6130                                  | 3190 | 231 | 0.130 | 5530                         | 2400 | 208 | 0.108 |
| 16       | 5690  | 4550 | 286 | 0.200 | 4590                                  | 2570 | 231 | 0.140 | 4140                         | 1790 | 208 | 0.108 |
| 20       | 4550  | 4000 | 286 | 0.220 | 3680                                  | 2350 | 231 | 0.160 | 3310                         | 1590 | 208 | 0.120 |
| 25       | 3640  | 3640 | 286 | 0.250 | 2940                                  | 2000 | 231 | 0.170 | 2650                         | 1270 | 208 | 0.120 |
| 30       | 3030  | 3390 | 286 | 0.280 | 2450                                  | 1760 | 231 | 0.180 | 2210                         | 1150 | 208 | 0.130 |
| 32       | 2850  | 3310 | 287 | 0.290 | 2300                                  | 1750 | 231 | 0.190 | 2070                         | 1080 | 208 | 0.130 |



RPM = rev./min.  
FEED = mm/min.  
Vc = m/min.  
fz = mm/t

i-HF mill

i-HS mill

i-HR mill

i-Xmill

Modular type

i-Dream Drill

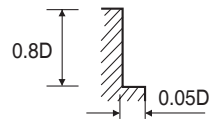
i-HW Drill

Turning Insert



## XSEME36 - 4Flute Square

| MATERIAL | NON-ALLOYED STEELS<br>ALLOY STEELS<br>CAST IRON |      |     |       | ALLOY STEELS<br>HEAT RESISTANT STEELS |      |    |       | STAINLESS STEELS |      |    |       | HARDENED STEELS              |      |    |       |
|----------|---|------|-----|-------|---------------------------------------|------|----|-------|------------------|------|----|-------|------------------------------|------|----|-------|
| HARDNESS | ~ HRC 35  |      |     |       | HRC 35~ HRC 45                        |      |    |       |                  |      |    |       | HRC 45~ HRC 55               |      |    |       |
| STRENGTH | ~ 1100N/mm <sup>2</sup>                         |      |     |       | 1110 ~ 1500N/mm <sup>2</sup>          |      |    |       |                  |      |    |       | 1500 ~ 2000N/mm <sup>2</sup> |      |    |       |
| DIAMETER | RPM   | FEED | Vc  | Fz    | RPM                                   | FEED | Vc | Fz    | RPM              | FEED | Vc | Fz    | RPM                          | FEED | Vc | Fz    |
| 10       | 4080  | 640  | 128 | 0.039 | 2500                                  | 300  | 79 | 0.030 | 2100             | 300  | 66 | 0.036 | 1700                         | 90   | 53 | 0.013 |
| 12       | 3430  | 545  | 129 | 0.040 | 2100                                  | 250  | 79 | 0.030 | 1700             | 240  | 64 | 0.035 | 1450                         | 80   | 55 | 0.014 |
| 16       | 2750  | 440  | 138 | 0.040 | 1700                                  | 205  | 85 | 0.030 | 1380             | 200  | 69 | 0.036 | 1130                         | 60   | 57 | 0.013 |
| 20       | 2100  | 335  | 132 | 0.040 | 1330                                  | 160  | 84 | 0.030 | 1050             | 150  | 66 | 0.036 | 850                          | 40   | 53 | 0.012 |
| 25       | 1700  | 265  | 134 | 0.039 | 1050                                  | 130  | 82 | 0.031 | 850              | 120  | 67 | 0.035 | 680                          | 30   | 53 | 0.011 |
| 30       | 1420  | 230  | 134 | 0.040 | 870                                   | 110  | 82 | 0.032 | 710              | 100  | 67 | 0.035 | 560                          | 25   | 53 | 0.011 |
| 32       | 1330  | 215  | 134 | 0.040 | 820                                   | 105  | 82 | 0.032 | 670              | 95   | 67 | 0.035 | 530                          | 25   | 53 | 0.012 |



RPM = rev./min.  
FEED = mm/min.  
Vc = m/min.  
fz = mm/t

i-HF mill

i-HS mill

i-HR mill

i-Xmill

Modular type

i-Dream Drill

i-HW Drill

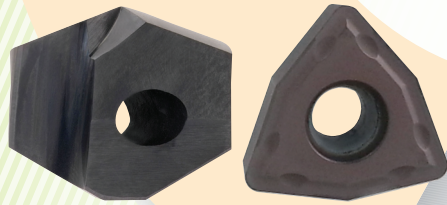
Turning Insert



# INDEXABLE TOOLS

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## Drilling



- \* *i-Dream Drill*
  - \* *i-HW Drill*
- 





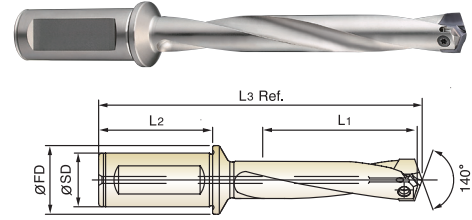
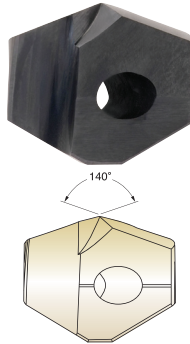
## INSERTS & HOLDERS

### Inserts

- ▶ Secure and accurate seating resulting in accurate repeatability and concentricity.

### Holders

- ▶ Special Alloy Steels maintain its hardness and toughness under high temperatures.
- ▶ Innovative surface treatment improves wear resistance and reduces corrosion.
- ▶ High Performance flute design allows maximum chip evacuation and minimum interference.



| Series                     | Insert EDP No.  |          |             |        | Insert O.D. |       |            | Holder EDP No. | Stock | Shank Dia.<br>SD | Shank Length<br>L2 | Flange Dia.<br>FD | Drilling Depth<br>L1 | Overall Length<br>L3 Ref. | Screw No. |           |       |
|----------------------------|-----------------|----------|-------------|--------|-------------|-------|------------|----------------|-------|------------------|--------------------|-------------------|----------------------|---------------------------|-----------|-----------|-------|
|                            | General (TiAlN) | Stock    | INOX (TiCN) | Stock  | h7          |       |            |                |       |                  |                    |                   |                      |                           |           |           |       |
|                            |                 |          |             |        | dec.        | frac. | mm         |                |       |                  |                    |                   |                      |                           |           |           |       |
| A<br>Ø12.00<br>~<br>Ø13.99 | YA1A1200        | ●        | YA2C1200    | ●      | 0.4724      |       | 12.00      | ZH12003020     | ●     |                  |                    |                   | 3D                   | 36                        | 112.4     | TX1516T08 |       |
|                            | YA1A1210        | ○        | YA2C1210    | ○      | 0.4764      |       | 12.10      | ZH12005020     | ●     | 20               | 50                 | 25                | 5D                   | 60                        | 136.4     |           |       |
|                            | YA1A1220        | ●        | YA2C1220    | ●      | 0.4803      |       | 12.20      | ZH12007020     | ●     |                  |                    |                   | 7D                   | 84                        | 160.4     |           |       |
|                            | YA1A1230        | ●        | YA2C1230    | ○      | 0.4844      | 31/64 | 12.30      |                |       |                  |                    |                   |                      |                           |           |           |       |
|                            | YA1A1250        | ●        | YA2C1250    | ●      | 0.4921      |       | 12.50      |                |       |                  |                    |                   |                      |                           |           |           |       |
|                            | YA1A1260        | ●        | YA2C1260    | ○      | 0.4961      |       | 12.60      | ZH12503020     | ●     |                  |                    |                   |                      | 3D                        | 37.5      |           | 113.4 |
|                            | YA1A1270        | ●        | YA2C1270    | ●      | 0.5000      | 1/2   | 12.70      | ZH12505020     | ●     | 20               | 50                 | 25                | 5D                   | 62.5                      | 138.4     |           |       |
|                            | YA1A1280        | ●        | YA2C1280    | ○      | 0.5039      |       | 12.80      | ZH12507020     | ●     |                  |                    |                   |                      | 7D                        | 87.5      |           | 163.4 |
|                            | YA1A1290        | ●        | YA2C1290    | ●      | 0.5079      |       | 12.90      |                |       |                  |                    |                   |                      |                           |           |           |       |
|                            | YA1A1300        | ●        | YA2C1300    | ●      | 0.5118      |       | 13.00      | ZH13003020     | ●     |                  |                    |                   |                      | 3D                        | 39        |           | 115.4 |
|                            | YA1A1310        | ●        | YA2C1310    | ●      | 0.5156      | 33/64 | 13.10      | ZH13005020     | ●     | 20               | 50                 | 25                | 5D                   | 65                        | 141.4     |           |       |
|                            | YA1A1320        | ●        | YA2C1320    | ●      | 0.5197      |       | 13.20      | ZH13007020     | ●     |                  |                    |                   |                      | 7D                        | 91        |           | 167.4 |
|                            | YA1A1349        | ●        | YA2C1349    | ●      | 0.5312      | 17/32 | 13.49      |                |       |                  |                    |                   |                      |                           |           |           |       |
|                            | YA1A1350        | ●        | YA2C1350    | ●      | 0.5315      |       | 13.50      |                |       |                  |                    |                   |                      |                           |           |           |       |
|                            | YA1A1360        | ●        | YA2C1360    | ●      | 0.5354      |       | 13.60      | ZH13503020     | ●     |                  |                    |                   |                      | 3D                        | 40.5      |           | 116.4 |
|                            | YA1A1370        | ●        | YA2C1370    | ●      | 0.5394      |       | 13.70      | ZH13505020     | ●     | 20               | 50                 | 25                | 5D                   | 67.5                      | 143.4     |           |       |
|                            | YA1A1380        | ●        | YA2C1380    | ●      | 0.5433      |       | 13.80      | ZH13507020     | ●     |                  |                    |                   |                      | 7D                        | 94.5      |           | 170.4 |
|                            | YA1A1389        | ●        | YA2C1389    | ●      | 0.5469      | 35/64 | 13.89      |                |       |                  |                    |                   |                      |                           |           |           |       |
| B<br>Ø14.00<br>~<br>Ø15.99 | YB1A1400        | ●        | YB2C1400    | ●      | 0.5512      |       | 14.00      | ZH14003020     | ●     |                  |                    |                   | 3D                   | 42                        | 118.9     | TX1415T08 |       |
|                            | YB1A1410        | ●        | YB2C1410    | ●      | 0.5551      |       | 14.10      | ZH14005020     | ●     | 20               | 50                 | 25                | 5D                   | 70                        | 146.9     |           |       |
|                            | YB1A1420        | ●        | YB2C1420    | ●      | 0.5591      |       | 14.20      | ZH14007020     | ●     |                  |                    |                   | 7D                   | 98                        | 174.9     |           |       |
|                            | YB1A1429        | ●        | YB2C1429    | ●      | 0.5625      | 9/16  | 14.29      |                |       |                  |                    |                   |                      |                           |           |           |       |
|                            | YB1A1430        | ●        | YB2C1430    | ●      | 0.5630      |       | 14.30      |                |       |                  |                    |                   |                      |                           |           |           |       |
|                            | YB1A1440        | ●        | YB2C1440    | ●      | 0.5669      |       | 14.40      |                |       |                  |                    |                   |                      |                           |           |           |       |
|                            | YB1A1450        | ●        | YB2C1450    | ●      | 0.5709      |       | 14.50      | ZH14503020     | ●     |                  |                    |                   |                      | 3D                        | 43.5      |           | 120.9 |
|                            | YB1A1460        | ●        | YB2C1460    | ○      | 0.5748      |       | 14.60      | ZH14505020     | ●     | 20               | 50                 | 25                | 5D                   | 72.5                      | 149.9     |           |       |
|                            | YB1A1468        | ●        | YB2C1468    | ●      | 0.5781      | 37/64 | 14.68      | ZH14507020     | ●     |                  |                    |                   |                      | 7D                        | 101.5     |           | 178.9 |
|                            | YB1A1480        | ●        | YB2C1480    | ○      | 0.5827      |       | 14.80      |                |       |                  |                    |                   |                      |                           |           |           |       |
|                            | YB1A1500        | ●        | YB2C1500    | ●      | 0.5906      |       | 15.00      |                |       |                  |                    |                   |                      |                           |           |           |       |
|                            | YB1A1508        | ○        | YB2C1508    | ●      | 0.5938      | 19/32 | 15.08      | ZH15003020     | ●     |                  |                    |                   |                      | 3D                        | 45        |           | 122.9 |
|                            | YB1A1510        | ○        | YB2C1510    | ●      | 0.5945      |       | 15.10      | ZH15005020     | ●     | 20               | 50                 | 25                | 5D                   | 75                        | 152.9     |           |       |
|                            | YB1A1520        | ●        | YB2C1520    | ●      | 0.5984      |       | 15.20      | ZH15007020     | ●     |                  |                    |                   |                      | 7D                        | 105       |           | 182.9 |
|                            | YB1A1530        | ●        | YB2C1530    | ●      | 0.6024      |       | 15.30      |                |       |                  |                    |                   |                      |                           |           |           |       |
|                            | YB1A1548        | ●        | YB2C1548    | ●      | 0.6094      | 39/64 | 15.48      |                |       |                  |                    |                   |                      |                           |           |           |       |
|                            | YB1A1550        | ●        | YB2C1550    | ●      | 0.6102      |       | 15.50      |                |       |                  |                    |                   |                      |                           |           |           |       |
|                            | YB1A1560        | ●        | YB2C1560    | ○      | 0.6142      |       | 15.60      | ZH15503020     | ●     |                  |                    |                   |                      | 3D                        | 46.5      |           | 123.9 |
| YB1A1570                   | ●               | YB2C1570 | ●           | 0.6181 |             | 15.70 | ZH15505020 | ●              | 20    | 50               | 25                 | 5D                | 77.5                 | 154.9                     |           |           |       |
| YB1A1580                   | ●               | YB2C1580 | ●           | 0.6220 |             | 15.80 | ZH15507020 | ●              |       |                  |                    |                   | 7D                   | 108.5                     | 185.9     |           |       |
| YB1A1587                   | ●               | YB2C1587 | ●           | 0.6250 | 5/8         | 15.87 |            |                |       |                  |                    |                   |                      |                           |           |           |       |

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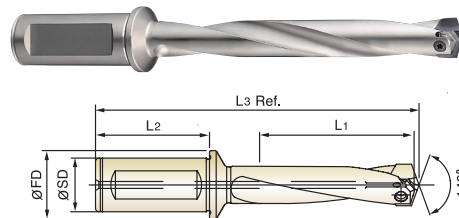
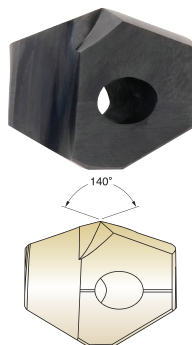


**Inserts**

- ▶ Secure and accurate seating resulting in accurate repeatability and concentricity.

