HUAREAL
Efficient
Cutting tools

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2024-2025 Catalogue HUAREAL

HUAREAL

2024-2025|
HUAREAL CUTTING TOOLS
# CATALOGUE

TURNING MILLING DRILLING

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# Introduction

■This catalogue presents Huareal's major cutting products as of October 2023.

■This catalogue mainly introduces turning tools, milling tools and drilling tools. Wherein:
Turning tools include general turning, Turning of small components，parting and grooving tool and threading tool;
Milling tools include indexable milling tool and solid carbide end mill;
Drilling tools include indexable short hole drills and solid carbide drill.

■Products in this catalogue may be attached with the following symbols:
Indexable inserts: ★ Recommended grade ☆ Available grade
Indexable cutting tools: ▲Standing inventory △Make-to-order
Solid carbide cutting tool: ●Standing inventory ○ Make-to-order
Application: ☀Fit well ☼ Applicable

■Product dimensions
The basic dimensions of products in this catalogue are marked according to the ISO13399 Standard, and the specific symbols and corresponding definitions are following attached. According to the ISO13399 Standard, customers can input cutting tool information into PLM, CAD, CAM, CNC, etc. without replacing data from different companies.
Huareal is actively engaged in providing "cutting tool data" based on the ISO13399 Standard.

## Overview of dimension codes according to ISO13399 Standard

| Parameter | Definition | | Parameter | Definition |
|---|---|---|---|---|
| ADJLN | Minimum adjustment limit | | CICTE | Cutting item count - limit position |
| ADJLX | Maximum adjustment limit | | CICTP | Cutting item count - peripheral position |
| ADJRG | Adjustment range | | CICTS | Cutting item count - side position |
| ALP | Clearance angle axial | | CICTSP | Cutting item count - cutter bar protection insert |
| AN | Clearance angle major | | CICTT | Cutting item count - total amount |
| ANN | Clearance angle minor | | CND | Coolant entry diameter |
| APMX | Depth of cut maximum | | CNSC | Coolant entry style code |
| APMX_EFW | Depth of cut maximum in feed direction end | | CNT | Coolant entry thread size |
| APMX_FFW | Depth of cut maximum in feed direction side | | COATING | Coating |
| AZ | Maximum plunge depth | | CP | Maximum coolant pressure |
| B | Shank width | | CRKS | Connection retention knob thread size |
| BAWS | Body angle workpiece side | | CRNT | Coolant radial entry thread size |
| BAMS | Body angle machine side | | CTPT | Operation type |
| BBD | Balanced by design | | CUTDIA | Workpiece parting diameter maximum |
| BBR | Balanced by rotational test | | CW | Cutting width |
| BCH | Corner chamfer length | | CWN | Minimum cutting width |
| BD | Body diameter | | CWTOLL | Insert width lower tolerance |
| BHTA | Body half taper angle | | CWTOLU | Insert width upper tolerance |
| BN | Face land width | | CWX | Cutting width maximum |
| BS | Wiper edge length | | CXSC | Coolant exit style code |
| BSG | Basic standard group | | CZC | Connection size code |
| BSR | Wiper edge radius | | CZCMS | Connection size code machine side |
| CDX | Cutting depth maximum | | CZCWS | Connection size code workpiece side |
| CEMR | Cutting edge main radius | | D1 | Fixing hole diameter |
| CF | Spot chamfer | | DAH | Diameter access hole |
| CHBA | Chamfer body angle | | DAXIN | Axial groove inside diameter minimum |
| CHBL | Chamfer body length | | DAXN | Face groove outside diameter minimum |
| CHW | Corner chamfer width | | DAXX | Axial groove outside diameter maximum |
| CICT | Cutting item count | | DBC | Diameter bolt circle |
| CICTBALL | Cutting item count - ball nose insert | | DC | Cutting diameter |
| DCB | Connection bore diameter | | KRINS | Major cutting edge angle |
| DCBN | Connection bore diameter minimum | | KWW | Keyway width |
| DCBX | Connection bore diameter maximum | | L | Cutting edge length |
| DCF | Cutting diameter face contact | | LAMS | Inclination angle |
| DCIN | Cutting inside diameter | | LB | Body length |
| DCN | Cutting diameter minimum | | LCF | Length chip flute |
| DCON | Connection diameter | | LCOX | Cut off length maximum |
| DCONMS | Connection diameter machine side | | LE | Cutting edge effective length |
| DCONWS | Connection diameter workpiece side | | LF | Functional length |
| DCONNWS | Interface diameter minimum workpiece side | | LFN | Functional length minimum |

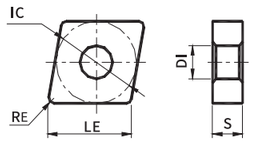
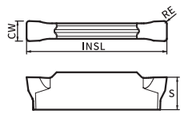
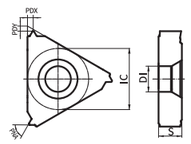
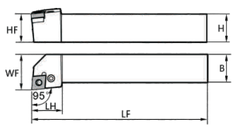
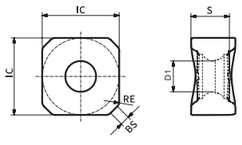
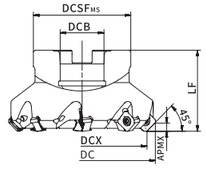
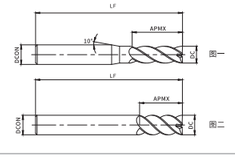
## Overview of dimension codes according to ISO13399 Standard

| Parameter | Definition | | Parameter | Definition |
|---|---|---|---|---|
| DCONXWS | Connection diameter maximum workpiece side | | LH | Cutting head length |
| DCPS | Data chip provision size | | LPR | Protruding length |
| DCSFMS | Contact surface diameter machine side | | LS | Shank length |
| DCSFWS | Contact surface diameter workpiece side | | LSC | Clamping length |
| DCX | Cutting diameter maximum | | LSCN | Clamping length minimum |
| DHUB | Hub diameter | | LSCS | Distance to clamping starting point |
| DIX | Tool changer interference diameter maximum | | LSCX | Clamping length maximum |
| DMIN | Minimum bore diameter | | LSD | Dead shank length |
| DMM | Shank diameter | | LU | Usable length (max. recommended) |
| DN | Neck diameter | | LU_BFW | Usable length - back face milling |
| DRVCT | Number of drives | | LUX | Usable length maximum |
| DSGN | Design | | MHD | Mounting hole distance |
| EPSR | Insert inclined angle | | MIID | Master insert identification |
| FHA | Flute helix angle | | MIIDE | Master insert identification - limit position |
| FLGT | Flange thickness | | MIIDS | Master insert identification - side position |
| FTDZ | Thread diameter size | | MIIDC | Master insert identification - central position |
| GB | Face land angle | | MIIDP | Master insert identification - peripheral position |
| H | Shank height | | MIIDI | Master insert identification - in-between position |
| HA | Theoretical thread height | | MMCC | Code for preset torque |
| HB | Thread height difference | | MMCX | Max.cutting torque |
| HBH | Head bottom offset height | | NOF | Flute count |
| HC | Thread height actual | | NT | Tooth count |
| HF | Functional height | | OAH | Overall height |
| HRY | Lowest point from reference plain | | OAL | Overall length |
| HTB | Body height | | OAW | Overall width |
| HTH | Height | | OH | Overhang recommended |
| IC | Inscribed circle diameter | | OHN | Overhang minimum |
| INSL | Insert length | | OHX | Overhang maximum |
| INSUC | Insert usage code | | ORDCODE | Ordercode |
| IZC | Insert size code | | PCL | Peripheral cylindrical length |
| KAPR | Tool cutting edge angle | | PDX | Profile distance ex |
| KAPR_EFW | Tool cutting edge angle - end feed | | PDY | Profile distance ey |
| KCH | Corner chamfer | | PHD | Premachined hole diameter |
| PHDX | Premachined hole diameter maximum | | TCT | Tolerance class tool |
| PL | Point length | | TCTR | Thread tolerance class |
| PNA | Profile included angle | | TD | Thread diameter |
| PRFRAD | Profile radius | | TDZ | Thread diameter size |
| PRSPC | Profile specification | | TFLA | Tap floating length ahead |
| PSIR | Tool lead angle | | TFLB | Tap floating length behind |
| PSIRL | Cutting edge angle major left hand | | TG | Tap gradient |

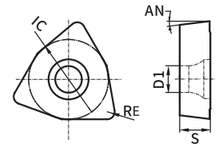
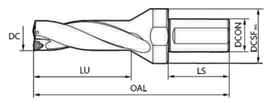
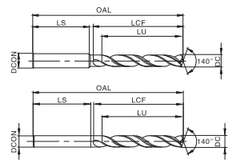
## Overview of dimension codes according to ISO13399 Standard

| Parameter | Definition | | Parameter | Definition |
|---|---|---|---|---|
| PSIRR | Cutting edge angle major right hand | | THBTP | Thread back taper characteristics |
| PSW | Premachined groove width | | THCA | Thread spiral correction angle |
| RADH | Radial body height | | THCHT | Threading chamfer type |
| RADW | Radial body width | | THFT | Thread form |
| RAR | Clearance angle right hand | | THFTS | Standard series thread profile |
| RE | Corner fillet radius | | THL | Thread length |
| REEQ | Corner fillet radius equivalence | | THUB | Hub thickness |
| REL | Corner fillet radius left hand | | TP | Thread pitch |
| RER | Corner fillet radius right hand | | TPI | Threads per inch |
| RETOLL | Corner radius lower tolerance | | TPIN | Threads per inch minimum |
| RETOLU | Corner radius upper tolerance | | TPIX | Threads per inch maximum |
| RGL | Regrind length | | TPN | Thread pitch minimum |
| RMPX | Ramping angle maximum | | TPT | Thread profile type |
| RPMX | Rotational speed maximum | | TPX | Thread pitch maximum |
| S | Insert thickness | | TRMAX | Tap range maximum |
| SDL | Step diameter length | | TQ | Torque |
| SIG | Corner angle | | TSYC | Tool style code |
| SPTL | Parting line | | TTP | Thread type |
| SSC | Insert seat model | | ULDR | Diameter ratio of machinable length |
| SSCE | Insert seat size code - limit position | | VCX | Cutting speed maximum |
| SSCP | Insert seat size code - peripheral position | | W1 | Insert width |
| SSCS | Insert seat size code - side position | | WB | Body width |
| STA | Step inclined angle | | WF | Functional width |
| STDNO | Standard Number | | WFCIRP | Width to reference point of cutting parts |
| SUBSTRATE | Tool substrate | | WSC | Clamping width |
| TCDC | Tolerance class cutting diameter | | WT | Weight |
| TCDCON | Interface diameter tolerance | | ZADJ | Adjustable insert count |
| TCDMM | Shank diameter tolerance | | ZEFF | Face effective cutting edge count |
| TCHA | Achievable hole tolerance | | ZEFP | Peripheral effective cutting edge count (ZEFP) |
| TCHAL | Achievable hole lower tolerance | | ZWX | Number of wiper edge inserts maximum |
| TCHAU | Achievable hole upper tolerance | | | |

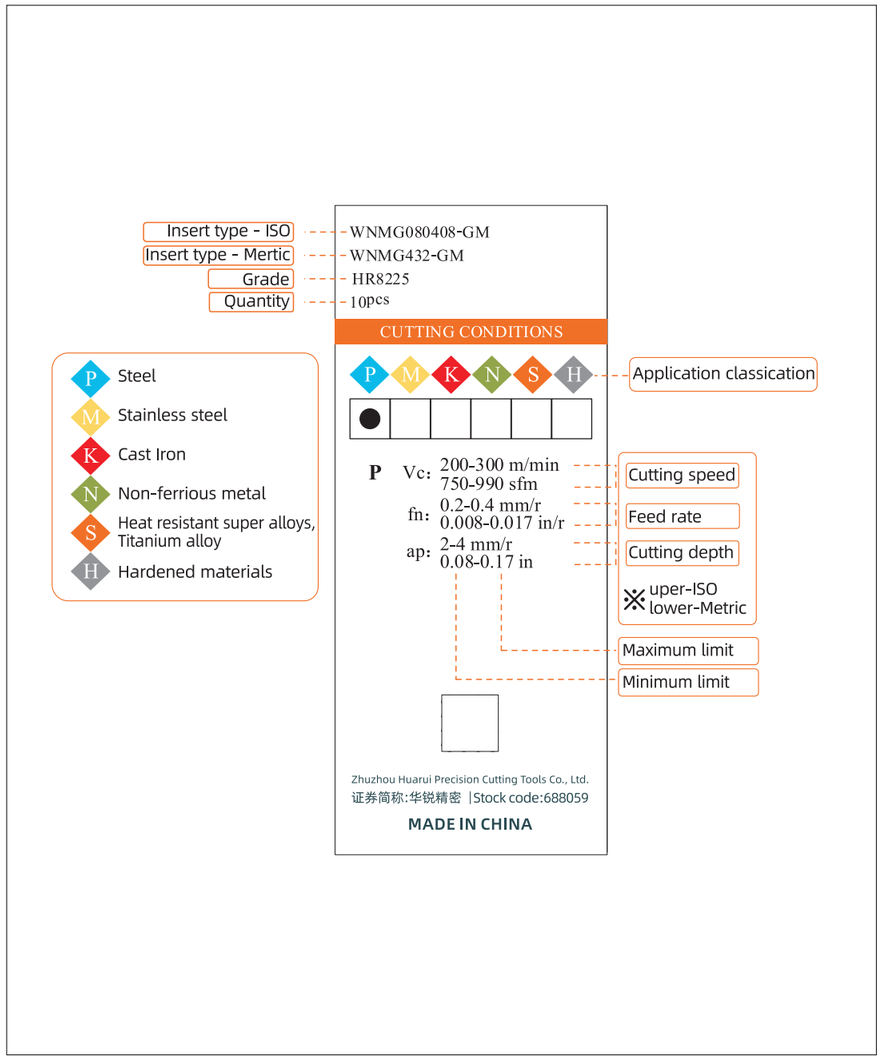
## Examples of basic dimension according to ISO13399 Standard

| Tool type | Basic size marking form | Code | Definition |
|---|---|---|---|
| Turning insert |  | IC | Inscribed circle diameter |
| | | LE | Cutting edge length |
| | | S | Insert thickness |
| | | D1 | Insert hole diameter |
| | | RE | Corner radius |
| Parting and grooving insert |  | INSL | Insert length |
| | | CW | Insert width |
| | | S | Insert thickness |
| | | RE | Corner radius |
| Thread insert |  | IC | Inscribed circle diameter |
| | | PDX | Profile distance ex |
| | | PDY | Profile distance ey |
| | | S | Insert thickness |
| | | DI | Insert hole diameter |
| | | PNA | Angle profile |
| Turning tool |  | H | Shank height |
| | | B | Shank width |
| | | LF | Overall length |
| | | LH | Cutting head length |
| | | HF | Functional height |
| | | WF | Functional width |
| Indexable milling insert |  | IC | Inscribed circle diameter |
| | | S | Insert thickness |
| | | D1 | Insert hole diameter |
| | | BS | Wiper edge length |
| | | RE | Corner radius |
| Indexable milling tool |  | DC | Cutting diameter |
| | | DCB | Bolt diameter |
| | | DCX | Cutting diameter maximum |
| | | DCSFMS | Contact surface diameter machine side |
| | | LF | Overall length |
| | | APMX | Cutting depth maximum |
| Solid carbide end mill |  | DC | Cutting diameter |
| | | DCON | Shank connection diameter |
| | | LF | Overall length |
| | | APMX | Cutting depth maximum |
| | | ZEFP | Peripheral effective cutting edge count |

## Examples of basic dimension according to ISO13399 Standard

| Tool type | Basic size marking form | Code | Definition |
|---|---|---|---|
| Short hole drilling insert |  | IC | Inscribed circle diameter |
| | | D1 | Insert hole diameter |
| | | S | Insert thickness |
| | | RE | Corner radius |
| | | AN | Clearance angle major |
| Short hole drilling tool |  | DC | Cutting diameter |
| | | DCON | Shank connection diameter |
| | | DCSFMS | Connection diameter machine side |
| | | LS | Shank length |
| | | LU | Usable length |
| | | OAL | Overall length |
| Solid carbide drill |  | DC | Cutting diameter |
| | | DCON | Shank connection diameter |
| | | OAL | Overall length |
| | | LCF | Length chip flute |
| | | LS | Shank length |
| | | LU | Usable length |

## Sticker Sample



# Selection guidance of general turning insert

## Description of turning insert overview

i According to the order of shape:

C - type → D - type → S - type → T - type → V - type → W - type → R - type

ii According to the order of clearance angle:

Negative insert

Positive insert

iii According to the processing method:

Finishing → Medium → Roughing → Heavy machining

**Workpiece materials:**

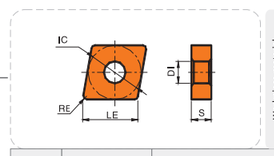
- Steel
- Stainless steel
- Cast iron
- Non-ferrous metal
- Heat resistant super alloys Titanium alloy

## Instructions for insert specifications and models

Cutting condition:
Stable : continuously stable cutting
Average : for general cutting
Tough : Heavy interrupted or unstable condition

**Insert shape, angle**

**80° CN□□**




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material:
- P Steel
- M Stainless steel
- K Cast iron
- N Non-ferrous metal
- S Heat resistant super alloys Titanium alloy

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | PVD | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8115 | HR8125 | HR8225 | HR6115 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HRK10 | HRK20 | HRC10 | HRC20 |
| Finishing | | CNMG120404-GF | 12.9 | 12.7 | 4.76 | 5.16 | 0.4 | ★ | ☆ | ★ | | | | | | | | | | |
| | | CNMG120408-GF | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | ★ | ☆ | ★ | | | | | | | | | | |
| Finishing | | CNMG120404-BF | 12.9 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | ☆ | ★ | | | | | |
| | | CNMG120408-BF | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | ☆ | ★ | | | | | |
| Semi-finishing | | CNMG120404-GM | 12.9 | 12.7 | 4.76 | 5.16 | 0.4 | ★ | ☆ | ★ | | | | | | | | | | |
| | | CNMG120408-GM | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | ★ | ☆ | ★ | | | | | | | | | | |
| | | CNMG120412-GM | 12.9 | 12.7 | 4.76 | 5.16 | 1.2 | ★ | ☆ | ★ | | | | | | | | | | |
| | | CNMG160608-GM | 16.1 | 15.875 | 6.35 | 6.35 | 0.8 | ★ | ☆ | ★ | | | | | | | | | | |
| | | CNMG160612-GM | 16.1 | 15.875 | 6.35 | 6.35 | 1.2 | ★ | ☆ | ★ | | | | | | | | | | |
| | | CNMG160616-GM | 16.1 | 15.875 | 6.35 | 6.35 | 1.6 | ★ | ☆ | ★ | | | | | | | | | | |
| Semi-finishing | | CNMG120404-BM | 12.9 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | ☆ | ★ | | | | | |
| | | CNMG120408-BM | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | ☆ | ★ | | | | | |
| | | CNMG120412-BM | 12.9 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | | ☆ | ★ | | | | | |

★ Recommended grade ☆ Available grade

Dimensioned structure drawing of inserts with marking
LE: Length of cutting edge
IC: Inscribed circle
S: Thickness
DI: Hole diameter
RE: Nose radius

Insert machining type: Finishing,medium, roughing and heavy machining

Grade

Insert shape | Description | Dimension | Inventory | Grade infomation

# Turning

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## Grade code key

HR 8 2 25

① ② ③ ④

### ①Grade code

### ②Classification codes

| Number | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|
| Classification of workpiece materials | General | Cast iron | Stainless steel | Steel | High-temp alloy |

### ③Number of grades in the same group

1-1st generation

2-2nd generation

3-3rd generation

### ④ISO material classification number

| | |
|---|---|
| 05 | 10 |
| 15 | 20 |
| 25 | 30 |
| 35 | 40 |

## Overview of general turning grades

| Type | Workpiece material | ISO | CVD coating | | | | | | PVD coating | | | | | | | Cemented carbide | | Cermet | | ISO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR1115C | |
| P | Unalloyedsteel/Alloyed steel | P01 | HR8105 | | | | | | | | | | | | | | | | | P01 |
| | | P05 | | | | | | | | | | | | | | | | HRC10 | HR1115C | P05 |
| | | P10 | | HR8115 | | | | | HR1135 | | | | | | | | | | | P10 |
| | | P15 | | | HR8125 | HR8225 | | | | | | HR7125 | HR7225 | HR5125 | HR5225 | | | | | P15 |
| | | P20 | | | | | | | | | | | | | | | | | | P20 |
| | | P25 | | | | | HR8135 | | | | | | | | | | | | | P25 |
| | | P30 | | | | | | | | | | | | | | | | | | P30 |
| | | P35 | | | | | | | | | | | | | | | | | | P35 |
| | | P40 | | | | | | | | | | | | | | | | | | P40 |
| | | P45 | | | | | | | | | | | | | | | | | | P45 |
| | | P50 | | | | | | | | | | | | | | | | | | P50 |
| M | Stainless steel | M05 | | | | | | | | | HR7115 | | | | | | | | | M05 |
| | | M10 | | | | | | | HR1135 | | | | | HR5125 | HR5225 | | | | | M10 |
| | | M15 | | | | | | | | | | HR7125 | HR7225 | | | | | | | M15 |
| | | M20 | | | | | | | | | | | | | | | | | | M20 |
| | | M25 | | | | | | | | | | | | | | | | | | M25 |
| | | M30 | | | | | | | | | | | | | | | | | | M30 |
| | | M35 | | | | | | | | | | | | | | | | | | M35 |
| | | M40 | | | | | | | | | | | | | | | | | | M40 |
| | | M45 | | | | | | | | | | | | | | | | | | M45 |
| K | Cast iron | K01 | | | | | | | | | | | | | | | | | | K01 |
| | | K05 | | | | | | | | | | | | | | | | | HR1115C | K05 |
| | | K10 | | | | | | HR6115 | | | | | | | | | | | | K10 |
| | | K15 | | | | | | | | | | | | | | | | | | K15 |
| | | K20 | | | | | | | | | | | | | | | | | | K20 |
| | | K25 | | | | | | | | | | | | | | | | | | K25 |
| | | K30 | | | | | | | | | | | | | | | | | | K30 |
| | | K35 | | | | | | | | | | | | | | | | | | K35 |
| | | K40 | | | | | | | | | | | | | | | | | | K40 |
| | | K45 | | | | | | | | | | | | | | | | | | K45 |
| | | K50 | | | | | | | | | | | | | | | | | | K50 |
| N | Aluminum/Aluminum alloy | N01 | | | | | | | | | | | | | | HRK10 | | | | N01 |
| | | N05 | | | | | | | | | | | | | | | HRK20 | | | N05 |
| | | N10 | | | | | | | | | | | | | | | | | | N10 |
| | | N15 | | | | | | | | | | | | | | | | | | N15 |
| | | N20 | | | | | | | | | | | | | | | | | | N20 |
| | | N25 | | | | | | | | | | | | | | | | | | N25 |
| | | N30 | | | | | | | | | | | | | | | | | | N30 |
| | | N40 | | | | | | | | | | | | | | | | | | N40 |
| S | Heat resistant super alloys Titanium alloy | S01 | | | | | | | | HR9105 | | | | | | | | | | S01 |
| | | S05 | | | | | | | | | | | | | | | | | | S05 |
| | | S10 | | | | | | | | | HR7115 | | | | | | | | | S10 |
| | | S15 | | | | | | | | | | | | | | | | | | S15 |
| | | S20 | | | | | | | | | | HR7125 | HR7225 | | | | | | | S20 |
| | | S25 | | | | | | | | | | | | | | | | | | S25 |
| | | S30 | | | | | | | | | | | | | | | | | | S30 |

## Turning grade overview

| Grade type | Grade | ISO | Color | Coating type | Coating Composition | Characteristics |
|---|---|---|---|---|---|---|
| Coated Carbide | HR8105 | ISO P | Black & Yellow | CVD | TiN+MT-TiCN+$Al_2O_3$ | • Suitable for steel turning under stabe working condition<br>• Brand new coating combine with high red hardness carbide substrate shows outstanding wear resistance and plastic deformation resistance |
| | HR8115 | ISO P | Black & Yellow | CVD | TiN+MT-TiCN+$Al_2O_3$ | • Suitable for light intermittent and continuous machining of steel<br>• The proprietary substrate of gradient alloy structure formed by special sintering process, together with thick TiCN, thick $Al_2O_3$, and sophisticated coating post treatment, greatly improves the wear resistance. It is suitable for finishing and semi-finishing of carbon steel and alloy steel |
| | HR8125 | ISO P | Black & Yellow | CVD | TiN+MT-TiCN+$Al_2O_3$ | • Suitable for intermittent machining and continuous machining of steel<br>• It has adopted the strengthen binder phase which can effectively inhibit the high temperature plastic deformation of the substrate; The high binder phase content functional gradient layer effectively controlled the crack propagation of the coating; |
| | HR8225 | ISO P | Black & Yellow | CVD | TiN+MT-TiCN+$Al_2O_3$ | • Preferred grade for steel truning; suitable for intermittent and continuous machining of steel,Strong universality<br>• Brand new well-distributed refined hard phase substrate combine with composite multilayer CVD coating. outstanding wear resistance and toughness |
| | HR8135 | ISO P | Black & Yellow | CVD | TiN+MT-TiCN+$Al_2O_3$ | • Grade for steel turining of strong impact working condition<br>• High toughness matrix composition, reinforced bonding phase, with excellent impact strength, suitable for turning under strong impact conditions. |
| Coated Carbide | HR1135 | ISO P、M | Bronze | PVD | AlTiSiN+TiSiN | • Precision small components turning high wear resistance grade<br>• The fine-grain cemented carbide matrix with the new nano-gradient composite structural coating has excellent wear resistance and build-up edge resistance, ensuring the stability of the insert life and the high quality of the machined surface. |
| | HR7125 | ISO M | Ash black | PVD | AlTiN | • Universal grade for continuous and intermittent turning of stainless steel<br>• Unique coating materials combined with new coating technology, the surface of the coated product is smooth, with low friction coefficient, high nano hardness, and excellent antioxidant performance. |
| | HR7225 | ISO M | Bronze | PVD | AlTiSiN+TiSiN | • Preferred grade for stainless steel turning<br>• The new non-metallic modified component reinforced nano-gradient composite structure "H2-Flex" coating, with uniformly refined submicron hard phase and optimized bonding phase composition, has excellent wear resistance and toughness. |
| | HR6115 | ISO K | Black | CVD | TiN+MT-TiCN+Al2O3 | • Preferred grade for cast iron turning<br>• The thickened CVD black coating and special coating post-treatment have excellent wear resistance and toughness, suitable for turning various cast iron materials and can also be used for rough machining of high-strength steel. |
| | HR7115 | ISO M、S | Bronze | PVD | AlTiSiN+TiSiN | • Preferred grade for high-temperature alloy and diffcult-<br>• The subfine grain carbide matrix combined with a new nano-gradient composite structure coating, special surface treatment technology, with excellent wear resistance, oxidation resistance and processing stability, suitable for turning of titanium alloys, superalloys, etc. |

## Turning grade overview

| Grade type | Grade | ISO | Color | Coating type | Coating Composition | Characteristics |
|---|---|---|---|---|---|---|
| Coated Carbide | HR9105 | ISO S | Gray | PVD | AlCrN | • Secondary grade for high-temperature alloy and diffcult-to-cut material<br>• The high red hardness alloy matrix paired with ultra-high hardness nano coating has excellent high-temperature wear resistance and adhesive wear resistance. |
| | HR5125 | ISO P、M | Ash black | PVD | AlTiN | • General grade for thread machining<br>• The strong toughness alloy matrix paired with a high hardness nano coating, which has excellent bonding force and extremely high toughness and edge strength. |
| | HR5225 | ISO P、M | Bronze | PVD | AlTiSiN+TiSiN | • High wear reistance grade for threading machining<br>• The sub micro crystalline matrix phase is combined with the new nano-gradient composite structure coating, which has excellent anti build-up edge and anti chipping properties. Suitable for thread machining of steel and stainless steel |
| Cemented carbide | HRK10 | ISO N | Silver Grey | Uncoated | / | • Preferred grade for aluminum alloy turning<br>• Uncoated cemented carbide material, fine particle matrix material, uniform particle size, high bending strength and good wear resistance. |
| | HRK20 | ISO N | Silver Grey | Uncoated | / | • General grade for aluminum alloy turning<br>• Uncoated cemented carbide material, with excellent wear resistance and anti-chipping properties, also excellent versatility |
| Cermet | HRC10 | ISO P | Silver Grey | Uncoated | / | • Good consistancy, especially suitable for low carbon steel finishing turning, as well as the workpiece surface quality has high requirements of the working conditions.<br>• Newly upgraded cermet grade, hard and compact surface with good chemical stability and adhesion resistance.Also great wear resistance and chipping resistance, insert consistancy, excellent machining surface quality. |
| Coated Cermet | HR115C | ISO P | Bronze | PVD | AlTiSiN+TiSiN | • Better high temperature resistance sutiable for higher cutting speed working condition compared to cermet grades.<br>• The coated cermet grade, with a new nano gradient composite structure coating, further improves the wear resistance, high temperature resistance, the unique transition layer treatment technology effectively improves the adhesion between the coating and the substrate, reduces the friction coefficient between the insert and workpiece.Insert services life and stability are outstanding |

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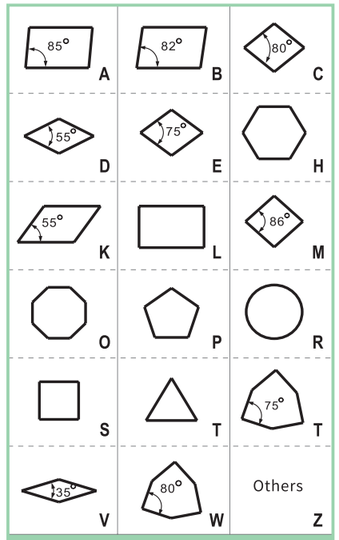
# General turning inserts code key




**Shape code**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| B | Yes | N/A | >65° | N | N/A | N/A | |
| H | Yes | Single-sided | >65° | R | N/A | Single-sided | |
| C | Yes | N/A | >65° | F | N/A | Double-sided | |
| J | Yes | Double-sided | >65° | A | Yes | N/A | |
| W | Yes | N/A | ≤65° | M | Yes | Single-sided | |
| T | Yes | Single-sided | ≤65° | G | Yes | Double-sided | |
| Q | Yes | N/A | ≤65° | X | --- | --- | special |
| U | Yes | Double-sided | ≤65° | | | | |
| Code | Hole | Chipbreaker | Insert section | Code | Hole | Chipbreaker | Insert section |

**Chipbreaker and clamping form**

| 32.00 | | | 32 | | | | | |
|---|---|---|---|---|---|---|---|---|
| 31.75 | | | 31 | | | | | |
| 25.40 | | | 25 | 25 | | | | |
| 25.00 | 25 | 25 | 25 | | | | | |
| 20.00 | | | 20 | | | | | |
| 19.05 | 19 | | 19 | 19 | 33 | | | |
| 16.00 | | 19 | 16 | | | | | |
| 15.875 | 16 | | 15 | 15 | 27 | | | |
| 12.70 | 12 | 15 | 12 | 12 | 22 | 22 | 08 | |
| 12.00 | | | 12 | | | | | |
| 10.00 | | | 10 | | | | | |
| 9.525 | 09 | 11 | 09 | 09 | 16 | 16 | 06 | 16 |
| 8.00 | | | 08 | | | | | |
| 6.35 | 06 | 07 | | | 11 | 11 | | |
| 6.00 | | | 06 | | | | | |
| 5.56 | | | | | 09 | | | |
| 5.50 | | | 05 | | | | | |
| 3.97 | | | | | 06 | | | |
| Inscribed circle diameter (mm) | C | D | R | S | T | V | W | K |
| | Insert shape | | | | | | | |

**Cutting edge length**

| 12 | 12.70 |
|---|---|
| 10 | 11.11 |
| T9 | 9.72 |
| 09 | 9.52 |
| 07 | 7.94 |
| T6 | 6.75 |
| 06 | 6.35 |
| T5 | 5.95 |
| 05 | 5.56 |
| T4 | 4.96 |
| 04 | 4.76 |
| T3 | 3.97 |
| 03 | 3.18 |
| T2 | 2.58 |
| 02 | 2.38 |
| T1 | 1.98 |
| 01 | 1.59 |
| T0 | 0.99 |
| 00 | 0.79 |
| Code | Thickness (mm) |



**Insert thickness**

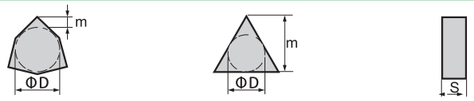
# C N M G 12 04 08 - GM (ISO)

# 4 3 2 (inch)

## Major clearance angle

| Code | Clearance angle | Code | Clearance angle |
|---|---|---|---|
| A | 3° | B | 5° |
| C | 7° | D | 15° |
| E | 20° | F | 25° |
| G | 30° | N | 0° |
| P | 11° | O | Others |

## Tolerance (mm)




| Class | Corner height (m) | Inscribed circle (ΦD) | Thickness (S) |
|---|---|---|---|
| A | ±0.005 | ±0.025 | ±0.025 |
| F | ±0.005 | ±0.013 | ±0.025 |
| C | ±0.013 | ±0.025 | ±0.025 |
| H | ±0.013 | ±0.013 | ±0.025 |
| E | ±0.025 | ±0.025 | ±0.025 |
| G | ±0.025 | ±0.025 | ±0.13 |
| J | ±0.005 | ±0.05-±0.13 | ±0.025 |
| K | ±0.013 | ±0.05-±0.13 | ±0.025 |
| L | ±0.025 | ±0.05-±0.13 | ±0.025 |
| M | ±0.08-±0.18 | ±0.05-±0.13 | ±0.13 |
| N | ±0.08-±0.18 | ±0.05-±0.13 | ±0.025 |
| U | ±0.13-±0.38 | ±0.08-±0.25 | ±0.13 |

◆ Tolerance requirements M-class (Distinguished by shape and inscribed circle size)
◆ Corner height (m) tolerance

| Inscribed circle | Regular triangle | Square | 80° rhombus | 55° rhombus | 35° rhombus | Circular |
|---|---|---|---|---|---|---|
| 6.35 | ±0.08 | ±0.08 | ±0.08 | ±0.11 | ±0.16 | --- |
| 9.525 | ±0.08 | ±0.08 | ±0.08 | ±0.11 | ±0.16 | --- |
| 12.7 | ±0.13 | ±0.13 | ±0.13 | ±0.15 | --- | --- |
| 15.875 | ±0.15 | ±0.15 | ±0.15 | ±0.18 | --- | --- |
| 19.05 | ±0.15 | ±0.15 | ±0.15 | ±0.18 | --- | --- |
| 25.4 | --- | ±0.18 | --- | --- | --- | --- |

◆Inscribed circle (ΦD) tolerance

| Inscribed circle | Regular triangle | Square | 80° rhombus | 55° rhombus | 35° rhombus | Circular |
|---|---|---|---|---|---|---|
| 6.35 | ±0.05 | ±0.05 | ±0.05 | ±0.05 | ±0.05 | --- |
| 9.525 | ±0.05 | ±0.05 | ±0.05 | ±0.05 | ±0.05 | ±0.05 |
| 12.7 | ±0.08 | ±0.08 | ±0.08 | ±0.08 | --- | ±0.08 |
| 15.875 | ±0.10 | ±0.10 | ±0.10 | ±0.10 | --- | ±0.10 |
| 19.05 | ±0.10 | ±0.10 | ±0.10 | ±0.10 | --- | ±0.10 |
| 25.4 | --- | ±0.13 | --- | --- | --- | ±0.13 |

## Inscribed circle

| Code | Inscribed circle diameter (mm) |
|---|---|
| 2 | 6.35 |
| 3 | 9.525 |
| 4 | 12.7 |
| 5 | 15.875 |
| 6 | 19.05 |
| 8 | 25.4 |

## Thickness

| Code | Thickness (mm) |
|---|---|
| 2 | 3.18 |
| 3 | 4.76 |
| 4 | 6.35 |
| 5 | 7.94 |
| 6 | 9.52 |