**Holders**

- ▶ Special Alloy Steels maintain its hardness and toughness under high temperatures.
- ▶ Innovative surface treatment improves wear resistance and reduces corrosion.
- ▶ High Performance flute design allows maximum chip evacuation and minimum interference.



| Series                     | Insert EDP No.  |          |             |        | Insert O.D. |       |       | Holder EDP No.   | Stock | Shank Dia. SD | Shank Length L2 | Flange Dia. FD | Drilling Depth |       | Overall Length L3 Ref. | Screw No. |
|----------------------------|-----------------|----------|-------------|--------|-------------|-------|-------|--|-------|---------------|-----------------|----------------|----------------|-------|------------------------|-----------|
|                            | General (TiAIN) | Stock    | INOX (TiCN) | Stock  | h7          |       |       |  |       |               |                 |                |                |       |                        |           |
|                            |                 |          |             |        | dec.        | frac. | mm    |  |       |               |                 |                |                |       |                        |           |
| C<br>Ø16.00<br>~<br>Ø17.99 | YC1A1600        | ●        | YC2C1600    | ●      | 0.6299      |       | 16.00 | ZH16003020<br>ZH16005020<br>ZH16007020<br>ZH16503020<br>ZH16505020<br>ZH16507020<br>ZH17003020<br>ZH17005020<br>ZH17007020<br>ZH17503020<br>ZH17505020<br>ZH17507020 | ●     | 20            | 50              | 25             | 3D             | 48    | 125.0                  | TX1617T08 |
|                            | YC1A1609        | ●        | YC2C1609    | ●      | 0.6335      |       | 16.09 |  |       |               |                 |                | 5D             | 80    | 157.0                  |           |
|                            | YC1A1620        | ●        | YC2C1620    | ○      | 0.6378      |       | 16.20 |  |       |               |                 |                | 7D             | 112   | 189.0                  |           |
|                            | YC1A1627        | ●        | YC2C1627    | ●      | 0.6406      | 41/64 | 16.27 |  |       |               |                 |                |                |       |                        |           |
|                            | YC1A1630        | ●        | YC2C1630    | ●      | 0.6417      |       | 16.30 |  |       |               |                 |                |                |       |                        |           |
|                            | YC1A1650        | ●        | YC2C1650    | ●      | 0.6496      |       | 16.50 |  |       |               |                 |                |                |       |                        |           |
|                            | YC1A1667        | ●        | YC2C1667    | ●      | 0.6562      | 21/32 | 16.67 |  |       |               |                 |                |                |       |                        |           |
|                            | YC1A1680        | ●        | YC2C1680    | ●      | 0.6614      |       | 16.80 |  |       |               |                 |                |                |       |                        |           |
|                            | YC1A1700        | ●        | YC2C1700    | ●      | 0.6693      |       | 17.00 |  |       |               |                 |                |                |       |                        |           |
|                            | YC1A1707        | ●        | YC2C1707    | ●      | 0.6719      | 43/64 | 17.07 |  |       |               |                 |                |                |       |                        |           |
|                            | YC1A1746        | ●        | YC2C1746    | ●      | 0.6875      | 11/16 | 17.46 |  |       |               |                 |                |                |       |                        |           |
|                            | YC1A1750        | ●        | YC2C1750    | ●      | 0.6890      |       | 17.50 |  |       |               |                 |                |                |       |                        |           |
|                            | YC1A1780        | ●        | YC2C1780    | ●      | 0.7008      |       | 17.80 |  |       |               |                 |                |                |       |                        |           |
|                            | YC1A1786        | ○        | YC2C1786    | ●      | 0.7031      | 45/64 | 17.86 |  |       |               |                 |                |                |       |                        |           |
| D<br>Ø18.00<br>~<br>Ø19.99 | YD1A1800        | ●        | YD2C1800    | ●      | 0.7087      |       | 18.00 | ZH18503025<br>ZH18505025<br>ZH18507025   | ●     | 25            | 56              | 32             | 3D             | 54    | 140.3                  | TX1819T15 |
|                            | YD1A1826        | ●        | YD2C1826    | ●      | 0.7188      | 23/32 | 18.26 | 5D   |       |               |                 |                | 90             | 176.3 |                        |           |
|                            | YD1A1850        | ●        | YD2C1850    | ●      | 0.7283      |       | 18.50 | 7D   |       |               |                 |                | 126            | 212.3 |                        |           |
|                            | YD1A1865        | ●        | YD2C1865    | ●      | 0.7344      | 47/64 | 18.65 |  |       |               |                 |                |                |       |                        |           |
|                            | YD1A1880        | ●        | YD2C1880    | ●      | 0.7402      |       | 18.80 |  |       |               |                 |                |                |       |                        |           |
|                            | YD1A1900        | ●        | YD2C1900    | ●      | 0.7480      |       | 19.00 |  |       |               |                 |                |                |       |                        |           |
|                            | YD1A1905        | ●        | YD2C1905    | ●      | 0.7500      | 3/4   | 19.05 |  |       |               |                 |                |                |       |                        |           |
|                            | YD1A1927        | ●        | YD2C1927    | ●      | 0.7587      |       | 19.27 |  |       |               |                 |                |                |       |                        |           |
|                            | YD1A1945        | ●        | YD2C1945    | ●      | 0.7656      | 49/64 | 19.45 |  |       |               |                 |                |                |       |                        |           |
|                            | YD1A1950        | ●        | YD2C1950    | ●      | 0.7677      |       | 19.50 |  |       |               |                 |                |                |       |                        |           |
|                            | YD1A1980        | ●        | YD2C1980    | ●      | 0.7795      |       | 19.80 |  |       |               |                 |                |                |       |                        |           |
| YD1A1984                   | ●               | YD2C1984 | ●           | 0.7812 | 25/32       | 19.84 |       |  |       |               |                 |                |                |       |                        |           |
| E<br>Ø20.00<br>~<br>Ø21.99 | YE1A2000        | ●        | YE2C2000    | ●      | 0.7874      |       | 20.00 | ZH20003025<br>ZH20005025<br>ZH20007025   | ●     | 25            | 56              | 32             | 3D             | 60    | 145.5                  | TX2021T20 |
|                            | YE1A2024        | ●        | YE2C2024    | ●      | 0.7969      | 51/64 | 20.24 | 5D   |       |               |                 |                | 100            | 185.5 |                        |           |
|                            | YE1A2050        | ●        | YE2C2050    | ●      | 0.8071      |       | 20.50 | 7D   |       |               |                 |                | 140            | 225.5 |                        |           |
|                            | YE1A2064        | ●        | YE2C2064    | ●      | 0.8125      | 13/16 | 20.64 |  |       |               |                 |                |                |       |                        |           |
|                            | YE1A2070        | ●        | YE2C2070    | ○      | 0.8150      |       | 20.70 |  |       |               |                 |                |                |       |                        |           |
|                            | YE1A2100        | ●        | YE2C2100    | ●      | 0.8268      |       | 21.00 |  |       |               |                 |                |                |       |                        |           |
|                            | YE1A2103        | ○        | YE2C2103    | ●      | 0.8281      | 53/64 | 21.03 |  |       |               |                 |                |                |       |                        |           |
|                            | YE1A2143        | ○        | YE2C2143    | ●      | 0.8438      | 27/32 | 21.43 |  |       |               |                 |                |                |       |                        |           |
|                            | YE1A2150        | ●        | YE2C2150    | ●      | 0.8465      |       | 21.50 |  |       |               |                 |                |                |       |                        |           |
|                            | YE1A2170        | ●        | YE2C2170    | ●      | 0.8543      |       | 21.70 |  |       |               |                 |                |                |       |                        |           |
|                            | YE1A2183        | ○        | YE2C2183    | ●      | 0.8594      | 55/64 | 21.83 |  |       |               |                 |                |                |       |                        |           |

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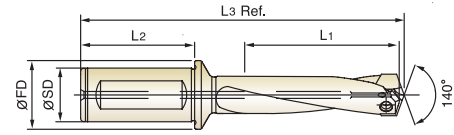
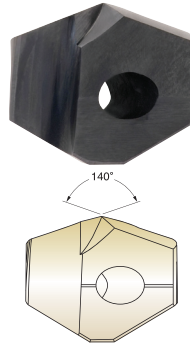
## INSERTS & HOLDERS

### Inserts

- ▶ Secure and accurate seating resulting in accurate repeatability and concentricity.

### Holders

- ▶ Special Alloy Steels maintain its hardness and toughness under high temperatures.
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| Series                     | Insert EDP No.  |       |             |       | Insert O.D. |        |            | Holder EDP No. | Stock | Shank Dia. | Shank Length | Flange Dia. | Drilling Depth | Overall Length | Screw No. |           |           |
|----------------------------|-----------------|-------|-------------|-------|-------------|--------|------------|----------------|-------|------------|--------------|-------------|----------------|----------------|-----------|-----------|-----------|
|                            | General (TiAlN) | Stock | INOX (TiCN) | Stock | h7          |        |            |                |       |            |              |             |                |                |           |           |           |
|                            |                 |       |             |       | dec.        | frac.  | mm         |                |       |            |              |             |                |                |           |           |           |
|                            |                 |       |             |       |             |        |            | SD             | L2    | FD         | L1           | L3 Ref.     |                |                |           |           |           |
| F<br>Ø22.00<br>~<br>Ø23.99 | YF2C2200        | ●     | YF1A2200    | ●     | 0.8661      |        | 22.00      | ZH22003025     | ●     |            |              |             | 3D             | 66             | 152.4     | TX2223T20 |           |
|                            | YF2C2223        | ●     | YF1A2223    | ●     | 0.8750      | 7/8    | 22.23      | ZH22005025     | ●     | 25         | 56           | 32          | 5D             | 110            | 196.4     |           |           |
|                            | YF2C2250        | ●     | YF1A2250    | ●     | 0.8858      |        | 22.50      | ZH22007025     | ●     |            |              |             | 7D             | 154            | 240.4     |           |           |
|                            | YF2C2262        | ○     | YF1A2262    | ●     | 0.8906      | 57/64  | 22.62      | ZH22503025     | ●     |            |              |             | 3D             | 67.5           | 153.4     |           |           |
|                            | YF2C2270        | ●     | YF1A2270    | ●     | 0.8937      |        | 22.70      | ZH22505025     | ●     | 25         | 56           | 32          | 5D             | 112.5          | 198.4     |           |           |
|                            | YF2C2300        | ●     | YF1A2300    | ●     | 0.9055      | 29/32  | 23.00      | ZH22507025     | ○     |            |              |             | 7D             | 157.5          | 243.4     |           |           |
|                            | YF2C2302        | ●     | YF1A2302    | ●     | 0.9062      | 59/64  | 23.02      | ZH23003025     | ●     | 25         | 56           | 32          | 3D             | 69             | 155.4     |           | TX2324T20 |
|                            | YF2C2342        | ●     | YF1A2342    | ●     | 0.9219      |        | 23.42      | ZH23005025     | ●     |            |              |             | 5D             | 115            | 201.4     |           |           |
|                            | YF2C2350        | ●     | YF1A2350    | ●     | 0.9252      |        | 23.50      | ZH23007025     | ●     |            |              |             | 7D             | 161            | 247.4     |           |           |
|                            | YF2C2370        | ●     | YF1A2370    | ○     | 0.9331      |        | 23.70      | ZH23503025     | ●     |            |              |             | 3D             | 70.5           | 157.4     |           |           |
|                            | YF2C2381        | ●     | YF1A2381    | ●     | 0.9375      | 15/16  | 23.81      | ZH23505025     | ○     | 25         | 56           | 32          | 5D             | 117.5          | 204.4     |           |           |
|                            |                 |       |             |       |             |        | ZH23507025 | ○              |       |            |              | 7D          | 164.5          | 251.4          |           |           |           |
| G<br>Ø24.00<br>~<br>Ø25.99 | YG1A2400        | ●     | YG2C2400    | ●     | 0.9449      |        | 24.00      | ZH24003032     | ●     |            |              |             | 3D             | 72             | 164.8     | TX2425T20 |           |
|                            | YG1A2421        | ○     | YG2C2421    | ●     | 0.9531      | 61/64  | 24.21      | ZH24005032     | ●     | 32         | 60           | 37          | 5D             | 120            | 212.8     |           |           |
|                            | YG1A2450        | ●     | YG2C2450    | ●     | 0.9646      |        | 24.50      | ZH24007032     | ●     |            |              |             | 7D             | 168            | 260.8     |           |           |
|                            | YG1A2461        | ○     | YG2C2461    | ●     | 0.9688      | 31/32  | 24.61      | ZH24503032     | ●     |            |              |             | 3D             | 73.5           | 165.8     |           |           |
|                            | YG1A2470        | ●     | YG2C2470    | ●     | 0.9724      |        | 24.70      | ZH24505032     | ●     | 32         | 60           | 37          | 5D             | 122.5          | 214.8     |           |           |
|                            | YG1A2500        | ●     | YG2C2500    | ●     | 0.9843      | 63/64  | 25.00      | ZH24507032     | ●     |            |              |             | 7D             | 171.5          | 263.8     |           |           |
|                            | YG1A2540        | ●     | YG2C2540    | ●     | 1.0000      | 1      | 25.40      | ZH25003032     | ●     |            |              |             | 3D             | 75             | 167.8     |           | TX2526T20 |
|                            | YG1A2550        | ●     | YG2C2550    | ●     | 1.0039      |        | 25.50      | ZH25005032     | ●     | 32         | 60           | 37          | 5D             | 125            | 217.8     |           |           |
|                            | YG1A2567        | ●     | YG2C2567    | ●     | 1.0106      |        | 25.67      | ZH25007032     | ●     |            |              |             | 7D             | 175            | 267.8     |           |           |
|                            | YG1A2570        | ●     | YG2C2570    | ○     | 1.0118      |        | 25.70      | ZH25503032     | ●     |            |              |             | 3D             | 76.5           | 170.8     |           |           |
|                            | YG1A2580        | ●     | YG2C2580    | ○     | 1.0156      | 1*1/64 | 25.80      | ZH25505032     | ●     | 32         | 60           | 37          | 5D             | 127.5          | 221.8     |           |           |
|                            |                 |       |             |       |             |        | ZH25507032 | ●              |       |            |              | 7D          | 178.5          | 272.8          |           |           |           |
| H<br>Ø26.00<br>~<br>Ø27.99 | YH1A2600        | ●     | YH2C2600    | ●     | 1.0236      |        | 26.00      | ZH26003032     | ●     |            |              |             | 3D             | 78             | 171.2     | TX2627T25 |           |
|                            | YH1A2619        | ●     | YH2C2619    | ●     | 1.0312      | 1*1/32 | 26.19      | ZH26005032     | ●     | 32         | 60           | 37          | 5D             | 130            | 223.2     |           |           |
|                            | YH1A2650        | ●     | YH2C2650    | ●     | 1.0433      |        | 26.50      | ZH26007032     | ●     |            |              |             | 7D             | 182            | 275.2     |           |           |
|                            | YH1A2659        | ●     | YH2C2659    | ●     | 1.0469      | 1*3/64 | 26.59      | ZH26503032     | ●     |            |              |             | 3D             | 79.5           | 172.2     |           |           |
|                            | YH1A2699        | ●     | YH2C2699    | ●     | 1.0625      | 1*1/1  | 26.99      | ZH26505032     | ●     | 32         | 60           | 37          | 5D             | 132.5          | 225.2     |           |           |
|                            |                 |       |             |       |             |        |            | ZH26507032     | ●     |            |              |             | 7D             | 185.5          | 278.2     |           |           |
|                            | YH1A2700        | ●     | YH2C2700    | ●     | 1.0630      |        | 27.00      | ZH27003032     | ●     |            |              |             | 3D             | 81             | 174.2     |           | TX2728T25 |
|                            | YH1A2750        | ●     | YH2C2750    | ●     | 1.0827      |        | 27.50      | ZH27005032     | ●     | 32         | 60           | 37          | 5D             | 135            | 228.2     |           |           |
|                            | YH1A2778        | ●     | YH2C2778    | ●     | 1.0938      | 1*3/32 | 27.78      | ZH27007032     | ●     |            |              |             | 7D             | 189            | 288.2     |           |           |
|                            |                 |       |             |       |             |        |            | ZH27503032     | ●     |            |              |             | 3D             | 82.5           | 175.2     |           |           |
|                            |                 |       |             |       |             |        |            | ZH27505032     | ●     | 32         | 60           | 37          | 5D             | 137.5          | 230.2     |           |           |
|                            |                 |       |             |       |             |        | ZH27507032 | ●              |       |            |              | 7D          | 192.5          | 285.2          |           |           |           |

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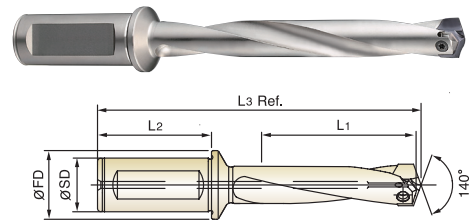
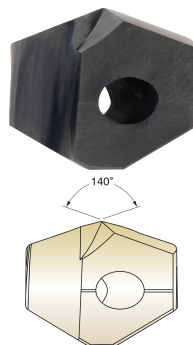
D r i l l i n g

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| Series                     | Insert EDP No.             |          |             |          | Insert O.D. |         |            | Holder EDP No. | Stock      | Shank Dia. SD | Shank Length L2 | Flange Dia. FD | Drilling Depth |         | Overall Length |            | Screw No. |
|----------------------------|----------------------------|----------|-------------|----------|-------------|---------|------------|----------------|------------|---------------|-----------------|----------------|----------------|---------|----------------|------------|-----------|
|                            | General (TiAlN)            | Stock    | INOX (TiCN) | Stock    | h7          |         |            |                |            |               |                 |                | L1             | L3 Ref. |                |            |           |
|                            |                            |          |             |          | dec.        | frac.   | mm         |                |            |               |                 |                |                |         |                |            |           |
| I<br>Ø28.00<br>~<br>Ø29.99 | Y11A2800                   | ●        | YI2C2800    | ●        | 1.1024      |         | 28.00      | ZH28003032     | ●          |               |                 |                | 3D             | 84      | 178.2          | TX2223T20  |           |
|                            | Y11A2818                   | ○        | YI2C2818    | ●        | 1.1094      | 1*7/64  | 28.18      | ZH28005032     | ●          | 32            | 60              | 37             | 5D             | 140     | 234.2          |            |           |
|                            |                            |          |             |          |             |         |            | ZH28007032     | ●          |               |                 |                | 7D             | 196     | 290.2          |            |           |
|                            | Y11A2850                   | ●        | YI2C2850    | ○        | 1.1220      |         | 28.50      | ZH28503032     | ●          |               |                 |                | 3D             | 85.5    | 179.2          |            |           |
|                            |                            |          |             |          |             |         |            | ZH28505032     | ●          | 32            | 60              | 37             | 5D             | 142.5   | 236.2          |            |           |
|                            | J<br>Ø30.00<br>~<br>Ø31.99 | Y11A2858 | ●           | YI2C2858 | ●           | 1.1250  | 1*1/8      | 28.58          | ZH28507032 | ●             |                 |                |                | 7D      | 199.5          | 293.2      | TX2324T20 |
|                            |                            | Y11A2900 | ●           | YI2C2900 | ●           | 1.1417  |            | 29.00          | ZH29003032 | ●             |                 |                |                | 3D      | 87             | 182.2      |           |
|                            |                            | Y11A2937 | ●           | YI2C2937 | ●           | 1.1562  | 1*5/32     | 29.37          | ZH29005032 | ●             | 32              | 60             | 37             | 5D      | 145            | 240.2      |           |
| ZH29007032                 |                            |          |             |          |             |         |            |                | ●          |               |                 |                | 7D             | 203     | 298.2          |            |           |
| Y11A2950                   |                            | ●        | YI2C2950    | ○        | 1.1614      |         | 29.50      | ZH29503032     | ●          |               |                 |                | 3D             | 88.5    | 183.2          |            |           |
|                            |                            |          |             |          |             |         |            | ZH29505032     | ●          | 32            | 60              | 37             | 5D             | 147.5   | 242.2          |            |           |
| J<br>Ø30.00<br>~<br>Ø31.99 |                            | Y11A2977 | ●           | YI2C2977 | ●           | 1.1719  | 1*11/64    | 29.77          | ZH29507032 | ●             |                 |                |                | 7D      | 206.5          | 301.2      |           |
|                            |                            |          |             |          |             |         |            |                | YJ1A3000   | ●             | YJ2C3000        | ●              | 1.1811         |         | 30.00          | ZH30003032 | ●         |
|                            | YJ1A3016                   | ●        | YJ2C3016    | ●        | 1.1875      | 1*3/16  | 30.16      | ZH30005032     | ●          | 32            | 60              | 37             | 5D             | 150     | 246.0          |            |           |
|                            |                            |          |             |          |             |         |            | ZH30007032     | ●          |               |                 |                | 7D             | 210     | 306.0          |            |           |
|                            | YJ1A3050                   | ●        | YJ2C3050    | ●        | 1.2008      |         | 30.50      | ZH30503032     | ●          |               |                 |                | 3D             | 91.5    | 187.0          |            |           |
|                            | YJ1A3056                   | ○        | YJ2C3056    | ●        | 1.2031      | 1*11/64 | 30.56      | ZH30505032     | ●          | 32            | 60              | 37             | 5D             | 152.5   | 248.0          |            |           |
|                            |                            |          |             |          |             |         |            | ZH30507032     | ●          |               |                 |                | 7D             | 213.5   | 309.0          |            |           |
|                            | YJ1A3100                   | ●        | YJ2C3100    | ●        | 1.2205      |         | 31.00      | ZH31003032     | ●          |               |                 |                | 3D             | 93      | 188.0          |            |           |
| ZH31005032                 |                            |          |             |          |             |         |            | ●              | 32         | 60            | 37              | 5D             | 155            | 250.0   |                |            |           |
| ZH31007032                 |                            |          |             |          |             |         |            | ●              |            |               |                 | 7D             | 217            | 312.0   |                |            |           |
| ZH31503032                 |                            |          |             |          |             |         |            | ●              |            |               |                 | 3D             | 94.5           | 191.0   | TX3132T25      |            |           |
| YJ1A3150                   | ●                          | YJ2C3150 | ●           | 1.2402   |             | 31.50   | ZH31505032 | ●              | 32         | 60            | 37              | 5D             | 157.5          | 254.0   |                |            |           |
|                            |                            |          |             |          |             |         | ZH31507032 | ●              |            |               |                 | 7D             | 220.5          | 317.0   |                |            |           |

\* Stock situation is subject to change without notice.

▶ 10×D Holder is available on your request.

◎ : Excellent ○ : Good

|      | Non-alloy Steels, Free Machining Steels | Carbon Steels   |                 | Alloy Steels    |                 | High Alloyed steels |                 | Structural Steels |                 | Tool Steels     |                 | Stainless Steels | Cast Iron       |                 | Aluminum        | Copper Alloys  |
|------|---|-----------------|-----------------|-----------------|-----------------|---------------------|-----------------|-------------------|-----------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|----------------|
|      |   | ~HRc24 (~HB250) | ~HRc28 (~HB275) | HRc28~ (HB275~) | ~HRc28 (~HB275) | HRc28~ (HB275~)     | ~HRc37 (~HB350) | HRc37~ (HB350~)   | ~HRc24 (~HB250) | HRc24~ (HB250~) | ~HRc13 (~HB200) | HRc13~ (HB200~)  | ~HRc28 (~HB275) | ~HRc19 (~HB220) | HRc19~ (HB220~) | ~HRc8 (~HB180) |
| Y*1A | ◎                                       | ◎               | ◎               | ◎               | ◎               | ◎                   | ◎               | ◎                 | ◎               | ◎               | ◎               |                  | ◎               | ◎               |                 |                |
| Y*2C |   | ○               |                 | ○               |                 |                     |                 |                   | ○               |                 |                 | ◎                |                 |                 | ○               | ○              |