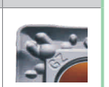
## Corner radius

| Code | Corner radius(mm) |
|---|---|
| 0 | 0.2 |
| 1 | 0.4 |
| 2 | 0.8 |
| 3 | 1.2 |
| 4 | 1.6 |
| 5 | 2.0 |
| 6 | 2.4 |

## Corner radius code

| Code | Corner radius (mm) |
|---|---|
| 00 | No fillet |
| 02 | 0.2 |
| 04 | 0.4 |
| 08 | 0.8 |
| 12 | 1.2 |
| 16 | 1.6 |
| 20 | 2.0 |
| 24 | 2.4 |
| 32 | 3.2 |
| X | Others |
| Insert diameter Mo (Metric) | Round insert |

## Chipbreaker code

| GF | GM | GR |
|---|---|---|
| | | |
| BF | BM | BR |
| | | |
| All-round chipbreaker | Flat chipbreaker | GZ |
| | |  |

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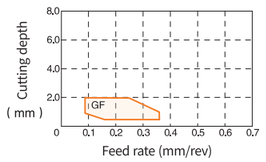
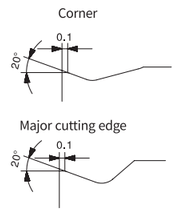
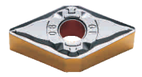
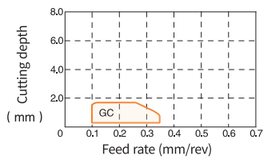
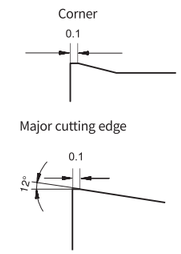
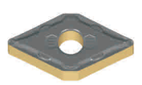
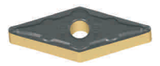
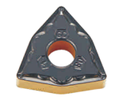
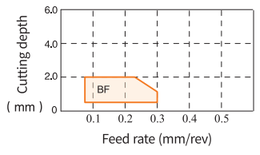
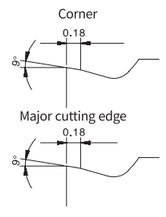
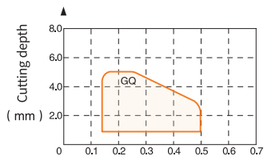
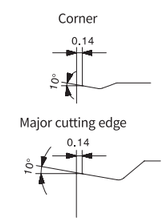
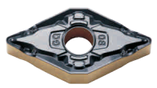
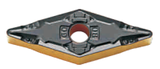
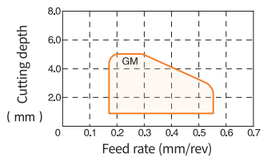
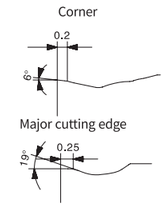
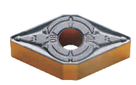
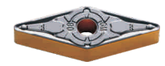
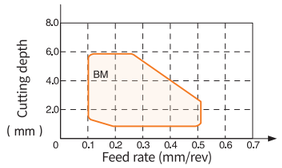
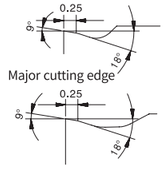
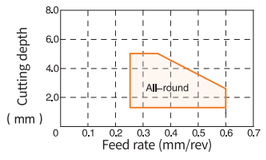
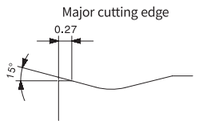
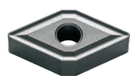
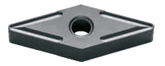
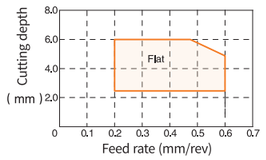
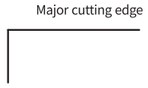
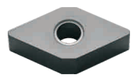
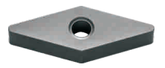
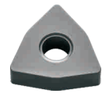
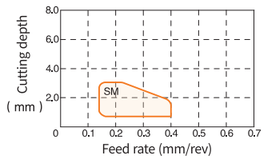
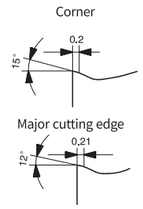
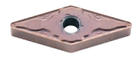
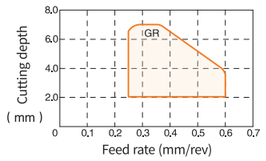
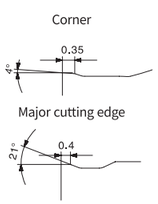
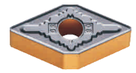
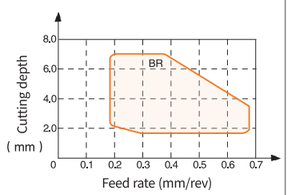
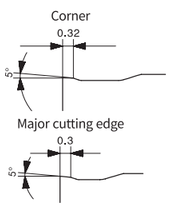
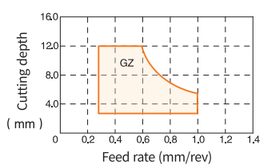
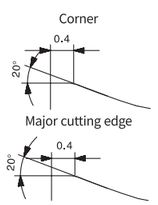
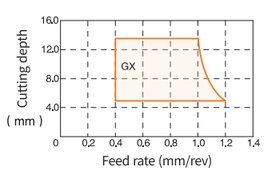
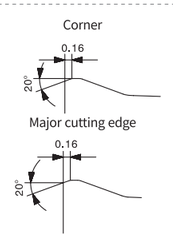
## Overview of general turning inserts (Negative)

| Usage | Tolerance | Chipbreaker | Features | Chipbreaker diagram | Sectional view of chipbreaker | | 80° C-type | 55° D-type | 90° S-type | 60° T-type | 35° V-type | 80° W-type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| For finishing | M | GF | **Recommended chipbreaker for finishing of P-type material**<br>◆ Extra-large positive rake angle, less cutting resistance.<br>◆ Positive cutting inclination angle can well control chip flow direction.<br>◆ The two-stage chip breaking table ensures good chip breaking even at small cutting depth. |  |  | | A19 |  A23 | A26 | A29 | A32 | A34 |
| | | GC | **Recommended chipbreaker for finishingof P-type materaial**<br>◆ Better chip control performance, great machining surface quality<br>◆ Cutting edge with sharpness and strength.<br>◆ Especially suitable for wall lifting processing. |  |  | | |  A23 | | A29 |  A32 |  A34 |
| | | BF | **Recommended chipbreaker for finishing of M-type material**<br>◆ Sharp cutting edge, less cutting resistance.<br>◆ Good chip disposal performance even at small cutting depth. |  |  | | A19 | A23 | A26 | A29 | A32 | A34 |
| For semi-finishing | M | GQ | **Semi-finishing of P-type material**<br>◆ It is suitable for finishing to semi-finishing of P-type material.<br>◆ Good chip removal performance with high versatility. |  |  | | A19 |  A23 | A26 | A29 |  A32 | A34 |

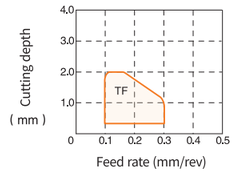
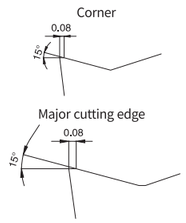
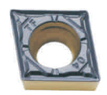
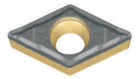
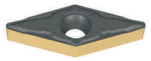
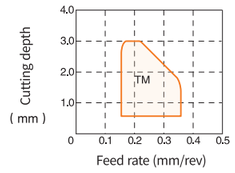
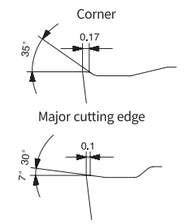
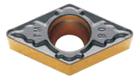
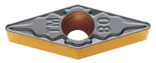
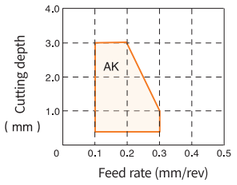
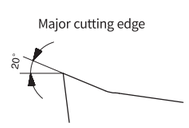
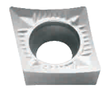
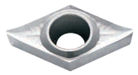
## Overview of general turning inserts (Negative)

| Usage | Tolerance | Chipbreaker | Features | Chipbreaker diagram | Sectional view of chipbreaker | | 80° C-type | 55° D-type | 90° S-type | 60° T-type | 35° V-type | 80° W-type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| For semi-finishing | M | **GM** | **Recommended chipbreaker for semi-finishing of P-type material**<br>◆ Special edge design, ensuring both sharpness and strength.<br>◆ The curved front face with variable cutting edge width and rake angle ensures the smooth flow and good control of chips.<br>◆ With high versatility and wide cutting range, efficient and consistent machining is achieved. |  |  | | A19 |  A24 | A26 | A29 |  A32 | A34 |
| | | **BM** | **Recommended chipbreaker for semi-finishing of stainless steel**<br>◆ Sharp cutting edge, less cutting resistance, good chip disposal performance even at small cutting depth.<br>◆ The micro-passivated cutting edge reduces the formation of build-up edge. |  |  | | A19 | A24 | A26 | A30 | A33 | A35 |
| | | **All-round** | **General machining chipbreaker**<br>◆ Double-sided chipbreaker, especially suitable for K-type material machining.<br>◆ Recommended cutting parameters |  |  | | A20 |  A24 | A27 | A30 |  A33 | A35 |
| | | **Flat** | **Machining grooves for brittle materials and H-type materials**<br>◆ With high structural strength and good fit to the cutter bar, it is more suitable for unstable cutting of cast iron. |  |  | | A20 |  A25 | A27 | A30 |  A33 |  A35 |

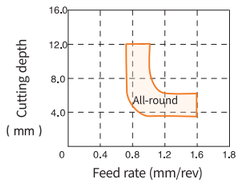
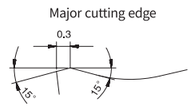
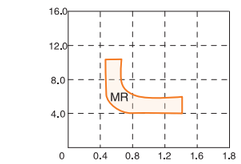
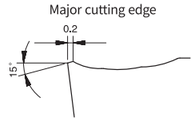
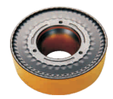
## Overview of general turning inserts (Negative)

| Usage | Tolerance | Chipbreaker | Features | Chipbreaker diagram | Sectional view of chipbreaker | | 80° C-type | 55° D-type | 90° S-type | 60° T-type | 35° V-type | 80° W-type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| For semi-finishing | M | SM | **Semi-finish machining grooves for S-type material and titanium alloys**<br>◆ Light and fast in cutting, the influence of work hardening and build-up edge on insert is effectively reduced. |  |  | | A21 | A25 | | |  A33 | A36 |
| For rough machining | M | GR | **Recommended chipbreaker for roughing of P-type material**<br>◆ Chipbreaking table with raced corner can effectively control the chip flow direction at small cutting depth;<br>◆ With a large rake angle and wide chamfer, both insert strength and sharpness are ensured;<br>◆ Double-sided groove is more cost-effective with good chip removal performance and enhanced versatility;<br>◆ It is suitable for roughing and semi-finishing of light-load cutting. |  |  | | A21 |  A25 | A27 | A31 | | A36 |
| | | BR | **Recommended chipbreaker for roughing of M-type material**<br>◆ Even edge passivation;<br>◆ Optimized chipbreaker convex plate;<br>◆ With firm cutting chamfer and land, it is capable of intermittent and heavy finishing;<br>◆ Large chip space enable it to achieve roughing and high feed finishing. |  |  | | A21 | | A28 | A31 | | A36 |
| For heavy machining | M | GZ | **Heavy machining chipbreaker for P-type material**<br>◆ The unique chipbreaker convex plate design on the rake face reduces the chip contact area at large cutting depth and provides excellent chip control.<br>◆ The sharp cutting edge can effectively reduce the cutting force. |  |  | | A21 | | A28 | | | |
| | | GX | **Heavy machining chipbreaker for P-type material**<br>◆ The variable chamfer design and special chipbreaker provide excellent chip control.<br>◆ The strong cutting edge can bear great impact. |  |  | | A22 | | A28 | | | |

## Overview of general turning inserts（Postive）

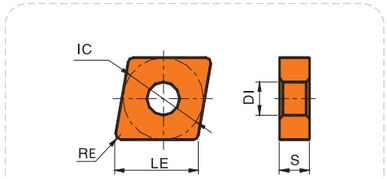
| Usage | Tolerance | Chipbreaker | Features | Chipbreaker diagram | Sectional view of chipbreaker | | 80° C-type | 55° D-type | 90° S-type | 60° T-type | 35° V-type | 80° W-type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| For finishing | M | TF | **General chipbreaker for finshing**<br>◆ Inclined cutting edge design ensures low cutting force, effectively reduce vibration, and ensure the machining surface quality<br>◆ Strong versatility and wide processing range. Inclination and chip control convex plate design can achieve excellent chip control performance. |  |  | |  A37 |  A38 | A39 | A40 |  A41 | |
| For semi-finishing | M | TM | **General chipbreaker for semi-finshing**<br>◆ It's suitable for internal or external semi-finishing of steel, stainless steel and cast iron |  |  | | A37 |  A38 | A39 | A40 |  A41 | |
| Aluminum alloy machining | G | AK | **Aluminum alloy machining chipbreaker**<br>◆ With a large rake angle and clearance angle, the cutting edge of the insert becomes sharper and therefore, cutting can be done in a faster and lighter pattern with effective chip breaking. |  |  | |  A37 |  A38 | | A40 | A41 | |

## Overview of general turning inserts(Special type)

| Usage | Tolerance | Chipbreaker | Features | Chipbreaker diagram | Sectional view of chipbreaker | | R shape |
|---|---|---|---|---|---|---|---|
| Profiling insert | M | **All-round chipbreaker** | ◆ With high strength, the cutting edge secures high safety and is the first choice for rough profiling.<br>◆ It is suitable for train wheel turning. |  |  | | A43 |
| | | **MR** | ◆ Large chip-breaking space prevents chip blockage during large cutting depth machining.<br>◆ The small pit group improves the chip machining performance during small cutting depth machining.<br>◆ It is suitable for train wheel turning. |  |  | |  A43 |

| Usage | Tolerance | Chipbreaker | 90° S-type | Chipbreaker | 90° S-type | | |
|---|---|---|---|---|---|---|---|
| Planer milling machining | M | **HAF** | A44 | **HSF** | A44 | | |

## 80° CN□□




Working condition: ● Stable ◔ Average ⌗ Tough

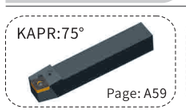
Workpiece material

| | | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ● | ● | ◔ | ⌗ | ⌗ | ● | | | | ● | | | | | | ●● | ●● |
| M | Stainless steel | | | | | | ● | | | | ●● | | | | | | | |
| K | Cast iron | | | | | | ●● | | | | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | | | ●● | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | ●● | | | | | | | | | |

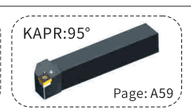
| Processing | Insert shape | Type | LE | IC | S | DI | RE | CVD | | | | | | PVD | | | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing | | CNMG120404–GF | 12.9 | 12.7 | 4.76 | 5.16 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | CNMG120408–GF | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| Finishing | | CNMG120404–BF | 12.9 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | | | ☆ | ★ | | | | | | | |
| | | CNMG120408–BF | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | | |
| Semi-finishing | | CNMG120408–GQ | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | CNMG120412–GQ | 12.9 | 12.7 | 4.76 | 5.16 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| Semi-finishing | | CNMG120404–GM | 12.9 | 12.7 | 4.76 | 5.16 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | CNMG120408–GM | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | CNMG120412–GM | 12.9 | 12.7 | 4.76 | 5.16 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | CNMG160608–GM | 16.1 | 15.875 | 6.35 | 6.35 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | CNMG160612–GM | 16.1 | 15.875 | 6.35 | 6.35 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | CNMG160616–GM | 16.1 | 15.875 | 6.35 | 6.35 | 1.6 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | CNMG190608–GM | 19.3 | 19.05 | 6.35 | 7.94 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | CNMG190612–GM | 19.3 | 19.05 | 6.35 | 7.94 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | CNMG190616–GM | 19.3 | 19.05 | 6.35 | 7.94 | 1.6 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| Semi-finishing | | CNMG120404–BM | 12.9 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | | | ☆ | ★ | | | | | | | |
| | | CNMG120408–BM | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | | |
| | | CNMG120412–BM | 12.9 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | | | | | ☆ | ★ | | | | | | | |

★ Recommended grade ☆ Available grade

### Applicable tools



PCBNR/L

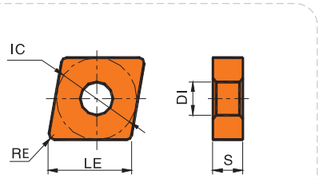


PCLNR/L

MCLNR/L



80° CN□□




Working condition: ● Stable ◔ Average ⌗ Tough

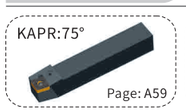
Workpiece material

| | | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ● | ● | ◔ | ⌗ | ⌗ | ● | | | | ● | | | | | | ●● | ●● |
| M | Stainless steel | | | | | | ● | | | | ●● | | | | | | | |
| K | Cast iron | | | | | | ●● | | | | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | | | ●● | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | ●● | | | | | | | | | |

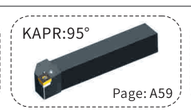
| Processing | Insert shape | Type | LE | IC | S | DI | RE | CVD | | | | | | PVD | | | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Cast iron machining | | CNMG120404 | 12.9 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMG120408 | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMG120412 | 12.9 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMG120416 | 12.9 | 12.7 | 4.76 | 5.16 | 1.6 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMG160608 | 16.1 | 15.875 | 6.35 | 6.35 | 0.8 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMG160612 | 16.1 | 15.875 | 6.35 | 6.35 | 1.2 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMG160616 | 16.1 | 15.875 | 6.35 | 6.35 | 1.6 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMG190612 | 19.3 | 19.05 | 6.35 | 7.94 | 1.2 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMG190616 | 19.3 | 19.05 | 6.35 | 7.94 | 1.6 | | | | | | ★ | | | | | | | | | | | | |
| Cast iron machining | | CNMA120404 | 12.9 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMA120408 | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMA120412 | 12.9 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMA120416 | 12.9 | 12.7 | 4.76 | 5.16 | 1.6 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMA160608 | 16.1 | 15.875 | 6.35 | 6.35 | 0.8 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMA160612 | 16.1 | 15.875 | 6.35 | 6.35 | 1.2 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMA160616 | 16.1 | 15.875 | 6.35 | 6.35 | 1.6 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMA190612 | 19.3 | 19.05 | 6.35 | 7.94 | 1.2 | | | | | | ★ | | | | | | | | | | | | |
| | | CNMA190616 | 19.3 | 19.05 | 6.35 | 7.94 | 1.6 | | | | | | ★ | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

### Applicable tools



PCBNR/L



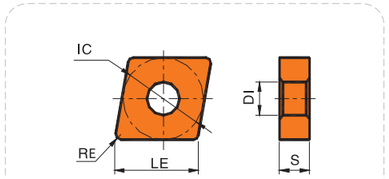
PCLNR/L

MCLNR/L

HUAREAL



## 80° CN□□




Working condition: ● Stable ◕ Average ⌗ Tough

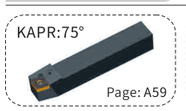
Workpiece material

| | | Working condition |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ⌗ ● ● ● ◕ ◕ |
| M | Stainless steel | ● ● ◕ ◕ |
| K | Cast iron | ◕ ◕ |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ● ● |

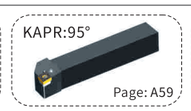
| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Semi-finishing | | CNMG120404–SM | 12.9 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | ☆ | ★ | | | | | | | | |
| | | CNMG120408–SM | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | ☆ | ★ | | | | | | | | |
| | | CNMG120412–SM | 12.9 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | | | ☆ | ★ | | | | | | | | |
| Roughing | | CNMG120408–GR | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | CNMG120412–GR | 12.9 | 12.7 | 4.76 | 5.16 | 1.2 | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | CNMG190608–GR | 19.3 | 19.05 | 6.35 | 7.94 | 0.8 | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | CNMG190612–GR | 19.3 | 19.05 | 6.35 | 7.94 | 1.2 | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | CNMG190616–GR | 19.3 | 19.05 | 6.35 | 7.94 | 1.6 | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| Roughing | | CNMG120408–BR | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | | ☆ | ★ | | | | | | | |
| | | CNMG120412–BR | 12.9 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | | | | ☆ | ★ | | | | | | | |
| | | CNMG190612–BR | 19.3 | 19.05 | 6.35 | 7.94 | 1.2 | | | | | | | | | ☆ | ★ | | | | | | | |
| | | CNMG190616–BR | 19.3 | 19.05 | 6.35 | 7.94 | 1.6 | | | | | | | | | ☆ | ★ | | | | | | | |
| Heavy machining | | CNMM160616–GZ | 16.1 | 15.875 | 6.35 | 6.35 | 1.6 | ★ | | ★ | | | | | | | | | | | | | | |
| | | CNMM190608–GZ | 19.3 | 19.05 | 6.35 | 7.94 | 0.8 | ★ | | ★ | | | | | | | | | | | | | | |
| | | CNMM190612–GZ | 19.3 | 19.05 | 6.35 | 7.94 | 1.2 | ★ | | ★ | | | | | | | | | | | | | | |
| | | CNMM190616–GZ | 19.3 | 19.05 | 6.35 | 7.94 | 1.6 | ★ | | ★ | | | | | | | | | | | | | | |
| | | CNMM190624–GZ | 19.3 | 19.05 | 6.35 | 7.94 | 2.4 | ★ | | ★ | | | | | | | | | | | | | | |
| | | CNMM250924–GZ | 25.792 | 25.4 | 9.525 | 9.12 | 2.4 | ★ | | ★ | | | | | | | | | | | | | | |
| | | CNMM250932–GZ | 25.792 | 25.4 | 9.525 | 9.12 | 3.2 | ★ | | ★ | | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

### Applicable tools



PCBNR/L

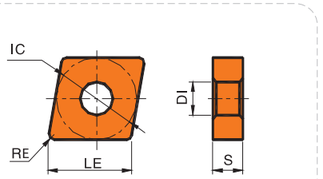


PCLNR/L

MCLNR/L



## 80° CN□□




Working condition: ● Stable ◕ Average ⌗ Tough

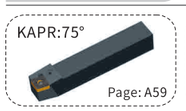
Workpiece material

| | | Working condition |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ◕ ◕ |
| M | Stainless steel | ● ● ◕ ◕ |
| K | Cast iron | ◕ ◕ |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ● ● |

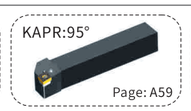
| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Heavy machining | | CNMM190608–GX | 19.3 | 19.05 | 6.35 | 7.94 | 0.8 | | ★ | ★ | | | | | | | | | | | | | | |
| | | CNMM190612–GX | 19.3 | 19.05 | 6.35 | 7.94 | 1.2 | | ★ | ★ | | | | | | | | | | | | | | |
| | | CNMM190616–GX | 19.3 | 19.05 | 6.35 | 7.94 | 1.6 | | ★ | ★ | | | | | | | | | | | | | | |
| | | CNMM190624–GX | 19.3 | 19.05 | 6.35 | 7.94 | 2.4 | | ★ | ★ | | | | | | | | | | | | | | |
| | | CNMM250716–GX | 25.792 | 25.4 | 7.94 | 9.12 | 1.6 | | ★ | ★ | | | | | | | | | | | | | | |
| | | CNMM250724–GX | 25.792 | 25.4 | 7.94 | 9.12 | 2.4 | | ★ | ★ | | | | | | | | | | | | | | |
| | | CNMM250732–GX | 25.792 | 25.4 | 7.94 | 9.12 | 3.2 | | ★ | ★ | | | | | | | | | | | | | | |
| | | CNMM250916–GX | 25.792 | 25.4 | 9.525 | 9.12 | 1.6 | | ★ | ★ | | | | | | | | | | | | | | |
| | | CNMM250924–GX | 25.792 | 25.4 | 9.525 | 9.12 | 2.4 | | ★ | ★ | | | | | | | | | | | | | | |
| | | CNMM250932–GX | 25.792 | 25.4 | 9.525 | 9.12 | 3.2 | | ★ | ★ | | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

### Applicable tools



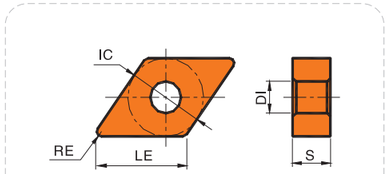
PCBNR/L



PCLNR/L

MCLNR/L

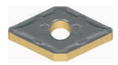
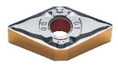
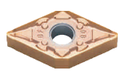
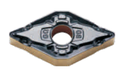
## 55°DN□□




Working condition: ● Stable ◕ Average ⌗ Tough

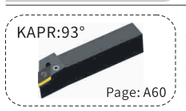
Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ◕ ◕ |
| M | Stainless steel | ● ◕ ◕ |
| K | Cast iron | ◕ |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● |

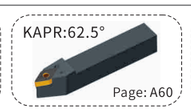
| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing |  | DNMG150404–GC | 15.5 | 12.7 | 4.76 | 5.16 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | DNMG150408–GC | 15.5 | 12.7 | 4.76 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| Finishing |  | DNMG150404–GF | 15.5 | 12.7 | 4.76 | 5.16 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | DNMG150408–GF | 15.5 | 12.7 | 4.76 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | DNMG150604–GF | 15.5 | 12.7 | 6.35 | 5.16 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | DNMG150608–GF | 15.5 | 12.7 | 6.35 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| Finishing |  | DNMG150404–BF | 15.5 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | | | ☆ | ★ | | | | | | | |
| | | DNMG150408–BF | 15.5 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | | |
| | | DNMG150604–BF | 15.5 | 12.7 | 6.35 | 5.16 | 0.4 | | | | | | | | | | ☆ | ★ | | | | | | | |
| | | DNMG150608–BF | 15.5 | 12.7 | 6.35 | 5.16 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | | |
| Semi-finishing |  | DNMG150408–GQ | 15.5 | 12.7 | 4.76 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | DNMG150412–GQ | 15.5 | 12.7 | 4.76 | 5.16 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | DNMG150608–GQ | 15.5 | 12.7 | 6.35 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | DNMG150612–GQ | 15.5 | 12.7 | 6.35 | 5.16 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

### Applicable tools

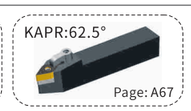


PDJNR/L



PDPNN

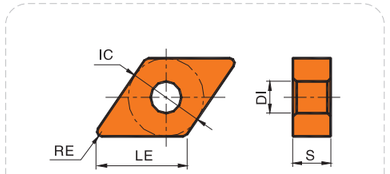
MDJNR/L



MDPNN



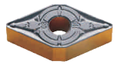
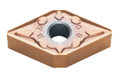
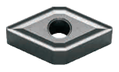
## 55°DN□□




Working condition: ● Stable ◕ Average ⌗ Tough

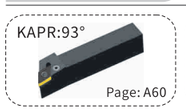
Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ◕ ◕ |
| M | Stainless steel | ● ◕ ◕ |
| K | Cast iron | ◕ |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● |

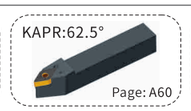
| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Semi-finishing |  | DNMG110412–GM | 11.6 | 9.525 | 4.76 | 3.81 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | DNMG150404–GM | 15.5 | 12.7 | 4.76 | 5.16 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | DNMG150408–GM | 15.5 | 12.7 | 4.76 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | DNMG150412–GM | 15.5 | 12.7 | 4.76 | 5.16 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | DNMG150604–GM | 15.5 | 12.7 | 6.35 | 5.16 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | DNMG150608–GM | 15.5 | 12.7 | 6.35 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | DNMG150612–GM | 15.5 | 12.7 | 6.35 | 5.16 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| Semi-finishing |  | DNMG150404–BM | 15.5 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | | | ☆ | ★ | | | | | | | |
| | | DNMG150408–BM | 15.5 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | | |
| | | DNMG150412–BM | 15.5 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | | | | | ☆ | ★ | | | | | | | |
| | | DNMG150604–BM | 15.5 | 12.7 | 6.35 | 5.16 | 0.4 | | | | | | | | | | ☆ | ★ | | | | | | | |
| | | DNMG150608–BM | 15.5 | 12.7 | 6.35 | 5.16 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | | |
| | | DNMG150612–BM | 15.5 | 12.7 | 6.35 | 5.16 | 1.2 | | | | | | | | | | ☆ | ★ | | | | | | | |
| Cast iron machining |  | DNMG150404 | 15.5 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | ★ | | | | | | | | | | | | |
| | | DNMG150408 | 15.5 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | ★ | | | | | | | | | | | | |
| | | DNMG150412 | 15.5 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | ★ | | | | | | | | | | | | |
| | | DNMG150604 | 15.5 | 12.7 | 6.35 | 5.16 | 0.4 | | | | | | ★ | | | | | | | | | | | | |
| | | DNMG150608 | 15.5 | 12.7 | 6.35 | 5.16 | 0.8 | | | | | | ★ | | | | | | | | | | | | |
| | | DNMG150612 | 15.5 | 12.7 | 6.35 | 5.16 | 1.2 | | | | | | ★ | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

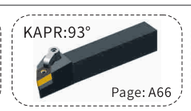
### Applicable tools



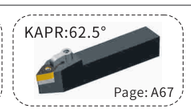
PDJNR/L



PDPNN

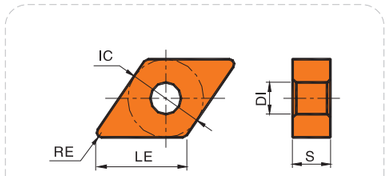


MDJNR/L



MDPNN

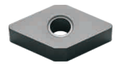
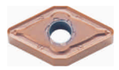
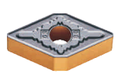
## 55°DN□□




Working condition: ● Stable ◕ Average ⌗ Tough

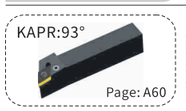
Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

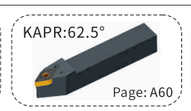
| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | | Cemented carbide | | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Cast iron machining |  | DNMA150404 | 15.5 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | ★ | | | | | | | | | | | |
| | | DNMA150408 | 15.5 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | ★ | | | | | | | | | | | |
| | | DNMA150412 | 15.5 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | ★ | | | | | | | | | | | |
| | | DNMA150604 | 15.5 | 12.7 | 6.35 | 5.16 | 0.4 | | | | | | ★ | | | | | | | | | | | |
| | | DNMA150608 | 15.5 | 12.7 | 6.35 | 5.16 | 0.8 | | | | | | ★ | | | | | | | | | | | |
| | | DNMA150612 | 15.5 | 12.7 | 6.35 | 5.16 | 1.2 | | | | | | ★ | | | | | | | | | | | |
| Semi-finishing |  | DNMG150404–SM | 15.5 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | ☆ | ★ | | | | | | | | |
| | | DNMG150408–SM | 15.5 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | ☆ | ★ | | | | | | | | |
| | | DNMG150412–SM | 15.5 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | | | ☆ | ★ | | | | | | | | |
| | | DNMG150604–SM | 15.5 | 12.7 | 6.35 | 5.16 | 0.4 | | | | | | | | ☆ | ★ | | | | | | | | |
| | | DNMG150608–SM | 15.5 | 12.7 | 6.35 | 5.16 | 0.8 | | | | | | | | ☆ | ★ | | | | | | | | |
| | | DNMG150612–SM | 15.5 | 12.7 | 6.35 | 5.16 | 1.2 | | | | | | | | ☆ | ★ | | | | | | | | |
| Roughing |  | | | | | | | | | | | | | | | | | | | | | | | |
| | | DNMG150608–GR | 15.5 | 12.7 | 6.35 | 5.16 | 0.8 | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | DNMG150612–GR | 15.5 | 12.7 | 6.35 | 5.16 | 1.2 | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

## Applicable tools

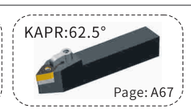


PDJNR/L



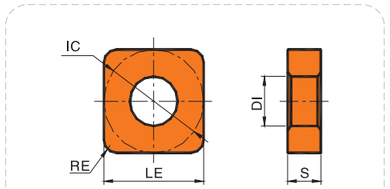
PDPNN

MDJNR/L



MDPNN

## 90°SN□□




Working condition: ● Stable ◕ Average ⌗ Tough

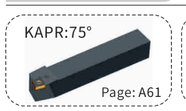
Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

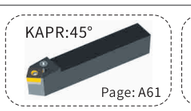
| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | | Cemented carbide | | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing | | SNMG120404–GF | 12.7 | 12.7 | 4.76 | 5.16 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | SNMG120408–GF | 12.7 | 12.7 | 4.76 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| Finishing | | SNMG120404–BF | 12.7 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | SNMG120408–BF | 12.7 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | |
| Semi-finishing | | SNMG120412–GQ | 12.7 | 12.7 | 4.76 | 5.16 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| Semi-finishing | | SNMG120404–GM | 12.7 | 12.7 | 4.76 | 5.16 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | SNMG120408–GM | 12.7 | 12.7 | 4.76 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | SNMG120412–GM | 12.7 | 12.7 | 4.76 | 5.16 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | SNMG190612–GM | 19.05 | 19.05 | 6.35 | 7.94 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | SNMG190616–GM | 19.05 | 19.05 | 6.35 | 7.94 | 1.6 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| Semi-finishing | | SNMG120404–BM | 12.7 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | SNMG120408–BM | 12.7 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | SNMG120412–BM | 12.7 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | | | | | ☆ | ★ | | | | | | |

★ Recommended grade ☆ Available grade

## Applicable tools



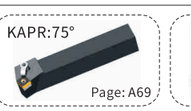
PSBNR/L



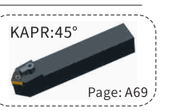
PSDNN

PSKNR/L

MSBNR/L

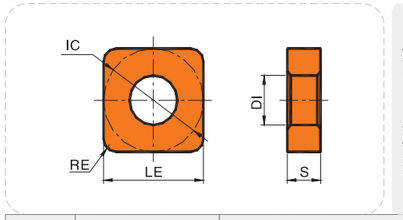


MSKNR/L



MSDNN

## 90°SN□□




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Cast iron machining | | SNMG120404 | 12.7 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | ★ | | | | | | | | | | | |
| | | SNMG120408 | 12.7 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | ★ | | | | | | | | | | | |
| | | SNMG120412 | 12.7 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | ★ | | | | | | | | | | | |
| | | SNMG150608 | 15.875 | 15.875 | 6.35 | 6.35 | 0.8 | | | | | | ★ | | | | | | | | | | | |
| | | SNMG150612 | 15.875 | 15.875 | 6.35 | 6.35 | 1.2 | | | | | | ★ | | | | | | | | | | | |
| | | SNMG150616 | 15.875 | 15.875 | 6.35 | 6.35 | 1.6 | | | | | | ★ | | | | | | | | | | | |
| | | SNMG190612 | 19.05 | 19.05 | 6.35 | 7.94 | 1.2 | | | | | | ★ | | | | | | | | | | | |
| | | SNMG190616 | 19.05 | 19.05 | 6.35 | 7.94 | 1.6 | | | | | | ★ | | | | | | | | | | | |
| Cast iron machining | | SNMA120404 | 12.7 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | ★ | | | | | | | | | | | |
| | | SNMA120408 | 12.7 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | ★ | | | | | | | | | | | |
| | | SNMA120412 | 12.7 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | ★ | | | | | | | | | | | |
| | | SNMA150608 | 15.875 | 15.875 | 6.35 | 6.35 | 0.8 | | | | | | ★ | | | | | | | | | | | |
| | | SNMA150612 | 15.875 | 15.875 | 6.35 | 6.35 | 1.2 | | | | | | ★ | | | | | | | | | | | |
| | | SNMA150616 | 15.875 | 15.875 | 6.35 | 6.35 | 1.6 | | | | | | ★ | | | | | | | | | | | |
| | | SNMA190612 | 19.05 | 19.05 | 6.35 | 7.94 | 1.2 | | | | | | ★ | | | | | | | | | | | |
| | | SNMA190616 | 19.05 | 19.05 | 6.35 | 7.94 | 1.6 | | | | | | ★ | | | | | | | | | | | |
| Roughing | | SNMG120408–GR | 12.7 | 12.7 | 4.76 | 5.16 | 0.8 | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | SNMG120412–GR | 12.7 | 12.7 | 4.76 | 5.16 | 1.2 | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | SNMG190608–GR | 19.05 | 19.05 | 6.35 | 7.94 | 0.8 | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | SNMG190612–GR | 19.05 | 19.05 | 6.35 | 7.94 | 1.2 | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | SNMG190616–GR | 19.05 | 19.05 | 6.35 | 7.94 | 1.6 | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |

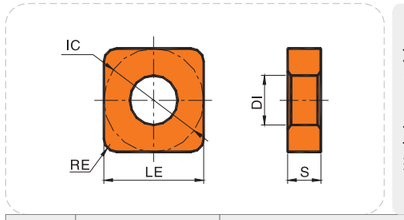
★ Recommended grade ☆ Available grade

### Applicable tools

PSBNR/L PSDNN PSKNR/L MSBNR/L MSKNR/L MSDNN



## 90°SN□□




Working condition: ● Stable ◕ Average ⌗ Tough

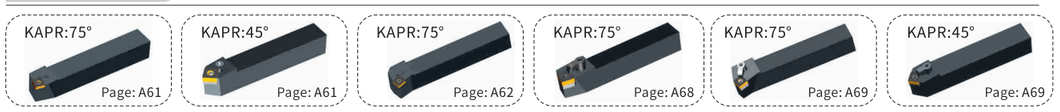
Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Roughing | | SNMG120408–BR | 12.7 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | SNMG120412–BR | 12.7 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | SNMG150612–BR | 15.875 | 15.875 | 6.35 | 6.35 | 1.2 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | SNMG190616–BR | 19.05 | 19.05 | 6.35 | 7.94 | 1.6 | | | | | | | | | | ☆ | ★ | | | | | | |
| Heavy machining | | SNMM150612–GZ | 15.875 | 15.875 | 6.35 | 6.35 | 1.2 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM190608–GZ | 19.05 | 19.05 | 6.35 | 7.94 | 0.8 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM190612–GZ | 19.05 | 19.05 | 6.35 | 7.94 | 1.2 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM190616–GZ | 19.05 | 19.05 | 6.35 | 7.94 | 1.6 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM190624–GZ | 19.05 | 19.05 | 6.35 | 7.94 | 2.4 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM250924–GZ | 25.4 | 25.4 | 9.525 | 9.12 | 2.4 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM250932–GZ | 25.4 | 25.4 | 9.525 | 9.12 | 3.2 | | ★ | | ★ | | | | | | | | | | | | | |
| Heavy machining | | SNMM190608–GX | 19.05 | 19.05 | 6.35 | 7.94 | 0.8 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM190612–GX | 19.05 | 19.05 | 6.35 | 7.94 | 1.2 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM190616–GX | 19.05 | 19.05 | 6.35 | 7.94 | 1.6 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM190624–GX | 19.05 | 19.05 | 6.35 | 7.94 | 2.4 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM250716–GX | 25.4 | 25.4 | 7.94 | 9.12 | 1.6 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM250724–GX | 25.4 | 25.4 | 7.94 | 9.12 | 2.4 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM250732–GX | 25.4 | 25.4 | 7.94 | 9.12 | 3.2 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM250916–GX | 25.4 | 25.4 | 9.525 | 9.12 | 1.6 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM250924–GX | 25.4 | 25.4 | 9.525 | 9.12 | 2.4 | | ★ | | ★ | | | | | | | | | | | | | |
| | | SNMM250932–GX | 25.4 | 25.4 | 9.525 | 9.12 | 3.2 | | ★ | | ★ | | | | | | | | | | | | | |

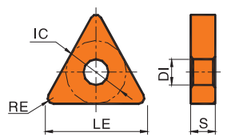
★ Recommended grade ☆ Available grade

### Applicable tools




PSBNR/L PSDNN PSKNR/L MSBNR/L MSKNR/L MSDNN

## 60°TN□□




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

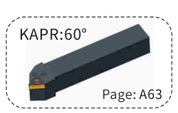
| | | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ● | ● | ⌗ | ◕ ⌗ | ⌗ | ⌗ | ● | | | ● | | | | | | ◕ | ◕ |
| M | Stainless steel | | | | | | ● | | | | ◕ | ◕ | | | | | | |
| K | Cast iron | | | | | | ◕ | | | | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | | | ● | ● | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | ● | ● | | | | | | | | |

| Processing | Insert shape | Type | LE | IC | S | DI | RE | CVD | | | | | | PVD | | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing | | TNMG160404–GC | 16.5 | 9.525 | 4.76 | 3.81 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | TNMG160408–GC | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| Finishing | | TNMG160404–GF | 16.5 | 9.525 | 4.76 | 3.81 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | TNMG160408–GF | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| Finishing | | TNMG160404–BF | 16.5 | 9.525 | 4.76 | 3.81 | 0.4 | | | | | | | | | | ☆ | ★ | | | | | | | |
| | | TNMG160408–BF | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | | |
| Semi-finishing | | TNMG160404–GQ | 16.5 | 9.525 | 4.76 | 3.81 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | TNMG160408–GQ | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | TNMG160412–GQ | 16.5 | 9.525 | 4.76 | 3.81 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| Semi-finishing | | TNMG160404–GM | 16.5 | 9.525 | 4.76 | 3.81 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | TNMG160408–GM | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | TNMG160412–GM | 16.5 | 9.525 | 4.76 | 3.81 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |
| | | TNMG220412–GM | 22 | 12.7 | 4.76 | 5.16 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

### Applicable tools

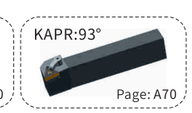
PTFNR/L



PTTNR/L

PTGNR/L

MTGNR/L

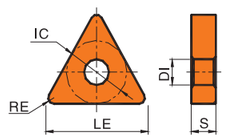


MTJNR/L

MTFNR/L



## 60°TN□□




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

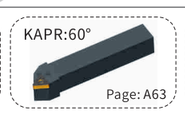
| | | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ● | ● | ⌗ | ◕ ⌗ | ⌗ | ⌗ | ● | | | ● | | | | | | ◕ | ◕ |
| M | Stainless steel | | | | | | ● | | | | ◕ | ◕ | | | | | | |
| K | Cast iron | | | | | | ◕ | | | | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | | | ● | ● | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | ● | ● | | | | | | | | |

| Processing | Insert shape | Type | LE | IC | S | DI | RE | CVD | | | | | | PVD | | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Semi-finishing | | TNMG160404–BM | 16.5 | 9.525 | 4.76 | 3.81 | 0.4 | | | | | | | | | | ☆ | ★ | | | | | | | |
| | | TNMG160408–BM | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | | |
| | | TNMG160412–BM | 16.5 | 9.525 | 4.76 | 3.81 | 1.2 | | | | | | | | | | ☆ | ★ | | | | | | | |
| Cast iron machining | | TNMG160404 | 16.5 | 9.525 | 4.76 | 3.81 | 0.4 | | | | | | ★ | | | | | | | | | | | | |
| | | TNMG160408 | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | | | | | | ★ | | | | | | | | | | | | |
| | | TNMG160212 | 16.5 | 9.525 | 4.76 | 3.81 | 1.2 | | | | | | ★ | | | | | | | | | | | | |
| | | TNMG220408 | 22 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | ★ | | | | | | | | | | | | |
| | | TNMG220412 | 22 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | ★ | | | | | | | | | | | | |
| | | TNMG220416 | 22 | 12.7 | 4.76 | 5.16 | 1.6 | | | | | | ★ | | | | | | | | | | | | |
| Roughing | | TNMA160404 | 16.5 | 9.525 | 4.76 | 3.81 | 0.4 | | | | | | ★ | | | | | | | | | | | | |
| | | TNMA160408 | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | | | | | | ★ | | | | | | | | | | | | |
| | | TNMA160412 | 16.5 | 9.525 | 4.76 | 3.81 | 1.2 | | | | | | ★ | | | | | | | | | | | | |
| | | TNMA220408 | 22 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | ★ | | | | | | | | | | | | |
| | | TNMA220412 | 22 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | ★ | | | | | | | | | | | | |
| | | TNMA220416 | 22 | 12.7 | 4.76 | 5.16 | 1.6 | | | | | | ★ | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

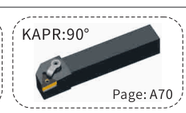
### Applicable tools

PTFNR/L

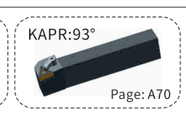


PTTNR/L

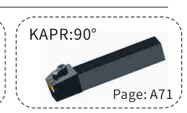
PTGNR/L



MTGNR/L



MTJNR/L

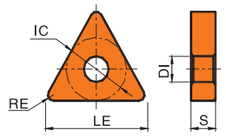


MTFNR/L

HUAREAL



## 60°TN□□




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ● ● |
| M | Stainless steel | ● ● ● ● ● |
| K | Cast iron | ● ● |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Roughing | | TNMG160408–GR | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | TNMG160412–GR | 16.5 | 9.525 | 4.76 | 3.81 | 1.2 | | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| Roughing | | TNMG160408–BR | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | TNMG160412–BR | 16.5 | 9.525 | 4.76 | 3.81 | 1.2 | | | | | | | | | | ☆ | ★ | | | | | | |

★ Recommended grade ☆ Available grade

### Applicable tools

PTFNR/L

PTTNR/L

PTGNR/L

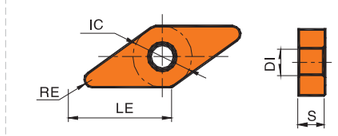
MTGNR/L

MTJNR/L

MTFNR/L



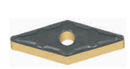
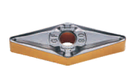
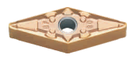
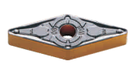
## 35°VN□□




Working condition: ● Stable ◕ Average ⌗ Tough

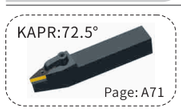
Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ● ● |
| M | Stainless steel | ● ● ● ● ● |
| K | Cast iron | ● ● |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing |  | VNMG160404–GC | 16.6 | 9.525 | 4.76 | 3.81 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | VNMG160408–GC | 16.6 | 9.525 | 4.76 | 3.81 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| Finishing |  | VNMG160404–GF | 16.6 | 9.525 | 4.76 | 3.81 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | VNMG160408–GF | 16.6 | 9.525 | 4.76 | 3.81 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| Finishing |  | VNMG160404–BF | 16.6 | 9.525 | 4.76 | 3.81 | 0.4 | | | | | | | | | | | ☆ | ★ | | | | | |
| | | VNMG160408–BF | 16.6 | 9.525 | 4.76 | 3.81 | 0.8 | | | | | | | | | | | ☆ | ★ | | | | | |
| Semi-finishing | | VNMG160404–GQ | 16.6 | 9.525 | 4.76 | 3.81 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | VNMG160408–GQ | 16.6 | 9.525 | 4.76 | 3.81 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | VNMG160412–GQ | 16.6 | 9.525 | 4.76 | 3.81 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| Semi-finishing |  | VNMG160404–GM | 16.6 | 9.525 | 4.76 | 3.81 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | VNMG160408–GM | 16.6 | 9.525 | 4.76 | 3.81 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | VNMG160412–GM | 16.6 | 9.525 | 4.76 | 3.81 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

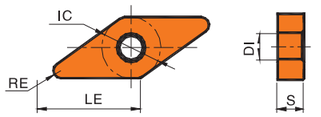
### Applicable tools



MVVNN

MVJNR/L

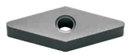
## 35°VN□□




Working condition: ● Stable ◕ Average ⌗ Tough

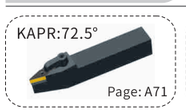
Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ● ● ● ● ● |
| M | Stainless steel | ● ● ● ● ● ● ● |
| K | Cast iron | ● ● |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● |

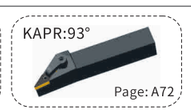
| Processing | Insert shape | Type | Dimension (mm) LE | IC | S | DI | RE | CVD HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | PVD HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | Cemented carbide HRK10 | HRK20 | Cermet HRC10 | HR115C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Semi-finishing | | VNMG160404–BM | 16.6 | 9.525 | 4.76 | 3.81 | 0.4 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | VNMG160408–BM | 16.6 | 9.525 | 4.76 | 3.81 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | VNMG160412–BM | 16.6 | 9.525 | 4.76 | 3.81 | 1.2 | | | | | | | | | | ☆ | ★ | | | | | | |
| Cast iron machining | | VNMG160404 | 16.6 | 9.525 | 4.76 | 3.81 | 0.4 | | | | | | ★ | | | | | | | | | | | |
| | | VNMG160408 | 16.6 | 9.525 | 4.76 | 3.81 | 0.8 | | | | | | ★ | | | | | | | | | | | |
| Cast iron machining |  | VNMA160404 | 16.6 | 9.525 | 4.76 | 3.81 | 0.4 | | | | | | ★ | | | | | | | | | | | |
| | | VNMA160408 | 16.6 | 9.525 | 4.76 | 3.81 | 0.8 | | | | | | ★ | | | | | | | | | | | |
| Semi-finishing | | VNMG160404–SM | 16.6 | 9.525 | 4.76 | 3.81 | 0.4 | | | | | | | | ☆ | ★ | | | | | | | | |
| | | VNMG160408–SM | 16.6 | 9.525 | 4.76 | 3.81 | 0.8 | | | | | | | | ☆ | ★ | | | | | | | | |

★ Recommended grade ☆ Available grade

### Applicable tools

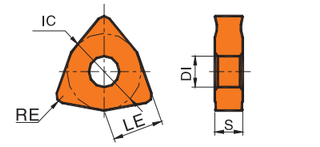


MVVNN



MVJNR/L

## 80°WN□□




Working condition: ● Stable ◕ Average ⌗ Tough

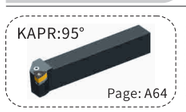
Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ● ● ● ● ● |
| M | Stainless steel | ● ● ● ● ● ● ● |
| K | Cast iron | ● ● |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● |

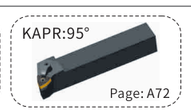
| Processing | Insert shape | Type | Dimension (mm) LE | IC | S | DI | RE | CVD HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | PVD HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | Cemented carbide HRK10 | HRK20 | Cermet HRC10 | HR115C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Finishing | | WNMG080404–GC | 8.7 | 12.7 | 4.76 | 5.16 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | WNMG080408–GC | 8.7 | 12.7 | 4.76 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| Finishing | | WNMG080404–GF | 8.7 | 12.7 | 4.76 | 5.16 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | WNMG080408–GF | 8.7 | 12.7 | 4.76 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| Finishing | | WNMG080402–BF | 8.7 | 12.7 | 4.76 | 5.16 | 0.2 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | WNMG080404–BF | 8.7 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | WNMG080408–BF | 8.7 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | |
| Semi-finishing | | WNMG080404–GQ | 8.7 | 12.7 | 4.76 | 5.16 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | WNMG080408–GQ | 8.7 | 12.7 | 4.76 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | WNMG080412–GQ | 8.7 | 12.7 | 4.76 | 5.16 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| Semi-finishing | | WNMG080404–GM | 8.7 | 12.7 | 4.76 | 5.16 | 0.4 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | WNMG080408–GM | 8.7 | 12.7 | 4.76 | 5.16 | 0.8 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |
| | | WNMG080412–GM | 8.7 | 12.7 | 4.76 | 5.16 | 1.2 | ☆ | ★ | ☆ | ★ | ☆ | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

### Applicable tools

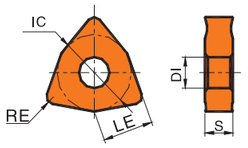


PWLNR/L



MWLNR/L

## 80°WN□□




Working condition: ● Stable ◕ Average ⌗ Tough

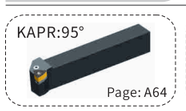
Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Semi-finishing | | WNMG06T312–BM | 6.6 | 9.525 | 3.97 | 3.81 | 1.2 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | WNMG060412–BM | 6.6 | 9.525 | 4.76 | 3.81 | 1.2 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | WNMG080404–BM | 8.7 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | WNMG080408–BM | 8.7 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | | | ☆ | ★ | | | | | | |
| | | WNMG080412–BM | 8.7 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | | | | | ☆ | ★ | | | | | | |
| Cast iron machining | | WNMG080404 | 8.7 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | ★ | | | | | | | | | | | |
| | | WNMG080408 | 8.7 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | ★ | | | | | | | | | | | |
| | | WNMG080412 | 8.7 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | ★ | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Cast iron machining | | WNMA060404 | 6.6 | 9.525 | 4.76 | 3.81 | 0.4 | | | | | | ★ | | | | | | | | | | | |
| | | WNMA060408 | 6.6 | 9.525 | 4.76 | 3.81 | 0.8 | | | | | | ★ | | | | | | | | | | | |
| | | WNMA080404 | 8.7 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | ★ | | | | | | | | | | | |
| | | WNMA080408 | 8.7 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | ★ | | | | | | | | | | | |
| | | WNMA080412 | 8.7 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | ★ | | | | | | | | | | | |
| | | WNMA080416 | 8.7 | 12.7 | 4.76 | 5.16 | 1.6 | | | | | | ★ | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

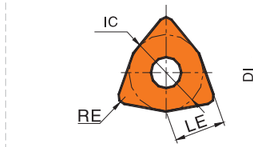
### Applicable tools



PWLNR/L

MWLNR/L

## 80°WN□□




Working condition: ● Stable ◕ Average ⌗ Tough

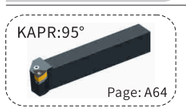
Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Semi-finishing | | WNMG080404–SM | 8.7 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | ☆ | ★ | | | | | | | | |
| | | WNMG080408–SM | 8.7 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | ☆ | ★ | | | | | | | | |
| | | WNMG080412–SM | 8.7 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | | | ☆ | ★ | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Roughing | | WNMG080408–GR | 8.7 | 12.7 | 4.76 | 5.16 | 0.8 | | | ★ | ☆ | ★ | ☆ | | | | | | | | | | | |
| | | WNMG080412–GR | 8.7 | 12.7 | 4.76 | 5.16 | 1.2 | | | ★ | ☆ | ★ | ☆ | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Roughing | | WNMG080408–BR | 8.7 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | | ☆ | ★ | | | | | | | |
| | | WNMG080412–BR | 8.7 | 12.7 | 4.76 | 5.16 | 1.2 | | | | | | | | | ☆ | ★ | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

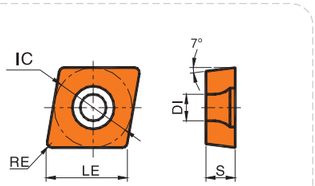
### Applicable tools



PWLNR/L

MWLNR/L

## 80°CC□□




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing | | CCGT060202–AK | 6.4 | 6.35 | 2.38 | 2.8 | 0.2 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | CCGT060204–AK | 6.4 | 6.35 | 2.38 | 2.8 | 0.4 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | CCGT09T302–AK | 9.7 | 9.525 | 3.97 | 4.4 | 0.2 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | CCGT09T304–AK | 9.7 | 9.525 | 3.97 | 4.4 | 0.4 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | CCGT09T308–AK | 9.7 | 9.525 | 3.97 | 4.4 | 0.8 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | CCGT120404–AK | 12.9 | 12.7 | 4.76 | 5.56 | 0.4 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | CCGT120408–AK | 12.9 | 12.7 | 4.76 | 5.56 | 0.8 | | | | | | | | | | | | | | ★ | ☆ | | |
| Finishing | | CCMT060204–TF | 6.4 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | CCMT060208–TF | 6.4 | 6.35 | 2.38 | 2.8 | 0.8 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | CCMT09T304–TF | 9.7 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | CCMT09T308–TF | 9.7 | 9.525 | 3.97 | 4.4 | 0.8 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| Semi-finishing | | CCMT060204–TM | 6.4 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | CCMT060208–TM | 6.4 | 6.35 | 2.38 | 2.8 | 0.8 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | CCMT09T304–TM | 9.7 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | CCMT09T308–TM | 9.7 | 9.525 | 3.97 | 4.4 | 0.8 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | CCMT120404–TM | 12.9 | 12.7 | 4.76 | 5.56 | 0.4 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | CCMT120408–TM | 12.9 | 12.7 | 4.76 | 5.56 | 0.8 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | CCMT120412–TM | 12.9 | 12.7 | 4.76 | 5.56 | 1.2 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |

★ Recommended grade ☆ Available grade

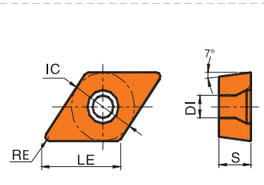
### Applicable tools

KAPR:95°

Page: A74

S□□-SCLCR/L

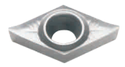
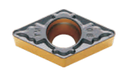
## 55°DC□□




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing |  | DCGT070202–AK | 7.8 | 6.35 | 2.38 | 2.8 | 0.2 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | DCGT070204–AK | 7.8 | 6.35 | 2.38 | 2.8 | 0.4 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | DCGT11T302–AK | 11.6 | 9.525 | 3.97 | 4.4 | 0.2 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | DCGT11T304–AK | 11.6 | 9.525 | 3.97 | 4.4 | 0.4 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | DCGT11T308–AK | 11.6 | 9.525 | 3.97 | 4.4 | 0.8 | | | | | | | | | | | | | | ★ | ☆ | | |
| Finishing | | DCMT11T304–TF | 11.6 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | DCMT11T308–TF | 11.6 | 9.525 | 3.97 | 4.4 | 0.8 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| Semi-finishing |  | DCMT070204–TM | 7.8 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | DCMT070208–TM | 7.8 | 6.35 | 2.38 | 2.8 | 0.8 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | DCMT11T304–TM | 11.6 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | DCMT11T308–TM | 11.6 | 9.525 | 3.97 | 4.4 | 0.8 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | DCMT11T312–TM | 11.6 | 9.525 | 3.97 | 4.4 | 1.2 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |

★ Recommended grade ☆ Available grade

### Applicable tools

KAPR:107.5°

Page: A74

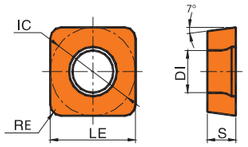
S□□-SDQCR/L

KAPR:93°

Page: A75

S□□-SDUCR/L

## 90°SC□□




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ● ● |
| M | Stainless steel | ● ● ● |
| K | Cast iron | ● ● |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing | | SCMT120408–TF | 12.7 | 12.7 | 4.76 | 5.56 | 0.8 | | ★ | ☆ | ★ | | | | | | ☆ | ★ | | | | | | |
| Semi-finishing | | SCMT09T304–TM | 9.525 | 9.525 | 3.97 | 4.4 | 0.4 | | ★ | ☆ | ★ | | | | | | ☆ | ★ | | | | | | |
| | | SCMT09T308–TM | 9.525 | 9.525 | 3.97 | 4.4 | 0.8 | | ★ | ☆ | ★ | | | | | | ☆ | ★ | | | | | | |
| | | SCMT120404–TM | 12.7 | 12.7 | 4.76 | 5.56 | 0.4 | | ★ | ☆ | ★ | | | | | | ☆ | ★ | | | | | | |
| | | SCMT120408–TM | 12.7 | 12.7 | 4.76 | 5.56 | 0.8 | | ★ | ☆ | ★ | | | | | | ☆ | ★ | | | | | | |
| | | SCMT120412–TM | 12.7 | 12.7 | 4.76 | 5.56 | 1.2 | | ★ | ☆ | ★ | | | | | | ☆ | ★ | | | | | | |

★ Recommended grade ☆ Available grade

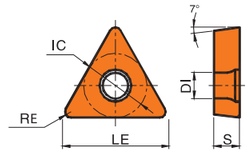
### Applicable tools

KAPR:75°

Page: A75

S□□-SSKCR/L

## 60°TC□□




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ● ● |
| M | Stainless steel | ● ● ● |
| K | Cast iron | ● ● |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing | | TCGT090204–AK | 9.7 | 5.56 | 2.38 | 2.8 | 0.4 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | TCGT110204–AK | 11.0 | 6.35 | 2.38 | 2.8 | 0.4 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | TCGT16T304–AK | 16.5 | 9.525 | 3.97 | 4.4 | 0.4 | | | | | | | | | | | | | | ★ | ☆ | | |
| Finishing | | TCMT110204–TF | 11.0 | 6.35 | 2.38 | 2.8 | 0.4 | | ★ | ☆ | ★ | | | | | | ☆ | ★ | | | | | | |
| Semi-finishing | | TCMT110204–TM | 11.0 | 6.35 | 2.38 | 2.8 | 0.4 | | ★ | ☆ | ★ | | | | | | ☆ | ★ | | | | | | |
| | | TCMT110208–TM | 11.0 | 6.35 | 2.38 | 2.8 | 0.8 | | ★ | ☆ | ★ | | | | | | ☆ | ★ | | | | | | |
| | | TCMT16T304–TM | 16.5 | 9.525 | 3.97 | 4.4 | 0.4 | | ★ | ☆ | ★ | | | | | | ☆ | ★ | | | | | | |
| | | TCMT16T308–TM | 16.5 | 9.525 | 3.97 | 4.4 | 0.8 | | ★ | ☆ | ★ | | | | | | ☆ | ★ | | | | | | |
| | | TCMT16T312–TM | 16.5 | 9.525 | 3.97 | 4.4 | 1.2 | | ★ | ☆ | ★ | | | | | | ☆ | ★ | | | | | | |

★ Recommended grade ☆ Available grade

### Applicable tools

KAPR:90°

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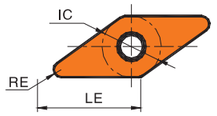
S□□-STFCR/L

HUAREAL



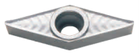
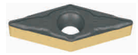
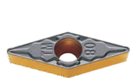
## 35°VB□□




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | Working condition |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ⌗ ⌗ |
| M | Stainless steel | ● ● ● ⌗ ⌗ |
| K | Cast iron | ● ⌗ |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● |

| Processing | Insert shape | Type | Dimension (mm) LE | IC | S | DI | RE | CVD HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | PVD HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | Cemented carbide HRK10 | HRK20 | Cermet HRC10 | HRC115C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Finishing |  | VBGT160402–AK | 16.5 | 9.525 | 4.76 | 4.4 | 0.2 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | VBGT160404–AK | 16.5 | 9.525 | 4.76 | 4.4 | 0.4 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | VBGT160408–AK | 16.5 | 9.525 | 4.76 | 4.4 | 0.8 | | | | | | | | | | | | | | ★ | ☆ | | |
| Finishing |  | VBMT160404–TF | 16.5 | 9.525 | 4.76 | 4.4 | 0.4 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | VBMT160408–TF | 16.5 | 9.525 | 4.76 | 4.4 | 0.8 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| Semi-finishing |  | VBMT110304–TM | 11.0 | 6.35 | 3.18 | 2.8 | 0.4 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | VBMT110308–TM | 11.0 | 6.35 | 3.18 | 2.8 | 0.8 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | VBMT160404–TM | 16.5 | 9.525 | 4.76 | 4.4 | 0.4 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | VBMT160408–TM | 16.5 | 9.525 | 4.76 | 4.4 | 0.8 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | VBMT160412–TM | 16.5 | 9.525 | 4.76 | 4.4 | 1.2 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |

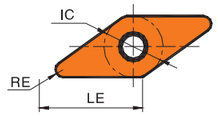
★ Recommended grade ☆ Available grade

### Applicable tools

S□□-SVQBR/L

S□□-SVUBR/L

## 35°VC□□




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | Working condition |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ⌗ ⌗ |
| M | Stainless steel | ● ● ● ⌗ ⌗ |
| K | Cast iron | ● ⌗ |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● |

| Processing | Insert shape | Type | Dimension (mm) LE | IC | S | DI | RE | CVD HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | PVD HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | Cemented carbide HRK10 | HRK20 | Cermet HRC10 | HRC115C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Semi-finishing | | VCGT110302–AK | 11.0 | 6.35 | 3.18 | 2.8 | 0.2 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | VCGT110304–AK | 11.0 | 6.35 | 3.18 | 2.8 | 0.4 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | VCGT160402–AK | 16.5 | 9.525 | 4.76 | 4.4 | 0.2 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | VCGT160404–AK | 16.5 | 9.525 | 4.76 | 4.4 | 0.4 | | | | | | | | | | | | | | ★ | ☆ | | |
| | | VCGT160408–AK | 16.5 | 9.525 | 4.76 | 4.4 | 0.8 | | | | | | | | | | | | | | ★ | ☆ | | |
| Semi-finishing | | VCMT110304–TM | 11.0 | 6.35 | 3.18 | 2.8 | 0.4 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | VCMT110308–TM | 11.0 | 6.35 | 3.18 | 2.8 | 0.8 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | VCMT160404–TM | 16.5 | 9.525 | 4.76 | 4.4 | 0.4 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | VCMT160408–TM | 16.5 | 9.525 | 4.76 | 4.4 | 0.8 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |
| | | VCMT160412–TM | 16.5 | 9.525 | 4.76 | 4.4 | 1.2 | ★ | ☆ | ★ | | | | | | | ☆ | ★ | | | | | | |

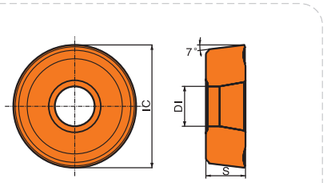
★ Recommended grade ☆ Available grade

### Applicable tools

S□□-SVQCR/L

S□□-SVUCR/L

## Profile turning insert




Working condition: ● Stable ◕ Average ⌗ Tough

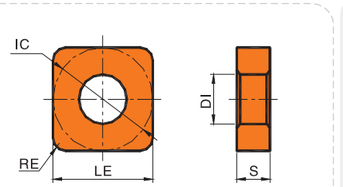
Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ● ● |
| M | Stainless steel | ● ● ● ● ● |
| K | Cast iron | ● ● |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● |

| Processing | Insert shape | Type | Dimension (mm) IC | S | DI | CVD HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | PVD HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | Cemented carbide HRK10 | HRK20 | Cermet HRC10 | HR115C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Profiling | | RCMX1003MO | 10 | 3.18 | 3.6 | | | ★ | ☆ | ★ | | | | | | | | | | | | |
| | | RCMX1204MO | 12 | 4.76 | 4.4 | | | ★ | ☆ | ★ | | | | | | | | | | | | |
| | | RCMX1606MO | 16 | 6.35 | 5.5 | | | ★ | ☆ | ★ | | | | | | | | | | | | |
| | | RCMX2006MO | 20 | 6.35 | 6.5 | | | ★ | ☆ | ★ | | | | | | | | | | | | |
| | | RCMX2507MO | 25 | 7.94 | 7.2 | | | ★ | ☆ | ★ | | | | | | | | | | | | |
| | | RCMX3209MO | 32 | 9.525 | 9.5 | | | ★ | ☆ | ★ | | | | | | | | | | | | |
| Profiling | | RCMX1606MO–MR | 16 | 6.35 | 5.5 | | | ★ | ☆ | ★ | | | | | | | | | | | | |
| | | RCMX2006MO–MR | 20 | 6.35 | 6.5 | | | ★ | ☆ | ★ | | | | | | | | | | | | |
| | | RCMX2507MO–MR | 25 | 7.94 | 7.2 | | | ★ | ☆ | ★ | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

## Planer insert




Working condition: ● Stable ◕ Average ⌗ Tough

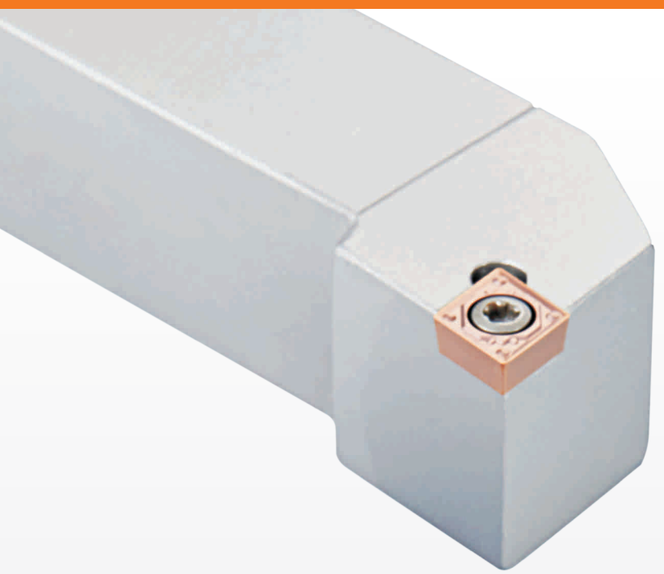
Workpiece material

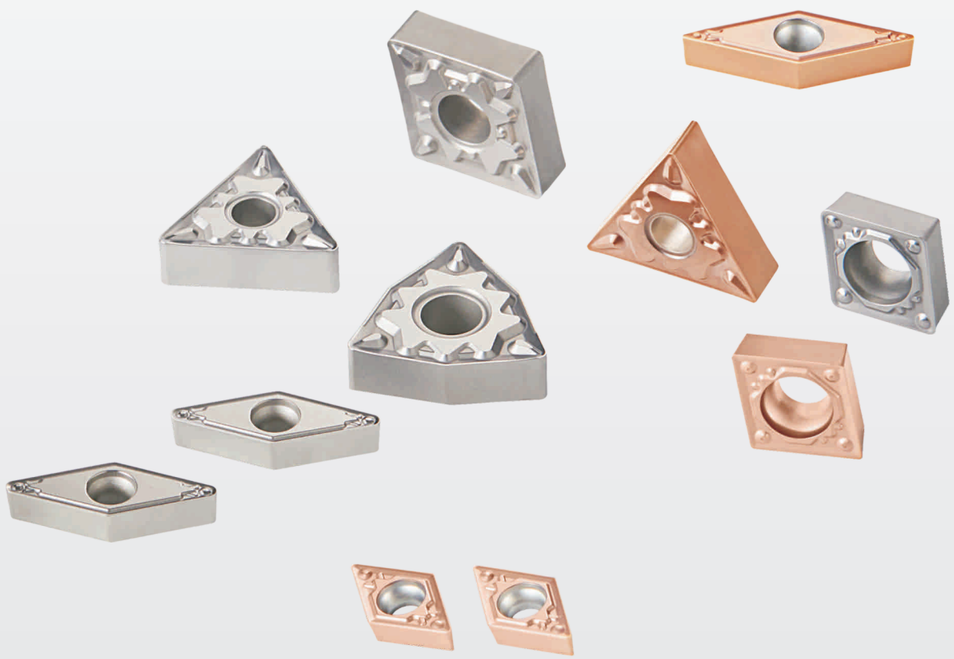
| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ● ● |
| M | Stainless steel | ● ● ● ● ● |
| K | Cast iron | ● ● |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● |

| Processing | Insert shape | Type | Dimension (mm) LE | IC | S | DI | RE | CVD HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | PVD HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | Cemented carbide HRK10 | HRK20 | Cermet HRC10 | HR115C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Planer machining | | SNMG120404–HAF | 12.7 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | | | ★ | | | | | | | |
| Planer machining | | SNMG120404–HSF | 12.7 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | | | ★ | | | | | | | |

★ Recommended grade ☆ Available grade

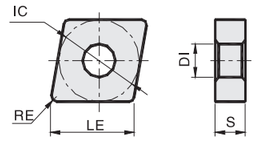
# Cermet insert





## Cermet insert

Working condition: ● Stable ◕ Average ⌗ Tough

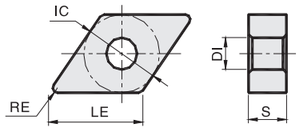



| Workpiece material | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | | PVD | | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing and semi-machining | | CNMG120404HQ | 12.9 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | | | | | | | | | | | ★ | ★ |
| | | CNMG120408HQ | 12.9 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | | | | | | | | | | | ★ | ★ |

★ Recommended grade ☆ Available grade

Working condition: ● Stable ◕ Average ⌗ Tough




| Workpiece material | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

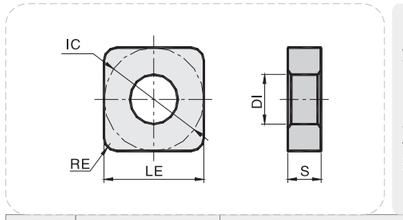
| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | | PVD | | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing and semi-machining | | DNMG150404HQ | 15.5 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | | | | | | | | | | | ★ | ★ |
| | | DNMG150408HQ | 15.5 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | | | | | | | | | | | ★ | ★ |