## METRIC

| Material<br>Werkstück                                       |   | Tensile<br>Strength<br>[N/mm <sup>2</sup> ] | Hardness |         | Cutting<br>Speed<br>Vc<br>[M/min] | Feed [mm/rev]   |                 |                 |                 |                 |           |
|---|---|---|----------|---------|-----------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------|
|   |   |   | HB       | HRc     |                                   | Ø12.0<br>~Ø14.9 | Ø15.0<br>~Ø17.9 | Ø18.0<br>~Ø21.9 | Ø22.0<br>~Ø26.9 | Ø27.0<br>~Ø31.9 |           |
| Non-alloyed steels,<br>Cast steels<br>Free-machining steels | 9SMn28, 9SMnPb28,<br>10SPb20 etc  | ~500  | 100~150  |         | 95~120                            | 0.16~0.28       | 0.21~0.35       | 0.27~0.40       | 0.34~0.52       | 0.37~0.55       |           |
|   |   | 500~850                                     | 150~250  | ~24     | 80~105                            | 0.14~0.24       | 0.21~0.35       | 0.27~0.40       | 0.34~0.52       | 0.37~0.55       |           |
| Low-alloyed steels,<br>Cast steels(<5% )<br>Carbon steels   | C15, C22, 20Mn5, Ck45,<br>C45 etc   | ~450  | 85~125   |         | 90~115                            | 0.14~0.25       | 0.20~0.33       | 0.25~0.39       | 0.31~0.47       | 0.34~0.50       |           |
|   |   | 450~755                                     | 125~225  | ~19     | 70~90                             | 0.12~0.20       | 0.17~0.28       | 0.22~0.32       | 0.30~0.46       | 0.33~0.49       |           |
|   |   | 755~900                                     | 225~265  | 19~27   | 60~80                             | 0.12~0.20       | 0.17~0.28       | 0.22~0.32       | 0.30~0.46       | 0.33~0.49       |           |
| Alloyed steels  | 45CrMo4, 42CrMo4,<br>16MnCr5,<br>Ck75, 35CrMo4,<br>16MnCr5 etc                  | 900~1200                                    | 265~350  | 27~37   | 55~70                             | 0.10~0.16       | 0.15~0.25       | 0.21~0.30       | 0.25~0.38       | 0.29~0.43       |           |
|   |   | ~600  | 125~175  | ~7      | 80~100                            | 0.14~0.24       | 0.17~0.28       | 0.22~0.32       | 0.30~0.46       | 0.34~0.50       |           |
|   |   | 600~800                                     | 175~235  | 7~22    | 70~90                             | 0.12~0.20       | 0.17~0.28       | 0.22~0.32       | 0.30~0.46       | 0.34~0.50       |           |
|   |   | 800~950                                     | 235~280  | 22~29   | 60~80                             | 0.12~0.20       | 0.15~0.25       | 0.22~0.32       | 0.30~0.46       | 0.34~0.50       |           |
|   |   | 950~1110                                    | 280~330  | 29~35   | 55~70                             | 0.10~0.16       | 0.13~0.21       | 0.21~0.30       | 0.25~0.38       | 0.29~0.43       |           |
| High-alloyed steels   | 36CrNiMo4,<br>41CrAlMo7 etc   | 1110~1230                                   | 330~360  | 35~39   | 45~60                             | 0.08~0.12       | 0.13~0.21       | 0.21~0.30       | 0.25~0.38       | 0.29~0.43       |           |
|   |   | 600~1020                                    | 225~300  | 19~32   | 45~60                             | 0.12~0.20       | 0.15~0.25       | 0.21~0.30       | 0.20~0.31       | 0.24~0.35       |           |
|   |   | 1020~1200                                   | 300~355  | 32~38   | 40~55                             | 0.10~0.16       | 0.11~0.18       | 0.21~0.30       | 0.20~0.31       | 0.24~0.35       |           |
| Structural steels   | St33, St37-2, St44-2,<br>St52, St60 etc   | 1200~1330                                   | 355~390  | 38~42   | 40~50                             | 0.08~0.12       | 0.09~0.14       | 0.18~0.26       | 0.19~0.29       | 0.23~0.34       |           |
|   |   | 350~500                                     | 100~150  |         | 75~95                             | 0.14~0.24       | 0.21~0.35       | 0.27~0.39       | 0.29~0.44       | 0.32~0.47       |           |
|   |   | 500~850                                     | 150~250  | ~24     | 60~75                             | 0.12~0.20       | 0.20~0.33       | 0.22~0.32       | 0.25~0.38       | 0.29~0.43       |           |
| Tool steels   | 102Cr6, 105WCr6,<br>C75W etc  | 850~1200                                    | 250~355  | 2~38    | 50~65                             | 0.10~0.16       | 0.17~0.28       | 0.21~0.30       | 0.21~0.32       | 0.26~0.38       |           |
|   |   | 500~705                                     | 150~210  | ~16     | 50~65                             | 0.10~0.16       | 0.13~0.21       | 0.18~0.26       | 0.20~0.31       | 0.24~0.35       |           |
| Grey cast iron  | Pearlitic, Ferritic<br>Pearlitic  | 705~950                                     | 210~280  | 16~29   | 40~50                             | 0.10~0.16       | 0.13~0.21       | 0.18~0.26       | 0.20~0.31       | 0.24~0.35       |           |
|   |   | 500~700                                     | 150~210  | ~16     | 100~125                           | 0.15~0.26       | 0.20~0.37       | 0.27~0.42       | 0.36~0.51       | 0.40~0.55       |           |
| Cast iron nodular   | Ferritic<br>Pearlitic   | 700~850                                     | 210~250  | 16~24   | 75~95                             | 0.11~0.20       | 0.16~0.29       | 0.20~0.30       | 0.25~0.35       | 0.29~0.40       |           |
|   |   | 540   | 165      | 4       | 95~120                            | 0.13~0.22       | 0.17~0.31       | 0.21~0.32       | 0.28~0.40       | 0.32~0.44       |           |
| Malleable cast iron   | Ferritic<br>Pearlitic   | 850   | 250      | 24      | 75~95                             | 0.11~0.20       | 0.14~0.26       | 0.19~0.29       | 0.25~0.35       | 0.29~0.40       |           |
|   |   | 450   | 125      |         | 100~125                           | 0.13~0.22       | 0.17~0.31       | 0.21~0.32       | 0.28~0.40       | 0.32~0.44       |           |
| Aluminum alloys<br>(Wrought)                                | not heat treatable<br>hardened  |   | 65       |         | 250~330                           | 0.30~0.40       | 0.35~0.45       | 0.40~0.50       | 0.45~0.55       | 0.50~0.60       |           |
|   |   |   | 150      |         | 200~250                           | 0.30~0.40       | 0.35~0.45       | 0.40~0.50       | 0.45~0.55       | 0.50~0.60       |           |
| Aluminum alloys<br>(Cast)                                   | ≤12% Si, not heat treatable<br>≤12% Si, hardened<br>>12% Si, not heat treatable |   | 75       |         | 200~50                            | 0.25~0.35       | 0.30~0.40       | 0.35~0.45       | 0.40~0.50       | 0.45~0.55       |           |
|   |   |   | 90       |         | 150~220                           | 0.25~0.35       | 0.30~0.40       | 0.35~0.45       | 0.40~0.50       | 0.45~0.55       |           |
|   |   |   | 130      |         | 100~200                           | 0.20~0.30       | 0.25~0.35       | 0.30~0.40       | 0.35~0.45       | 0.40~0.50       |           |
| Copper alloys   | Free machining(Pb>1%)<br>Brass<br>Electrolitic copper                           |   | 110      |         | 115~145                           | 0.16~0.28       | 0.23~0.36       | 0.29~0.36       | 0.37~0.45       | 0.41~0.48       |           |
|   |   |   | 90       |         | 145~185                           | 0.17~0.29       | 0.24~0.37       | 0.30~0.38       | 0.38~0.46       | 0.42~0.49       |           |
|   |   |   | 100      |         | 95~120                            | 0.06~0.09       | 0.09~0.13       | 0.11~0.13       | 0.15~0.18       | 0.19~0.22       |           |
| Non ferrous<br>material                                     | Duroplastics<br>Fiber plastics<br>Hard rubber                                   |   |          |         |                                   |                 |                 |                 |                 |                 |           |
|   |   |   |          |         |                                   |                 |                 |                 |                 |                 |           |
|   |   |   |          |         |                                   |                 |                 |                 |                 |                 |           |
| Stainless steels  | Austenitic and<br>Austenitic/ferritic   | Y*1A / Y*2C                                 | 450~610  | 135~185 | ~9                                | 45~60           | 0.10~0.16       | 0.12~0.18       | 0.14~0.20       | 0.15~0.26       | 0.18~0.28 |
|   |   | Y*2C  | 610~930  | 185~275 | 9~28                              | 30~45           | 0.08~0.14       | 0.09~0.15       | 0.10~0.16       | 0.12~0.20       | 0.14~0.22 |

\*Formulas :

RPM = revolution per minute (rev/min)  
M/min = surface meter per minute(M/min)  
DIA. = diameter of drill (mm)  
mm/rev = feed rate(mm/rev)

$$M/min = \frac{(RPM) \cdot \pi \cdot (DIA.)}{1000}$$

$$mm/min = (RPM) \cdot (mm/rev)$$

$$RPM = \frac{(M/min) \cdot 1000}{(\pi) \cdot (DIA.)}$$

- ▶ The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.  
Speed and feed reductions (20% reduction in speed and 10% reduction in feed) are recommended.
- ▶ Recommend you to reduce the feed rate to 85%, 70% when you use 5xD, 7xD holders.
- ▶ For use of 7xD holder, we recommend to drill a centering pre-hole with equal to or larger than 140° point angle to min. 2/3 cutting diameter.  
The use of the centering pre-hole improves hole location, roundness and surface finish.

# INCH

| Material<br>Werkstück                                       |   | Tensile<br>Strength         | Hardness |         | Cutting<br>Speed | Feed [IPR]    |               |                     |                     |                     |
|---|---|-----------------------------|----------|---------|------------------|---------------|---------------|---------------------|---------------------|---------------------|
|   |   |                             | MPa      | HB      |                  | HRc           | Vc<br>[SFM]   | Ø 31/64<br>~Ø 37/64 | Ø 19/32<br>~Ø 45/64 | Ø 23/32<br>~Ø 55/64 |
| Non-alloyed steels,<br>Cast steels<br>Free-machining steels | 9SMn28, 9SMnPb28,   | ~500                        | 100~150  |         | 312~394          | 0.006~0.011   | 0.008~0.014   | 0.011~0.016         | 0.013~0.020         | 0.015~0.022         |
|   | 10SPb20 etc   | 500~850                     | 150~250  | ~24     | 262~344          | 0.006~0.009   | 0.008~0.014   | 0.011~0.016         | 0.013~0.020         | 0.015~0.022         |
| Low-alloyed steels,<br>Cast steels(<5% )<br>Carbon steels   | C15, C22, 20Mn5, Ck45,<br>C45 etc   | ~450                        | 85~125   |         | 295~377          | 0.006~0.010   | 0.008~0.013   | 0.010~0.015         | 0.012~0.019         | 0.013~0.020         |
|   |   | 450~755                     | 125~225  | ~19     | 230~295          | 0.005~0.008   | 0.007~0.011   | 0.009~0.013         | 0.012~0.018         | 0.013~0.019         |
|   |   | 755~900                     | 225~265  | 19~27   | 197~262          | 0.005~0.008   | 0.007~0.011   | 0.009~0.013         | 0.012~0.018         | 0.013~0.019         |
| Alloyed steels  | 45CrMo4, 42CrMo4,<br>16MnCr5,<br>Ck75, 35CrMo4,<br>16MnCr5 etc                  | 900~1200                    | 265~350  | 27~37   | 180~230          | 0.004~0.006   | 0.006~0.010   | 0.008~0.012         | 0.010~0.015         | 0.011~0.017         |
|   |   | ~600                        | 125~175  | ~7      | 262~328          | 0.006~0.009   | 0.007~0.011   | 0.009~0.013         | 0.012~0.018         | 0.013~0.020         |
|   |   | 600~800                     | 175~235  | 7~22    | 230~295          | 0.005~0.008   | 0.007~0.011   | 0.009~0.013         | 0.012~0.018         | 0.013~0.020         |
|   |   | 800~950                     | 235~280  | 22~29   | 197~262          | 0.005~0.008   | 0.006~0.010   | 0.009~0.013         | 0.012~0.018         | 0.013~0.020         |
|   |   | 950~1110                    | 280~330  | 29~35   | 180~230          | 0.004~0.006   | 0.005~0.008   | 0.008~0.012         | 0.010~0.015         | 0.011~0.017         |
| High-alloyed steels   | 36CrNiMo4,<br>41CrAlMo7 etc   | 1110~1230                   | 330~360  | 35~39   | 148~197          | 0.003~0.005   | 0.005~0.008   | 0.008~0.012         | 0.010~0.015         | 0.011~0.017         |
|   |   | 600~1020                    | 225~300  | 19~32   | 148~197          | 0.005~0.008   | 0.006~0.010   | 0.008~0.012         | 0.008~0.012         | 0.009~0.014         |
|   |   | 1020~1200                   | 300~355  | 32~38   | 131~180          | 0.004~0.006   | 0.004~0.007   | 0.008~0.012         | 0.008~0.012         | 0.009~0.014         |
| Structural steels   | St33, St37-2, St44-2,<br>St52, St60 etc   | 1200~1330                   | 355~390  | 38~42   | 131~164          | 0.003~0.005   | 0.004~0.006   | 0.007~0.010         | 0.007~0.011         | 0.009~0.013         |
|   |   | 350~500                     | 100~150  |         | 246~312          | 0.006~0.009   | 0.008~0.014   | 0.011~0.015         | 0.011~0.017         | 0.013~0.019         |
|   |   | 500~850                     | 150~250  | ~24     | 197~246          | 0.005~0.008   | 0.008~0.013   | 0.009~0.013         | 0.010~0.015         | 0.011~0.017         |
| Tool steels   | 102Cr6, 105WCr6,<br>C75W etc  | 850~1200                    | 250~355  | 24~38   | 164~213          | 0.004~0.006   | 0.007~0.011   | 0.008~0.012         | 0.008~0.013         | 0.010~0.015         |
|   |   | 500~705                     | 150~210  | ~16     | 164~213          | 0.004~0.006   | 0.005~0.008   | 0.007~0.010         | 0.008~0.012         | 0.009~0.014         |
| Grey cast iron  | Pearlitic, Ferritic<br>Pearlitic  | 705~950                     | 210~280  | 16~29   | 131~164          | 0.004~0.006   | 0.005~0.008   | 0.007~0.010         | 0.008~0.012         | 0.009~0.014         |
|   |   | 500~700                     | 150~210  | ~16     | 328~410          | 0.006~0.010   | 0.008~0.015   | 0.011~0.017         | 0.014~0.020         | 0.016~0.022         |
| Cast iron nodular   | Ferritic<br>Pearlitic   | 700~850                     | 210~250  | 16~24   | 246~312          | 0.004~0.008   | 0.006~0.011   | 0.008~0.012         | 0.010~0.014         | 0.011~0.016         |
|   |   | 540                         | 165      | 4       | 312~394          | 0.005~0.009   | 0.007~0.012   | 0.008~0.013         | 0.011~0.016         | 0.013~0.017         |
| Malleable cast iron   | Ferritic<br>Pearlitic   | 850                         | 250      | 24      | 246~312          | 0.004~0.008   | 0.006~0.010   | 0.007~0.011         | 0.010~0.014         | 0.011~0.016         |
|   |   | 450                         | 125      |         | 328~410          | 0.005~0.009   | 0.007~0.012   | 0.008~0.013         | 0.011~0.016         | 0.013~0.017         |
| Aluminum alloys<br>(Wrought)                                | not heat treatable<br>hardened  | 780                         | 230      | 21      | 246~312          | 0.004~0.007   | 0.006~0.010   | 0.007~0.011         | 0.010~0.014         | 0.011~0.016         |
|   |   | not heat treatable          | 65       |         | 820~1083         | 0.0118~0.0157 | 0.0138~0.0177 | 0.0157~0.0197       | 0.0177~0.0217       | 0.0197~0.0236       |
| Aluminum alloys<br>(Cast)                                   | ≤12% Si, not heat treatable<br>≤12% Si, hardened<br>>12% Si, not heat treatable | hardened                    | 150      |         | 656~820          | 0.0118~0.0157 | 0.0138~0.0177 | 0.0157~0.0197       | 0.0177~0.0217       | 0.0197~0.0236       |
|   |   | ≤12% Si, not heat treatable | 75       |         | 656~820          | 0.0098~0.0138 | 0.0118~0.0157 | 0.0138~0.0177       | 0.0157~0.0197       | 0.0177~0.0217       |
|   |   | ≤12% Si, hardened           | 90       |         | 492~722          | 0.0098~0.0138 | 0.0118~0.0157 | 0.0138~0.0177       | 0.0157~0.0197       | 0.0177~0.0217       |
| Copper alloys   | Free machining(Pb>1%)<br>Brass<br>Electrolytic copper                           | >12% Si, not heat treatable | 130      |         | 328~656          | 0.0079~0.0118 | 0.0098~0.0138 | 0.0118~0.0157       | 0.0138~0.0177       | 0.0157~0.0197       |
|   |   | Free machining(Pb>1%)       | 110      |         | 377~476          | 0.006~0.011   | 0.009~0.014   | 0.011~0.014         | 0.015~0.018         | 0.016~0.019         |
|   |   | Brass                       | 90       |         | 476~607          | 0.007~0.011   | 0.009~0.015   | 0.012~0.015         | 0.015~0.018         | 0.017~0.019         |
| Non ferrous<br>material                                     | Electrolytic copper   |                             | 100      |         | 312~394          | 0.002~0.004   | 0.004~0.005   | 0.004~0.005         | 0.006~0.007         | 0.007~0.009         |
|   |   | Duroplastics                |          |         |                  |               |               |                     |                     |                     |
| Stainless steels  | Austenitic and<br>Austenitic/ferritic   | Fiber plastics              |          |         |                  |               |               |                     |                     |                     |
|   |   | Hard rubber                 |          |         |                  |               |               |                     |                     |                     |
|   |   | Y*2C                        | 450~610  | 135~185 | ~9               | 145~197       | 0.004~0.006   | 0.005~0.007         | 0.006~0.008         | 0.006~0.011         |
|   |   | 610~930                     | 185~275  | 9~28    | 89~145           | 0.003~0.005   | 0.004~0.006   | 0.004~0.006         | 0.005~0.008         | 0.006~0.009         |

Y\*1A / Y\*2C

Y\*2C

RPM = revolution per minute (rev/min)  
SFM = surface feet per minute (ft/min)  
DIA. = diameter of drill (inch)  
IPR = feed rate (inch/rev)  
IPM = inch per minute penetration rate

\*Formulas :

$$SFM = \frac{(RPM) \cdot \pi \cdot (DIA.)}{12}$$

$$IPM = (RPM) \cdot (IPR)$$

$$RPM = \frac{(SFM) \cdot 12}{(\pi) \cdot (DIA.)}$$

- ▶ The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.  
Speed and feed reductions (20% reduction in speed and 10% reduction in feed) are recommended.
- ▶ Recommend you to reduce the feed rate to 85%, 70% when you use 5xD, 7xD holders.
- ▶ For use of 7xD holder, we recommend to drill a centering pre-hole with equal to or larger than 140° point angle to min. 2/3 cutting diameter.  
The use of the centering pre-hole improves hole location, roundness and surface finish.