★ Recommended grade ☆ Available grade

HUAREAL



## Cermet insert




Working condition: ● Stable ◕ Average ⌗ Tough

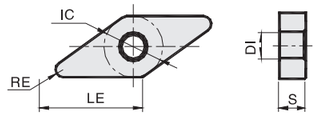
Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing and semi-machining | | SNMG120404HQ | 12.7 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | | | | | | | | | ★ | ★ |

★ Recommended grade ☆ Available grade

## Cermet insert




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing and semi-machining | | VNMG160404HQ | 16.5 | 9.525 | 4.76 | 3.81 | 0.4 | | | | | | | | | | | | | | | | ★ | ★ |
| | | VNMG160408HQ | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | | | | | | | | | | | | | | | | ★ | ★ |

★ Recommended grade ☆ Available grade

Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing and semi-machining | | TNMG160404HQ | 16.5 | 9.525 | 4.76 | 3.81 | 0.4 | | | | | | | | | | | | | | | | ★ | ★ |
| | | TNMG160408HQ | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | | | | | | | | | | | | | | | | ★ | ★ |

★ Recommended grade ☆ Available grade

Working condition: ● Stable ◕ Average ⌗ Tough

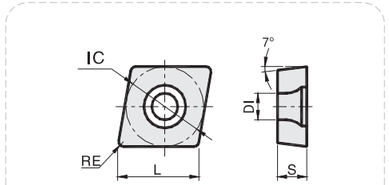
Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing and semi-machining | | WNMG080404HQ | 8.7 | 12.7 | 4.76 | 5.16 | 0.4 | | | | | | | | | | | | | | | | ★ | ★ |
| | | WNMG080408HQ | 8.7 | 12.7 | 4.76 | 5.16 | 0.8 | | | | | | | | | | | | | | | | ★ | ★ |

★ Recommended grade ☆ Available grade

## Cermet insert




Working condition: ● Stable ◕ Average ⌗ Tough

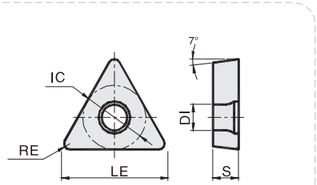
Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ◕ ◕ | |
| M | Stainless steel | ● ● ◕ ◕ |
| K | Cast iron | ◕ |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ◕ ◕ |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing and semi-machining | | CCMT060204HQ | 6.4 | 6.35 | 2.38 | 2.8 | 0.4 | | | | | | | | | | | | | | | | ★ | ☆ |
| | | CCMT09T304HQ | 9.7 | 9.525 | 3.97 | 4.4 | 0.4 | | | | | | | | | | | | | | | | ★ | ☆ |
| | | CCMT09T308HQ | 9.7 | 9.525 | 3.97 | 4.4 | 0.8 | | | | | | | | | | | | | | | | ★ | ☆ |
| | | CPMH090308HQ | 9.7 | 9.525 | 3.18 | 4.4 | 0.8 | | | | | | | | | | | | | | | | ★ | ☆ |

★ Recommended grade ☆ Available grade

## Cermet insert




Working condition: ● Stable ◕ Average ⌗ Tough

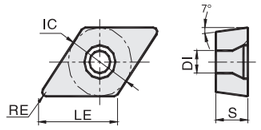
Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ◕ ◕ | |
| M | Stainless steel | ● ● ◕ ◕ |
| K | Cast iron | ◕ |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ◕ ◕ |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing and semi-machining | | TCMT110204HQ | 11.0 | 6.35 | 2.38 | 2.8 | 0.4 | | | | | | | | | | | | | | | | ★ | ☆ |

★ Recommended grade ☆ Available grade

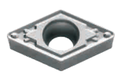
## Indexable milling




Working condition: ● Stable ◕ Average ⌗ Tough

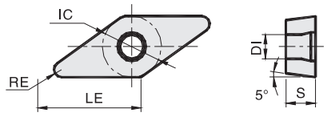
Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ◕ ◕ | |
| M | Stainless steel | ● ● ◕ ◕ |
| K | Cast iron | ◕ |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ◕ ◕ |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing and semi-machining |  | DCMT070202HQ | 7.8 | 6.35 | 2.38 | 2.8 | 0.2 | | | | | | | | | | | | | | | | ★ | ☆ |
| | | DCMT070204HQ | 7.8 | 6.35 | 2.38 | 2.8 | 0.4 | | | | | | | | | | | | | | | | ★ | ☆ |
| | | DCMT070208HQ | 7.8 | 6.35 | 2.38 | 2.8 | 0.8 | | | | | | | | | | | | | | | | ★ | ☆ |
| | | DCMT11T302HQ | 11.6 | 9.525 | 3.97 | 4.4 | 0.2 | | | | | | | | | | | | | | | | ★ | ☆ |
| | | DCMT11T304HQ | 11.6 | 9.525 | 3.97 | 4.4 | 0.4 | | | | | | | | | | | | | | | | ★ | ☆ |
| | | DCMT11T308HQ | 11.6 | 9.525 | 3.97 | 4.4 | 0.8 | | | | | | | | | | | | | | | | ★ | ☆ |

★ Recommended grade ☆ Available grade

## Indexable milling




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ◕ ◕ | |
| M | Stainless steel | ● ● ◕ ◕ |
| K | Cast iron | ◕ |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ◕ ◕ |

| Processing | Insert shape | Type | Dimension (mm) | | | | | CVD | | | | | | PVD | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Finishing and semi-machining | | VBMT110304HQ | 11.0 | 6.35 | 3.18 | 2.8 | 0.4 | | | | | | | | | | | | | | | | ★ | ☆ |
| | | VBMT110308HQ | 11.0 | 6.35 | 3.18 | 2.8 | 0.8 | | | | | | | | | | | | | | | | ★ | ☆ |
| | | VBMT160404HQ | 16.5 | 9.525 | 4.76 | 4.4 | 0.4 | | | | | | | | | | | | | | | | ★ | ☆ |
| | | VBMT160408HQ | 16.5 | 9.525 | 4.76 | 4.4 | 0.8 | | | | | | | | | | | | | | | | ★ | ☆ |

★ Recommended grade ☆ Available grade

# A Turning

## General turning tool


◆ Code key of general turning tools ---------- A-53
Code key of general external turning tools ---------- A-53
Code key of general internal turning tools ---------- A-54
◆ Overview of general turning tools (external machining) ------ A-55
◆ General turning tools ---------- A-59
P-type clamping external turning tool ---------- A-59
M-type clamping external turning tool ---------- A-65
S-type clamping internal turning tool ---------- A-74

## Code key of general external turning tools

| P | C | L | N | R | 25 | 25 | M | 12 |
|---|---|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ |

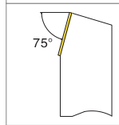
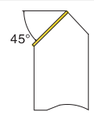
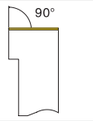
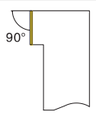
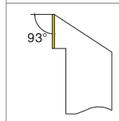
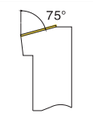
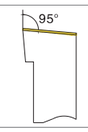
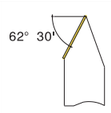
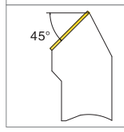
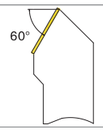
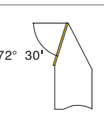
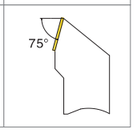
### ① Clamping

| | |
|---|---|
| M | Rigid clamping |
| P | Lever clamping |

### ②Insert shape

| | | |
|---|---|---|
| C | 80° rhombus | |
| D | 55° rhombus | |
| R | Circular | |
| S | Square | |
| T | Regular triangle | |
| V | 35° rhombus | |
| W | Equilateral unequal hexagon | |

### ③ Entering angle

| B | D | F | G |
|---|---|---|---|
|  |  |  |  |
| J | K | L | P |
|  |  |  |  |
| S | T | V | R |
|  |  |  |  |

### ④ Insert clearance angle

| | |
|---|---|
| N | Negative style (0°) |

### ⑤Hand of tool

| | |
|---|---|
| R | Right hand |
| L | Left hand |
| N | Left and right hands |

### ⑥Corner height (mm)

| | |
|---|---|
| 8 | 08 |
| 10 | 10 |
| 12 | 12 |
| 16 | 16 |
| 20 | 20 |
| 25 | 25 |
| 32 | 32 |

### ⑦Width of tool holder (mm)

| | |
|---|---|
| 8 | 08 |
| 10 | 10 |
| 12 | 12 |
| 16 | 16 |
| 20 | 20 |
| 25 | 25 |
| 32 | 32 |

### ⑧ Tool length (mm)

| | |
|---|---|
| D | 60 |
| E | 70 |
| F | 80 |
| H | 100 |
| K | 125 |
| M | 150 |
| P | 170 |
| Q | 180 |
| R | 200 |

### ⑨Cutting edge length (mm)

| Inscribed circle of insert | Insert shape | | | | | |
|---|---|---|---|---|---|---|
| | Square | Regular triangle | Circular | 80°rhombus | 55°rhombus | 35°rhombus |
| 6.00 | -- | -- | 06 | -- | -- | -- |
| 6.35 | -- | 11 | -- | 06 | 07 | 11 |
| 7.94 | -- | 13 | -- | -- | -- | -- |
| 8.00 | -- | -- | 08 | -- | -- | -- |
| 9.525 | 09 | 16 | -- | 09 | 11 | 16 |
| 10.00 | -- | -- | 10 | -- | -- | -- |
| 12.00 | -- | -- | 12 | -- | -- | -- |
| 12.70 | 12 | 22 | -- | 12 | 15 | -- |
| 15.875 | 15 | 27 | -- | 16 | -- | -- |
| 16.00 | -- | -- | 16 | -- | -- | -- |
| 19.05 | 19 | -- | -- | 19 | -- | -- |
| 20.00 | -- | -- | 20 | -- | -- | -- |
| 25.00 | -- | -- | 25 | -- | -- | -- |
| 25.40 | 25 | -- | -- | -- | -- | -- |
| 32.00 | - | - | 32 | - | - | - |

## Code key of general internal turning tools

| S | 16 | M | - | S | C | L | C | R | 09 |
|---|---|---|---|---|---|---|---|---|---|
| ① | ② | ③ | | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ |

### ① Tool material

| Mark | Material |
|---|---|
| S | Steel |

### ② Tool diameter (mm)

| | |
|---|---|
| 08 | 08 |
| 10 | 10 |
| 12 | 12 |
| 16 | 16 |
| 20 | 20 |
| 25 | 25 |
| 32 | 32 |

### ③ Shank length (mm)

| | |
|---|---|
| K | 125 |
| M | 150 |
| Q | 180 |
| R | 200 |
| S | 250 |
| T | 300 |
| U | 350 |

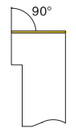
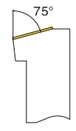
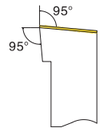
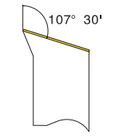
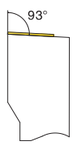
### ④ Clamping

| | |
|---|---|
| S | Screw clamping |

### ⑤ Insert shape

| | | |
|---|---|---|
| C | 80° rhombus | |
| D | 55° rhombus | |
| S | Square | |
| T | Regular triangle | |
| V | 35° rhombus | |

### ⑥ Entering angle

| F | K | L | Q |
|---|---|---|---|
|  |  |  |  |
| U | | | |
|  | | | |

### ⑦ Insert clearance angle

| | |
|---|---|
| C | 7° |
| P | 11° |

### ⑧Hand of tool

| | |
|---|---|
| R | Right hand |
| L | Left hand |
| N | Left and right hands |

### ⑨Cutting edge length (mm)

| Inscribed circle of insert | Insert shape | | | | |
|---|---|---|---|---|---|
| | Square | Regular triangle | 80° rhombus | 55° rhombus | 35° rhombus |
| 5.556 | -- | 09 | -- | -- | -- |
| 6.350 | -- | 11 | 06 | 07 | 11 |
| 9.525 | 09 | 16 | 09 | 11 | -- |
| 12.70 | 12 | -- | 12 | -- | -- |

# Overview of general turning tools (external machining)

| Clamping style | Model | Entering angle (KAPR)° | Application: External turning | Face turning | External and face turning | Profiling | Profiling | Profiling | Workpiece shape | | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P | PCBNR/L | 75° | ☺ | | | | | | ☺ | | A59 |
| | PCLNR/L | 95° | | | ☺ | | | | ☺ | | A59 |
| | PDJNR/L | 93° | | | | | ☺ | | ☺ | ☹ | A60 |
| | PDPNN | 62.5° | | | | | | ☺ | ☺ | | A60 |
| | PSBNR/L | 75° | ☺ | | | | | | ☺ | | A61 |
| | PSDNN | 45° | | | | | | ☺ | ☺ | | A61 |
| | PSKNR/L | 75° | | ☺ | | | | | ☺ | | A62 |
| | PSSNR/L | 45° | ☺ | | | | | | ☺ | | A62 |
| | PTFNR/L | 90° | | ☺ | | | | | ☺ | ☹ | A63 |
| | PTTNR/L | 60° | ☺ | | | | | | ☺ | | A63 |
| | PTGNR/L | 90° | ☺ | | | | | | ☺ | | A64 |
| | PWLNR/L | 95° | | | ☺ | | | | ☺ | ☹ | A64 |
| M | MCBNR/L | 75° | ☺ | | | | | | ☺ | | A65 |
| | MCLNR/L | 95° | | | ☺ | | | | ☺ | | A65 |

☺ Recommanded ☹ Available



# Overview of general turning tools (external machining)

| Clamping style | Model | Entering angle (KAPR)° | Application: External turning | Face turning | External and face turning | Profiling | Profiling | Profiling | Workpiece shape | | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M | MDJNR/L | 93° | | | | | ☺ | | ☺ | | A66 |
| | MDPNN | 62.5° | | | | | | ☺ | ☺ | | A67 |
| | MSBNR/L | 75° | ☺ | | | | | | ☺ | ☹ | A68 |
| | MSRNR/L | 75° | ☺ | | | | | | ☺ | | A68 |
| | MSKNR/L | 75° | | ☺ | | | | | ☺ | | A69 |
| | MSDNN | 45° | | | | | | ☺ | ☺ | | A69 |
| | MTGNR/L | 90° | ☺ | | | | | | ☺ | | A70 |
| | MTJNR/L | 93° | ☺ | | | | | | ☺ | | A70 |
| | MTFNR/L | 90° | | ☺ | | | | | ☺ | ☹ | A71 |
| | MVVNN | 72.5° | | | | | | ☺ | ☺ | | A71 |
| | MVJNR/L | 93° | | | | | ☺ | | ☺ | | A72 |
| | MWLNR/L | 95° | | | ☺ | | | | ☺ | ☹ | A72 |
| | MRGCR/L | / | | | | ☺ | | | ☺ | | A73 |
| | MRDCN | / | | | | ☺ | | | ☺ | | A73 |

☺ Recommanded ☹ Available

# Overview of general turning tools (internal machining)

| Model | Tool shape | Entering angle (KAPR) ° | Shank diameter | Tool length | Minimum workpiece diameter | Page |
|---|---|---|---|---|---|---|
| S□□-SCLCR/L | | 95° | 12 | 150 | 16 | A74 |
| | | | 16 | 180 | 20 | |
| | | | 20 | 200 | 25 | |
| | | | 25 | 250 | 32 | |
| S□□-SDQCR/L | | 107.5° | 12 | 150 | 16 | A74 |
| | | | 16 | 180 | 20 | |
| | | | 20 | 200 | 25 | |
| | | | 25 | 250 | 32 | |
| S□□-SDUCR/L | | 93° | 12 | 150 | 16 | A75 |
| | | | 16 | 180 | 20 | |
| | | | 20 | 200 | 25 | |
| | | | | | | |
| S□□-SSKCR/L | | 75° | 12 | 150 | 16 | A75 |
| | | | 16 | 180 | 20 | |
| | | | 20 | 200 | 25 | |
| | | | 25 | 250 | 32 | |
| S□□-STFCR/L | | 90° | 16 | 180 | 20 | A76 |
| | | | 20 | 200 | 25 | |
| | | | 25 | 250 | 32 | |
| | | | | | | |
| S□□-SVQBR/L | | 107.5° | | | | A76 |
| | | | 20 | 200 | 27 | |
| | | | 25 | 250 | 35 | |
| | | | | | | |
| S□□-SVUBR/L | | 93° | | | | A77 |
| | | | 25 | 250 | 35 | |
| | | | | | | |
| | | | | | | |
| S□□-SVQCR/L | | 107.5° | | | | A77 |
| | | | 16 | 180 | 22 | |
| | | | 25 | 250 | 35 | |
| | | | | | | |
| S□□-SVUCR/L | | 93° | | | | A78 |
| | | | 20 | 200 | 28 | |
| | | | 25 | 250 | 35 | |
| | | | | | | |
| S□□-SCLPR/L | | 95° | 12 | 150 | 16 | A78 |
| | | | 16 | 180 | 20 | |
| | | | 20 | 200 | 25 | |
| | | | | | | |
| S□□-SDQPR/L | | 107.5° | 12 | 150 | 16 | A79 |
| | | | 16 | 180 | 20 | |
| | | | 20 | 200 | 25 | |
| | | | | | | |

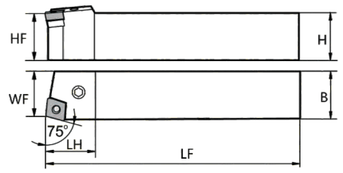


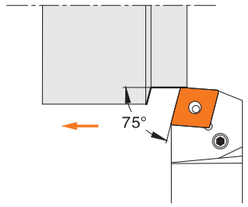
Overview of general turning tools (internal machining)

| Model | Tool shape | Entering angle (KAPR) ° | Shank diameter | Tool length | Minimum workpiece diameter | Page |
|---|---|---|---|---|---|---|
| S□□-SDUPR/L | | 93° | 12 | 150 | 16 | A79 |
| | | | 16 | 180 | 20 | |
| | | | | | | |
| | | | | | | |
| S□□-STUPR/L | | 93° | 12 | 180 | 16 | A80 |
| | | | 16 | 180 | 20 | |
| | | | | | | |
| | | | | | | |

## External turning tool

### PCBNR/L
KAPR:75°

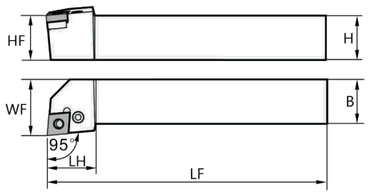


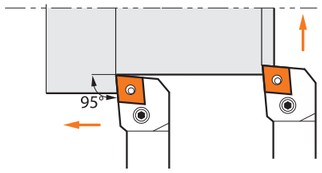




| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Lever lock screw | Shim | Wrench | Lever | shim pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| PCBNR/L | 2020K12 | △ | △ | 20 | 20 | 125 | 27 | 20 | 17 | LLS0821 | HC12WE | WR30L | GH4 | DD4L | CN**1204 |
| | 2525M12 | ▲ | ▲ | 25 | 25 | 150 | 27 | 25 | 22 | | | | | | |
| | 3232P12 | △ | △ | 32 | 32 | 170 | 32 | 32 | 27 | | | | | | |
| | 2525M16 | ▲ | ▲ | 25 | 25 | 150 | 38 | 25 | 22 | LLS0825 | HC16WE | WR30L | GH5 | DD5L | CN**1606 |
| | 3232P16 | △ | △ | 32 | 32 | 170 | 38 | 32 | 27 | | | | | | |
| | 3232P19 | △ | △ | 32 | 32 | 170 | 42 | 32 | 27 | LLS1027 | HC19WE | WR40L | GH6 | DD6L | CN**1906 |

▲Standing inventory △Make–to–order

### PCLNR/L
KAPR:95°



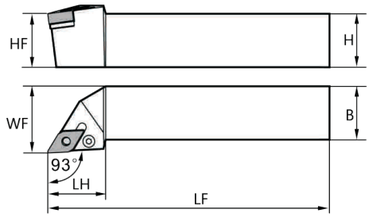

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Lever lock screw | Shim | Wrench | Lever | shim pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| PCLNR/L | 2020K12 | △ | △ | 20 | 20 | 125 | 28 | 20 | 25 | LLS0821 | HC12WE | WR30L | GH4 | DD4L | CN**1204 |
| | 2525M12 | ▲ | ▲ | 25 | 25 | 150 | 32 | 25 | 32 | | | | | | |
| | 3232P12 | △ | △ | 32 | 32 | 170 | 32 | 32 | 40 | | | | | | |
| | 2525M16 | ▲ | ▲ | 25 | 25 | 150 | 38 | 25 | 32 | LLS0825 | HC16WE | WR30L | GH5 | DD5L | CN**1606 |
| | 3232P16 | △ | △ | 32 | 32 | 170 | 38 | 32 | 40 | | | | | | |
| | 3232P19 | △ | △ | 32 | 32 | 170 | 42 | 32 | 40 | LLS1027 | HC19WE | WR40L | GH6 | DD6L | CN**1906 |

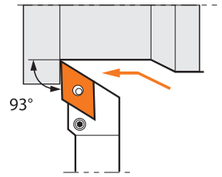
▲Standing inventory △Make–to–order



## External turning tool

### PDJNR/L
KAPR:93°

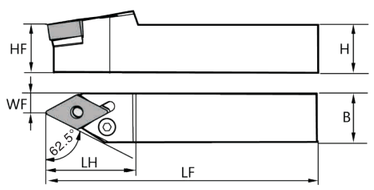


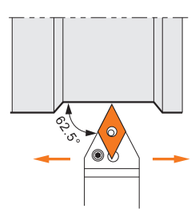




| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Lever lock screw | Shim | Wrench | Lever | shim pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| PDJNR/L | 2020K11 | △ | △ | 20 | 20 | 125 | 25 | 20 | 25 | LLS0617 | HD11WE | WR25L | GH3 | DD3L | DN**1104 |
| | 2525M11 | ▲ | ▲ | 25 | 25 | 150 | 28 | 25 | 32 | | | | | | |
| | 2020K15 | △ | △ | 20 | 20 | 125 | 38 | 20 | 25 | LLS0821 | HD15WE | WR30L | GH4B | DD4L | DN**1506 |
| | 2525M15 | ▲ | ▲ | 25 | 25 | 150 | 38 | 25 | 32 | | | | | | |
| | 3232P15 | △ | △ | 32 | 32 | 170 | 38 | 32 | 40 | | | | | | |
| | 2020K15H | △ | △ | 20 | 20 | 125 | 38 | 20 | 25 | LLS0821 | HD15WE | WR30L | GH4 | DD4L | DN**1504 |
| | 2525M15H | ▲ | ▲ | 25 | 25 | 150 | 38 | 25 | 32 | | | | | | |
| | 3232P15H | △ | △ | 32 | 32 | 170 | 38 | 32 | 40 | | | | | | |

▲Standing inventory △Make–to–order

### PDPNN
KAPR:62.5°



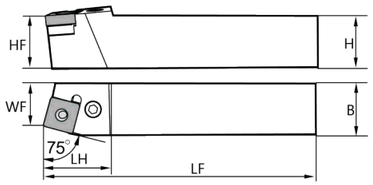



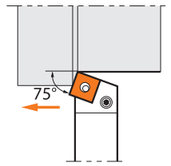

| Model | | Inventory | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Size of cutter square | | Length size | | Corner height | Head width | Lever lock screw | Shim | Wrench | Lever | shim pin | |
| | | | H | B | LF | LH | HF | WF | | | | | | |
| PDPNN | 2020K15 | ▲ | 20 | 20 | 125 | 38 | 20 | 8 | LLS0821 | HD15WE | WR30L | GHB | DD4L | DN**1506 |
| | 2525M15 | ▲ | 25 | 25 | 150 | 38 | 25 | 12.5 | | | | | | |
| | 3232P15 | △ | 32 | 32 | 170 | 38 | 32 | 16 | | | | | | |
| | 2020K15H | △ | 20 | 20 | 125 | 38 | 20 | 8 | LLS0821 | HD15WE | WR30L | GH4 | DD4L | DN**1504 |
| | 2525M15H | ▲ | 25 | 25 | 150 | 38 | 25 | 12.5 | | | | | | |
| | 3232P15H | △ | 32 | 32 | 170 | 38 | 32 | 16 | | | | | | |

▲Standing inventory △Make–to–order

## External turning tool

### PSBNR/L
KAPR:75°

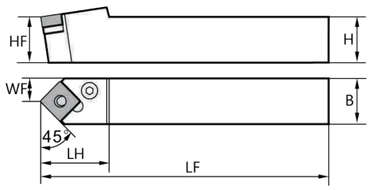


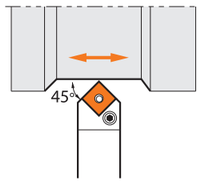




| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Lever lock screw | Shim | Wrench | Lever | shim pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| PSBNR/L | 2020K12 | △ | △ | 20 | 20 | 125 | 28 | 20 | 17 | LLS0821 | HS12WE | WR30L | GH4 | DD4L | SN**1204 |
| | 2525M12 | ▲ | ▲ | 25 | 25 | 150 | 28 | 25 | 22 | | | | | | |
| | 3232P12 | △ | △ | 32 | 32 | 170 | 32 | 32 | 27 | | | | | | |
| | 2525M15 | ▲ | ▲ | 25 | 25 | 150 | 28 | 25 | 22 | LLS0825 | HS15WE | WR30L | GH5 | DD5L | SN**1506 |
| | 3232P15 | △ | △ | 32 | 32 | 170 | 32 | 32 | 27 | | | | | | |
| | 3232P19 | △ | △ | 32 | 32 | 170 | 32 | 32 | 27 | LLS1027 | HS19WE | WR40L | GH6 | DD6L | SN**1906 |

▲Standing inventory △Make–to–order

### PSDNN
KAPR:45°




| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Lever lock screw | Shim | Wrench | Lever | shim pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| PSDNN | 2020K12 | △ | △ | 20 | 20 | 125 | 30 | 20 | 10 | LLS0821 | HS12WE | WR30L | GH4 | DD4L | SN**1204 |
| | 2525M12 | ▲ | ▲ | 25 | 25 | 150 | 30 | 25 | 12.5 | | | | | | |
| | 3232P12 | △ | △ | 32 | 32 | 170 | 40 | 32 | 16 | | | | | | |
| | 2525M15 | ▲ | ▲ | 25 | 25 | 150 | 40 | 25 | 12.5 | LLS0825 | HS15WE | WR30L | GH5 | DD5L | SN**1506 |
| | 3232P15 | △ | △ | 32 | 32 | 170 | 40 | 32 | 16 | | | | | | |
| | 3232P19 | △ | △ | 32 | 32 | 170 | 40 | 32 | 16 | LLS1027 | HS19WE | WR40L | GH6 | DD6L | SN**1906 |

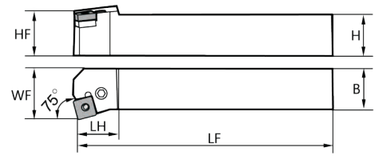
▲Standing inventory △Make–to–order

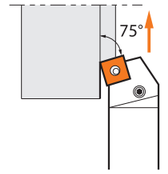




## External turning tool

### PSKNR/L
KAPR:75°

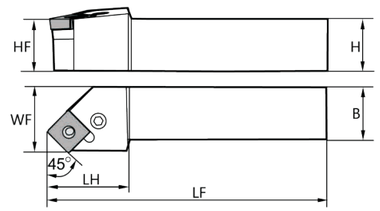


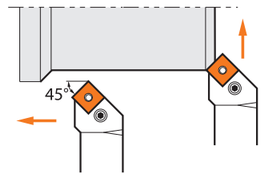




| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Lever lock screw | Shim | Wrench | Lever | shim pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| PSKNR/L | 2020K12 | △ | △ | 20 | 20 | 125 | 28 | 20 | 25 | LLS0821 | HS12WE | WR30L | GH4 | DD4L | SN**1204 |
| | 2525M12 | ▲ | ▲ | 25 | 25 | 150 | 28 | 25 | 32 | | | | | | |
| | 3232P12 | △ | △ | 32 | 32 | 170 | 32 | 32 | 40 | | | | | | |
| | 2525M15 | ▲ | ▲ | 25 | 25 | 150 | 28 | 25 | 32 | LLS0825 | HS15WE | WR30L | GH5 | DD5L | SN**1506 |
| | 3232P15 | △ | △ | 32 | 32 | 170 | 32 | 32 | 40 | | | | | | |
| | 3232P19 | △ | △ | 32 | 32 | 170 | 32 | 32 | 40 | LLS1027 | HS19WE | WR40L | GH6 | DD6L | SN**1906 |

▲Standing inventory △Make–to–order

### PSSNR/L
KAPR:45°



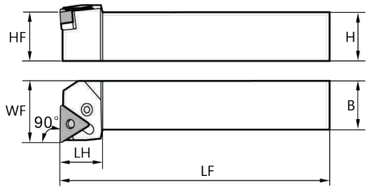

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Lever lock screw | Shim | Wrench | Lever | shim pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| PSSNR/L | 2020K12 | △ | △ | 20 | 20 | 125 | 28 | 20 | 25 | LLS0821 | HS12E | WR30L | GH4 | DD4L | SN**1204 |
| | 2525M12 | ▲ | ▲ | 25 | 25 | 150 | 28 | 25 | 32 | | | | | | |
| | 3232P12 | △ | △ | 32 | 32 | 170 | 32 | 32 | 40 | | | | | | |
| | 2525M15 | ▲ | ▲ | 25 | 25 | 150 | 28 | 25 | 32 | LLS0825 | HS15WE | WR30L | GH5 | DD5L | SN**1506 |
| | 3232P15 | △ | △ | 32 | 32 | 170 | 32 | 32 | 40 | | | | | | |
| | 3232P19 | △ | △ | 32 | 32 | 170 | 32 | 32 | 40 | LLS1027 | HS19WE | WR40L | GH6 | DD6L | SN**1906 |

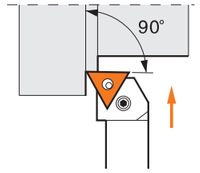
▲Standing inventory △Make–to–order

## External turning tool

### PTFNR/L

KAPR:90°



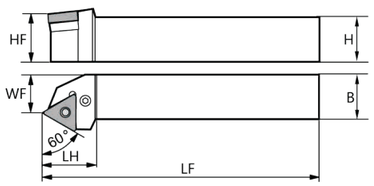



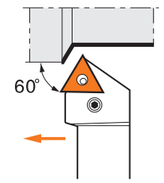

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Lever lock screw | Shim | Wrench | Lever | shim pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| PTFNR/L | 2020K16 | △ | △ | 20 | 20 | 125 | 23 | 20 | 25 | LLS0617 | HT16WE | WR25L | GH3 | DD3L | TN**1604 |
| | 2525M16 | ▲ | ▲ | 25 | 25 | 150 | 23 | 25 | 32 | | | | | | |
| | 2525M22 | △ | △ | 25 | 25 | 150 | 28 | 25 | 32 | LLS0821 | HT22WE | WR30L | GH4 | DD4L | TN**2204 |
| | 3232P22 | ▲ | ▲ | 32 | 32 | 170 | 28 | 32 | 40 | | | | | | |
| | 3232P27 | △ | △ | 32 | 32 | 170 | 34 | 32 | 40 | LLS0825 | HT27WE | WR30L | GH5 | DD5L | TN**2706 |

▲Standing inventory △Make–to–order

### PTTNR/L

KAPR:60°




| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Lever lock screw | Shim | Wrench | Lever | shim pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| PTTNR/L | 2020K16 | △ | △ | 20 | 20 | 125 | 23 | 20 | 17 | LLS0617 | HT16WE | WR25L | GH3 | DD3L | TN**1604 |
| | 2525M16 | ▲ | ▲ | 25 | 25 | 150 | 23 | 25 | 22 | | | | | | |
| | 2525M22 | ▲ | ▲ | 25 | 25 | 150 | 32 | 20 | 22 | LLS0821 | HT22WE | WR40L | GH4 | DD4L | TN**2204 |

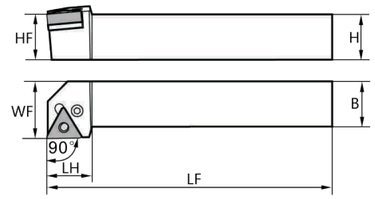
▲Standing inventory △Make–to–order

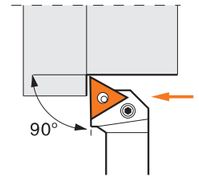


## External turning tool

### PTGNR/L

KAPR:90°



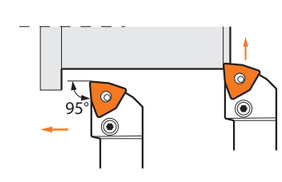




| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Lever lock screw | Shim | Wrench | Lever | shim pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| PTGNR/L | 2020K16 | △ | △ | 20 | 20 | 125 | 23 | 20 | 25 | | | | | | |
| | 2525M16 | ▲ | ▲ | 25 | 25 | 150 | 23 | 25 | 32 | LLS0617 | HT16WE | WR25L | GH3 | DD3L | TN**1604 |
| | 3232P16 | △ | △ | 32 | 32 | 170 | 28 | 32 | 40 | | | | | | |
| | 2525M22 | ▲ | ▲ | 25 | 25 | 150 | 28 | 25 | 32 | | | | | | |
| | 3232P22 | △ | △ | 32 | 32 | 170 | 28 | 32 | 40 | LLS0821 | HT22WE | WR30L | GH4 | DD4L | TN**2204 |
| | 3232P27 | △ | △ | 32 | 32 | 170 | 33 | 32 | 40 | LLS0825 | HT27WE | WR40L | GH5 | DD5L | TN**2706 |

▲Standing inventory △Make–to–order

### PWLNR/L

KAPR:95°



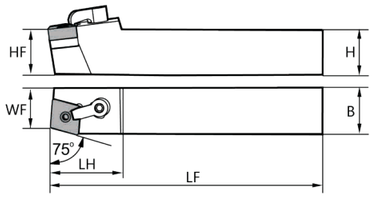

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Lever lock screw | Shim | Wrench | Lever | shim pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| PWLNR/L | 2020K06 | △ | △ | 20 | 20 | 125 | 23 | 20 | 25 | LLS0617 | HW06WE | WR25L | GH3 | DD3L | WN**0604 |
| | 2525M06 | ▲ | ▲ | 25 | 25 | 150 | 23 | 25 | 32 | | | | | | |
| | 2020K08 | △ | △ | 20 | 20 | 125 | 28 | 20 | 25 | | | | | | |
| | 2525M08 | ▲ | ▲ | 25 | 25 | 150 | 28 | 25 | 32 | LLS0821 | HW08WE | WR30L | GH4 | DD4L | WN**0804 |
| | 3232P08 | △ | △ | 32 | 32 | 170 | 28 | 32 | 40 | | | | | | |

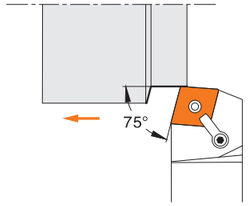
▲Standing inventory △Make–to–order

## External turning tool

### MCBNR/L

KAPR:75°



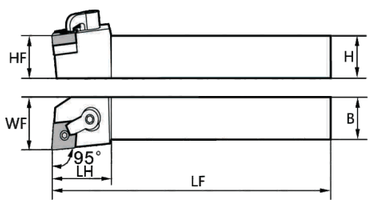



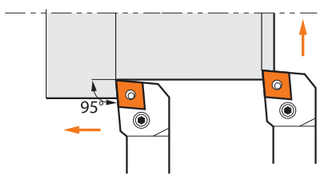

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| MCBNR/L | 2020K12 | △ | △ | 20 | 20 | 125 | 35 | 20 | 17 | HM6 × 20 | HC12WI | WR25L<br>WR30L | HYD1 | MP6 × 17 | CN**1204 |
| | 2525M12 | ▲ | ▲ | 25 | 25 | 150 | 35 | 25 | 22 | | | | | | |
| | 3232P12 | △ | △ | 32 | 32 | 170 | 35 | 32 | 27 | | | | | | |
| | 2525M16 | ▲ | ▲ | 25 | 25 | 150 | 42 | 25 | 22 | HM6 × 25 | HC16WI | WR30L | HYD2 | MP8 × 21 | CN**1606 |
| | 3232P16 | △ | △ | 32 | 32 | 170 | 42 | 32 | 27 | HM6 × 28 | | | | | |
| | 3232P19 | △ | △ | 32 | 32 | 170 | 42 | 32 | 27 | HM8 × 35 | HC19WI | WR40L | HYD5X | MP10 × 21 | CN**1906 |

▲Standing inventory △Make–to–order

### MCLNR/L

KAPR:95°



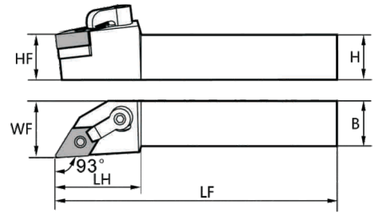

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| MCLNR/L | 2020K12 | △ | △ | 20 | 20 | 125 | 32 | 20 | 25 | HM6 × 20 | HC12WI | WR25L<br>WR30L | HYD1 | MP6 × 17 | CN**1204 |
| | 2525M12 | ▲ | ▲ | 25 | 25 | 150 | 32 | 25 | 32 | HM6 × 25 | | | | | |
| | 3232P12 | ▲ | ▲ | 32 | 32 | 170 | 32 | 32 | 40 | HM6 × 28 | | | | | |
| | 2525M16 | △ | △ | 25 | 25 | 150 | 38 | 25 | 32 | HM6 × 25 | HC16WI | WR30L | HYD2 | MP8 × 21 | CN**1606 |
| | 3232P16 | △ | △ | 32 | 32 | 170 | 38 | 32 | 40 | HM6 × 28 | | | | | |
| | 3232P19 | △ | △ | 32 | 32 | 170 | 42 | 32 | 40 | HM8 × 35 | HC19WI | WR40L | HYD5X | MP10 × 21 | CN**1906 |

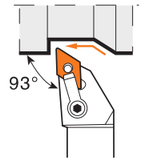
▲Standing inventory △Make–to–order

## External turning tool

### MDJNR/L

KAPR:93°



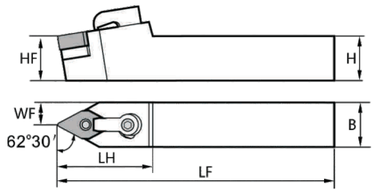

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| MDJNR/L | 2020K11 | △ | △ | 20 | 20 | 125 | 32 | 20 | 25 | HM6 × 25 | HD11WI | WR20L<br>WR30L | HYD1 | MP5 × 13 | DN**1104 |
| | 2525M11 | ▲ | ▲ | 25 | 25 | 150 | 32 | 25 | 32 | | | | | | |
| | 3232P11 | △ | △ | 32 | 32 | 170 | 32 | 32 | 40 | HM6 × 28 | | | | | |
| | 2020K15 | △ | △ | 20 | 20 | 125 | 38 | 20 | 25 | | HD15WI | WR25L<br>WR30L | HYD2 | MP6 × 19 | DN**1506 |
| | 2525M15 | ▲ | ▲ | 25 | 25 | 150 | 38 | 25 | 32 | HM6 × 25 | | | | | |
| | 3232P15 | △ | △ | 32 | 32 | 170 | 38 | 32 | 40 | HM6 × 28 | | | | | |
| | 2020K15H | △ | △ | 20 | 20 | 125 | 38 | 20 | 25 | HM6 × 20 | | | | MP6 × 17 | DN**1504 |
| | 2525M15H | ▲ | ▲ | 25 | 25 | 150 | 38 | 25 | 32 | HM6 × 25 | | | | | |
| | 3232P15H | △ | △ | 32 | 32 | 170 | 38 | 32 | 40 | HM6 × 28 | | | | | |

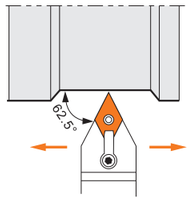
▲Standing inventory △Make–to–order

## External turning tool

### MDPNN

KAPR:62.5°



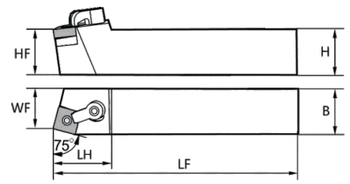

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| MDPNN | 2020K11 | △ | △ | 20 | 20 | 125 | 35 | 20 | 10 | HM6 × 20 | HD11WI | WR20L<br>WR30L | HYD1 | MP5 × 13 | DN**1104 |
| | 2525M11 | ▲ | ▲ | 25 | 25 | 150 | 35 | 25 | 12.5 | HM6 × 25 | | | | | |
| | 3232P11 | △ | △ | 32 | 32 | 170 | 42 | 32 | 16 | HM6 × 28 | | | | | |
| | 2020K15 | △ | △ | 20 | 20 | 125 | 42 | 20 | 12.5 | HM6 × 20 | HD15WI | WR25L<br>WR30L | HYD2 | MP6 × 19 | DN**1506 |
| | 2525M15 | ▲ | ▲ | 25 | 25 | 150 | 42 | 25 | 12.5 | HM6 × 25 | | | | | |
| | 3232P15 | △ | △ | 32 | 32 | 170 | 42 | 32 | 16 | HM6 × 28 | | | | | |
| | 2020K15H | △ | △ | 20 | 20 | 125 | 42 | 20 | 12.5 | HM6 × 20 | | | | MP6 × 17 | DN**1504 |
| | 2525M15H | ▲ | ▲ | 25 | 25 | 150 | 42 | 25 | 12.5 | HM6 × 25 | | | | | |
| | 3232R15H | △ | △ | 32 | 32 | 200 | 42 | 32 | 16 | HM6 × 28 | | | | | |

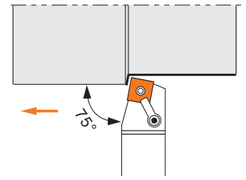
▲Standing inventory △Make–to–order

## External turning tool

### MSBNR/L

KAPR:75°



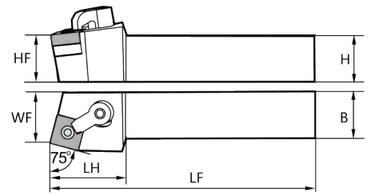



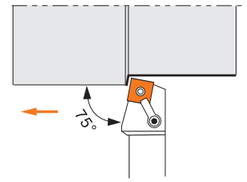

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| MSBNR/L | 2020K12 | △ | △ | 20 | 20 | 125 | 32 | 20 | 17 | HM6 × 20 | HS12WI | WR25L<br>WR30L | HYD1 | MP6 × 17 | SN**1204 |
| | 2525M12 | ▲ | ▲ | 25 | 25 | 150 | 32 | 25 | 22 | HM6 × 25 | | | | | |
| | 3232P12 | △ | △ | 32 | 32 | 170 | 32 | 32 | 27 | HM6 × 28 | | | | | |
| | 2525M15 | ▲ | ▲ | 25 | 25 | 150 | 38 | 25 | 22 | HM6 × 25 | HS15WI | WR30L | HYD2 | MP8 × 21 | SN**1506 |
| | 3232P15 | △ | △ | 32 | 32 | 170 | 38 | 32 | 27 | HM6 × 28 | | | | | |
| | 3232P19 | △ | △ | 32 | 32 | 170 | 42 | 32 | 27 | HM8 × 35 | HS19WI | WR40L | HYD5X | MP10 × 21 | SN**1906 |

▲Standing inventory △Make–to–order

### MSRNR/L

KAPR:75°



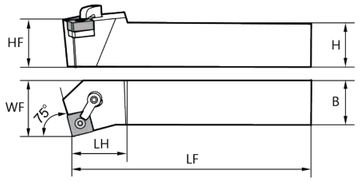



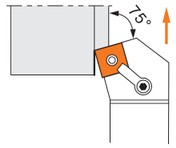

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| MSRNR/L | 2020K12 | △ | △ | 20 | 20 | 125 | 32 | 20 | 22 | HM6 × 20 | HS12WI | WR25L<br>WR30L | HYD1 | MP6 × 17 | SN**1204 |
| | 2525M12 | ▲ | ▲ | 25 | 25 | 150 | 32 | 25 | 27 | HM6 × 25 | | | | | |
| | 3232P12 | △ | △ | 32 | 32 | 170 | 32 | 32 | 35 | HM6 × 28 | | | | | |
| | 2525M15 | ▲ | ▲ | 25 | 25 | 150 | 38 | 25 | 27 | HM6 × 25 | HS15WI | WR30L | HYD2 | MP8 × 21 | SN**1506 |
| | 3232P15 | △ | △ | 32 | 32 | 170 | 38 | 32 | 35 | HM6 × 28 | | | | | |
| | 3232P19 | △ | △ | 32 | 32 | 170 | 42 | 32 | 35 | HM8 × 35 | HS19WI | WR40L | HYD5X | MP10 × 21 | SN**1906 |

▲Standing inventory △Make–to–order

## External turning tool

### MSKNR/L
KAPR:75°

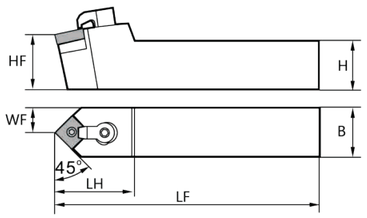


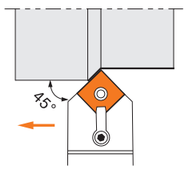




| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| MSKNR/L | 2020K12 | △ | △ | 20 | 20 | 125 | 32 | 20 | 25 | HM6 × 20 | HS12WI | WR25L<br>WR30L | HYD1 | MP6 × 17 | SN**1204 |
|  | 2525M12 | ▲ | ▲ | 25 | 25 | 150 | 32 | 25 | 32 | HM6 × 25 | | | | | |
| | 3232P12 | △ | △ | 32 | 32 | 170 | 32 | 32 | 40 | HM6 × 28 | | | | | |
| | 2525M15 | ▲ | ▲ | 25 | 25 | 150 | 38 | 25 | 32 | HM6 × 25 | HS15WI | WR30L | HYD2 | MP8 × 21 | SN**1506 |
| | 3232P15 | △ | △ | 32 | 32 | 170 | 38 | 32 | 40 | HM6 × 28 | | | | | |
| | 3232P19 | △ | △ | 32 | 32 | 170 | 42 | 32 | 40 | HM8 × 35 | HS19WI | WR40L | HYD5X | MP10 × 21 | SN**1906 |

▲Standing inventory △Make–to–order

### MSDNN
KAPR:45°



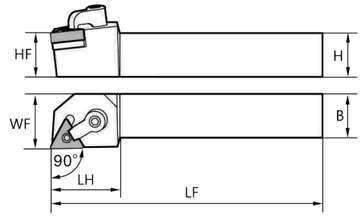

| Model | | Inventory | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | | H | B | LF | LH | HF | WF | | | | | | |
| MSDNN | 2020K12 | △ | 20 | 20 | 125 | 35 | 20 | 10 | HM6 × 25 | HS12WI | WR25L<br>WR30L | HYD1 | MP6 × 17 | SN**1204 |
| | 2525M12 | ▲ | 25 | 25 | 150 | 35 | 25 | 12.5 | | | | | | |
| | 3232P12 | △ | 32 | 32 | 170 | 42 | 32 | 16 | HM6 × 28 | | | | | |
| | 2525M15 | ▲ | 25 | 25 | 150 | 42 | 25 | 12.5 | | HS15WI | WR30L | HYD2 | MP8 × 21 | SN**1506 |
| | 3232P15 | △ | 32 | 32 | 170 | 42 | 32 | 16 | | | | | | |

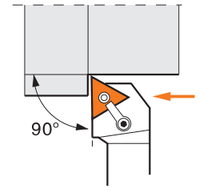
▲Standing inventory △Make–to–order



## External turning tool

### MTGNR/L
KAPR:90°

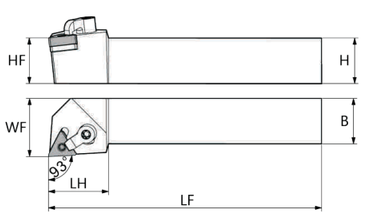


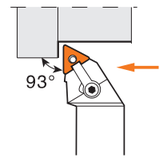




| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| MTGNR/L | 2020K16 | △ | △ | 20 | 20 | 125 | 32 | 20 | 25 | HM6 × 25 | HT16WI | WR20L<br>WR30L | HYD1 | MP5 × 13 | TN**1604 |
| | 2525M16 | ▲ | ▲ | 25 | 25 | 150 | 32 | 25 | 32 | | | | | | |
| | 3232P16 | △ | △ | 32 | 32 | 170 | 32 | 32 | 40 | HM6 × 28 | | | | | |
| | 2525M22 | ▲ | ▲ | 25 | 25 | 150 | 38 | 25 | 32 | HM6 × 25 | HT22WI | WR25L<br>WR30L | HYD2 | MP6 × 17 | TN**2204 |
| | 3232P22 | △ | △ | 32 | 32 | 170 | 38 | 32 | 40 | HM6 × 28 | | | | | |

▲Standing inventory △Make–to–order

### MTJNR/L
KAPR:93°



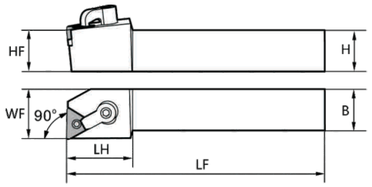

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| MTJNR/L | 2020K16 | △ | △ | 20 | 20 | 125 | 32 | 20 | 25 | HM6 × 25 | HT16WI | WR20L<br>WR30L | HYD1 | MP5 × 13 | TN**1604 |
| | 2525M16 | ▲ | ▲ | 25 | 25 | 150 | 32 | 25 | 32 | | | | | | |
| | 3232P16 | △ | △ | 32 | 32 | 170 | 32 | 32 | 40 | HM6 × 30 | | | | | |
| | 2525M22 | ▲ | ▲ | 25 | 25 | 150 | 38 | 25 | 32 | | HT22WI | WR30L | HYD2 | MP6 × 17 | TN**2204 |
| | 3232P22 | △ | △ | 32 | 32 | 170 | 38 | 32 | 40 | | | | | | |

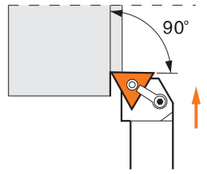
▲Standing inventory △Make–to–order

## External turning tool

**MTFNR/L**

KAPR:90°



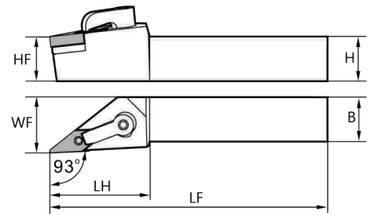

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| MTFNR/L | 2020K16 | △ | △ | 20 | 20 | 125 | 32 | 20 | 25 | HM6 × 25 | HT16WI | WR20L<br>WR30L | HYD1 | MP5 × 13 | TN**1604 |
| | 2525M16 | ▲ | ▲ | 25 | 25 | 150 | 32 | 25 | 32 | | | | | | |
| | 3225P16 | △ | △ | 32 | 25 | 170 | 32 | 32 | 32 | HM6 × 28 | | | | | |
| | 3232P16 | △ | △ | 32 | 32 | 170 | 32 | 32 | 40 | | | | | | |
| | 2525M22 | ▲ | ▲ | 25 | 25 | 150 | 38 | 25 | 32 | HM6 × 25 | HT22WI | WR25L<br>WR30L | HYD2 | MP6 × 17 | TN**2204 |
| | 3225P22 | △ | △ | 32 | 25 | 170 | 38 | 32 | 32 | HM6 × 28 | | | | | |
| | 3232P22 | △ | △ | 32 | 32 | 170 | 38 | 32 | 40 | | | | | | |

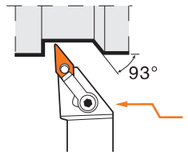
▲Standing inventory △Make–to–order

## External turning tool

**MVJNR/L**

KAPR:93°



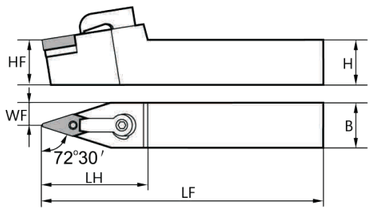

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| MVJNR/L | 2020K16 | △ | △ | 20 | 20 | 125 | 45 | 20 | 25 | HM6 × 25 | HV16WI | WR20L<br>MR30L | HYD3 | MP5 × 13 | VN**1604 |
| | 2525M16 | ▲ | ▲ | 25 | 25 | 150 | 45 | 25 | 32 | | | | | | |
| | 3232P16 | △ | △ | 32 | 32 | 170 | 45 | 32 | 40 | HM6 × 28 | | | | | |

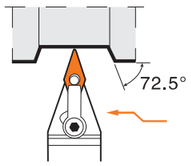
▲Standing inventory △Make–to–order

## External turning tool

**MVVNN**

KAPR:72.5°



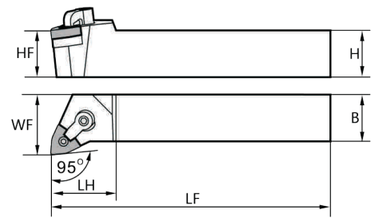

| Model | | Inventory | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | | H | B | LF | LH | HF | WF | | | | | | |
| MVVNN | 2020K16 | △ | 20 | 20 | 125 | 45 | 20 | 10 | HM6 × 25 | HV16WI | WR20L<br>WR30L | HYD3 | MP5 × 13 | VN**1604 |
| | 2525M16 | ▲ | 25 | 25 | 150 | 45 | 25 | 12.5 | | | | | | |
| | 3232P16 | △ | 32 | 32 | 170 | 45 | 32 | 16 | HM6 × 28 | | | | | |

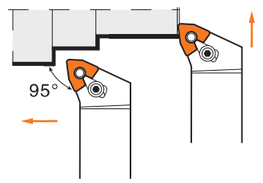
▲Standing inventory △Make–to–order

## External turning tool

**MWLNR/L**

KAPR:95°



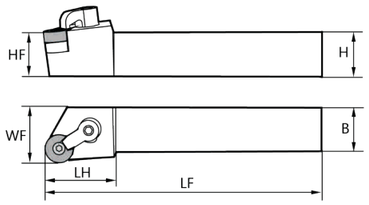



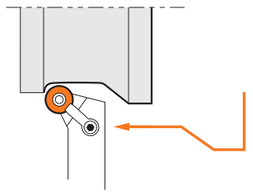

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| MWLNR/L | 2020K06 | △ | △ | 20 | 20 | 125 | 28 | 20 | 25 | HM5 × 20 | HW06WI | WR20L<br>WR30L | HYD0 | MP5 × 13 | WN**0604 |
| | 2525M06 | ▲ | ▲ | 25 | 25 | 150 | 28 | 25 | 32 | | | | | | |
| | 2020K08 | △ | △ | 20 | 20 | 125 | 32 | 20 | 25 | HM6 × 20 | HW08WI | WR25L<br>WR30L | HYD1 | MP6 × 17 | WN**0804 |
| | 2525M08 | ▲ | ▲ | 25 | 25 | 150 | 32 | 25 | 32 | HM6 × 25 | | | | | |
| | 3232P08 | △ | △ | 32 | 32 | 170 | 32 | 32 | 40 | HM6 × 28 | | | | | |

▲Standing inventory △Make–to–order

## External turning tool

### MRGCR/L

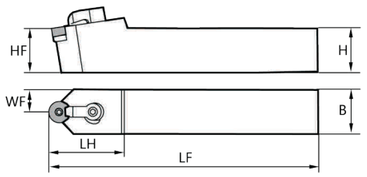


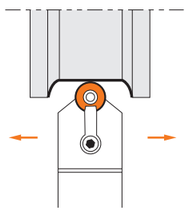



| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| MRGCR/L | 2525M12 | △ | △ | 25 | 25 | 150 | 45 | 25 | 32 | HM6 × 25 | HR12WI | WR25L | HYD1 | MP6 × 17 | RC**1204 |
|  | 3232P12 | ▲ | ▲ | 32 | 32 | 170 | 45 | 32 | 40 | HM6 × 28 | | WR30L | | | |

▲Standing inventory △Make–to–order

### MRDCN



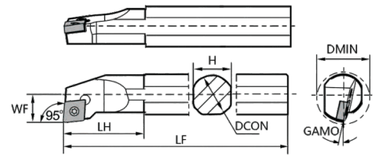
| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | | | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size of cutter square | | Length size | | Corner height | Head width | Clamp screw | Shim | Wrench | Cantilever clamp | Lock pin | |
| | | R | L | H | B | LF | LH | HF | WF | | | | | | |
| MRDCN | 2020K12 | △ | △ | 20 | 20 | 125 | 35 | 20 | 10 | HM6 × 25 | HR12WI | WR30L | HYD1 | MP6 × 17 | RC**1204 |
| | 2525M12 | ▲ | ▲ | 25 | 25 | 150 | 35 | 25 | 12.5 | HM6 × 30 | | | | | |
| | 3232P12 | △ | △ | 32 | 32 | 170 | 35 | 32 | 16 | | | | | | |

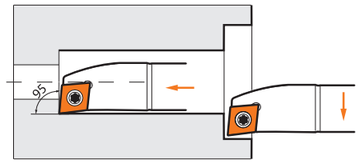
▲Standing inventory △Make–to–order

## Internal turning tool

### S□□-SCLCR/L

KAPR:95°



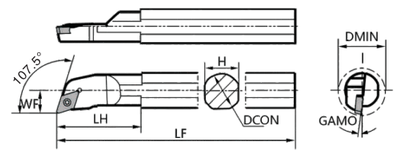



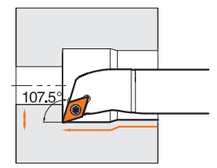

| Model | | Inventory | | Basic dimension (mm) | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | DMIN | DCON | H | LF | WF | Insert screw | Wrench | |
| | | R | L | | | | | | | | |
| | S12M–SCLCR/L06 | △ | △ | 16 | 12 | 11 | 150 | 7.5 | M2.5 × 5.5 | WR15 | CC**0602 |
| | S12M–SCLCR/L09 | △ | △ | 16 | 12 | 11 | 150 | 8 | M3.5 × 8 | | CC**09T3 |
| | S16Q–SCLCR/L09 | △ | △ | 20 | 16 | 15 | 180 | 10 | | | |
| | S20R–SCLCR/L09 | ▲ | ▲ | 25 | 20 | 19 | 200 | 12 | M3.5 × 10 | | |
| | S25S–SCLCR/L09 | ▲ | ▲ | 32 | 25 | 24 | 250 | 15.5 | | | |
| | S20R–SCLCR/L12 | ▲ | ▲ | 25 | 20 | 19 | 200 | 12.5 | M4.0 × 11 | | CC**1204 |
| | S25S–SCLCR/L12 | ▲ | ▲ | 32 | 25 | 24 | 250 | 15.5 | | | |

▲Standing inventory △Make–to–order

### S□□-SDQCR/L

KAPR:107.5°



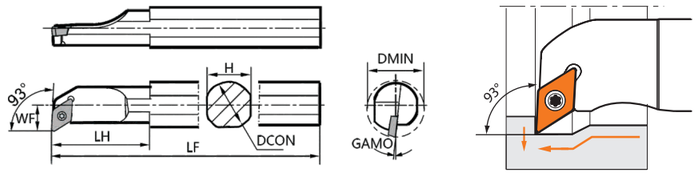

| Model | | Inventory | | Basic dimension (mm) | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | DMIN | DCON | H | LF | WF | Insert screw | Wrench | |
| | | R | L | | | | | | | | |
| | S12M–SDQCR/L07 | △ | △ | 16 | 12 | 11 | 150 | 9 | M2.5 × 6.5 | WR07 | DC**0702 |
| | S16Q–SDQCR/L07 | △ | △ | 20 | 16 | 15 | 180 | 11 | | | |
| | S20R–SDQCR/L11 | ▲ | ▲ | 25 | 20 | 19 | 200 | 13 | M3.5 × 8 | WR15 | DC**11T3 |
| | S25S–SDQCR/L11 | ▲ | ▲ | 32 | 25 | 24 | 250 | 17 | M3.5 × 10 | | |

▲Standing inventory △Make–to–order

## Internal turning tool

### S□□-SDUCR/L

KAPR:93°

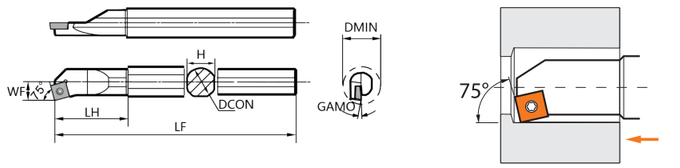



| Model | | Inventory | | Basic dimension (mm) | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | DMIN | DCON | H | LF | WF | Insert screw | Wrench | |
| | S12M–SDUCR/L07 | △ | △ | 16 | 12 | 11 | 150 | 9 | M2.5 × 6.5 | WR07 | DC**0702 |
| | S16Q–SDUCR/L07 | △ | △ | 20 | 16 | 15 | 180 | 11 | | | |
| | S20R–SDUCR/L11 | ▲ | ▲ | 25 | 20 | 19 | 200 | 13 | M3.5 × 8 | WR15 | DC**11T3 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

▲Standing inventory △Make–to–order

### S□□-SSKCR/L

KAPR:75°




| Model | | Inventory | | Basic dimension (mm) | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | DMIN | DCON | H | LF | WF | Insert screw | Wrench | |
| | S12M– SSKCR/L09 | △ | △ | 16 | 12 | 11 | 150 | 9 | M3.5 × 8 | WR15 | SC**09T3 |
| | S16Q– SSKCR/L09 | △ | △ | 20 | 16 | 15 | 180 | 11 | | | |
| | S20R– SSKCR/L09 | ▲ | ▲ | 25 | 20 | 19 | 200 | 13 | | | |
| | S25S– SSKCR/L12 | ▲ | ▲ | 32 | 25 | 24 | 250 | 17 | M4 × 1 | WR15 | SC**1204 |
| | | | | | | | | | | | |

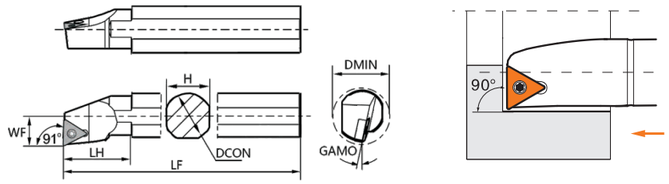
▲Standing inventory △Make–to–order



## Internal turning tool

### S□□-STFCR/L

KAPR:90°

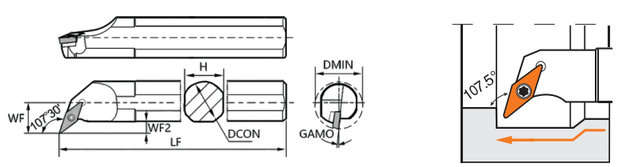



| Model | | Inventory | | Basic dimension (mm) | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | DMIN | DCON | H | LF | WF | Insert screw | Wrench | |
| | S16Q–STFCR/L11 | △ | △ | 20 | 16 | 15 | 180 | 10 | M2.5 × 6.5 | WR07 | TC**1102 |
| | S20R–STFCR/L11 | △ | △ | 25 | 20 | 19 | 200 | 12 | | | |
| | S25S–STFCR/L16 | ▲ | ▲ | 32 | 25 | 24 | 250 | 16 | M3.5 × 10 | WR15 | TC**16T3 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

▲Standing inventory △Make–to–order

### S□□-SVQBR/L

KAPR:107.5°



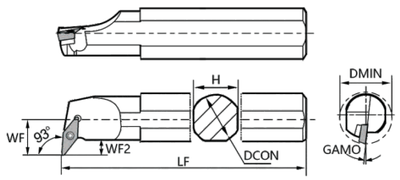

| Model | | Inventory | | Basic dimension (mm) | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | DMIN | DCON | H | LF | WF | Insert screw | Wrench | |
| | | | | | | | | | | | |
| | S20R–SVQBR/L16 | ▲ | ▲ | 27 | 20 | 19 | 200 | 14 | M3.5 × 12 | WR15 | VB**1604 |
| | S25S–SVQBR/L16 | ▲ | ▲ | 35 | 25 | 24 | 250 | 20 | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

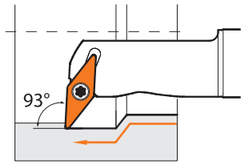
▲Standing inventory △Make–to–order

## Internal turning tool

### S□□-SVUBR/L

KAPR:93°



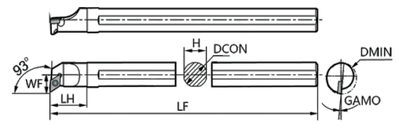

| Model | | Inventory | | Basic dimension (mm) | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | DMIN | DCON | H | LF | WF | Insert screw | Wrench | |
| | S25S– SVUBR/L16 | ▲ | ▲ | 35 | 25 | 24 | 250 | 20 | M3.5 × 12 | WR15 | VB**1604 |

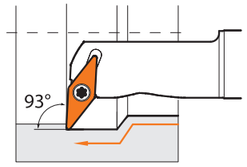
▲Standing inventory △Make–to–order

## Internal turning tool

### S□□-SVUCR/L

KAPR:93°



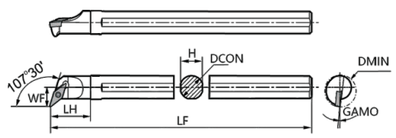



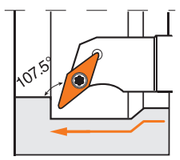

| Model | | Inventory | | Basic dimension (mm) | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | DMIN | DCON | H | LF | WF | Insert screw | Wrench | |
| | S20R–SVUCR/L11 | ▲ | ▲ | 28 | 20 | 19 | 200 | 14 | M3.5 × 12 | WR15 | VC**1604 |
| | S25S–SVUCR/L16 | ▲ | ▲ | 35 | 25 | 24 | 250 | 20 | | | |

▲Standing inventory △Make–to–order

### S□□-SVQCR/L

KAPR:107.5°



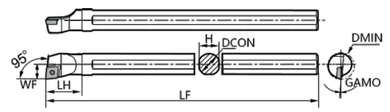



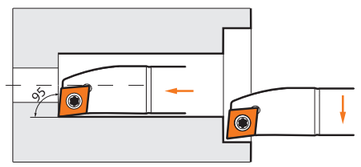

| Model | | Inventory | | Basic dimension (mm) | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | DMIN | DCON | H | LF | WF | Insert screw | Wrench | |
| | S16Q–SVQCR/L11 | ▲ | ▲ | 22 | 16 | 15 | 180 | 12 | M2.5 × 6.5 | WR07 | VC**1103 |
| | S25S–SVQCR/L16 | ▲ | ▲ | 35 | 25 | 24 | 250 | 20 | M3.5 × 12 | WR15 | VC**1604 |

▲Standing inventory △Make–to–order

### S□□-SCLPR/L

KAPR:95°



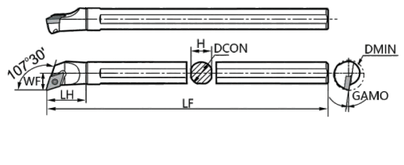

| Model | | Inventory | | Basic dimension (mm) | | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | DMIN | DCON | H | LF | WF | GAMO | Insert screw | Wrench | |
| | S12M–SCLPR/L06 | △ | △ | 16 | 12 | 11 | 150 | 8 | –4° | M2.5 × 5.5 | WR07 | CP**0602 |
| | S16Q–SCLPR/L09 | △ | △ | 20 | 16 | 15 | 180 | 10 | –4° | M3.5 × 8 | WR15 | CP**09T3 |
| | S20R–SCLPR/L09 | ▲ | ▲ | 25 | 20 | 18 | 200 | 13 | –4° | | | |

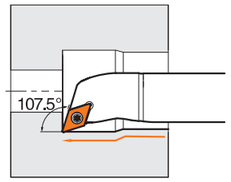
▲Standing inventory △Make–to–order

## Internal turning tool

### S□□-SDQPR/L

KAPR:107.5°



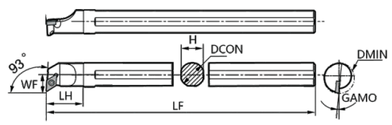



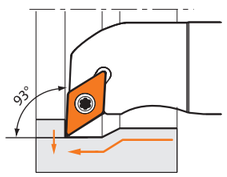

| Model | | Inventory | | Basic dimension (mm) | | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | DMIN | DCON | H | LF | WF | GAMO | Insert screw | Wrench | |
| | S12M–SDQPR/L07 | △ | △ | 16 | 12 | 11 | 150 | 9 | –8° | M2.5 × 5.5 | WR07 | DP**0702 |
| | S16Q–SDQPR/L07 | △ | △ | 20 | 16 | 15 | 180 | 11 | –6° | M2.5 × 6.5 | | |
| | S20R–SDQPR/L11 | ▲ | ▲ | 25 | 20 | 18 | 200 | 13 | –6° | M3.5 × 8 | WR15 | DP**11T3 |

▲Standing inventory △Make–to–order

### S□□-SDUPR/L

KAPR:93°




| Model | | Inventory | | Basic dimension (mm) | | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | DMIN | DCON | H | LF | WF | GAMO | Insert screw | Wrench | |
| | S12M–SDUPR/L07 | △ | △ | 16 | 12 | 11 | 150 | 9 | –8° | M2.5 × 5.5 | WR07 | DP**0702 |
| | S16Q–SDUPR/L07 | ▲ | ▲ | 20 | 16 | 15 | 180 | 11 | –6° | M2.5 × 6.5 | | |

▲Standing inventory △Make–to–order



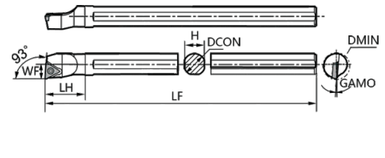


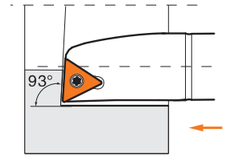
A General turning
Turing of small components
Parting and grooving
Threading
B Indexable milling
Solid carbide end mill
C Short hole drill
Solid carbide drill

## Internal turning tool

### S□□-STUPR/L

KAPR:93°




| Model | | Inventory | | Basic dimension (mm) | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | DMIN | DCON | H | LF | WF | Insert screw | Wrench | |
| | S12Q–STUPR/L11 | △ | △ | 16 | 12 | 11.4 | 180 | 7.5 | M2.5 × 6.5 | WR07 | TP**1103 |
| | S16R–STUPR/L11 | ▲ | ▲ | 20 | 16 | 15 | 180 | 10 | | | |

▲Standing inventory △Make–to–order

## Comparison table of general turning inserts in metric and Inch（Negative）

| C-type negative angle | | |
|---|---|---|
| CNMG | 090304 | 321 |
| | 090308 | 322 |
| | 120404 | 431 |
| | 120408 | 432 |
| | 120412 | 433 |
| | 120416 | 434 |
| | 160608 | 542 |
| | 160612 | 543 |
| | 160616 | 544 |
| | 190608 | 642 |
| | 190612 | 643 |
| | 190616 | 644 |
| | 190624 | 646 |
| | 250724 | 856 |
| | 250732 | 858 |
| | 250924 | 866 |
| | 250932 | 868 |
| | | |

| D-type negative angle | | |
|---|---|---|
| DNMG | 110404 | 331 |
| | 110408 | 332 |
| | 110412 | 333 |
| | 150404 | 431 |
| | 150408 | 432 |
| | 150412 | 433 |
| | 150604 | 441 |
| | 150608 | 442 |
| | 150612 | 443 |
| | 150616 | 444 |
| | 190608 | 542 |
| | 190612 | 543 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| S-type negative angle | ISO | Inch |
|---|---|---|
| SNMG | 090304 | 321 |
| | 090308 | 322 |
| | 090312 | 323 |
| | 120404 | 431 |
| | 120408 | 432 |
| | 120412 | 433 |
| | 120416 | 434 |
| | 150608 | 542 |
| | 150612 | 543 |
| | 150616 | 544 |
| | 190412 | 633 |
| | 190424 | 636 |
| | 190612 | 643 |
| | 190616 | 644 |
| | 250724 | 856 |
| | 250732 | 858 |
| | 250924 | 866 |
| | 250932 | 868 |

| T-type negative angle | ISO | Inch |
|---|---|---|
| TNMG | 110304 | 221 |
| | 110308 | 222 |
| | 160404 | 331 |
| | 160408 | 332 |
| | 160412 | 333 |
| | 220404 | 431 |
| | 220408 | 432 |
| | 220412 | 433 |
| | 220416 | 434 |
| | 270608 | 542 |
| | 270612 | 543 |
| | 270616 | 544 |

| W-type negative angle | ISO | Inch |
|---|---|---|
| WNMG | 06T304 | 3(2.5)1 |
| | 06T308 | 3(2.5)2 |
| | 06T312 | 3(2.5)3 |
| | 060404 | 331 |
| | 060408 | 332 |
| | 060412 | 333 |
| | 080404 | 431 |
| | 080408 | 432 |
| | 080412 | 433 |
| | | |
| | | |
| | | |

| V-type negative angle | ISO | Inch |
|---|---|---|
| VNMG | 160404 | 331 |
| | 160408 | 332 |
| | 160412 | 333 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| R-type negative angle | ISO | Inch |
|---|---|---|
| RNMG | 0903MO | 32 |
| | 1204MO | 43 |
| | | |
| | | |