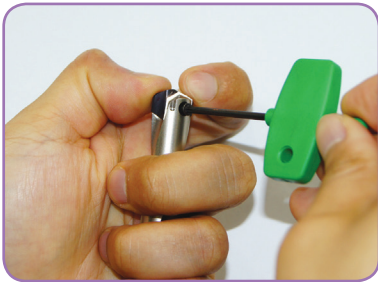
## Assembly of i-Dream Drills






Make sure to clean the insert and insert seat.



Slide the drill insert into the slot of the holder and press down the insert to touch the bottom of the slot.



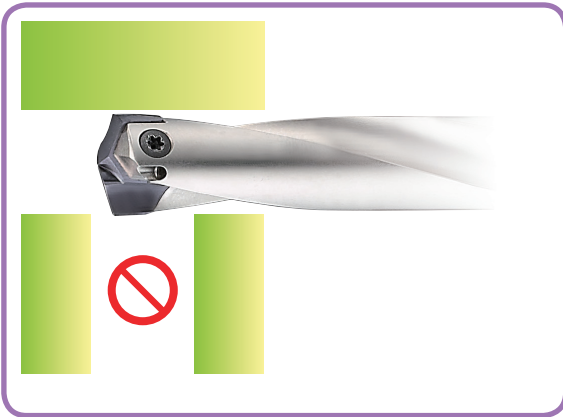
After confirming the insert is pressed down to the bottom of the slot, tighten the screw using anti-seize compound.

| WRENCH TYPE  | PRODUCT No. | T-HANDLE No.  | SERIES (SIZE)             |
|--|-------------|---|---------------------------|
| <br>WING TYPE     | TWWT08      | —   | A (Ø 12.00~Ø 13.99)       |
|  |             |   | B (Ø 14.00~Ø 15.99)       |
|  |             |   | C (Ø 16.00~Ø 17.99)       |
| <br>TORX BIT TYPE | TWBT15      | TWH600<br> | D (Ø 18.00~Ø 19.99)       |
|  | TWBT20      |   | E, F, G (Ø 20.00~Ø 25.99) |
|  | TWBT25      |   | H, I, J (Ø 26.00~Ø 31.99) |

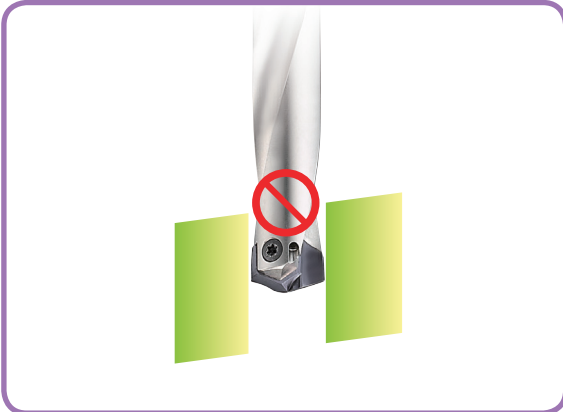
Use the wing type or T-type wrench.

- ▶ Need to use appropriate wrenches and screws as indicated.
- ▶ It's important to tighten up the screw properly.

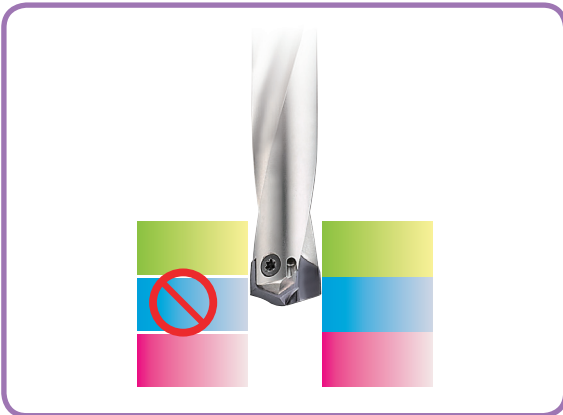
## Caution-not Recommendable Application



Intersecting cross hole is bigger than the drill insert's Margin Length.

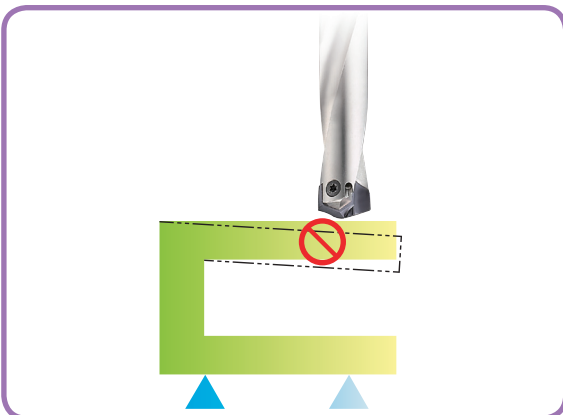


Material with slanting entrance and exit over 7 degree. (If drilling 7 degree or under slanting surface, reduce the feed about 30-50%)



For drilling stacked plates, minimize the space between the plates.

The space stacked plates can cause insert breakage or poor chip control.



The material needs to be fixtured securely before drilling.

i-HF mill

i-HS mill

i-HR mill

i-Xmill

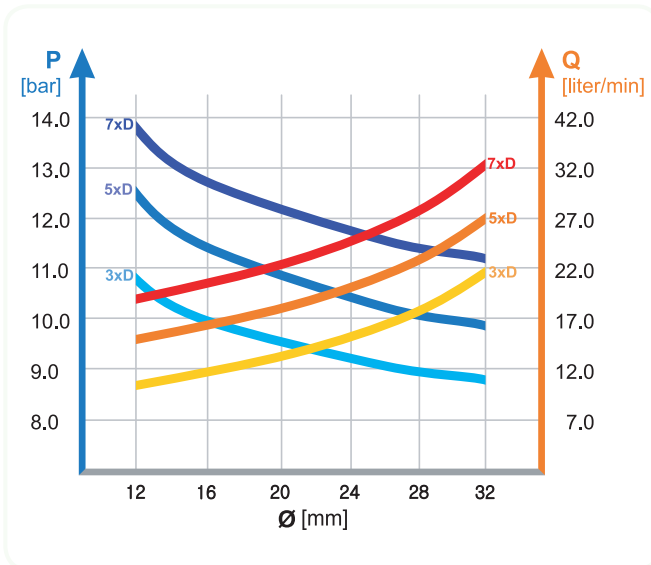
Modular type

i-Dream Drill

i-HW Drill

Turning Insert

## Recommended Coolant Pressure and Flow Rate on Vertical Drilling

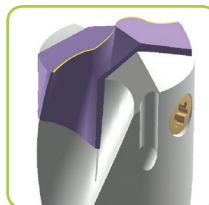


- Recommended emulsion mix is 6 - 8%.
- For Drilling in Stainless and High Strength steels, a mix of 10% is recommended.
- For horizontal drilling, 30% reduction on the coolant pressure and flow rate is possible.
- Dry drilling is possible for 1-2xD drilling. But not recommended.

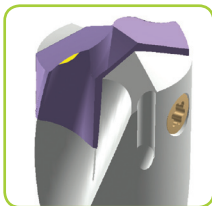
## Trouble Shooting



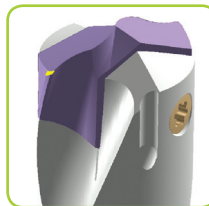
- 1) Heavy flank wear / Fast flank wear**
- Reduce cutting speed
  - Increase feed



- 2) Chipping on cutting edge**
- Reduce feed
  - Check the rigidity of spindle and chuck
  - Rigid clamping of workpiece



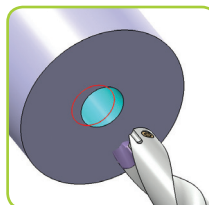
- 3) Build up on cutting edge**
- Increase cutting speed
  - Use a coated insert



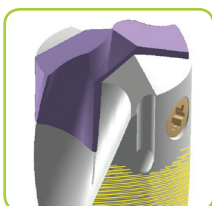
- 4) Chipping or break down on outer corner**
- Reduce feed
  - Rigid clamping of workpiece



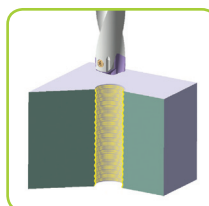
- 5) Wear of land margin**
- Rigid clamping of workpiece
  - Reduce cutting speed
  - Increase coolant flow



- 6) Unsatisfactory positioning of the hole**
- Rigid clamping of workpiece
  - Reduce feed during entrance or exit



- 7) Scratching on holder**
- Rigid clamping of workpiece
  - Reduce feed
  - Increase coolant flow



- 8) Unsatisfactory surface finish**
- Rigid clamping of workpiece
  - Increase coolant flow and pressure





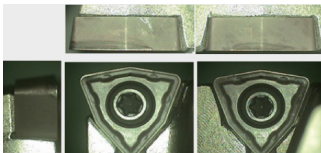
## Recommended Cutting Conditions

|          | Work piece        | Grade | ISO Classification | Recommended Cutting Speed Vc (m/min) |
|----------|-------------------|-------|--------------------|--------------------------------------|
| <b>P</b> | Steel             | YA702 | P20~30             | 150 (80~180)                         |
| <b>M</b> | Stainless Steel   | YA703 | M20~30             | 130 (80~180)                         |
| <b>K</b> | Cast Iron         | YA102 | K10~20             | 150 (80~200)                         |
|          |                   | YA503 | K20~30             | 150 (80~200)                         |
|          | Ductile Cast Iron | YA102 | K10~20             | 120 (60~180)                         |
|          |                   | YA503 | K20~30             | 120 (60~180)                         |

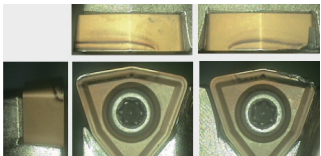
## Cutting Performance Test Result

### Machining situation

YG-1



Competitor



### Work piece

- JIS : SCM440
- DIN : 42CrMo4
- AISI : 4140

### Work piece

### SCM440

|                    |            |                     |
|--------------------|------------|---------------------|
| Cutting Conditions | Speed (vc) | 150 m/min           |
|                    | Feed (fz)  | 0.12 mm/tooth       |
|                    | Depth (ap) | 70mm (Through hole) |
|                    | Coolant    | Through coolant     |
|                    | Insert     | WCMT050308 (YA702)  |
|                    | Cutter     | Ø28 - 3D            |



**150% longer tool life than competitor !**

## Series

| Insert | ● Continuous | ◕ Minor Intermittent | ⊕ Heavy Intermittent |   |  |  |  |  |
|--------|--------------|----------------------|----------------------|---|--|--|--|--|
|        | P            | Steel                | ◕                    | ◕ |  |  |  |  |
|        | M            | Stainless Steel      | ◕                    | ⊕ |  |  |  |  |
|        | K            | Cast Iron            |                      |   |  |  |  |  |
|        | N            | Non Ferrous          |                      |   |  |  |  |  |
|        | S            | Heat Resistant       |                      |   |  |  |  |  |

| SHAPE | DESIGNATION    | EDP No.     |            | Grade |       |     |         |  | Dimension |     |       |      |     |
|-------|----------------|-------------|------------|-------|-------|-----|---------|--|-----------|-----|-------|------|-----|
|       |                |             |            | PVD   |       | CVD | Carbide |  |           |     |       |      |     |
|       |                |             |            | A7    | A8    |     |         |  | I         | D   | S     | ØD1  |     |
|       | ISO            | Designation | Grade Code | YA702 | YA703 |     |         |  |           |     |       |      |     |
|       | WCMT050308-HAM | C08W1A0A2   | □□         | ◎     |       |     |         |  |           | 5.4 | 7.94  | 3.18 | 3.4 |
|       | WCMT06T308-HAM | C08W1A1A2   | □□         | ◎     |       |     |         |  |           | 6.5 | 9.525 | 3.97 | 3.8 |
|       | WCMT080408-HAM | C08W1A2A2   | □□         | ◎     |       |     |         |  |           | 8.7 | 12.7  | 4.76 | 4.4 |

\* EDP No of each selected item is a combination of "Designation" & "Grade Code" in EDP No. column.

For example, EDP No of WCMT050308-HAM YA702 is C08W1A0A2A7

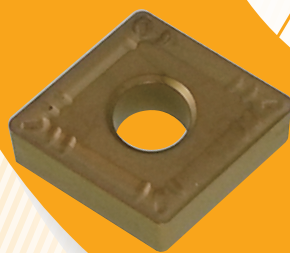
\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ◎ : Will be launched by end of 2014

# INDEXABLE TOOLS

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## Turning



*Turning Insert Designation System (ISO)*  
\* *Turning Insert*

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# Turning Insert Designation System (ISO)

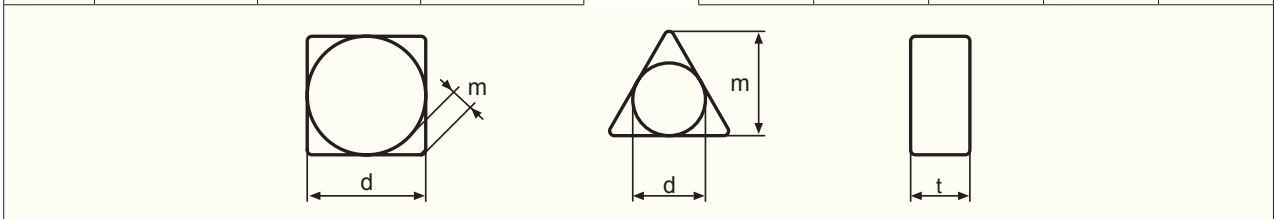
| 1. INSERT SHAPE |          |          |          | 2. RELIEF ANGLE |          |          |          | 4. CROSS SECTION SHAPE |          |          |
|-----------------|----------|----------|----------|-----------------|----------|----------|----------|------------------------|----------|----------|
|                 |          |          |          |                 |          |          |          |                        |          |          |
| <b>C</b>        | <b>D</b> | <b>E</b> | <b>H</b> |                 |          |          |          | <b>A</b>               | <b>G</b> | <b>M</b> |
|                 |          |          |          | 0°              | 5°       | 7°       | 11°      |                        |          |          |
| <b>K</b>        | <b>R</b> | <b>S</b> | <b>T</b> | <b>N</b>        | <b>B</b> | <b>C</b> | <b>P</b> | <b>R</b>               | <b>W</b> | <b>T</b> |
|                 |          |          |          |                 |          |          |          | <b>special</b>         |          |          |
| <b>V</b>        | <b>W</b> |          |          |                 |          |          |          | <b>X</b>               |          |          |



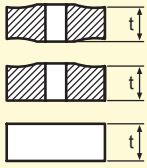
## 3. TOLERANCE

|   | Tolerance (mm) |         |         |
|---|----------------|---------|---------|
|   | m              | t       | d       |
| A | ± 0.005        | ± 0.025 | ± 0.025 |
| F | ± 0.005        | ± 0.025 | ± 0.013 |
| C | ± 0.013        | ± 0.025 | ± 0.025 |
| H | ± 0.013        | ± 0.025 | ± 0.013 |
| E | ± 0.025        | ± 0.025 | ± 0.025 |
| G | ± 0.025        | ± 0.13  | ± 0.025 |

| d(mm)  | m       |         | d       |         |
|--------|---------|---------|---------|---------|
|        | M class | U class | M class | U class |
| 6.35   | ± 0.08  | ± 0.13  | ± 0.05  | ± 0.08  |
| 9.525  | ± 0.08  | ± 0.13  | ± 0.05  | ± 0.08  |
| 12.7   | ± 0.13  | ± 0.20  | ± 0.08  | ± 0.13  |
| 15.875 | ± 0.15  | ± 0.27  | ± 0.10  | ± 0.18  |
| 19.05  | ± 0.15  | ± 0.27  | ± 0.10  | ± 0.18  |
| 25.4   |         | ± 0.38  | ± 0.13  | ± 0.25  |



### 6. THICKNESS (MM)



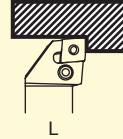
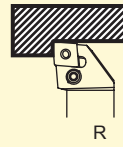
| t  | Thickness |
|----|-----------|
| 02 | 2.38      |
| 03 | 3.18      |
| T3 | 3.97      |
| 04 | 4.76      |
| 06 | 6.35      |
| 07 | 7.94      |
| 09 | 9.52      |

### 7. NOSE R (MM)



| R  | Thickness |
|----|-----------|
| 02 | 0.2       |
| 04 | 0.4       |
| 08 | 0.8       |
| 10 | 1.0       |
| 12 | 1.2       |
| 16 | 1.6       |
| 20 | 2.0       |

### 8. CUTTING DIRECTION



### 9. CHIP BREAKER

HBM

For medium-Roughing of steel

|    |    |    |     |     |
|----|----|----|-----|-----|
| 12 | 04 | 08 | (R) | C/B |
| 5  | 6  | 7  | 8   | 9   |

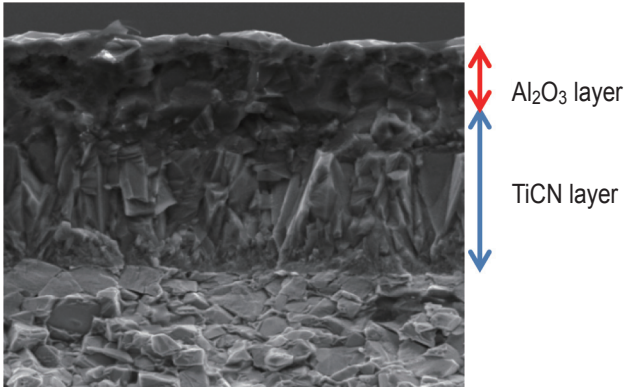
### 5. CUTTING EDGE LENGTH (MM)

| I.C.   | C  | D  | R  | S  | T  | V  | W  | K  | H  |
|--------|----|----|----|----|----|----|----|----|----|
| 3.97   | 03 | 04 |    | 03 | 06 |    | 02 |    |    |
| 4.76   | 04 | 05 |    | 04 | 08 | 08 |    |    |    |
| 5.56   | 05 | 06 |    | 05 | 09 | 09 | 03 |    |    |
| 6.35   | 06 | 07 |    | 06 | 11 | 11 | 04 |    |    |
| 7.94   | 08 | 09 |    | 07 | 13 | 13 | 05 |    |    |
| 9.525  | 09 | 11 | 09 | 09 | 16 | 16 | 06 | 16 |    |
| 12.7   | 12 | 15 |    | 12 | 22 | 22 | 08 |    | 05 |
| 15.875 | 16 | 19 | 15 | 15 | 27 | 27 | 10 |    |    |
| 19.05  | 19 | 23 | 19 | 19 | 33 | 33 | 13 |    | 10 |
| 25.4   | 25 | 31 | 25 | 25 | 44 | 44 | 17 |    |    |

# Turning Insert

## YB302 (Steel turning grade)

1. Comprehensive grade can cover most of steel turning application
2. Dedicated carbide substrate equipped with toughness & wear resistance
3. Al<sub>2</sub>O<sub>3</sub> coating having excellent oxidation resistance & chipping resistance



Coating structure of YB302

## Characteristics of Steel Turning coating grade

| Grade | ISO     | Features & Application  |
|-------|---------|---|
| YB302 | P20~P30 | <ul style="list-style-type: none"> <li>* Turning grade having wide application range for steel turning</li> <li>* Excellent cutting performance due to the coating layers having excellent oxidation resistance &amp; chipping resistance</li> <li>* MT TiCN + Al<sub>2</sub>O<sub>3</sub> CVD Coating</li> </ul> |

## Application Example

### Machining situation



Work piece  
 - JIS : S50C  
 - DIN : 1.201 (C45R)  
 - AISI : 1049

| Work piece         |            | S50C                   |
|--------------------|------------|------------------------|
| Cutting Conditions | Speed (vc) | 301 m/min              |
|                    | Feed (fn)  | 0.3 mm/rev             |
|                    | Depth (ap) | 1.25mm                 |
|                    | Coolant    | Wet                    |
|                    | Insert     | CNMG120408-HBM (YB302) |

|            |               |
|------------|---------------|
| YG-1       | 100pcs/Corner |
| Competitor | 70pcs/Corner  |

**130% longer tool life than competitor !**

**Machining situation**



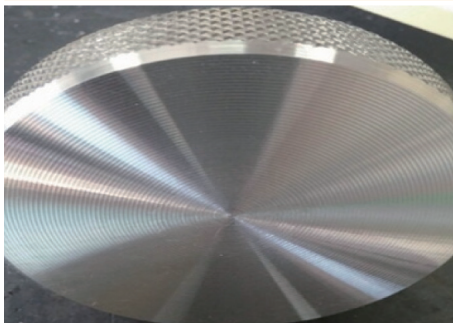
**Work piece**  
 - JIS : S45C  
 - DIN : 1.1191 (C45E)  
 - AISI : 1045

| Work piece         |            | S45C (Heat treated)    |
|--------------------|------------|------------------------|
| Cutting Conditions | Speed (vc) | 290 m/min              |
|                    | Feed (fn)  | 0.12 mm/rev            |
|                    | Depth (ap) | 1mm                    |
|                    | Coolant    | Wet                    |
|                    | Insert     | CNMG120408-HBM (YB302) |



**200% longer tool life than competitor !**

**Machining situation**



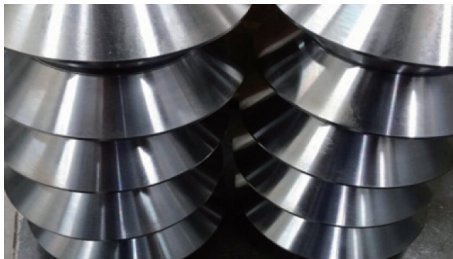
**Work piece**  
 - JIS : S45C  
 - DIN : 1.1191 (C45E)  
 - AISI : 1045

| Work piece         |            | S45C                   |
|--------------------|------------|------------------------|
| Cutting Conditions | Speed (vc) | 94 m/min               |
|                    | Feed (fn)  | 0.25 mm/rev            |
|                    | Depth (ap) | 3mm                    |
|                    | Coolant    | -                      |
|                    | Insert     | CNMG120408-HBM (YB302) |



**140% longer tool life than competitor !**

**Machining situation**



**Work piece**  
 - JIS : S45C  
 - DIN : 1.1191 (C45E)  
 - AISI : 1045

| Work piece         |            | S45C                   |
|--------------------|------------|------------------------|
| Cutting Conditions | Speed (vc) | 250 m/min              |
|                    | Feed (fn)  | 0.23 mm/rev            |
|                    | Depth (ap) | 3mm                    |
|                    | Coolant    | Wet                    |
|                    | Insert     | CNMG120408-HBM (YB302) |



**140% longer tool life than competitor !**

# Turning Insert

## Turning (Out-Side)

|             |                |                    |                    |  |  |  |  |  |  |
|-------------|----------------|--------------------|--------------------|--|--|--|--|--|--|
| <b>CNMG</b> | Continuous     | Minor Intermittent | Heavy Intermittent |  |  |  |  |  |  |
|             | <b>P</b>       | Steel              |                    |  |  |  |  |  |  |
|             | <b>M</b>       | Stainless Steel    |                    |  |  |  |  |  |  |
|             | <b>K</b>       | Cast Iron          |                    |  |  |  |  |  |  |
|             | <b>N</b>       | Non Ferrous        |                    |  |  |  |  |  |  |
| <b>S</b>    | Heat Resistant |                    |                    |  |  |  |  |  |  |

| SHAPE | DESIGNATION           | EDP No.          |       | Grade |  |     |         | Dimension |      |      |      |     |      |
|-------|-----------------------|------------------|-------|-------|--|-----|---------|-----------|------|------|------|-----|------|
|       |                       |                  |       | CVD   |  | PVD | Carbide | l         | D    | S    | r    | ØD1 |      |
|       |                       |                  |       | AB    |  |     |         |           |      |      |      |     |      |
| ISO   | Designation           | Grade Code       | YB302 |       |  |     |         |           |      |      |      |     |      |
|       | <b>CNMG120408-HBM</b> | <b>C01C1A0A1</b> | □ □   | ◎     |  |     |         |           | 12.0 | 12.7 | 4.76 | 0.8 | 5.16 |

\* EDP No of each selected item is a combination of "Designation" & "Grade Code" in EDP No. column.  
For example, EDP No of CNMG120408-HBM YB302 is C01C1A0A1AB.

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ◎ : Will be launched by end of 2014

## Turning (In-Side)

|             |                |                    |                    |  |  |  |  |  |  |
|-------------|----------------|--------------------|--------------------|--|--|--|--|--|--|
| <b>CCMT</b> | Continuous     | Minor Intermittent | Heavy Intermittent |  |  |  |  |  |  |
|             | <b>P</b>       | Steel              |                    |  |  |  |  |  |  |
|             | <b>M</b>       | Stainless Steel    |                    |  |  |  |  |  |  |
|             | <b>K</b>       | Cast Iron          |                    |  |  |  |  |  |  |
|             | <b>N</b>       | Non Ferrous        |                    |  |  |  |  |  |  |
| <b>S</b>    | Heat Resistant |                    |                    |  |  |  |  |  |  |

| SHAPE | DESIGNATION           | EDP No.          |       | Grade |  |     |         | Dimension |     |       |      |     |     |
|-------|-----------------------|------------------|-------|-------|--|-----|---------|-----------|-----|-------|------|-----|-----|
|       |                       |                  |       | CVD   |  | PVD | Carbide | l         | D   | S     | r    | ØD1 |     |
|       |                       |                  |       | AB    |  |     |         |           |     |       |      |     |     |
| ISO   | Designation           | Grade Code       | YB302 |       |  |     |         |           |     |       |      |     |     |
|       | <b>CCMT060204-HBM</b> | <b>C01C2A1A1</b> | □ □   | ◎     |  |     |         |           | 6.0 | 6.35  | 2.38 | 0.4 | 2.8 |
|       | <b>CCMT09T304-HBM</b> | <b>C01C2A2A1</b> | □ □   | ◎     |  |     |         |           | 9.2 | 9.525 | 3.97 | 0.4 | 4.4 |

\* EDP No of each selected item is a combination of "Designation" & "Grade Code" in EDP No. column.  
For example, EDP No of CCMT060204-HBM YB302 is C01C2A1A1AB.

\* Stock situation is subject to change without notice.