## Comparison table of general turning inserts in metric and Inch（Positive）

| C-shape postive | ISO | Inch |
|---|---|---|
| CCMT/ CCGT | 060202 | 2(1.5)0 |
| | 060204 | 2(1.5)1 |
| | 060208 | 2(1.5)2 |
| | 09T302 | 3(2.5)0 |
| | 09T304 | 3(2.5)1 |
| | 09T308 | 3(2.5)2 |
| | 120404 | 431 |
| | 120408 | 432 |
| | 120412 | 433 |
| | | |
| | | |
| | | |
| | | |

| D-shape postive | ISO | Inch |
|---|---|---|
| DCMT/ DCGT | 070202 | 2(1.5)0 |
| | 070204 | 2(1.5)1 |
| | 070208 | 2(1.5)2 |
| | 11T302 | 3(2.5)0 |
| | 11T304 | 3(2.5)1 |
| | 11T308 | 3(2.5)2 |
| | 11T312 | 3(2.5)3 |
| | | |
| | | |
| | | |
| | | |
| | | |

| S-shape postive | ISO | Inch |
|---|---|---|
| SCMT | 060204 | 2(1.5)1 |
| | 09T302 | 3(2.5)0 |
| | 09T304 | 3(2.5)1 |
| | 09T308 | 3(2.5) 2 |
| | 120404 | 431 |
| | 120408 | 432 |
| | 120412 | 433 |
| | 150404 | 531 |
| | 150408 | 532 |
| | 150412 | 533 |
| | 190408 | 632 |
| | 190412 | 633 |
| | 190416 | 634 |

| T-shape postive | ISO | Inch |
|---|---|---|
| TCMT/ TCGT | 06T102 | 1.2(1.2)0 |
| | 06T104 | 1.2(1.2)1 |
| | 06T108 | 1.2(1.2)2 |
| | 090202 | 1.8(1.5)0 |
| | 090204 | 1.8(1.5)1 |
| | 090208 | 1.8(1.5)2 |
| | 110202 | 2(1.5)0 |
| | 110204 | 2(1.5)1 |
| | 110208 | 2(1.5)2 |
| | 110302 | 220 |
| | 110304 | 221 |
| | 110308 | 222 |
| | 16T302 | 3(2.5)0 |
| | 16T304 | 3(2.5)1 |
| | 16T308 | 3(2.5)2 |
| | 16T312 | 3(2.5)3 |
| | 160400 | 330 |
| | 220408 | 432 |
| | 220412 | 433 |
| | 220416 | 434 |
| | 270408 | 532 |
| | 270412 | 533 |
| | 330612 | 643 |
| | 330616 | 644 |

| V-shape postive | ISO | Inch |
|---|---|---|
| VBMT/ VBGT VCMT/ VCGT | 110202 | 2(1.5)0 |
| | 110204 | 2(1.5)1 |
| | 110208 | 2(1.5)2 |
| | 110302 | 220 |
| | 110304 | 221 |
| | 110308 | 222 |
| | 160402 | 330 |
| | 160404 | 331 |
| | 160408 | 332 |
| | 160412 | 333 |

# Cutting speed recommendations for general external turning

| Machined workpiece materials | | | | | | Product grade | | | | | |

# Cutting speed recommendations for general external turning

| Machined workpiece materials | | | | | | Product grade | | | | | |

## Cutting parameters recommendation for internal turning

(Positive style: standard machining diameter ＞ϕ10)

[Cutting depth: radius value (radial cutting depth)]

| ISO | Raw material | Hardness | Processing | Condition | Recommended material | Corner radius (RE) | Lower limit - recommended value -upper limit | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Speed Vc (m/min) | Cutting depth ap (mm) | Feed f (mm/rev) |
| P | Low carbon steel<br>Low carbon alloy Steel | ⩽ 300HB | Precision finishing | Continuous Interrupt | HR8115 HR8225 | 0.4 | 250–300– 350<br>120–170– 220 | 0.05–0.3–0.5<br>0.05–0.3–0.5 | 0.03– 0.1– 0.15<br>0.03– 0.1– 0.15 |
| | | | Finishing | Continuous Interrupt | HR8115 HR8225 | 0.4 0.8 | 200–250– 300<br>150–200– 250 | 0.2 –0.5–1.0<br>0.2 –0.5–1.0 | 0.05– 0.1– 0.2<br>0.05– 0.1– 0.2 |
| | | | Finishing - semi-finishing | Continuous Interrupt | HR8115 HR8225 | 0.4 0.8 | 150–200– 250<br>100–150– 200 | 0.5 –1.0–2.0<br>0.5 –1.0–1.5 | 0.1– 0.15–0.25<br>0.1– 0 15– 0.2 |
| | | | Semi-finishing | Continuous Interrupt | HR8115 HR8225 | 0.4 0.8 | 100–150– 200<br>80– 120– 150 | 1.0 –1.5–2.5<br>1.0 –1.5–2.0 | 0.1– 0.15– 0.3<br>0.1– 0.15– 0.2 |
| | Medium carbon steel Medium carbon alloy | ⩽ 300HB | Precision finishing | Continuous Interrupt | HR8115 HR8225 | 0.4 0.8 | 150–200– 250<br>120–140– 170 | 0.05–0.3–0.5<br>0.05–0.3–0.5 | 0.03– 0.1– 0.15<br>0.03– 0.1– 0.15 |
| | | | Finishing | Continuous Interrupt | HR8115 HR8225 | 0.4 0.8 | 150–200– 250<br>120–180– 200 | 0.2 –0.5–1.0<br>0.2 –0.5–1.0 | 0.05– 0.1– 0.2<br>0.05– 0.1– 0.2 |
| | | | Finishing - semi-finishing | Continuous Interrupt | HR8115 HR8225 | 0.4 0.8 | 120–180– 220<br>100–150– 200 | 0.5 –1.0–2.0<br>0.5 –1.0–1.5 | 0.1– 0.15–0.25<br>0.1– 0.15– 0.2 |
| | | | Semi-finishing | Continuous Interrupt | HR8115 HR8225 | 0.4 0.8 | 100–150– 200<br>80– 120– 150 | 1.0 –1.5–2.5<br>1.0 –1.5–2.0 | 0.1– 0.15– 0.3<br>0.1– 0.15 – 0.2 |
| | High carbon Alloy steel | ⩽ 280HB | Precision finishing | Continuous Interrupt | HR8115 HR8225 | 0.4 0.8 | 120–150– 180<br>110–130– 160 | 0.05–0.3–0.5<br>0.05–0.3–0.5 | 0.03– 0.1– 0.15<br>0.03– 0.1– 0.15 |
| | | | Finishing | Continuous Interrupt | HR8115 HR8225 | 0.4 0.8 | 120–150– 180<br>100–120– 150 | 0.2 –0.5–1.0<br>0.2 –0.5–1.0 | 0.05– 0.1– 0.2<br>0.05– 0.1– 0.2 |
| | | | Finishing - semi-finishing | Continuous Interrupt | HR8115 HR8225 | 0.4 0.8 | 120–150– 180<br>100–120– 150 | 0.5 –1.0–2.0<br>0.5 –1.0–1.5 | 0.1– 0.15–0.25<br>0.1– 0.15– 0.2 |
| | | | Semi-finishing | Continuous Interrupt | HR8115 HR8225 | 0.4 0.8 | 100–120– 150<br>80– 100– 120 | 1.0 –1.5–2.5<br>1.0 –1.5–2.0 | 0.1– 0.15– 0.3<br>0.1– 0 15– 0.2 |
| M | Stainless steel (austenite) | ⩽ 220HB | Finishing | Continuous Interrupt | HR7125 HR7225 | 0.4 0.8 | 120–150– 180<br>100–120– 150 | 0.2 –0.5–0.8<br>0.2 –0.5–0.8 | 0.05 –0.08– 0.1<br>0.05–0.08 – 0.1 |
| | | | Semi-finishing | Continuous Interrupt | HR7125 HR7225 | 0.4 0.8 | 120–150– 180<br>100–120– 150 | 0.5 –1.0–1.5<br>0.5 –1.0–1.5 | 0.05 –0.1 – 0.2<br>0.05– 0.1 – 0.2 |
| | Stainless steel (precipitation and hardening) | ⩽ 300HB | Finishing | Continuous Interrupt | HR7125 HR7225 | 0.4 0.8 | 80– 100– 120<br>60– 80– 100 | 0.2 –0.7–1.0<br>0.2 –0.7–1.0 | 0.05– 0.1 – 0.15<br>0.05– 0.1 – 0.15 |
| | | | Semi-finishing | Continuous Interrupt | HR7125 HR7225 | 0.4 0.8 | 80– 100– 120<br>60– 80– 100 | 0.5 –1.0–1.5<br>0.5 –1.0–1.5 | 0.05– 0.1 – 0.2<br>0.05– 0.1 – 0.2 |
| K | Grey cast iron | ⩽ 250HB | High speed finishing | Continuous Interrupt | HR6115 | 0.4 0.8 | 400–500– 600<br>200–250– 350 | 0.05–0.2–0.5<br>0.2 –0.5–1.0 | 0.05– 0.1 – 0.15<br>0.05– 0.1 – 0.15 |
| | | | Finishing (with high luster) | Continuous Interrupt | HR6115 | 0.4 0.8 | 200–250– 300<br>120–180– 230 | 0.2 –0.5–1.0<br>0.2 –0.5–1.0 | 0.05– 0.1 – 0.2<br>0.05– 0.1 – 0.2 |
| | | | Finishing | Continuous Interrupt | HR6115 | 0.4 0.8 | 150–180– 200<br>100–150– 180 | 0.2 –0.5–1.0<br>0.2 –0.5–1.0 | 0.05– 0.1 – 0.2<br>0.05– 0.1 – 0.2 |
| | | | Semi-finishing | Continuous Interrupt | HR6115 | 0.4 0.8 | 100–150– 200<br>80– 120– 150 | 0.5 –1.0–2.0<br>0.5 –1.0–2.0 | 0.1– 0.15– 0.2<br>0.05– 0.1 – 0.15 |
| | Nodular cast iron | ⩽ 270HB | High speed finishing | Continuous Interrupt | HR6115 | 0.4 0.8 | 200–300– 400<br>150–200– 250 | 0.05–0.2–0.5<br>0.2 –0.5–1.0 | 0.03– 0.05– 0.1<br>0.05– 0 1 – 0.15 |
| | | | Finishing (with high luster) | Continuous Interrupt | HR6115 | 0.4 0.8 | 150–200– 250<br>120–150– 200 | 0.2 –0.5–1.0<br>0.2 –0.5–1.0 | 0.05– 0.1 – 0.2<br>0.05– 0.1– 0.2 |
| | | | Finishing | Continuous Interrupt | HR6115 | 0.4 0.8 | 120–150– 180<br>100–120– 150 | 0.2 –0.5–1.0<br>0.2 –0.5–1.0 | 0.05– 0.1 – 0.2<br>0.05– 0.1 – 0.2 |
| | | | Semi-finishing | Continuous Interrupt | HR6115 | 0.4 0.8 | 100–120– 150<br>80– 100– 120 | 0.5 –1.0–2.0<br>0.5 –1.0–2.0 | 0.05– 0.1 – 0.2<br>0.05– 0.1 – 0.15 |
| N | Non-ferrous metal Copper - copper alloy Aluminum/ aluminum alloy (Si ＜ 10%), etc. | ⩽ 100HB | High speed finishing (Iridescence surface luster) | Continuous | HRK10 HRK20 | 0.4 0.8 | 200–400–1000 | 0.05–0.1–0.3 | 0.05–0.1–0.15 |
| | | | Finishing | Continuous Interrupt | HRK10 HRK20 | 0.4 0.8 | 100–200– 400<br>100–200– 400 | 0.05–0.5–1.0<br>0.05–0.5–1.0 | 0.03– 0.1– 0.2<br>0.03– 0.1– 0.2 |
| S | Titanium alloy | ⩽ 400HB | Precision finishing (Iridescence surface luster) | Continuous Interrupt | HR9105 HR7115 | 0.4 0.8 | 100–120– 150<br>70– 100– 120 | 0.05–0.1–0.3<br>0.05–0.1–0.3 | 0.03– 0.07– 0.1<br>0.03– 0.07– 0.1 |
| | | | Finishing | Continuous Interrupt | HR9105 HR7115 | 0.4 0.8 | 30– 50– 70<br>30– 50– 70 | 0.05–0.5–1.0<br>0.05–0.5–1.0 | 0.03– 0.1– 0.2<br>0.03– 0.1– 0.2 |
| | Heat resistant super alloys | ⩽ 350HB | Finishing | Continuous Interrupt | HR9105 HR7115 | 0.4 0.8 | 10– 30– 50<br>10– 30– 50 | 0.05–0.5–1.0<br>0.05–0.5–1.0 | 0.03– 0.1– 0.2<br>0.03– 0.1– 0.2 |
| | | | Finishing | Continuous Interrupt | HR9105 HR7115 | 0.4 0.8 | 40– 60– 80<br>40– 60– 80 | 0.1 –0.3–0.5<br>0.1 –0.3–0.5 | 0.03– 0.05– 0.1<br>0.03– 0.05– 0.1 |
| H | Quenched steel Hardened materials | 40~50 HRC | Finishing | Continuous Interrupt | HRK10 | 0.4 0.8 | 60– 80– 100<br>30– 50– 70 | 0.05–0.3–0.5<br>0.05–0.3–0.5 | 0.05– 0.08– 0.1<br>0.05– 0.08– 0.1 |
| | | 45~68 HRC | Finishing | Continuous Interrupt | HRK10 | 0.4 0.8 | 100–140– 180<br>90– 120– 160 | 0.1 –0.2–0.3<br>0.1 –0.2–0.3 | 0.02– 0.07– 0.1<br>0.02– 0.07– 0.1 |
| | | | Semi-finishing | Continuous | HRK10 | 0.4 0.8 | 60–80–100 | 0.3–0.7–1.0 | 0.03–01–0.15 |

## Recommended cutting parameters for cermet brand

| | Material name | Low carbon steel/ low carbon alloy steel | Middle carbon steel/ middle carbon alloy steel | High carbon alloy steel |
|---|---|---|---|---|
| | Hardness | ⩽150HB | ⩽250HB | ⩽350HB |
| HRC10 | Vc/ ( m/min ) | 100–200–300 | | 100–150–200 |
| | f/ ( mm/rev ) | 0.10~0.30 | | 0.05~0.25 |
| HR115C | Vc/ ( m/min ) | 200–300–400 | | 180–260–320 |
| | f/ ( mm/rev ) | 0.10~0.30 | | 0.05~0.25 |

## Cutting parameters for S-type internal turning

| Workpiece material | | Hardness | Machining form | L/D⩽3 | | L/D=4 | | L/D=5 | | L/D=6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Feed (mm/rev) | Cutting depth (mm) | Feed (mm/rev) | Cutting depth (mm) | Feed (mm/rev) | Cutting depth (mm) | Feed (mm/rev) | Cutting depth (mm) |
| P | Carbon steel, alloy steel 45#、42CrMo | HB 180-280 | Finishing | 0.05-0.1-0.15 | ＜0.2 | 0.05-0.1-0.15 | ＜0.2 | | | | |
| | | | semi-finishing | 0.15-0.25-0.35 | ＜3.0 | 0.1-0.15-0.2 | ＜1.5 | | | | |
| M | Stainless steel 1Cr18Ni9Ti 0Cr18Ni9 | ⩽ HB220 | Finishing | 0.05-0.1-0.15 | ＜0.2 | 0.05-0.1-0.15 | ＜0.2 | | | | |
| | | | semi-finishing | 0.15-0.2-0.25 | ＜2.0 | 0.1-0.15-0.2 | ＜1.0 | | | | |
| N | Aluminum alloy | ——— | Finishing | 0.05-0.1-0.15 | ＜0.2 | 0.05-0.1-0.15 | ＜0.2 | 0.05-0.1-0.15 | -0.15 | 0.05-0.1-0.15 | ＜0.1 |
| | | | semi-finishing | 0.05-0.1-0.15 | ＜2.0 | 0.05-0.1-0.15 | ＜1.5 | 0.05-0.1-0.15 | -1.0 | 0.05-0.1-0.15 | ＜1.0 |

# Cutting parameters recommendation for general turining chipbreaker (Negative)

| Workpiece material | Hardness | Chipbreaker | Cutting range | Grade | Cuttingspeed (m/min) | Fn (mm/rev) | Ap (mm) |
|---|---|---|---|---|---|---|---|
| Mild steel (45#、A3etc) | ≤180HB | GF | ● | HR8105 | 250–420 | 0.08–0.36 | 0.30–2.00 |
| | | | ● | HR8115 | 230–400 | 0.08–0.36 | 0.30–2.00 |
| | | | ● | HR8125 | 215–360 | 0.08–0.36 | 0.30–2.00 |
| | | | ● | HR8225 | 225–380 | 0.08–0.36 | 0.30–2.00 |
| | | | ◕ | HR8105 | 250–420 | 0.08–0.36 | 0.30–2.00 |
| | | | ◕ | HR8115 | 230–400 | 0.08–0.31 | 0.30–2.00 |
| | | | ◕ | HR8125 | 215–360 | 0.08–0.31 | 0.30–2.00 |
| | | | ◕ | HR8225 | 225–380 | 0.08–0.31 | 0.30–2.00 |
| | | GC | ● | HR8105 | 230–400 | 0.10–0.30 | 0.30–1.50 |
| | | | ● | HR8115 | 215–360 | 0.10–0.30 | 0.30–1.50 |
| | | | ● | HR8125 | 190–355 | 0.10–0.30 | 0.30–1.50 |
| | | | ● | HR8225 | 205–375 | 0.10–0.30 | 0.30–1.50 |
| | | | ◕ | HR8105 | 230–400 | 0.10–0.25 | 0.30–1.50 |
| | | | ◕ | HR8115 | 215–360 | 0.10–0.25 | 0.30–1.50 |
| | | | ◕ | HR8125 | 190–355 | 0.10–0.25 | 0.30–1.50 |
| | | | ◕ | HR8225 | 205–375 | 0.10–0.25 | 0.30–1.50 |
| | | | ⌗ | HR8125 | 190–355 | 0.10–0.20 | 0.30–1.50 |
| | | | ⌗ | HR8225 | 205–375 | 0.10–0.20 | 0.30–1.50 |
| | | GQ | ● | HR8105 | 230–400 | 0.14–0.50 | 1.00–5.00 |
| | | | ● | HR8115 | 215–360 | 0.14–0.50 | 1.00–5.00 |
| | | | ● | HR8125 | 190–355 | 0.14–0.50 | 1.00–5.00 |
| | | | ● | HR8225 | 205–375 | 0.14–0.50 | 1.00–5.00 |
| | | | ◕ | HR8105 | 230–400 | 0.14–0.45 | 1.00–5.00 |
| | | | ◕ | HR8115 | 215–360 | 0.14–0.45 | 1.00–5.00 |
| | | | ◕ | HR8125 | 190–355 | 0.14–0.45 | 1.00–5.00 |
| | | | ◕ | HR8225 | 205–375 | 0.14–0.45 | 1.00–5.00 |
| | | | ⌗ | HR8125 | 190–355 | 0.14–0.40 | 1.00–5.00 |
| | | | ⌗ | HR8225 | 205–375 | 0.14–0.40 | 1.00–5.00 |
| | | GM | ● | HR8105 | 230–400 | 0.16–0.55 | 1.00–5.00 |
| | | | ● | HR8115 | 215–360 | 0.16–0.55 | 1.00–5.00 |
| | | | ● | HR8125 | 190–355 | 0.16–0.55 | 1.00–5.00 |
| | | | ● | HR8225 | 205–375 | 0.16–0.55 | 1.00–5.00 |
| | | | ◕ | HR8105 | 225–380 | 0.16–0.50 | 1.00–5.00 |
| | | | ◕ | HR8115 | 200–380 | 0.16–0.50 | 1.00–5.00 |
| | | | ◕ | HR8125 | 185–350 | 0.16–0.50 | 1.00–5.00 |
| | | | ◕ | HR8225 | 195–360 | 0.16–0.50 | 1.00–5.00 |
| | | | ⌗ | HR8125 | 185–320 | 0.16–0.45 | 1.00–5.00 |
| | | | ⌗ | HR8225 | 195–360 | 0.16–0.45 | 1.00–5.00 |

● Stable ◕ Average ⌗ Tough

| Workpiece material | Hardness | Chipbreaker | Cutting range | Grade | Cuttingspeed (m/min) | Fn (mm/rev) | Ap (mm) |
|---|---|---|---|---|---|---|---|
| Mild steel (45#、A3etc) | ≤180HB | GR | ● | HR8115 | 235–320 | 0.25–0.60 | 2.00–7.00 |
| | | | ● | HR8125 | 185–295 | 0.25–0.60 | 2.00–7.00 |
| | | | ● | HR8225 | 195–315 | 0.25–0.60 | 2.00–7.00 |
| | | | ◕ | HR8115 | 235–320 | 0.25–0.55 | 2.00–7.00 |
| | | | ◕ | HR8125 | 195–315 | 0.25–0.55 | 2.00–7.00 |
| | | | ◕ | HR8225 | 185–295 | 0.25–0.55 | 2.00–7.00 |
| | | | ⌗ | HR8115 | 235–320 | 0.25–0.50 | 2.00–7.00 |
| | | | ⌗ | HR8125 | 185–295 | 0.25–0.50 | 2.00–7.00 |
| | | | ⌗ | HR8225 | 195–315 | 0.25–0.50 | 2.00–7.00 |
| | | GZ | ● | HR8105 | 120–255 | 0.25–1.00 | 3.00–12.00 |
| | | | ● | HR8115 | 100–200 | 0.25–1.00 | 3.00–12.00 |
| | | | ● | HR8125 | 100–180 | 0.25–1.00 | 3.00–12.00 |
| | | | ● | HR8225 | 100–195 | 0.25–1.00 | 3.00–12.00 |
| | | | ◕ | HR8105 | 120–255 | 0.25–0.95 | 3.00–12.00 |
| | | | ◕ | HR8115 | 100–200 | 0.25–0.95 | 3.00–12.00 |
| | | | ◕ | HR8125 | 100–180 | 0.25–0.95 | 3.00–12.00 |
| | | | ◕ | HR8225 | 100–195 | 0.25–0.95 | 3.00–12.00 |
| | | | ⌗ | HR8115 | 60–180 | 0.25–0.90 | 3.00–12.00 |
| | | | ⌗ | HR8125 | 60–180 | 0.25–0.90 | 3.00–12.00 |
| | | | ⌗ | HR8225 | 60–180 | 0.25–0.90 | 3.00–12.00 |
| | | GX | ● | HR8105 | 135–230 | 0.40–1.20 | 4.50–13.00 |
| | | | ● | HR8115 | 135–220 | 0.40–1.20 | 4.50–13.00 |
| | | | ● | HR8125 | 80–140 | 0.40–1.20 | 4.50–13.00 |
| | | | ● | HR8225 | 80–160 | 0.40–1.20 | 4.50–13.00 |
| | | | ◕ | HR8105 | 120–220 | 0.40–1.15 | 4.50–13.00 |
| | | | ◕ | HR8115 | 100–180 | 0.40–1.15 | 4.50–13.00 |
| | | | ◕ | HR8125 | 100–160 | 0.40–1.15 | 4.50–13.00 |
| | | | ◕ | HR8225 | 115–170 | 0.40–1.15 | 4.50–13.00 |
| | | | ⌗ | HR8115 | 60–180 | 0.40–1.10 | 4.50–13.00 |
| | | | ⌗ | HR8125 | 60–160 | 0.40–1.10 | 4.50–13.00 |
| | | | ⌗ | HR8225 | 60–170 | 0.40–1.10 | 4.50–13.00 |
| Carbon steel ,alloy steel (40Cr、42CrMo etc) | 180-280HB | GF | ● | HR8105 | 250–420 | 0.08–0.36 | 0.30–2.00 |
| | | | ● | HR8115 | 230–400 | 0.08–0.36 | 0.30–2.00 |
| | | | ● | HR8125 | 215–360 | 0.08–0.36 | 0.30–2.00 |
| | | | ● | HR8225 | 225–380 | 0.08–0.36 | 0.30–2.00 |
| | | | ◕ | HR8105 | 250–420 | 0.08–0.36 | 0.30–2.00 |
| | | | ◕ | HR8115 | 230–400 | 0.08–0.31 | 0.30–2.00 |
| | | | ◕ | HR8125 | 215–360 | 0.08–0.31 | 0.30–2.00 |
| | | | ◕ | HR8225 | 225–380 | 0.08–0.31 | 0.30–2.00 |

● Stable ◕ Average ⌗ Tough

HUAREAL

# Cutting parameters recommendation for general turining chipbreaker (Negative)

| Workpiece material | Hardness | Chipbreaker | Cutting range | Grade | Cuttingspeed (m/min) | Fn (mm/rev) | Ap (mm) |
|---|---|---|---|---|---|---|---|
| Carbon steel, alloy steel (40Cr、42CrMo etc) | 180-280HB | GC | ● | HR8105 | 230–400 | 0.10–0.30 | 0.30–1.50 |
| | | | ● | HR8115 | 215–360 | 0.10–0.30 | 0.30–1.50 |
| | | | ● | HR8125 | 190–355 | 0.10–0.30 | 0.30–1.50 |
| | | | ● | HR8225 | 205–375 | 0.10–0.30 | 0.30–1.50 |
| | | | ◕ | HR8105 | 230–400 | 0.10–0.25 | 0.30–1.50 |
| | | | ◕ | HR8115 | 215–360 | 0.10–0.25 | 0.30–1.50 |
| | | | ◕ | HR8125 | 190–355 | 0.10–0.25 | 0.30–1.50 |
| | | | ◕ | HR8225 | 205–375 | 0.10–0.25 | 0.30–1.50 |
| | | | ⌗ | HR8125 | 190–355 | 0.10–0.20 | 0.30–1.50 |
| | | | ⌗ | HR8225 | 205–375 | 0.10–0.20 | 0.30–1.50 |
| | | GQ | ● | HR8105 | 230–400 | 0.14–0.50 | 1.00–5.00 |
| | | | ● | HR8115 | 215–360 | 0.14–0.50 | 1.00–5.00 |
| | | | ● | HR8125 | 190–355 | 0.14–0.50 | 1.00–5.00 |
| | | | ● | HR8225 | 205–375 | 0.14–0.50 | 1.00–5.00 |
| | | | ◕ | HR8105 | 230–400 | 0.14–0.45 | 1.00–5.00 |
| | | | ◕ | HR8115 | 215–360 | 0.14–0.45 | 1.00–5.00 |
| | | | ◕ | HR8125 | 190–355 | 0.14–0.45 | 1.00–5.00 |
| | | | ◕ | HR8225 | 205–375 | 0.14–0.45 | 1.00–5.00 |
| | | | ⌗ | HR8125 | 190–355 | 0.14–0.40 | 1.00–5.00 |
| | | | ⌗ | HR8225 | 205–375 | 0.14–0.40 | 1.00–5.00 |
| | | GM | ● | HR8105 | 230–400 | 0.16–0.55 | 1.00–5.00 |
| | | | ● | HR8115 | 215–360 | 0.16–0.55 | 1.00–5.00 |
| | | | ● | HR8125 | 190–355 | 0.16–0.55 | 1.00–5.00 |
| | | | ● | HR8225 | 205–375 | 0.16–0.55 | 1.00–5.00 |
| | | | ◕ | HR8105 | 225–430 | 0.16–0.50 | 1.00–5.00 |
| | | | ◕ | HR8115 | 200–405 | 0.16–0.50 | 1.00–5.00 |
| | | | ◕ | HR8125 | 185–350 | 0.16–0.50 | 1.00–5.00 |
| | | | ◕ | HR8225 | 195–360 | 0.16–0.50 | 1.00–5.00 |
| | | | ⌗ | HR8125 | 185–350 | 0.16–0.45 | 1.00–5.00 |
| | | | ⌗ | HR8225 | 195–360 | 0.16–0.45 | 1.00–5.00 |
| | | GR | ● | HR8115 | 235–320 | 0.25–0.60 | 2.00–7.00 |
| | | | ● | HR8125 | 195–315 | 0.25–0.60 | 2.00–7.00 |
| | | | ● | HR8225 | 185–295 | 0.25–0.60 | 2.00–7.00 |
| | | | ◕ | HR8115 | 235–320 | 0.25–0.55 | 2.00–7.00 |
| | | | ◕ | HR8125 | 195–315 | 0.25–0.55 | 2.00–7.00 |
| | | | ◕ | HR8225 | 185–295 | 0.25–0.55 | 2.00–7.00 |
| | | | ⌗ | HR8115 | 235–320 | 0.25–0.50 | 2.00–7.00 |
| | | | ⌗ | HR8125 | 195–315 | 0.25–0.50 | 2.00–7.00 |
| | | | ⌗ | HR8225 | 185–295 | 0.25–0.50 | 2.00–7.00 |

● Stable ◕ Average ⌗ Tough

| Workpiece material | Hardness | Chipbreaker | Cutting range | Grade | Cuttingspeed (m/min) | Fn (mm/rev) | Ap (mm) |
|---|---|---|---|---|---|---|---|
| Carbon steel, alloy steel (40Cr、42CrMo etc) | 180-280HB | GZ | ● | HR8105 | 120–255 | 0.25–1.00 | 3.00–12.00 |
| | | | ● | HR8115 | 100–200 | 0.25–1.00 | 3.00–12.00 |
| | | | ● | HR8125 | 100–180 | 0.25–1.00 | 3.00–12.00 |
| | | | ● | HR8225 | 100–195 | 0.25–1.00 | 3.00–12.00 |
| | | | ◕ | HR8105 | 120–255 | 0.25–0.95 | 3.00–12.00 |
| | | | ◕ | HR8115 | 100–200 | 0.25–0.95 | 3.00–12.00 |
| | | | ◕ | HR8125 | 100–180 | 0.25–0.95 | 3.00–12.00 |
| | | | ◕ | HR8225 | 100–195 | 0.25–0.95 | 3.00–12.00 |
| | | | ⌗ | HR8115 | 60–180 | 0.25–0.90 | 3.00–12.00 |
| | | | ⌗ | HR8125 | 60–180 | 0.25–0.90 | 3.00–12.00 |
| | | | ⌗ | HR8225 | 60–180 | 0.25–0.90 | 3.00–12.00 |
| | | GX | ● | HR8105 | 135–230 | 0.40–1.20 | 4.50–13.00 |
| | | | ● | HR8115 | 135–220 | 0.40–1.20 | 4.50–13.00 |
| | | | ● | HR8125 | 80–140 | 0.40–1.20 | 4.50–13.00 |
| | | | ● | HR8225 | 80–160 | 0.40–1.20 | 4.50–13.00 |
| | | | ◕ | HR8105 | 120–220 | 0.40–1.15 | 4.50–13.00 |
| | | | ◕ | HR8115 | 100–180 | 0.40–1.15 | 4.50–13.00 |
| | | | ◕ | HR8125 | 100–160 | 0.40–1.15 | 4.50–13.00 |
| | | | ◕ | HR8225 | 115–170 | 0.40–1.15 | 4.50–13.00 |
| | | | ⌗ | HR8115 | 60–180 | 0.40–1.10 | 4.50–13.00 |
| | | | ⌗ | HR8125 | 60–160 | 0.40–1.10 | 4.50–13.00 |
| | | | ⌗ | HR8225 | 60–170 | 0.40–1.10 | 4.50–13.00 |
| Carbon steel, alloy steel (quenching material, etc) | ⩾280HB | GF | ● | HR8105 | 230–400 | 0.10–0.40 | 0.30–2.00 |
| | | | ● | HR8115 | 210–380 | 0.10–0.40 | 0.30–2.00 |
| | | | ◕ | HR8105 | 230–380 | 0.10–0.35 | 0.30–2.00 |
| | | | ◕ | HR8115 | 210–360 | 0.10–0.35 | 0.30–2.00 |
| | | GC | ● | HR8105 | 215–380 | 0.10–0.30 | 0.30–1.50 |
| | | | ● | HR8115 | 190–360 | 0.10–0.30 | 0.30–1.50 |
| | | | ◕ | HR8105 | 215–400 | 0.10–0.25 | 0.30–1.50 |
| | | | ◕ | HR8115 | 190–380 | 0.10–0.25 | 0.30–1.50 |
| | | GQ | ● | HR8105 | 220–400 | 0.20–0.60 | 0.90–4.00 |
| | | | ● | HR8115 | 205–380 | 0.20–0.60 | 0.90–4.00 |
| | | | ◕ | HR8105 | 220–380 | 0.20–0.55 | 0.90–4.00 |
| | | | ◕ | HR8115 | 205–360 | 0.20–0.55 | 0.90–4.00 |
| | | GM | ● | HR8105 | 220–400 | 0.20–0.55 | 1.00–4.00 |
| | | | ● | HR8115 | 205–380 | 0.20–0.55 | 1.00–4.00 |
| | | | ◕ | HR8105 | 220–380 | 0.20–0.50 | 1.00–4.00 |
| | | | ◕ | HR8115 | 205–360 | 0.20–0.50 | 1.00–4.00 |

● Stable ◕ Average ⌗ Tough

# Cutting parameters recommendation for general turining chipbreaker (Negative)

| Workpiece material | Hardness | Chipbreaker | Cutting range | Grade | Cuttingspeed (m/min) | Fn (mm/rev) | Ap (mm) |
|---|---|---|---|---|---|---|---|
| Carbon steel, alloy steel (quenching material, etc) | ⩾280HB | GR | ● | HR8115 | 225–360 | 0.25–0.60 | 1.50–6.00 |
| | | | ◕ | HR8225 | 225–340 | 0.25–0.55 | 1.50–6.00 |
| | | GZ | ● | HR8115 | 120–245 | 0.50–1.26 | 3.00–11.00 |
| | | | ● | HR8225 | 100–190 | 0.50–1.26 | 3.00–11.00 |
| | | | ◕ | HR8115 | 110–245 | 0.50–1.21 | 3.00–11.00 |
| | | | ◕ | HR8225 | 90–190 | 0.50–1.21 | 3.00–11.00 |
| | | GX | ● | HR8115 | 120–220 | 0.70–1.30 | 4.00–12.00 |
| | | | ● | HR8225 | 120–210 | 0.70–1.30 | 4.00–12.00 |
| | | | ◕ | HR8115 | 80–220 | 0.70–1.25 | 4.00–12.00 |
| | | | ◕ | HR8225 | 80–210 | 0.70–1.25 | 4.00–12.00 |
| Austenitic stainless steel (SUS304、SUS316etc) | ⩽200HB | BF | ● | HR7125 | 95–185 | 0.08–0.30 | 0.20–2.00 |
| | | | ● | HR7225 | 95–185 | 0.08–0.30 | 0.20–2.00 |
| | | | ◕ | HR7125 | 95–185 | 0.08–0.25 | 0.20–2.00 |
| | | | ◕ | HR7225 | 95–185 | 0.08–0.25 | 0.20–2.00 |
| | | BM | ● | HR7125 | 90–170 | 0.10–0.52 | 1.00–5.80 |
| | | | ● | HR7225 | 90–170 | 0.10–0.52 | 1.00–5.80 |
| | | | ◕ | HR7125 | 90–170 | 0.10–0.47 | 1.00–5.80 |
| | | | ◕ | HR7225 | 90–170 | 0.10–0.47 | 1.00–5.80 |
| | | | ⌗ | HR7125 | 90–170 | 0.10–0.42 | 1.00–5.80 |
| | | | ⌗ | HR7225 | 90–170 | 0.10–0.42 | 1.00–5.80 |
| | | BR | ● | HR7125 | 80–150 | 0.18–0.66 | 1.70–7.00 |
| | | | ● | HR7225 | 80–150 | 0.18–0.66 | 1.70–7.00 |
| | | | ◕ | HR7125 | 80–150 | 0.18–0.61 | 1.70–7.00 |
| | | | ◕ | HR7225 | 80–150 | 0.18–0.61 | 1.70–7.00 |
| | | | ⌗ | HR7125 | 80–150 | 0.18–0.56 | 1.70–7.00 |
| | | | ⌗ | HR7225 | 80–150 | 0.18–0.56 | 1.70–7.00 |
| Martebsitic stainless steel (SUS431、SUS420etc) | >200HB | BF | ● | HR7225 | 85–175 | 0.08–0.30 | 0.20–2.00 |
| | | | ◕ | HR7225 | 85–175 | 0.08–0.25 | 0.20–2.00 |
| | | BM | ● | HR7225 | 80–160 | 0.10–0.52 | 1.00–5.80 |
| | | | ◕ | HR7225 | 80–160 | 0.10–0.47 | 1.00–5.80 |
| | | | ⌗ | HR7225 | 80–160 | 0.10–0.42 | 1.00–5.80 |
| | | BR | ● | HR7225 | 70–140 | 0.18–0.66 | 1.70–7.00 |
| | | | ◕ | HR7225 | 70–140 | 0.18–0.61 | 1.70–7.00 |
| | | | ⌗ | HR7225 | 70–140 | 0.18–0.56 | 1.70–7.00 |