\* ● : Stock item ○ : Order made item ◎ : Will be launched by end of 2014



## Recommended cutting conditions

| Designation           | Grade        | Recommended cutting conditions       |          |         |                     |          |         |   |          |         |
|-----------------------|--------------|--------------------------------------|----------|---------|---------------------|----------|---------|---|----------|---------|
|                       |              | Carbon steel, Mild steel             |          |         | General Alloy steel |          |         | High hardened steel, Heat treated steel |          |         |
|                       |              | (SM10C, SM15C, SM25C, SS400, SCM415) |          |         | (SCM430, SCM440)    |          |         | (SNC415, SNCM439, STS12/61)             |          |         |
|                       |              | Under 180HB                          |          |         | 180~260HB           |          |         | 260~350HB                               |          |         |
|                       |              | vc                                   | fn       | Depth   | vc                  | fn       | Depth   | vc                                      | fn       | Depth   |
|                       |              | [m/min]                              | [mm/rev] | [mm]    | [m/min]             | [mm/rev] | [mm]    | [m/min]                                 | [mm/rev] | [mm]    |
| <b>CNMG120408-HBM</b> | <b>YB302</b> | 200~240                              | 0.1~0.5  | 1.0~5.0 | 200~340             | 0.1~0.5  | 1.0~5.0 | 100~160                                 | 0.1~0.5  | 1.0~3.0 |
| <b>CCMT060204-HBM</b> | <b>YB302</b> | 200~340                              | 0.1~0.35 | 0.5~3.0 | 200~340             | 0.1~0.35 | 0.1~1.5 | 100~160                                 | 0.1~0.35 | 1.0~3.0 |
| <b>CCMT09T304-HBM</b> | <b>YB302</b> | 200~340                              | 0.1~0.35 | 1.0~3.0 | 160~220             | 0.1~0.35 | 1.0~3.0 | 100~160                                 | 0.1~0.35 | 1.0~3.0 |

## Comparasion table of Chip Breaker

| YG-1                  | Kyocera | Mitsubishi | Sumitomo | Tungaloy | Iscar | Sandvik  | Kennametal | Seco | Walter | TaeguTec | Korloy |
|-----------------------|---------|------------|----------|----------|-------|----------|------------|------|--------|----------|--------|
| <b>CNMG120408-HBM</b> | GS,PS   | MA         | GU       | DM,TM,ZM | TF    | SM       | MN         | M3   | NM,NM4 | MP       | VM     |
|                       | CS,HS   | MH         | GE       | 32Y      | PP    | PM       | MP         | MR5  | NM5    | MC       | GM     |
|                       | PT      | MV         | UX       | 32,37    |       | MR       |            | MF5  | NM7    | MT       |        |
| <b>CCMT060204-HBM</b> |         | MV         | MU       | 24       | 19    | PR,UR,KM | MF         | F2   | PM2    | MT       | C25    |
| <b>CCMT09T304-HBM</b> | G       | MQ         | SF       |          |       |          |            |      | PM5    |          | HMP    |

# Grade Comparasion

## Milling Grade

| ISO    | YG-1  | Sandvik          | Walter                  | Seco                      | Kennametal      | Mitsubishi                 | Sumitomo | Tungaloy                         | Kyocera                          | Iscar | Valenite | DIJECT           | TaeguTec         | Korloy           |
|--------|-------|------------------|-------------------------|---------------------------|-----------------|----------------------------|----------|----------------------------------|----------------------------------|-------|----------|------------------|------------------|------------------|
| P10-40 | YA702 | GC4220<br>GC4230 | WKP25<br>WAM10<br>WAM20 | MP1500<br>MP2500<br>T250M | KC5525<br>KU25T | VP15TF<br>VP20RT<br>VP30RT | ACP200   | AH725<br>AH730<br>GH330<br>AH120 | PR630<br>PR660<br>PR730<br>PR830 | IC950 | VC935    | JC5015<br>JC5040 | TT7080<br>TT7030 | PC3500<br>PC3600 |
|        | YG702 |                  |                         |                           |                 |                            |          |                                  |                                  |       |          |                  |                  |                  |
|        | YG602 |                  |                         |                           |                 |                            |          |                                  |                                  |       |          |                  |                  |                  |
|        | YA703 |                  |                         |                           |                 |                            |          |                                  |                                  |       |          |                  |                  |                  |

| ISO    | YG-1  | Sandvik          | Walter         | Seco                     | Kennametal | Mitsubishi | Sumitomo | Tungaloy                | Kyocera                           | Iscar          | Valenite       | DIJECT | TaeguTec         | Korloy                     |
|--------|-------|------------------|----------------|--------------------------|------------|------------|----------|-------------------------|-----------------------------------|----------------|----------------|--------|------------------|----------------------------|
| M20-40 | YA702 | GC1030<br>GC2030 | WAM30<br>WXM35 | MH1000<br>MP2500<br>F30M | KC635M     | VC15TF     | ACP300   | T3130<br>AH725<br>AH120 | PR730<br>PR830<br>PR925<br>PR1025 | IC808<br>IC908 | VC928<br>VC902 | JC5015 | TT9080<br>TT8080 | PC5300<br>PC9530<br>NC5330 |
|        | YA703 |                  |                |                          |            |            |          |                         |                                   |                |                |        |                  |                            |
|        | YG602 |                  |                |                          |            |            |          |                         |                                   |                |                |        |                  |                            |
|        |       |                  |                |                          |            |            |          |                         |                                   |                |                |        |                  |                            |

| ISO    | YG-1  | Sandvik  | Walter                  | Seco                       | Kennametal                | Mitsubishi                | Sumitomo         | Tungaloy                | Kyocera                 | Iscar                    | Valenite     | DIJECT                   | TaeguTec         | Korloy                     |
|--------|-------|--|-------------------------|----------------------------|---------------------------|---------------------------|------------------|-------------------------|-------------------------|--------------------------|--------------|--------------------------|------------------|----------------------------|
| K05-30 | YG501 | GC1020<br>GC3020<br>GC3220<br>GC4230<br>GC3040 | WAK15<br>WKK25<br>WKP35 | MK1500<br>MK2000<br>MK3000 | KC915M<br>KCK15<br>KC520M | MC5020<br>VP15TF<br>F5010 | ACK200<br>ACK300 | T1115<br>AH120<br>GH110 | PR905<br>PR510<br>PR610 | IC5100<br>IC810<br>IC910 | VN5<br>VC928 | JC600<br>JC610<br>JC5080 | TT6800<br>TT6080 | PC8110<br>PC6510<br>PC5300 |
|        | YA102 |  |                         |                            |                           |                           |                  |                         |                         |                          |              |                          |                  |                            |
|        | YG602 |  |                         |                            |                           |                           |                  |                         |                         |                          |              |                          |                  |                            |
|        | YA503 |  |                         |                            |                           |                           |                  |                         |                         |                          |              |                          |                  |                            |
|        |       |  |                         |                            |                           |                           |                  |                         |                         |                          |              |                          |                  |                            |
|        |       |  |                         |                            |                           |                           |                  |                         |                         |                          |              |                          |                  |                            |

## Turning Grade

| ISO    | YG-1  | Sandvik          | Walte           | Seco             | Kennametal | Mitsubishi | Sumitomo         | Tungaloy       | Kyocera          | Iscar            | Valenite | DIJECT | TaeguTec         | Korloy           |
|--------|-------|------------------|-----------------|------------------|------------|------------|------------------|----------------|------------------|------------------|----------|--------|------------------|------------------|
| P20-30 | YB302 | GC4225<br>GC4025 | WPP20S<br>WPP20 | TP2500<br>TP2000 | KCP25      | UE6020     | AC820P<br>AC830P | T9125<br>T9135 | CA5525<br>CA5535 | IC8250<br>IC9250 | VP5525   | JC215V | TT8125<br>TT8135 | NC3220<br>NC3120 |
|        |       |                  |                 |                  |            |            |                  |                |                  |                  |          |        |                  |                  |

## DAMAGE OF INSERT & COUNTER MEASURE

|   | Cause of Damage   | Counter action   |
|---|---|--|
|  <p><b>Flank wear</b></p>            | <ol style="list-style-type: none"> <li>1. In-appropriate feed rate</li> <li>2. Cutting speed is too high</li> <li>3. Carbide grade with insufficient hardness</li> </ol>  | <ol style="list-style-type: none"> <li>1. Adjust feed rate according to speed and depth</li> <li>2. Reduce cutting speed</li> <li>3. Use harder carbide grade</li> </ol>   |
|  <p><b>Chipping</b></p>              | <ol style="list-style-type: none"> <li>1. Too high feed rate</li> <li>2. Too low cutting speed</li> <li>3. Vibration of holder &amp; machine</li> <li>4. Too much sharp cutting edge</li> <li>5. In-appropriate harder grade</li> </ol> | <ol style="list-style-type: none"> <li>1. Reduce feed rate</li> <li>2. Improve the cutting speed</li> <li>3. Reduce the holder overhang &amp; improve the rigidity of machine and work piece</li> <li>4. Change the sharpness of the insert</li> <li>5. Use tougher carbide grade</li> </ol> |
|  <p><b>Thermal crack</b></p>         | <ol style="list-style-type: none"> <li>1. Cooling system trouble</li> <li>2. Too high cutting speed</li> <li>3. Too big temperature gap of cutting edge (thermal shock)</li> </ol>  | <ol style="list-style-type: none"> <li>1. Check cooling system, supply enough coolant or use dry milling</li> <li>2. Reduce cutting speed</li> <li>3. Choose thermal shock resistant grade</li> </ol>  |
|  <p><b>Built-up edge</b></p>       | <ol style="list-style-type: none"> <li>1. Too low cutting speed</li> <li>2. Insufficient coolant</li> <li>3. When machine sticky material</li> <li>4. Not enough rake angle</li> </ol>  | <ol style="list-style-type: none"> <li>1. Increase cutting speed</li> <li>2. Supply enough coolant</li> <li>3. Choose coated grade (CVD, PVD)</li> <li>4. Choose high rake angle</li> </ol>  |
|  <p><b>Notching</b></p>            | <ol style="list-style-type: none"> <li>1. Grade having in-sufficient hardness</li> <li>2. Work hardening of workpiece surface area</li> <li>3. Burrs of workpiece</li> </ol>  | <ol style="list-style-type: none"> <li>1. Choose harder grade</li> <li>2. Change the cutting condition (feed &amp; depth)</li> <li>3. Reduce cutting speed</li> </ol>  |
|  <p><b>Fracture</b></p>            | <ol style="list-style-type: none"> <li>1. Too high cutting pressure on the cutting edge area</li> <li>2. Insufficient strength of the grade</li> <li>3. Too small corner angle</li> <li>4. Too big cutting force fluctuation</li> </ol> | <ol style="list-style-type: none"> <li>1. Choose tougher grade</li> <li>2. Reduce feed rate and depth of cut</li> <li>3. Choose the insert having bigger corner angle or bigger corner radius</li> <li>4. Apply negative land on edge</li> </ol>   |
|  <p><b>Cratering</b></p>           | <ol style="list-style-type: none"> <li>1. Grade having in-sufficient thermal-wear resistance</li> <li>2. In-sufficient coolant supply</li> <li>3. Too high cutting speed and feed rate</li> </ol>                                       | <ol style="list-style-type: none"> <li>1. Choose harder grade having high thermal wear resistant</li> <li>2. Supply enough coolant</li> <li>3. Reduce cutting speed and feed rate</li> </ol>   |
|  <p><b>Plastic deformation</b></p> | <ol style="list-style-type: none"> <li>1. Carbide grade with in-sufficient hardness</li> <li>2. Too high cutting speed</li> <li>3. Too high temperature on the cutting edge</li> <li>4. Too high stress on the cutting edge</li> </ol>  | <ol style="list-style-type: none"> <li>1. Choose harder grade</li> <li>2. Reduce cutting speed</li> <li>3. Supply enough coolant</li> <li>4. Choose inser having bigger corner radius</li> </ol>   |

## TROUBLE SHOOTING

| Trouble                                  | Cause                           | Counter measure    |               |                                 |                    |           |              |         |
|--|---------------------------------|--------------------|---------------|---------------------------------|--------------------|-----------|--------------|---------|
|  |                                 | Selection of grade |               |                                 | Cutting conditions |           |              |         |
|  |                                 | Harder grade       | Tougher grade | Better Anti Built-up edge grade | Cutting speed      | Feed rate | Depth of cut | Coolant |
| Heat                                     | Inappropriate cutting condition |                    |               |                                 | ↓                  | ↓         | ↓            |         |
|  | Inappropriate insert shape      | ●                  |               |                                 |                    |           |              |         |
| Poor tolerance                           | Inappropriate insert tolerance  |                    |               |                                 |                    |           |              |         |
|  | Move of workpiece or insert     |                    |               |                                 |                    |           |              |         |
| Poor surface quality of machined surface | Premature insert wear           | ●                  |               | ●                               | ↓                  |           |              | ●       |
|  | Chipping of cutting edge        |                    | ●             |                                 |                    | ↓         | ↓            |         |
|  | Built up edge                   |                    |               | ●                               | ↑                  | ↑         |              | ●       |
|  | Inappropriate cutting condition |                    |               |                                 | ↑                  | ↓         | ↓            | ●       |
|  | Inappropriate insert shape      |                    |               |                                 |                    |           |              |         |
|  | Chatter                         |                    | ●             |                                 |                    | ↓         | ↓            | ↓       |
| Change of cutting edge line              | Premature flank wear            | ●                  |               |                                 |                    |           |              |         |
|  | Inappropriate cutting condition |                    |               |                                 | ↓                  | ↑         |              |         |
| Burr, Chipping (Steel, Aluminum)         | Inappropriate cutting condition |                    |               |                                 | ↓                  | ↑         |              | ●       |
|  | Inappropriate insert shape      | ●                  |               | ⊙                               |                    |           |              |         |
| Chipping of work piece (Cast Iron)       | Inappropriate cutting condition |                    |               |                                 |                    | ↓         | ↓            |         |
|  | Inappropriate insert shape      | ●                  |               |                                 |                    |           |              |         |
| Burr (Mild steel)                        | Inappropriate cutting condition |                    |               |                                 | ↑                  | ↓         |              | ●       |
|  | Inappropriate insert shape      | ●                  |               | ⊙                               |                    |           |              |         |

| Trouble                                  | Cause                           | Designation change  |            |        |                       |                                    |                 |                             |                     |             |
|--|---------------------------------|---------------------|------------|--------|-----------------------|------------------------------------|-----------------|-----------------------------|---------------------|-------------|
|  |                                 | Designation change  |            |        |                       |                                    |                 | Machine                     |                     |             |
|  |                                 | Change chip breaker | Rake angle | Nose R | Cutting edge strength | Change to tighter tolerance insert | Holder Strength | Clamping of insert & holder | Over hang of holder | Horse power |
| Heat                                     | Inappropriate cutting condition |                     |            |        |                       |                                    |                 |                             |                     |             |
|  | Inappropriate insert shape      | ●                   | ↑          |        | ↓                     |                                    |                 |                             |                     |             |
| Poor tolerance                           | Inappropriate insert tolerance  |                     |            |        |                       | ●                                  |                 |                             |                     |             |
|  | Move of workpiece or insert     | ●                   | ↑          | ↓      |                       |                                    | ●               | ●                           | ●                   | ●           |
| Poor surface quality of machined surface | Premature insert wear           | ●                   | ↑          | ↑      | ↓                     | ●                                  |                 |                             |                     |             |
|  | Chipping of cutting edge        | ●                   |            | ↑      | ↑                     |                                    |                 | ●                           | ●                   | ●           |
|  | Built up edge                   | ●                   | ↑          |        | ↓                     | ●                                  |                 |                             |                     |             |
|  | Inappropriate cutting condition |                     |            |        |                       |                                    |                 |                             |                     |             |
|  | Inappropriate insert shape      | ●                   |            | ↑      | ↓                     | ●                                  |                 |                             |                     |             |
|  | Chatter                         | ●                   | ↑          | ↓      | ↓                     |                                    | ●               | ●                           | ●                   | ●           |
| Change of cutting edge line              | Premature flank wear            |                     |            | ↑      |                       |                                    |                 |                             |                     |             |
|  | Inappropriate cutting condition |                     |            |        |                       |                                    |                 |                             |                     |             |
| Burr, Chipping (Steel, Aluminum)         | Inappropriate cutting condition |                     |            |        |                       |                                    |                 |                             |                     |             |
|  | Inappropriate insert shape      | ●                   | ↑          | ↓      | ↓                     |                                    |                 |                             |                     |             |
| Chipping of work piece (Cast Iron)       | Inappropriate cutting condition |                     |            |        |                       |                                    |                 |                             |                     |             |
|  | Inappropriate insert shape      | ●                   | ↑          | ↑      | ↓                     |                                    | ●               | ●                           | ●                   | ●           |
| Burr (Mild steel)                        | Inappropriate cutting condition |                     |            |        |                       |                                    |                 |                             |                     |             |
|  | Inappropriate insert shape      | ●                   | ↑          |        | ↓                     |                                    |                 |                             |                     |             |

## FORMULAE FOR CALCULATION OF CUTTING PARAMETERS

### Cutting speed (Vc) [m/min]

$$V_c = \frac{d \cdot \pi \cdot n}{1000} \text{ [m/min]}$$

### Revolutions per minute (n) [rev./min]

$$n = \frac{V_c \cdot 1000}{d \cdot \pi} \text{ [rev./min]}$$

### Feed rate (Vf)[rev./min]

$$V_f = f \cdot n \text{ [rev./min]}$$

### Feed per tooth[mm]

$$f_z = \frac{V_f}{n \cdot z} \text{ [mm]}$$

### Feed per revolution[mm]

$$V_f = f \cdot n \text{ [mm]}$$

### Metal removal rate[cm<sup>3</sup>/min]

$$Q = \frac{a_p a_e v_f}{1000} \text{ [cm}^3/\text{min]}$$

### Power consumption[kW]

$$h_m = \frac{a_p a_e v_f}{60 \cdot 10^6 \cdot \eta_m} \cdot k_c$$

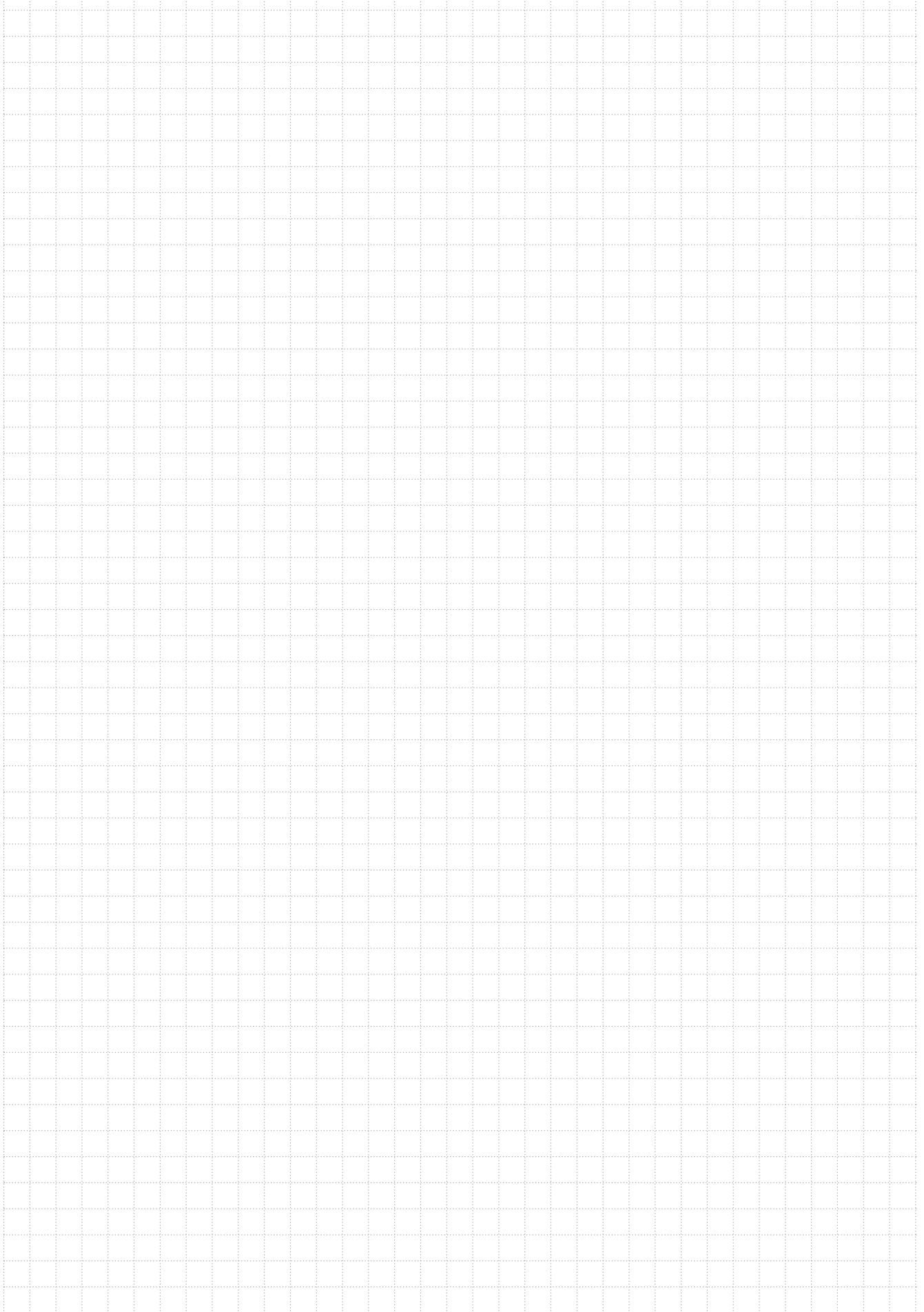
### Material designations & dimensions

|       |  |
|-------|--|
| ae    | Cutting width [mm]   |
| ap    | Depth of cut [mm]  |
| d1    | Cutter diameter [mm]   |
| Dw    | Work piece diameter [mm]                                       |
| fz    | Feed per tooth   |
| hm    | Medium chip thickness  |
| k     | Number of insert rows  |
| kc    | Specific cutting force [N/mm <sup>2</sup> ]                    |
| kc1.1 | Specific cutting force for 1mm <sup>2</sup> chip cross section |
| l1    | Length of wiper facet [mm]                                     |
| mc    | Increase of specific cutting force                             |
| n     | Revolutions of spindle [min <sup>-1</sup> ]                    |
| Pmot  | Power consumption [kW]   |
| Q     | Mechanical efficiency [%]                                      |
| Vc    | Cutting speed [m/min]  |
| Vf    | Feed rate [mm/min]   |
| z     | Effective number of edges [pcs.]                               |
| ηm    | Mechanical efficiency [%]                                      |
| Y0    | Perpendicular rake angle (effective rake angle) [°]            |
| Yf    | Lateral rake angle (radial rake angle) [°]                     |
| Yp    | Tool back clearance (axial rake angle) [°]                     |
| Yw    | Rake angle of the insert [°]                                   |
| k     | Cutting edge angle [°]   |
| λs    | Inclination angle [°]  |
| a     | Clearance angle [°]  |
| a1    | Clearance angle of the corner facet [°]                        |

## CLASSIFICATION OF WORK PIECE MATERIALS

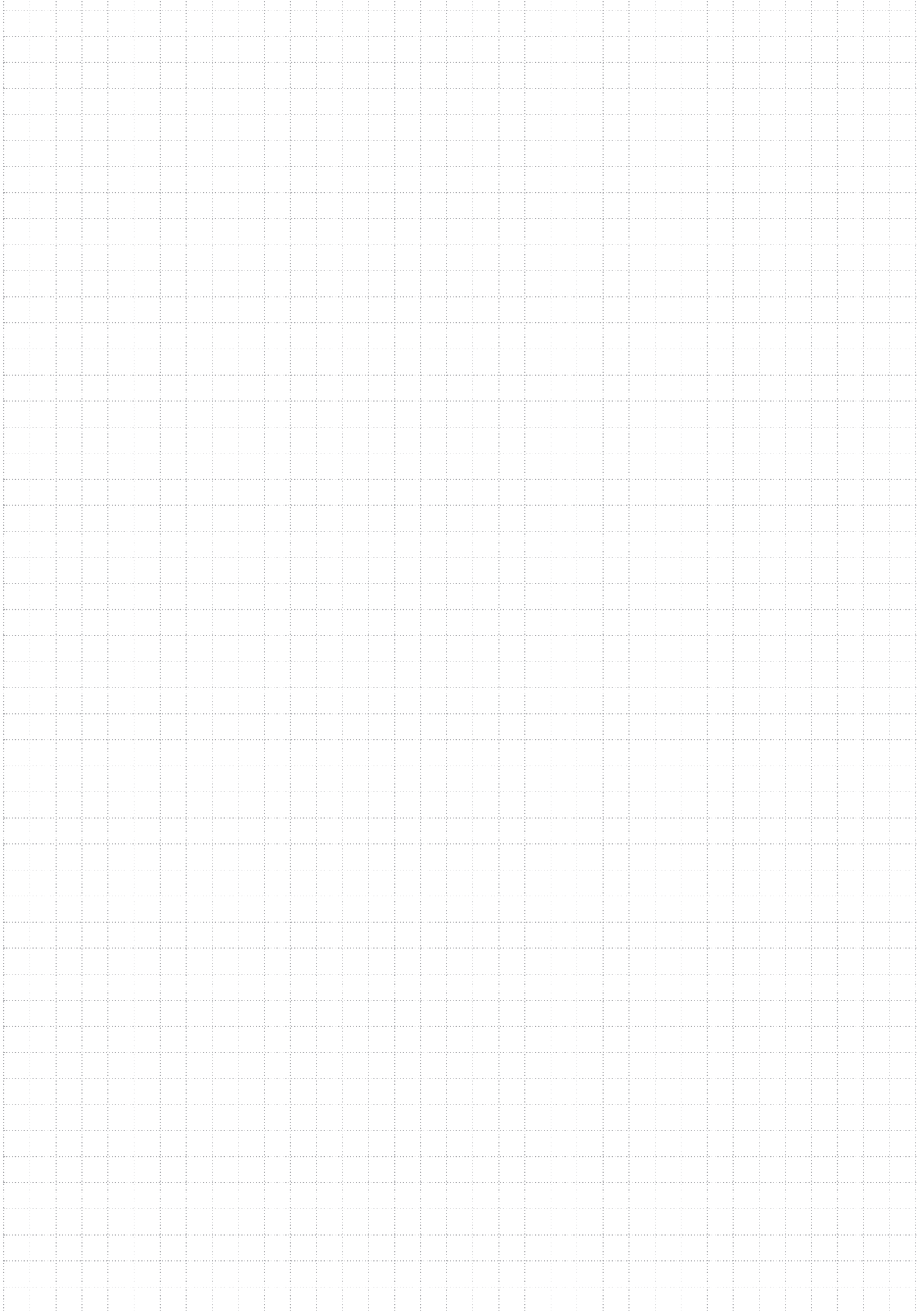
|          |   |
|----------|---|
| <b>P</b> | <p>Carbon steels (non alloyed)<br/>           Carbon cast steels<br/>           Carbon tool steels<br/>           Low-alloyed steels<br/>           Low and medium alloyed steels<br/>           Alloyed tool steels<br/>           Ferritic and martensitic corrosion-resistant steels<br/>           ASTM A176-74 and cast steels</p> |
| <b>M</b> | <p>Austenitic and ferritic-austenitic corrosion-resistant<br/>           Heat-resistant and Creep-resistant steels<br/>           Non-magnetic and abrasive-resistant steels</p>  |
| <b>K</b> | <p>Grey cast iron (non-alloyed &amp; alloyed)<br/>           Nodular cast iron<br/>           Malleable cast iron</p>   |
| <b>N</b> | <p>Non-ferrous metals<br/>           Aluminum alloys<br/>           Copper alloys</p>   |
| <b>S</b> | <p>Special creep-resistant Ni, Co, Fe and Ti based alloys<br/>           NIMONIC 80A-ASTM A637<br/>           INCOLOY 800HT-UNS No 8811<br/>           INCONEL 617-No 6617</p>  |
| <b>H</b> | <p>Heat-treated steels with hardness 48-60 HRC<br/>           Hardened steels HRC48-60<br/>           Hardened ingot-mould iron<br/>           Heat resistance supper alloy</p>   |

# MEMO





# MEMO



# MEMO