● Stable ◕ Average ⌗ Tough

| Workpiece material | Hardness | Chipbreaker | Cutting range | Grade | Cuttingspeed (m/min) | Fn (mm/rev) | Ap (mm) |
|---|---|---|---|---|---|---|---|
| Grey cast iron (HT200、Ht300etc) | ⩽350MPa | no | ● | HR6115 | 155–285 | 0.20–0.60 | 2.50–6.00 |
| | | | ◕ | HR6115 | 155–285 | 0.20–0.55 | 2.50–6.00 |
| | | | ⌗ | HR6115 | 155–285 | 0.20–0.50 | 2.50–6.00 |
| | | All round | ● | HR6115 | 165–300 | 0.25–0.60 | 1.60–5.00 |
| | | | ◕ | HR6115 | 165–300 | 0.25–0.55 | 1.60–5.00 |
| | | | ⌗ | HR6115 | 165–300 | 0.25–0.50 | 1.60–5.00 |
| Nodular cast iron (QT400、Qt500etc) | ⩽450MPa | no | ● | HR6115 | 145–270 | 0.20–0.60 | 2.50–6.00 |
| | | | ◕ | HR6115 | 145–270 | 0.20–0.55 | 2.50–6.00 |
| | | | ⌗ | HR6115 | 145–270 | 0.20–0.50 | 2.50–6.00 |
| | | All round | ● | HR6115 | 155–285 | 0.25–0.60 | 1.60–5.00 |
| | | | ◕ | HR6115 | 155–285 | 0.25–0.55 | 1.60–5.00 |
| | | | ⌗ | HR6115 | 155–285 | 0.25–0.50 | 1.60–5.00 |
| Heat-resistance alloy (Gh4169etc) | —— | SM | ● | HR7115 | 30–70 | 0.15–0.40 | 0.70–3.00 |
| | | | ● | HR9105 | 40–80 | 0.15–0.40 | 0.70–3.00 |
| | | | ◕ | HR7115 | 30–70 | 0.15–0.35 | 0.70–3.00 |
| | | | ◕ | HR9105 | 40–80 | 0.15–0.35 | 0.70–3.00 |
| | | | ⌗ | HR7115 | 30–70 | 0.15–0.30 | 0.70–3.00 |
| | | | ⌗ | HR9105 | 40–80 | 0.15–0.30 | 0.70–3.00 |

● Stable ◕ Average ⌗ Tough

# Cutting parameters recommendation for general turining chipbreaker (Positive)

| Workpiece material | Hardness | Chipbreaker | Cutting range | Grade | Cuttingspeed (m/min) | Fn (mm/rev) | Ap (mm) |
|---|---|---|---|---|---|---|---|
| Mild steel (45#、A3etc) | ≤180HB | TF | ● | HR8105 | 250–425 | 0.10–0.30 | 0.30–2.00 |
| | | | ● | HR8115 | 230–355 | 0.10–0.30 | 0.30–2.00 |
| | | | ● | HR8125 | 225–320 | 0.10–0.30 | 0.30–2.00 |
| | | | ● | HR8225 | 220–310 | 0.10–0.30 | 0.30–2.00 |
| | | | ◕ | HR8105 | 250–425 | 0.10–0.25 | 0.30–2.00 |
| | | | ◕ | HR8115 | 230–355 | 0.10–0.25 | 0.30–2.00 |
| | | | ◕ | HR8125 | 225–320 | 0.10–0.25 | 0.30–2.00 |
| | | | ◕ | HR8225 | 220–310 | 0.10–0.25 | 0.30–2.00 |
| | | TM | ● | HR8105 | 230–440 | 0.15–0.35 | 0.50–3.00 |
| | | | ● | HR8115 | 215–415 | 0.15–0.35 | 0.50–3.00 |
| | | | ● | HR8125 | 190–355 | 0.15–0.35 | 0.50–3.00 |
| | | | ● | HR8225 | 205–375 | 0.15–0.35 | 0.50–3.00 |
| | | | ◕ | HR8105 | 225–430 | 0.15–0.30 | 0.50–3.00 |
| | | | ◕ | HR8115 | 200–405 | 0.15–0.30 | 0.50–3.00 |
| | | | ◕ | HR8125 | 185–350 | 0.15–0.30 | 0.50–3.00 |
| | | | ◕ | HR8225 | 195–360 | 0.15–0.30 | 0.50–3.00 |
| | | | ⌗ | HR8125 | 185–350 | 0.15–0.25 | 0.50–3.00 |
| | | | ⌗ | HR8225 | 195–360 | 0.15–0.25 | 0.50–3.00 |
| Carbon steel, alloy steel (40Cr、42CrMoetc) | 180-280HB | TF | ● | HR8105 | 250–480 | 0.10–0.30 | 0.30–2.00 |
| | | | ● | HR8115 | 230–440 | 0.10–0.30 | 0.30–2.00 |
| | | | ● | HR8125 | 215–415 | 0.10–0.30 | 0.30–2.00 |
| | | | ● | HR8225 | 225–410 | 0.10–0.30 | 0.30–2.00 |
| | | | ◕ | HR8105 | 250–480 | 0.10–0.25 | 0.30–2.00 |
| | | | ◕ | HR8115 | 230–440 | 0.10–0.25 | 0.30–2.00 |
| | | | ◕ | HR8125 | 215–415 | 0.10–0.25 | 0.30–2.00 |
| | | | ◕ | HR8225 | 225–410 | 0.10–0.25 | 0.30–2.00 |
| | | TM | ● | HR8105 | 230–440 | 0.15–0.35 | 0.50–3.00 |
| | | | ● | HR8115 | 215–415 | 0.15–0.35 | 0.50–3.00 |
| | | | ● | HR8125 | 190–355 | 0.15–0.35 | 0.50–3.00 |
| | | | ● | HR8225 | 205–375 | 0.15–0.35 | 0.50–3.00 |
| | | | ◕ | HR8105 | 225–430 | 0.15–0.30 | 0.50–3.00 |
| | | | ◕ | HR8115 | 200–405 | 0.15–0.30 | 0.50–3.00 |
| | | | ◕ | HR8125 | 185–350 | 0.15–0.30 | 0.50–3.00 |
| | | | ◕ | HR8225 | 195–360 | 0.15–0.30 | 0.50–3.00 |
| | | | ⌗ | HR8125 | 185–350 | 0.15–0.25 | 0.50–3.00 |
| | | | ⌗ | HR8225 | 195–360 | 0.15–0.25 | 0.50–3.00 |

● Stable ◕ Average ⌗ Tough

| Workpiece material | Hardness | Chipbreaker | Cutting range | Grade | Cuttingspeed (m/min) | Fn (mm/rev) | Ap (mm) |
|---|---|---|---|---|---|---|---|
| Carbon steel, alloy steel (quenching material, etc) | ⩾280HB | TF | ● | HR8115 | 230–460 | 0.10–0.30 | 0.30–2.00 |
| | | | ● | HR8225 | 210–420 | 0.10–0.30 | 0.30–2.00 |
| | | | ◕ | HR8115 | 230–460 | 0.10–0.25 | 0.30–2.00 |
| | | | ◕ | HR8225 | 210–420 | 0.10–0.25 | 0.30–2.00 |
| | | TM | ● | HR8115 | 215–420 | 0.15–0.35 | 0.50–3.00 |
| | | | ● | HR8225 | 190–395 | 0.15–0.35 | 0.50–3.00 |
| | | | ◕ | HR8115 | 215–420 | 0.15–0.30 | 0.50–3.00 |
| | | | ◕ | HR8225 | 190–395 | 0.15–0.30 | 0.50–3.00 |
| Austenitic stainless steel (SUS304、SUS316 etc) | ≤200HB | TF | ● | HR7125 | 95–185 | 0.10–0.30 | 0.30–2.00 |
| | | | ● | HR7225 | 95–185 | 0.10–0.30 | 0.30–2.00 |
| | | | ◕ | HR7125 | 95–185 | 0.10–0.25 | 0.30–2.00 |
| | | | ◕ | HR7225 | 95–185 | 0.10–0.25 | 0.30–2.00 |
| | | TM | ● | HR7125 | 80–150 | 0.15–0.35 | 0.50–3.00 |
| | | | ● | HR7225 | 80–150 | 0.15–0.35 | 0.50–3.00 |
| | | | ◕ | HR7125 | 80–150 | 0.15–0.30 | 0.50–3.00 |
| | | | ◕ | HR7225 | 80–150 | 0.15–0.30 | 0.50–3.00 |
| | | | ⌗ | HR7125 | 80–150 | 0.15–0.25 | 0.50–3.00 |
| | | | ⌗ | HR7225 | 80–150 | 0.15–0.25 | 0.50–3.00 |
| Martebsitic stainless steel (SUS431、SUS420 etc) | >200HB | TF | ● | HR7125 | 85–175 | 0.10–0.30 | 0.30–2.00 |
| | | | ● | HR7225 | 85–175 | 0.10–0.30 | 0.30–2.00 |
| | | | ◕ | HR7125 | 85–175 | 0.10–0.25 | 0.30–2.00 |
| | | | ◕ | HR7225 | 85–175 | 0.10–0.25 | 0.30–2.00 |
| | | TM | ● | HR7125 | 70–140 | 0.15–0.35 | 0.50–3.00 |
| | | | ● | HR7225 | 70–140 | 0.15–0.35 | 0.50–3.00 |
| | | | ◕ | HR7125 | 70–140 | 0.15–0.30 | 0.50–3.00 |
| | | | ◕ | HR7225 | 70–140 | 0.15–0.30 | 0.50–3.00 |
| | | | ⌗ | HR7125 | 70–140 | 0.15–0.25 | 0.50–3.00 |
| | | | ⌗ | HR7225 | 70–140 | 0.15–0.25 | 0.50–3.00 |
| Non-ferrous metal (aluminum alloy) | —— | AK | ● | HRK10 | 300–700 | 0.10–0.30 | 0.50–3.00 |
| | | | ● | HRK20 | 300–700 | 0.10–0.30 | 0.50–3.00 |
| | | | ◕ | HRK10 | 300–700 | 0.10–0.25 | 0.50–3.00 |
| | | | ◕ | HRK20 | 300–700 | 0.10–0.25 | 0.50–3.00 |
| | | | ⌗ | HRK10 | 300–700 | 0.10–0.20 | 0.50–3.00 |
| | | | ⌗ | HRK20 | 300–700 | 0.10–0.20 | 0.50–3.00 |

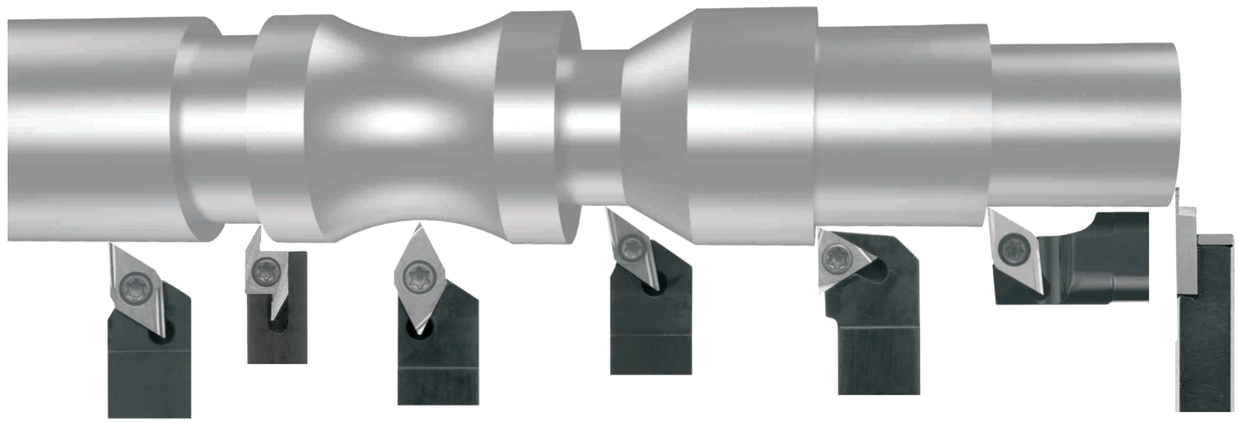
● Stable ◕ Average ⌗ Tough

# Turning of small components



## Comparison table of chipbreaker for general turning

| ISO | application | Huareal | SANDVIK | KENNAMETAL | ISCAR | MITUSUBISHI | HITACHI | KYOCERA | SUMIYOMO | TAGUTEC | ZCC.CT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Finishing (Negative) | GF<br>GC | LC<br>XF<br>MF | PMFN<br>CT | ----<br>NF | SA<br>SY<br>SH | BE<br>CE<br>B<br>BH | PP<br>XQ<br>CQ<br>HQ | LU<br>FE<br>SU | FG<br>FC | DF<br>PF<br>SF |
| | Semi–finish (Negative) | GQ<br>GM | XM、QM<br>PMC、PM<br>SM、KM<br>HM | P、MG<br>MN<br>MP1 | GN<br>RF、LF | MA<br>MV<br>MH<br>MP | AH<br>AE<br>AY | HS、PS<br>PQ、GS<br>PT、PG | GU(UG)<br>GE<br>UX | ML<br>MP<br>MC<br>PC<br>MT | DM<br>PM |
| | Tough machining (Negative) | GR | PR、XMR<br>KR | RP<br>RN | M3P、NR<br>---- | RP<br>GH<br>MAS<br>MT | RE<br>AR<br>---- | HT<br>GT<br>PH<br>---- | MU<br>ME<br>MX | RT<br>---- | DR<br>LR |
| | Heavy Machining (Negative) | GZ<br>GX | QR<br>HR、SR<br>----<br>MR | RM、MR<br>RH<br>----<br>---- | NM<br>TNM<br>----<br>R3P | HZ、HX<br>HL、HH<br>HXD<br>HR<br>HV<br>HCS | TE、UE<br>----<br>H<br>HX、HE | PX<br>----<br>----<br>---- | HG<br>HP<br>HU<br>HW<br>HF | RX<br>RH<br>HT<br>HD<br>HY<br>HZ | HDR<br>HPR |
| | Finishing (Positive) | TF | MM、XM<br>VM | MF | SM、14 | LM、SV | JQ | MQ | GU | FC<br>PC | HF |
| | Semi–finish (Positive) | TM | UM、PM<br>MX、PR | MF<br>MP | ---- | MV<br>MP | JE | HQ<br>XQ<br>GK | MU | MT<br>PC | HM |
| M | Finishing (Negative) | BF | MF | FP、FS<br>LF | ---- | LM<br>SH | SE、MP | MQ<br>GU | SU<br>EF | EA<br>SF | EF |
| | Semi–finish (Negative) | BM | MM、MMC<br>SMR | MP | M3M、PP | MM | DE | ---- | GU | ET | EM |
| | Tough machining (Negative) | BR | ----<br>MR、MRR | UP<br>---- | ----<br>MR | ES、1M<br>2M、HL<br>RM、GH<br>HM | ----<br>---- | ----<br>TK | HM<br>EM<br>MU | VF<br>SU | ER |
| | Finishing (Positive) | TF | MM、XM<br>VM | FP、FF | SM、14 | LM、FM | MP | CF、MQ<br>CK | FC | FC<br>PC | FF |
| | Semi–finish (Positive) | TM | MM | MP | ---- | MW | ---- | HQ<br>GK | MU | ---- | EM |
| K | Semi–finish (Negative) | All round | KF | UN | GN | LK<br>MA<br>MK | V、VA | C | UZ | MT | All round |
| | Tough machining (Negative) | Flat | KM、KR<br>KRR | ---- | ---- | GK<br>RK<br>GH | Y、RE | ZS、GC | GZ(UX) | RT | ---- |
| N | Non–ferrous metal machining | AK | ---- | MS | ---- | ---- | | AH | AX | ---- | no |
| S | Finishing (Negative) | ---- | SF、SGF | ---- | ---- | LS<br>FJ | ---- | ---- | EF | ---- | NF<br>NGF |
| | Semi–finish (Negative) | SM | SM、SMC | ---- | ---- | MS<br>MJ | VI | ---- | EG、EX | ---- | NM |
| H | Finishing | ---- | ---- | ---- | ---- | ---- | | ---- | FV* | ---- | no |
| | Semi–finish | ---- | ---- | ---- | ---- | ---- | | ---- | GH | ---- | no |



# Turning of small components

## Turning

### Turning of small components


- Small components turning application A-101
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- Turning of small components A-122
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- Shallow groove tools code key A-130
- Shallow groove turning insert shallow groove tools A-131
- Shallow groove insert customization form A-137
- Recommended cutting parameters for shallow groove insert A-139
- Parting & grooving insert code key for small components A-140
- Parting & grooving tool code key for small components A-140

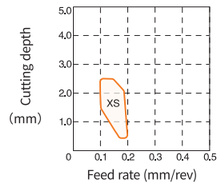
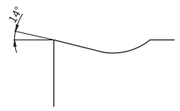
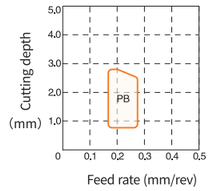
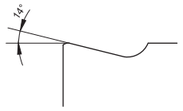
## Small components turning application

| Type | Material | ISO | PVD | | Cemented Carbide | Cermet | Coated Cermet | ISO |
|---|---|---|---|---|---|---|---|---|
| | | | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| P | Unalloyed steel/Alloyed steel | P05 | HR1135 | | | HRC10 | HR115C | P05 |
| | | P15 | | HR7125 | | | | P15 |
| | | P25 | | | | | | P25 |
| | | P35 | | | | | | P35 |
| M | Stainless steel | M05 | HR1135 | | | | | M05 |
| | | M15 | | HR7125 | | | | M15 |
| | | M25 | | | | | | M25 |
| | | M35 | | | | | | M35 |
| K | Cast iron | K05 | | | | | | K05 |
| | | K15 | | | HRK10 | | | K15 |
| | | K25 | | | | | | K25 |
| | | K35 | | | | | | K35 |
| N | Aluminum/ Aluminum alloy | N05 | | | HRK10 | | | N05 |
| | | N15 | | | | | | N15 |
| | | N25 | | | | | | N25 |
| | | N35 | | | | | | N35 |
| S | Heat resistant super alloys Titanium alloy | S05 | | | | | | S05 |
| | | S15 | | HR7125 | | | | S15 |
| | | S25 | | | | | | S25 |
| | | S35 | | | | | | S35 |
| H | Hardened steel | H05 | | | | | | H05 |
| | | H15 | HR1135 | | | | | H15 |
| | | H25 | | | | | | H25 |
| | | H35 | | | | | | H35 |

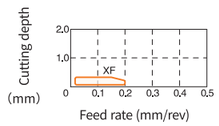
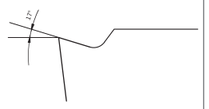
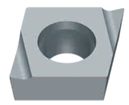
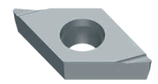
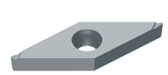
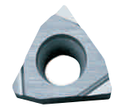
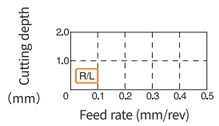
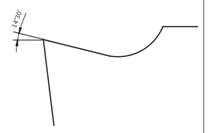
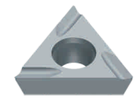
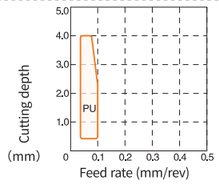
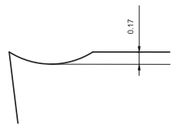
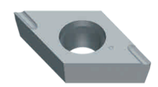
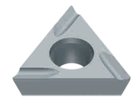
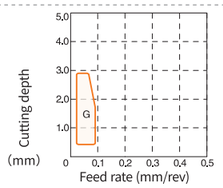
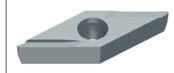
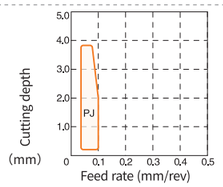
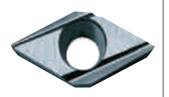
## Small components turning grade overview

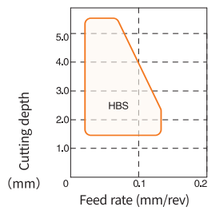
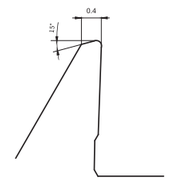
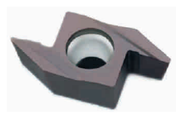
| Grade | Type | Features | Application |
|---|---|---|---|
| HR1135 | PVD coating Carbide | The fine-grain cemented carbide matrix with the new nano-gradient composite structural coating has excellent wear resistance and build-up edge resistance, ensuring the stability of the insert life and the high quality of the machined surface. | High wear resistance grade, suitable for high cutting speed turning of small part |
| HR7125 | PVD coating Carbide | Unique coating materials combined with new coating technology, the surface of product is smooth, with low friction coefficient, high nano hardness, and excellent antioxidant performance. | Preferred grade for precision small part turning. Great versatility |
| HRC10 | Cermet | Newly upgraded cermet grade, hard and compact surface with good chemical stability and adhesion resistance.Also great wear resistance and chipping resistance, insert consistancy, excellent machining surface quality. | Good consistancy, especially suitable for low carbon steel finishing turning, as well as the workpiece surface quality has high requirements |
| HR115C | Coated Cermet | The coated cermet grade, with a new nano gradient composite structure coating, further improves the wear resistance, high temperature resistance, the unique transition layer treatment technology effectively improves the adhesion between the coating and the substrate, reduces the friction coefficient between the insert and workpiece.Insert services life and stability are outstanding | Better high temperature resistance sutiable for higher cutting speed working condition compared to cermet grades. |
| HRK10 | Carbide | Non-coated cemented carbide, fine matrix material, uniform particle size, high bending strength, good wear resistance, stable overall performance. | Preferred grade for turning on aluminum alloy |

## Small components turning insert overview( Negative)

| Type | Usage | Tolerance | Chipbreaker | Features | Chipbreaker diagram | Sectional view of chipbreaker | | 80° C-type | 55° D-type | 90° S-type | 60° T-type | 35° V-type | 80° W-type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Negative | Ultra finishing | G | XS | ◆ Sloped chipbreaker design, stable control of chip removal direction, ensure smooth cutting.<br>◆ Sharp cutting edge, can effectively reduce cutting force. Achieve excellent cutting results. |  |  | | | | | A107 | | |
| | Finishing | G | PB | ◆ Design of cutting inlcination angle can well control chip removal direction and reduce cutting force.<br>◆ The high strength of cutting corner makes it more suitable for machining with a feed rate of 0.15-0.25mm/r. |  |  | | | | | A107 | | |

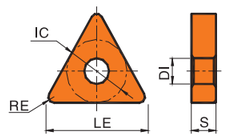
## Small components turning insert overview(Postive)

| Type | Usage | Tolerance | Chipbreaker | Features | Chipbreaker diagram | Sectional view of chipbreaker | | 80° C-type | 55° D-type | 90° S-type | 60° T-type | 35° V-type | 80° W-type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Postive insert | Ultra finishing | G | XF | ◆Inclined chipbreaker design, stable control of chip removal direction, ensure smooth cutting.<br>◆Sharp cutting edge, can effectively reduce cutting force. Achieve a excellent cutting results. |  |  | |  A108 |  A111 | | |  A117 |  A118 |
| | | | No code name | ◆Design of cutting inlcination angle can well control chip removal direction and reduce cutting force.<br>◆Even cutting edge width design, sharp edge, machining workpiece surface quality is excellent. |  |  | | | |  A113 | | |
| | Finishing | | PU | ◆The design of small groove width and small chip up-curl radius can meet the requirements of chip breaking under the condition of small cutting depth. |  |  | | A110 |  A112 | |  A114 | | |
| | | G | PY | ◆The design of small groove width and small chip up-curl radius can meet the requirements of chip breaking under the condition of small cutting depth. |  | | | | | | |  A117 | |
| | | | PJ | ◆Can adapt to low feed rate and low cutting depth change, stable control cutting. |  | | | |  A111 | | | | |

| Type | Usage | Chipbreaker | Features | Chipbreaker diagram | Sectional view of chipbreaker | | shape |
|---|---|---|---|---|---|---|---|
| Back turning | Back turning | HBS | ◆The specially designed insert shape meets the requirements of back turning machining during the small part machining.<br>◆The special chipbreaker structure design can stably control the direction of chip removal and reduce cutting resistance. |  |  | |  A119 |

## Negative insert

Working condition: ● Stable ◕ Average ⌗ Tough




Workpiece material

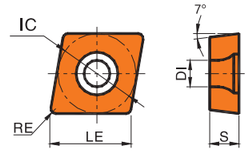
| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | | ● | ● | | | | | | | |
| M | Stainless steel | ◕ | ◕ | | | | | | | | | | |
| K | Cast iron | | | | | | | | | | | | |
| N | Non-ferrous metal | | | ◕ | | | | | | | | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | | | | | | | | |

| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| Ultra finishing | | TNGG160402R–XS | 16.5 | 9.525 | 4.76 | 3.81 | 0.2 | ★ | ★ | | ☆ | | STLN**–16 Page(A122) |
| | | TNGG160402L–XS | 16.5 | 9.525 | 4.76 | 3.81 | 0.2 | ★ | ★ | | ☆ | | |
| | | TNGG160404R–XS | 16.5 | 9.525 | 4.76 | 3.81 | 0.4 | ★ | ★ | | ☆ | | |
| | | TNGG160404L–XS | 16.5 | 9.525 | 4.76 | 3.81 | 0.4 | ★ | ★ | | ☆ | | |
| | | TNGG160408R–XS | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | ★ | ★ | | ☆ | | |
| | | TNGG160408L–XS | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | ★ | ★ | | ☆ | | |
| Finishing | | TNGG160402R–PB | 16.5 | 9.525 | 4.76 | 3.81 | 0.2 | ★ | ★ | | ☆ | | STLN**–16 Page(A122) |
| | | TNGG160402L–PB | 16.5 | 9.525 | 4.76 | 3.81 | 0.2 | ★ | ★ | | ☆ | | |
| | | TNGG160404R–PB | 16.5 | 9.525 | 4.76 | 3.81 | 0.4 | ★ | ★ | | ☆ | | |
| | | TNGG160404L–PB | 16.5 | 9.525 | 4.76 | 3.81 | 0.4 | ★ | ★ | | ☆ | | |
| | | TNGG160408R–PB | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | ★ | ★ | | ☆ | | |
| | | TNGG160408L–PB | 16.5 | 9.525 | 4.76 | 3.81 | 0.8 | ★ | ★ | | ☆ | | |

★ Recommended grade ☆ Available grade

## Postive insert

Working condition: ● Stable ◕ Average ⌗ Tough




Workpiece material

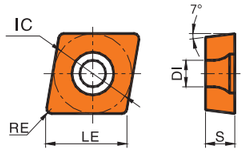
| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | | ● | ● | | | | | | | |
| M | Stainless steel | ◕ | ◕ | | | | | | | | | | |
| K | Cast iron | | | | | | | | | | | | |
| N | Non-ferrous metal | | | ◕ | | | | | | | | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | | | | | | | | |

| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| Ultra finishing | | CCGT0301005R–XF | 3.6 | 3.5 | 1.4 | 1.9 | 0.05 | ★ | ★ | | ☆ | | SCLC**–03 Page (A122) S–SCLC**–03 Page(A126) |
| | | CCGT0301005L–XF | 3.6 | 3.5 | 1.4 | 1.9 | 0.05 | ★ | ★ | | ☆ | | |
| | | CCGT030101R–XF | 3.6 | 3.5 | 1.4 | 1.9 | 0.1 | ★ | ★ | | ☆ | | |
| | | CCGT030101L–XF | 3.6 | 3.5 | 1.4 | 1.9 | 0.1 | ★ | ★ | | ☆ | | |
| | | CCGT030102R–XF | 3.6 | 3.5 | 1.4 | 1.9 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT030102L–XF | 3.6 | 3.5 | 1.4 | 1.9 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT030104R–XF | 3.6 | 3.5 | 1.4 | 1.9 | 0.4 | ★ | ★ | | ☆ | | |
| | | CCGT030104L–XF | 3.6 | 3.5 | 1.4 | 1.9 | 0.4 | ★ | ★ | | ☆ | | |
| | | CCGT0401005R–XF | 4.4 | 4.3 | 1.8 | 2.3 | 0.05 | ★ | ★ | | ☆ | | SCLC**–04 Page(A122) S–SCLC**–04 Page(A126) |
| | | CCGT0401005L–XF | 4.4 | 4.3 | 1.8 | 2.3 | 0.05 | ★ | ★ | | ☆ | | |
| | | CCGT040101R–XF | 4.4 | 4.3 | 1.8 | 2.3 | 0.1 | ★ | ★ | | ☆ | | |
| | | CCGT040101L–XF | 4.4 | 4.3 | 1.8 | 2.3 | 0.1 | ★ | ★ | | ☆ | | |
| | | CCGT040102R–XF | 4.4 | 4.3 | 1.8 | 2.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT040102L–XF | 4.4 | 4.3 | 1.8 | 2.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT040104R–XF | 4.4 | 4.3 | 1.8 | 2.3 | 0.4 | ★ | ★ | | ☆ | | |
| | | CCGT040104L–XF | 4.4 | 4.3 | 1.8 | 2.3 | 0.4 | ★ | ★ | | ☆ | | |
| | | CCGT060201R–XF | 6.4 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | SCLC**–06 Page(A122) S–SCLC**–06 Page(A126) |
| | | CCGT060201L–XF | 6.4 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | CCGT060202R–XF | 6.4 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT060202L–XF | 6.4 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT060204R–XF | 6.4 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | CCGT060204L–XF | 6.4 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |

★ Recommended grade ☆ Available grade

## Postive insert

Working condition: ● Stable ◕ Average ⌗ Tough




| Workpiece material | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | ⌗ | | ● | ● | | | | | | |
| M | Stainless steel | ◕ | ◕ | ⌗ | | | | | | | | | |
| K | Cast iron | | | | | | | | | | | | |
| N | Non-ferrous metal | | | | ◕ | | | | | | | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | | | | | | | | |

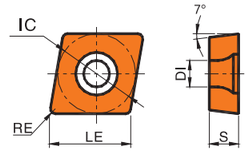
| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| Ultra finishing | | CCGT09T301R–XF | 9.7 | 9.525 | 3.97 | 4.4 | 0.1 | ★ | ★ | | ☆ | | SCLC**–09 Page(A122) S–SCLC**–09 Page(A126) |
| | | CCGT09T301L–XF | 9.7 | 9.525 | 3.97 | 4.4 | 0.1 | ★ | ★ | | ☆ | | |
| | | CCGT09T302R–XF | 9.7 | 9.525 | 3.97 | 4.4 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT09T302L–XF | 9.7 | 9.525 | 3.97 | 4.4 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT09T304R–XF | 9.7 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |
| | | CCGT09T304L–XF | 9.7 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |

★ Recommended grade ☆ Available grade



## Postive insert

Working condition: ● Stable ◕ Average ⌗ Tough

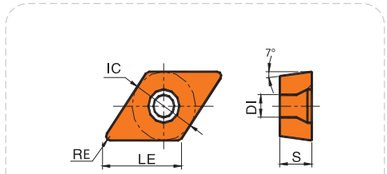



| Workpiece material | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | ⌗ | | ● | ● | | | | | | |
| M | Stainless steel | ◕ | ◕ | ⌗ | | | | | | | | | |
| K | Cast iron | | | | | | | | | | | | |
| N | Non-ferrous metal | | | | ◕ | | | | | | | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | | | | | | | | |

| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| Finishing | | CCGT0602005FR–PU | 6.4 | 6.35 | 2.38 | 2.8 | 0.05 | ★ | ★ | | ☆ | | SCLC**–06 Page(A122) S–SCLC**–06 Page(A126) |
| | | CCGT0602005FL–PU | 6.4 | 6.35 | 2.38 | 2.8 | 0.05 | ★ | ★ | | ☆ | | |
| | | CCGT060201FR–PU | 6.4 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | CCGT060201FL–PU | 6.4 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | CCGT060202FR–PU | 6.4 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT060202FL–PU | 6.4 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT060204FR–PU | 6.4 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | CCGT060204FL–PU | 6.4 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | CCGT09T3005FR–PU | 9.7 | 9.525 | 3.97 | 4.4 | 0.05 | ★ | ★ | | ☆ | | SCLC**–09 Page(A122) S–SCLC**–09 Page(A126) |
| | | CCGT09T3005FL–PU | 9.7 | 9.525 | 3.97 | 4.4 | 0.05 | ★ | ★ | | ☆ | | |
| | | CCGT09T301FR–PU | 9.7 | 9.525 | 3.97 | 4.4 | 0.1 | ★ | ★ | | ☆ | | |
| | | CCGT09T301FL–PU | 9.7 | 9.525 | 3.97 | 4.4 | 0.1 | ★ | ★ | | ☆ | | |
| | | CCGT09T302FR–PU | 9.7 | 9.525 | 3.97 | 4.4 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT09T302FL–PU | 9.7 | 9.525 | 3.97 | 4.4 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT09T304FR–PU | 9.7 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |
| | | CCGT09T304FL–PU | 9.7 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |
| | | CCGT060201R–PU | 6.4 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | SCLC**–06 Page(A122) S–SCLC**–06 Page(A126) |
| | | CCGT060201L–PU | 6.4 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | CCGT060202R–PU | 6.4 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT060202L–PU | 6.4 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT060204R–PU | 6.4 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | CCGT060204L–PU | 6.4 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | CCGT09T301R–PU | 9.7 | 9.525 | 3.97 | 4.4 | 0.1 | ★ | ★ | | ☆ | | SCLC**–09 Page(A122) S–SCLC**–09 Page(A126) |
| | | CCGT09T301L–PU | 9.7 | 9.525 | 3.97 | 4.4 | 0.1 | ★ | ★ | | ☆ | | |
| | | CCGT09T302R–PU | 9.7 | 9.525 | 3.97 | 4.4 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT09T302L–PU | 9.7 | 9.525 | 3.97 | 4.4 | 0.2 | ★ | ★ | | ☆ | | |
| | | CCGT09T304R–PU | 9.7 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |
| | | CCGT09T304L–PU | 9.7 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |

★ Recommended grade ☆ Available grade

## Postive insert




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

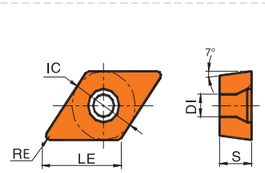
| | | | | | | |
|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | | ● | ● |
| M | Stainless steel | ◕ | ◕ | | | |
| K | Cast iron | | | | | |
| N | Non-ferrous metal | | | ◕ | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | |

| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| Ultra finishing | | DCGT0702005R–XF | 7.8 | 6.35 | 2.38 | 2.8 | 0.05 | ★ | ★ | | ☆ | | SDJC**–07<br>SDNC**–07<br>Page(A123)<br>S–SDUC**–07<br>Page(A127) |
| | | DCGT0702005L–XF | 7.8 | 6.35 | 2.38 | 2.8 | 0.05 | ★ | ★ | | ☆ | | |
| | | DCGT070201R–XF | 7.8 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | DCGT070201L–XF | 7.8 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | DCGT070202R–XF | 7.8 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | DCGT070202L–XF | 7.8 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | DCGT070204R–XF | 7.8 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | DCGT070204L–XF | 7.8 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | DCGT11T3005R–XF | 11.6 | 9.525 | 3.97 | 4.4 | 0.05 | ★ | ★ | | ☆ | | SDJC**–11<br>SDNC**–11<br>Page(A123)<br>S–SDUC**–11<br>Page(A127) |
| | | DCGT11T3005L–XF | 11.6 | 9.525 | 3.97 | 4.4 | 0.05 | ★ | ★ | | ☆ | | |
| | | DCGT11T301R–XF | 11.6 | 9.525 | 3.97 | 4.4 | 0.1 | ★ | ★ | | ☆ | | |
| | | DCGT11T301L–XF | 11.6 | 9.525 | 3.97 | 4.4 | 0.1 | ★ | ★ | | ☆ | | |
| | | DCGT11T302R–XF | 11.6 | 9.525 | 3.97 | 4.4 | 0.2 | ★ | ★ | | ☆ | | |
| | | DCGT11T302L–XF | 11.6 | 9.525 | 3.97 | 4.4 | 0.2 | ★ | ★ | | ☆ | | |
| | | DCGT11T304R–XF | 11.6 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |
| | | DCGT11T304L–XF | 11.6 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |
| Finishing | | DCGT11T301FR–PJ | 11.6 | 9.525 | 3.97 | 4.4 | 0.1 | ★ | ★ | | ☆ | | SDJC**–11<br>SDNC**–11<br>Page(A123)<br>S–SDUC**–11<br>Page(A127) |
| | | DCGT11T302FR–PJ | 11.6 | 9.525 | 3.97 | 4.4 | 0.2 | ★ | ★ | | ☆ | | |
| | | DCGT11T304ER–PJ | 11.6 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |

★ Recommended grade ☆ Available grade



## Postive insert




Working condition: ● Stable ◕ Average ⌗ Tough

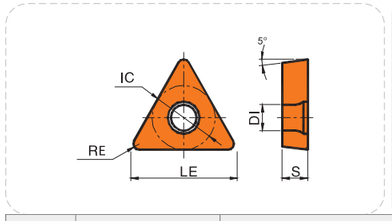
Workpiece material

| | | | | | | |
|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | | ● | ● |
| M | Stainless steel | ◕ | ◕ | | | |
| K | Cast iron | | | | | |
| N | Non-ferrous metal | | | ◕ | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | |

| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| Finishing | | DCGT0702005FR–PU | 7.8 | 6.35 | 2.38 | 2.8 | 0.05 | ★ | ★ | | ☆ | | SDJC**–07<br>SDNC**–07<br>Page(A123)<br>S–SDUC**–07<br>Page(A127) |
| | | DCGT0702005FL–PU | 7.8 | 6.35 | 2.38 | 2.8 | 0.05 | ★ | ★ | | ☆ | | |
| | | DCGT070201FR–PU | 7.8 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | DCGT070201FL–PU | 7.8 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | DCGT070202FR–PU | 7.8 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | DCGT070202FL–PU | 7.8 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | DCGT070204FR–PU | 7.8 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | DCGT070204FL–PU | 7.8 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | DCGT11T3005FR–PU | 11.6 | 9.525 | 3.97 | 4.4 | 0.05 | ★ | ★ | | ☆ | | SDJC**–11<br>SDNC**–11<br>Page(A123)<br>S–SDUC**–11<br>Page(A127) |
| | | DCGT11T3005FL–PU | 11.6 | 9.525 | 3.97 | 4.4 | 0.05 | ★ | ★ | | ☆ | | |
| | | DCGT11T301FR–PU | 11.6 | 9.525 | 3.97 | 4.4 | 0.1 | ★ | ★ | | ☆ | | |
| | | DCGT11T301FL–PU | 11.6 | 9.525 | 3.97 | 4.4 | 0.1 | ★ | ★ | | ☆ | | |
| | | DCGT11T302FR–PU | 11.6 | 9.525 | 3.97 | 4.4 | 0.2 | ★ | ★ | | ☆ | | |
| | | DCGT11T302FL–PU | 11.6 | 9.525 | 3.97 | 4.4 | 0.2 | ★ | ★ | | ☆ | | |
| | | DCGT11T304FR–PU | 11.6 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |
| | | DCGT11T304FL–PU | 11.6 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |
| | | DCGT070201R–PU | 7.8 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | SDJC**–07<br>SDNC**–07<br>Page(A123)<br>S–SDUC**–07<br>Page(A127) |
| | | DCGT070201L–PU | 7.8 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | DCGT070202R–PU | 7.8 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | DCGT070202L–PU | 7.8 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | DCGT070204R–PU | 7.8 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | DCGT070204L–PU | 7.8 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | DCGT11T301R–PU | 11.6 | 9.525 | 3.97 | 4.4 | 0.1 | ★ | ★ | | ☆ | | SDJC**–11<br>SDNC**–11<br>Page(A123)<br>S–SDUC**–11<br>Page(A127) |
| | | DCGT11T301L–PU | 11.6 | 9.525 | 3.97 | 4.4 | 0.1 | ★ | ★ | | ☆ | | |
| | | DCGT11T302R–PU | 11.6 | 9.525 | 3.97 | 4.4 | 0.2 | ★ | ★ | | ☆ | | |
| | | DCGT11T302L–PU | 11.6 | 9.525 | 3.97 | 4.4 | 0.2 | ★ | ★ | | ☆ | | |
| | | DCGT11T304R–PU | 11.6 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |
| | | DCGT11T304L–PU | 11.6 | 9.525 | 3.97 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |

★ Recommended grade ☆ Available grade

## Postive insert



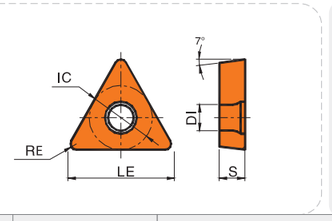

Working condition: ● Stable ◕ Average ⌗ Tough

| Workpiece material | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| P | Steel | ● | ●◕ | | ● | ● | | |
| M | Stainless steel | ●◕ | ●◕ | | | | | |
| K | Cast iron | | | | | | | |
| N | Non-ferrous metal | | | ●◕ | | | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | | | |

| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| Ultra finishing | | TBGT060101R | 6.9 | 3.97 | 1.59 | 2.3 | 0.1 | ★ | ★ | | ☆ | | S–STLB**–06 Page(A128) |
| | | TBGT060101L | 6.9 | 3.97 | 1.59 | 2.3 | 0.1 | ★ | ★ | | ☆ | | |
| | | TBGT060102R | 6.9 | 3.97 | 1.59 | 2.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | TBGT060102L | 6.9 | 3.97 | 1.59 | 2.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | TBGT060104R | 6.9 | 3.97 | 1.59 | 2.3 | 0.4 | ★ | ★ | | ☆ | | |
| | | TBGT060104L | 6.9 | 3.97 | 1.59 | 2.3 | 0.4 | ★ | ★ | | ☆ | | |

★ Recommended grade ☆ Available grade

## Postive insert




Working condition: ● Stable ◕ Average ⌗ Tough

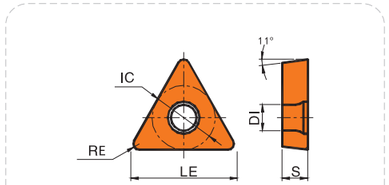
| Workpiece material | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| P | Steel | ● | ●◕ | | ● | ● | | |
| M | Stainless steel | ●◕ | ●◕ | | | | | |
| K | Cast iron | | | | | | | |
| N | Non-ferrous metal | | | ●◕ | | | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | | | |

| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| Ultra finishing | | TCGT080201R–PU | 8.2 | 4.76 | 2.38 | 2.3 | 0.1 | ★ | ★ | | ☆ | | STGC**–08 Page(A124) |
| | | TCGT080201F–PU | 8.2 | 4.76 | 2.38 | 2.3 | 0.1 | ★ | ★ | | ☆ | | |
| | | TCGT080202R–PU | 8.2 | 4.76 | 2.38 | 2.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | TCGT080202L–PU | 8.2 | 4.76 | 2.38 | 2.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | TCGT110201R–PU | 11 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | STGC**–11 Page(A124) |
| | | TCGT110201L–PU | 11 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | TCGT110202R–PU | 11 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | TCGT110202L–PU | 11 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | TCGT110204R–PU | 11 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | TCGT110204L–PU | 11 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | TCGT0802005FR–PU | 8.2 | 4.76 | 2.38 | 2.3 | 0.05 | ★ | ★ | | ☆ | | STGC**–08 Page(A124) |
| | | TCGT0802005FL–PU | 8.2 | 4.76 | 2.38 | 2.3 | 0.05 | ★ | ★ | | ☆ | | |
| | | TCGT080201FR–PU | 8.2 | 4.76 | 2.38 | 2.3 | 0.1 | ★ | ★ | | ☆ | | |
| | | TCGT080201FL–PU | 8.2 | 4.76 | 2.38 | 2.3 | 0.1 | ★ | ★ | | ☆ | | |
| | | TCGT080202FR–PU | 8.2 | 4.76 | 2.38 | 2.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | TCGT080202FL–PU | 8.2 | 4.76 | 2.38 | 2.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | TCGT1102005FR–PU | 11 | 6.35 | 2.38 | 2.8 | 0.05 | ★ | ★ | | ☆ | | STGC**–11 Page(A124) |
| | | TCGT1102005FL–PU | 11 | 6.35 | 2.38 | 2.8 | 0.05 | ★ | ★ | | ☆ | | |
| | | TCGT110201FR–PU | 11 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | TCGT110201FL–PU | 11 | 6.35 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | TCGT110202FR–PU | 11 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | TCGT110202FL–PU | 11 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | TCGT110204FR–PU | 11 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | TCGT110204FL–PU | 11 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |

★ Recommended grade ☆ Available grade

## Postive insert

Working condition: ● Stable ◕ Average ⌗ Tough




| Workpiece material | | | | | | | |
|---|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ ◕ | | ● | ● |
| M | Stainless steel | ◕ ◕ | ◕ ◕ | | | |
| K | Cast iron | | | | | |
| N | Non-ferrous metal | | | ◕ ◕ | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | |

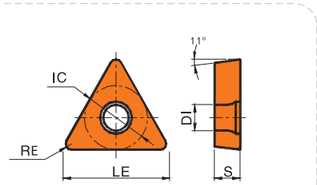
| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| Ultra finishing | | TPGH080201R | 8.2 | 4.76 | 2.38 | 2.3 | 0.1 | ★ | ★ | | ☆ | | STGP**–08 Page(A124) S–STLP**–08 Page(A128) |
| | | TPGH080201L | 8.2 | 4.76 | 2.38 | 2.3 | 0.1 | ★ | ★ | | ☆ | | |
| | | TPGH080202R | 8.2 | 4.76 | 2.38 | 2.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | TPGH080202L | 8.2 | 4.76 | 2.38 | 2.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | TPGH080204R | 8.2 | 4.76 | 2.38 | 2.3 | 0.4 | ★ | ★ | | ☆ | | |
| | | TPGH080204L | 8.2 | 4.76 | 2.38 | 2.3 | 0.4 | ★ | ★ | | ☆ | | |
| | | TPGH090201R | 9.6 | 5.56 | 2.38 | 3.2 | 0.1 | ★ | ★ | | ☆ | | STGP**–09 Page(A124) S–STLP**–09 Page(A128) |
| | | TPGH090201L | 9.6 | 5.56 | 2.38 | 3.2 | 0.1 | ★ | ★ | | ☆ | | |
| | | TPGH090202R | 9.6 | 5.56 | 2.38 | 3.2 | 0.2 | ★ | ★ | | ☆ | | |
| | | TPGH090202L | 9.6 | 5.56 | 2.38 | 3.2 | 0.2 | ★ | ★ | | ☆ | | |
| | | TPGH090204R | 9.6 | 5.56 | 2.38 | 3.2 | 0.4 | ★ | ★ | | ☆ | | STGP**–11 Page(A124) S–STLP**–11 Page(A128) |
| | | TPGH090204L | 9.6 | 5.56 | 2.38 | 3.2 | 0.4 | ★ | ★ | | ☆ | | |
| | | TPGH110202R | 11 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | TPGH110202L | 11 | 6.35 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | TPGH110204R | 11 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | TPGH110204L | 11 | 6.35 | 2.38 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | TPGH110302R | 11 | 6.35 | 3.18 | 3.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | TPGH110302L | 11 | 6.35 | 3.18 | 3.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | TPGH110304R | 11 | 6.35 | 3.18 | 3.3 | 0.4 | ★ | ★ | | ☆ | | |
| | | TPGH110304L | 11 | 6.35 | 3.18 | 3.3 | 0.4 | ★ | ★ | | ☆ | | |
| | | TPGH110308R | 11 | 6.35 | 3.18 | 3.3 | 0.8 | ★ | ★ | | ☆ | | |
| | | TPGH110308L | 11 | 6.35 | 3.18 | 3.3 | 0.8 | ★ | ★ | | ☆ | | |

★ Recommended grade ☆ Available grade



## Postive insert

Working condition: ● Stable ◕ Average ⌗ Tough

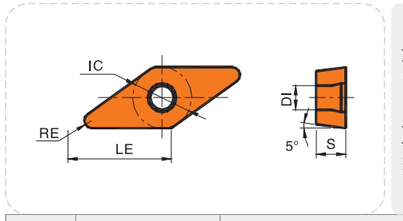



| Workpiece material | | | | | | | |
|---|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ ◕ | | ● | ● |
| M | Stainless steel | ◕ ◕ | ◕ ◕ | | | |
| K | Cast iron | | | | | |
| N | Non-ferrous metal | | | ◕ ◕ | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | |

| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| Ultra finishing | | TPGH0902005R–PU | 9.6 | 5.56 | 2.38 | 2.8 | 0.05 | ★ | ★ | | ☆ | | STGP**–09 Page(A124) S–STLP**–09 Page(A142) |
| | | TPGH0902005L–PU | 9.6 | 5.56 | 2.38 | 2.8 | 0.05 | ★ | ★ | | ☆ | | |
| | | TPGH090201R–PU | 9.6 | 5.56 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | TPGH090201L–PU | 9.6 | 5.56 | 2.38 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | TPGH090202R–PU | 9.6 | 5.56 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | TPGH090202L–PU | 9.6 | 5.56 | 2.38 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | TPGH1103005R–PU | 11 | 6.35 | 3.18 | 3.3 | 0.05 | ★ | ★ | | ☆ | | STGP**–11 Page(A124) S–STLP**–11 Page(A128) |
| | | TPGH1103005L–PU | 11 | 6.35 | 3.18 | 3.3 | 0.05 | ★ | ★ | | ☆ | | |
| | | TPGH110301R–PU | 11 | 6.35 | 3.18 | 3.3 | 0.1 | ★ | ★ | | ☆ | | |
| | | TPGH110301L–PU | 11 | 6.35 | 3.18 | 3.3 | 0.1 | ★ | ★ | | ☆ | | |
| | | TPGH110302R–PU | 11 | 6.35 | 3.18 | 3.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | TPGH110302L–PU | 11 | 6.35 | 3.18 | 3.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | TPGH110304R–PU | 11 | 6.35 | 3.18 | 3.3 | 0.4 | ★ | ★ | | ☆ | | |
| | | TPGH110304L–PU | 11 | 6.35 | 3.18 | 3.3 | 0.4 | ★ | ★ | | ☆ | | |

★ Recommended grade ☆ Available grade

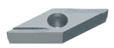
## Postive insert




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | | | | | |
|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | | ● | ● |
| M | Stainless steel | ◕ | ◕ | | | |
| K | Cast iron | | | | | |
| N | Non-ferrous metal | | | ◕ | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | |

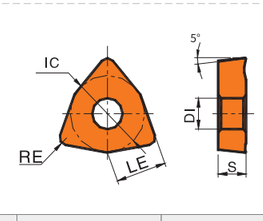
| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| Ultra finishing | | VBGT1103005R–XF | 11 | 6.35 | 3.18 | 2.8 | 0.05 | ★ | ★ | | ☆ | | SVJB**–11<br>SVVB**–11<br>Page(A125) |
| | | VBGT1103005L–XF | 11 | 6.35 | 3.18 | 2.8 | 0.05 | ★ | ★ | | ☆ | | |
| | | VBGT110301R–XF | 11 | 6.35 | 3.18 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | VBGT110301L–XF | 11 | 6.35 | 3.18 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | VBGT110302R–XF | 11 | 6.35 | 3.18 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | VBGT110302L–XF | 11 | 6.35 | 3.18 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | VBGT110304R–XF | 11 | 6.35 | 3.18 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | VBGT110304L–XF | 11 | 6.35 | 3.18 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| Finishing |  | VBGT1103005R–PY | 11 | 6.35 | 3.18 | 2.8 | 0.05 | ★ | ★ | | ☆ | | SVJB**–11<br>SVVB**–11<br>Page(A125) |
| | | VBGT1103005L–PY | 11 | 6.35 | 3.18 | 2.8 | 0.05 | ★ | ★ | | ☆ | | |
| | | VBGT110301R–PY | 11 | 6.35 | 3.18 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | VBGT110301L–PY | 11 | 6.35 | 3.18 | 2.8 | 0.1 | ★ | ★ | | ☆ | | |
| | | VBGT110302R–PY | 11 | 6.35 | 3.18 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | VBGT110302L–PY | 11 | 6.35 | 3.18 | 2.8 | 0.2 | ★ | ★ | | ☆ | | |
| | | VBGT110304R–PY | 11 | 6.35 | 3.18 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | VBGT110304L–PY | 11 | 6.35 | 3.18 | 2.8 | 0.4 | ★ | ★ | | ☆ | | |
| | | VBGT160402R–PY | 16.6 | 9.525 | 4.76 | 4.4 | 0.2 | ★ | ★ | | ☆ | | SVJB**–16<br>SVVB**–16<br>Page(A125) |
| | | VBGT160402L–PY | 16.6 | 9.525 | 4.76 | 4.4 | 0.2 | ★ | ★ | | ☆ | | |
| | | VBGT160404R–PY | 16.6 | 9.525 | 4.76 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |
| | | VBGT160404L–PY | 16.6 | 9.525 | 4.76 | 4.4 | 0.4 | ★ | ★ | | ☆ | | |
| | | VBGT160408R–PY | 16.6 | 9.525 | 4.76 | 4.4 | 0.8 | ★ | ★ | | ☆ | | |
| | | VBGT160408L–PY | 16.6 | 9.525 | 4.76 | 4.4 | 0.8 | ★ | ★ | | ☆ | | |

★ Recommended grade ☆ Available grade





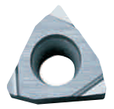
## Postive insert




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | | | | | |
|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | | ● | ● |
| M | Stainless steel | ◕ | ◕ | | | |
| K | Cast iron | | | | | |
| N | Non-ferrous metal | | | ◕ | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | |

| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| Ultra finishing |  | WBGT060101L–XF | 3.3 | 4 | 1.59 | 2.3 | 0.1 | ★ | ★ | | ☆ | | S–SWUB**–06<br>Page(A129) |
| | | WBGT060102L–XF | 3.3 | 4 | 1.59 | 2.3 | 0.2 | ★ | ★ | | ☆ | | |
| | | WBGT060104L–XF | 3.3 | 4 | 1.59 | 2.3 | 0.4 | ★ | ★ | | ☆ | | |

★ Recommended grade ☆ Available grade

## Back turning insert code key

| HBS | 15 | R | 4 | 005 |
|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ |

| ①Insert name | |
|---|---|
| HBS | Back turning inserts |

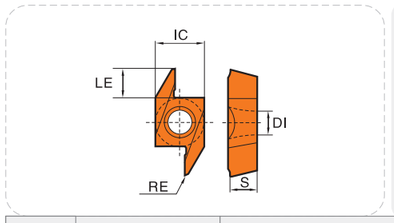
| ②Insert length（mm） | |
|---|---|
| 15 | 15.4 |

| ③Cutting direction | |
|---|---|
| R | Right |

| ④Thinkness | |
|---|---|
| 4 | 4. 2 |

| ⑤Corner radius（mm） | |
|---|---|
| 005 | 0.05 |

## Back turning insert




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | | | | | |
|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | | ● | ● |
| M | Stainless steel | ◕ | ◕ | | | |
| K | Cast iron | | | | | |
| N | Non-ferrous metal | | | ◕ | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | |

| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LE | IC | S | DI | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C |
| Back turning | | HBS15R4005 | 4.2 | 7 | 3.97 | 3.4 | 0.05 | ★ | ★ | | ☆ | |
| | | HBS15R4015 | 4.2 | 7 | 3.97 | 3.4 | 0.15 | ★ | ★ | | ☆ | |

★ Recommended grade ☆ Available grade

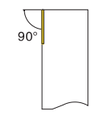
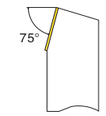
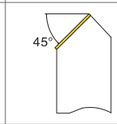
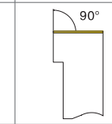
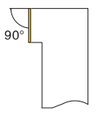
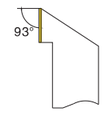
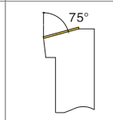
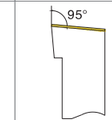
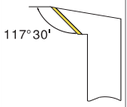
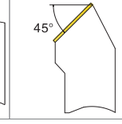
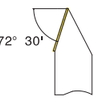
## Cody key of external turning tools for small components

| S | C | L | C | R | 12 | 12 | JX | - | 09 |
|---|---|---|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | | ⑨ |

| ① Clamping | |
|---|---|
| A | Backside calmping |
| C | Pressing calmping |
| P | Lever calmping |
| S | Screw calmping |

| ② Insert shape | | |
|---|---|---|
| C | 80° rhombus | 80° |
| D | 55° rhombus | 55° |
| S | Square | 90° |
| T | Regular triangle | 60° |
| V | 35° rhombus | 35° |

③ Entering angle

| A | B | D | F |
|---|---|---|---|
|  |  |  |  |
| G | J | K | L |
|  |  |  |  |
| N | P | S | T |
| |  |  | |
| V | | | |
|  | | | |

| ④ Insert clearance angle | |
|---|---|
| B | 5°Postive |
| C | 7°Postive |
| N | 0°Negative |
| P | 11°Postive |

| ⑤Hand of tool | |
|---|---|
| R | Right hand |
| L | Left hand |
| N | Left and right hands |

| ⑥Corner height (mm) | |
|---|---|
| 8 | 08 |
| 10 | 10 |
| 12 | 12 |
| 16 | 16 |
| 20 | 20 |
| 25 | 25 |

| ⑦Width of tool holder (mm) | |
|---|---|
| 8 | 08 |
| 10 | 10 |
| 12 | 12 |
| 16 | 16 |
| 20 | 20 |
| 25 | 25 |

| ⑧ Tool length (mm) | |
|---|---|
| F | 80 |
| H | 100 |
| JX | 120 |
| K | 125 |
| M | 150 |

⑨Cutting edge length (mm)

| Inscribed circle of insert | Insert shape | | | | |
|---|---|---|---|---|---|
| | Square | Regular triangle | 80°rhombus | 55°rhombus | 35°rhombus |
| 6.00 | – | – | – | – | – |
| 6.35 | – | 11 | 06 | 07 | 11 |
| 7.94 | – | 13 | – | – | – |
| 8.00 | – | – | – | – | – |
| 9.525 | 09 | 16 | 09 | 11 | 16 |
| 10.00 | – | – | – | – | – |
| 12.00 | – | – | – | – | – |
| 12.70 | 12 | 22 | 12 | 15 | – |

# Cody key of internal turning tools for small components

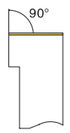
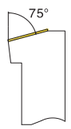
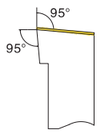
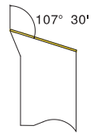
| S | 16 | M | - | S | C | L | C | R | 09 |
|---|---|---|---|---|---|---|---|---|---|
| ① | ② | ③ | | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ |

| ① Tool material | |
|---|---|
| S | Steel |

| ② Tool diameter (mm) | |
|---|---|
| 08 | 08 |
| 10 | 10 |
| 12 | 12 |
| 16 | 16 |
| 20 | 20 |
| 25 | 25 |
| 32 | 32 |

| ③ Shank length (mm) | |
|---|---|
| K | 125 |
| M | 150 |
| Q | 180 |
| R | 200 |
| S | 250 |
| T | 300 |
| U | 350 |

| ④ Clamping | |
|---|---|
| S | Screw clamping |

| ⑥ Entering angle | | | |
|---|---|---|---|
| F | K | L | Q |
|   |   |   |   |
| U | | | |
| | | | |

| ⑤ Insert shape | | |
|---|---|---|
| C | 80°Rhombus | |
| D | 55°Rhombus | |
| S | Square | |
| T | Regular triangle | |
| V | 35°Rhombus | |

| ⑦ Insert clearance angle | |
|---|---|
| C | 7° |
| P | 11° |

| ⑧Hand of tool | |
|---|---|
| R | Right hand |
| L | Left hand |
| N | Left and right hands |

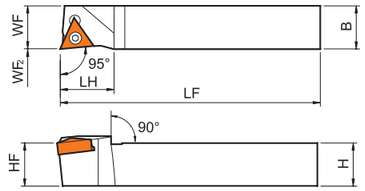
| ⑨Cutting edge length (mm) | | | | | |
|---|---|---|---|---|---|
| Inscribed circle IC | Insert shape | | | | |
| | Square | Regular triangle | 80° Rhombus | 55° Rhombus | 35° Rhombus |
| 5.556 | – | 09 | – | – | – |
| 6.350 | – | 11 | 06 | 07 | 11 |
| 9.525 | 09 | 16 | 09 | 11 | – |
| 12.70 | 12 | – | 12 | – | – |

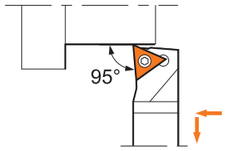


## Turning of small components

**STLN**

KARP:95°



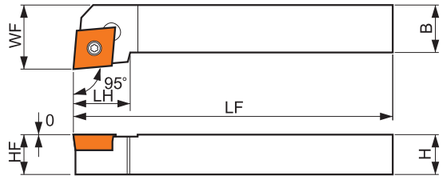



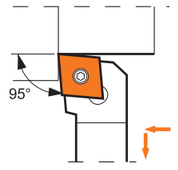

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | H | HF | B | LF | LH | WF | Insert screw | Wrench | |
| | | | | | | | | | | | | |
| STLNRL | 1616JX–16 | △ | △ | 16 | 16 | 16 | 120 | 15 | 16 | M4X10 | WR15 | TNGG16** |
| | 2020JX–16 | △ | △ | 20 | 20 | 20 | 120 | 15 | 20 | | | |

▲Standing inventory △Make-to-order

**SCLCR/L**

KARP:95°



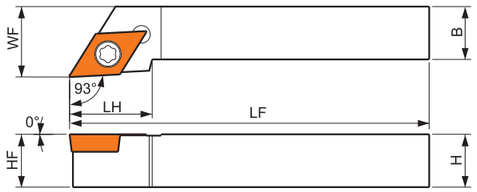



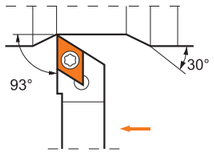

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | H | HF | B | LF | LH | WF | Insert screw | Wrench | |
| | | | | | | | | | | | | |
| SCLCR/L | 1010F–06 | △ | △ | 10 | 10 | 10 | 80 | 9 | 12 | M2.5X7 | WR15 | CCGT06** |
| | 1010F–09 | △ | △ | 10 | 10 | 10 | 80 | 14 | 14 | M4.0X8.5 | WR15 | CCGT09** |
| | 1212H–09 | ▲ | ▲ | 12 | 12 | 12 | 100 | 14 | 16 | | | |
| | 1616H–09 | △ | △ | 16 | 16 | 16 | 100 | 15 | 20 | | | |
| | 2020K–09 | △ | △ | 20 | 20 | 20 | 125 | 22 | 25 | | | |
| | 2525M–09 | △ | △ | 25 | 25 | 25 | 150 | 22 | 32 | | | |

▲Standing inventory △Make-to-order

## Turning of small components

### SDJCR/L
KARP:93°

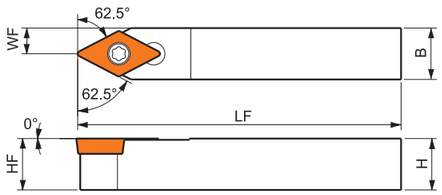


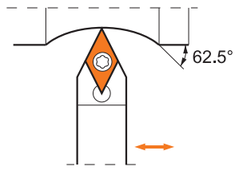




| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | H | HF | B | LF | LH | WF | Insert screw | Wrench | |
| SDJCR/L | 1010F–07 | △ | △ | 10 | 10 | 10 | 80 | 12 | 12 | M2.5X7 | WR08 | DCGT07** |
| | 1010F–11 | △ | △ | 10 | 10 | 10 | 80 | 18 | 12 | M4.0X8.5 | WR15 | DCGT11** |
| | 1212H–11 | ▲ | ▲ | 12 | 12 | 12 | 100 | 18 | 16 | | | |
| | 1616H–11 | △ | △ | 16 | 16 | 16 | 100 | 18 | 20 | | | |
| | 2020K–11 | △ | △ | 20 | 20 | 20 | 125 | 18 | 25 | | | |
| | 2525M–11 | △ | △ | 25 | 25 | 25 | 150 | 23 | 32 | | | |

▲Standing inventory △Make-to-order

### SDNCN
KARP:62.5°



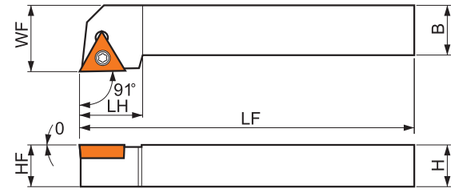



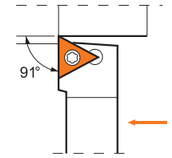

| Model | | Inventory | | Dimension (mm) | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | H | HF | B | LF | WF | Insert screw | Wrench | |
| SDNCN | 1010JX–07 | △ | △ | 10 | 10 | 10 | 120 | 5 | M2.5X7 | WR8 | DCGT07** |
| | 1212JX–07 | ▲ | ▲ | 12 | 12 | 12 | 120 | 6 | | | |
| | 1010JX–11 | △ | △ | 10 | 10 | 10 | 120 | 5 | M4.0X8.5 | WR15 | DCGT11** |
| | 1212JX–11 | ▲ | ▲ | 12 | 12 | 12 | 120 | 6 | | | |
| | 1616JX–11 | △ | △ | 16 | 16 | 16 | 120 | 8 | | | |
| | 1010F–11 | △ | △ | 10 | 10 | 10 | 80 | 5 | | | |
| | 1212F–11 | ▲ | ▲ | 12 | 12 | 12 | 80 | 6 | | | |
| | 1616H–11 | △ | △ | 16 | 16 | 16 | 100 | 8 | | | |

▲Standing inventory △Make-to-order

## Turning of small components

### STGC(P)
KARP:91°



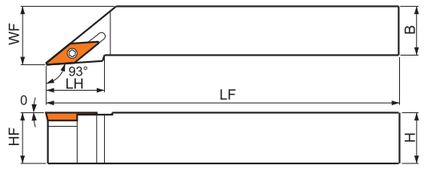



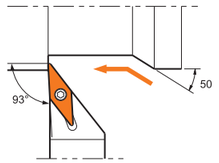

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | H | HF | B | LF | LH | WF | Insert screw | Wrench | |
| STGCR/L | 0808E–08 | △ | △ | 8 | 8 | 8 | 70 | 12 | 10 | M2.0X5 | WR6 | TCGT08** |
| | 1010F–08 | △ | △ | 10 | 10 | 10 | 80 | 12 | 12 | | | |
| | 1010F–11 | △ | △ | 10 | 10 | 10 | 80 | 15 | 14 | M2.5X7 | WR8 | TCGT11** |
| | 1212H–11 | ▲ | ▲ | 12 | 12 | 12 | 100 | 15 | 16 | | | |
| | 1616H–11 | △ | △ | 16 | 16 | 16 | 100 | 15 | 20 | | | |
| | 2020K–11 | △ | △ | 20 | 20 | 20 | 125 | 15 | 25 | | | |
| | 2525M–11 | △ | △ | 25 | 25 | 25 | 150 | 20 | 32 | | | |
| STGPR/L | 0808E–08 | △ | △ | 8 | 8 | 8 | 70 | 12 | 10 | M2.0X5 | WR6 | TPGT08** |
| | 1010F–09 | △ | △ | 10 | 10 | 10 | 80 | 12 | 12 | | | TPGH09** |
| | 1010F–11 | △ | △ | 10 | 10 | 10 | 80 | 15 | 14 | M2.5X7 | WR8 | TPGT11** |
| | 1212H–11 | ▲ | ▲ | 12 | 12 | 12 | 100 | 15 | 16 | | | |
| | 1616H–11 | △ | △ | 16 | 16 | 16 | 100 | 15 | 20 | | | |

▲Standing inventory △Make-to-order

## Turning of small components

### SVJBR/L
KARP:93°

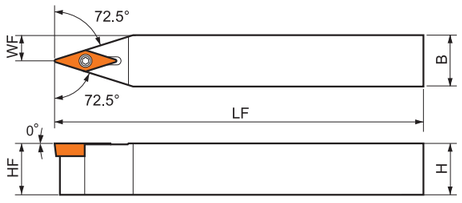


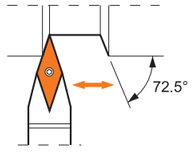




| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Insert screw | Wrench | |
| | | R | L | H | HF | B | LF | LH | WF | | | |
| SVJBR/L | 2020K–11 | △ | △ | 20 | 20 | 20 | 125 | 30 | 10 | M2.5X7 | WR8 | VBGT11** |
| | 2525M–11 | △ | △ | 25 | 25 | 25 | 150 | 35 | 12.5 | | | |
| | 2020K–16 | △ | △ | 20 | 20 | 20 | 125 | 30 | 10 | M4X12.5 | WR15 | VBGT16** |
| | 2525M–16 | △ | △ | 25 | 25 | 25 | 150 | 30 | 12.5 | | | |

▲Standing inventory △Make-to-order

### SVVBR/L
KARP:72.5°




| Model | | Inventory | | Dimension (mm) | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Insert screw | Wrench | |
| | | R | L | H | HF | B | LF | WF | | | |
| SVVBNL | 1010JX–11 | △ | △ | 10 | 10 | 10 | 120 | 5 | M2.5X7 | WR8 | VBGT11** |
| | 1212JX–11 | △ | △ | 12 | 12 | 12 | 120 | 6 | | | |
| | 1616JX–11 | △ | △ | 16 | 16 | 16 | 120 | 8 | | | |
| | 1010F–11 | △ | △ | 10 | 10 | 10 | 80 | 5 | | | |
| | 1212F–11 | △ | △ | 12 | 12 | 12 | 85 | 6 | | | |
| | 1616H–11 | △ | △ | 16 | 16 | 16 | 100 | 8 | | | |
| | 2020K–11 | △ | △ | 20 | 20 | 20 | 125 | 10 | | | |
| | 2525M–11 | △ | △ | 25 | 25 | 25 | 150 | 12.5 | | | |
| | 2020K–16 | △ | △ | 20 | 20 | 20 | 125 | 10 | M4X12.5 | WR15 | VBGT16** |
| | 2525M–16 | △ | △ | 25 | 25 | 25 | 150 | 12.5 | | | |

▲Standing inventory △Make-to-order

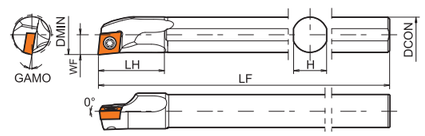


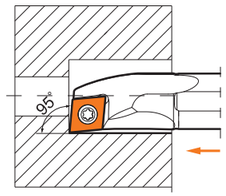


A General turning
Turing of small components
Parting and grooving
Threading
B Indexable milling
Solid carbide end mill
C Short hole drill
Solid carbide drill

## Turning of small components

### S-SCLC
KARP:95°



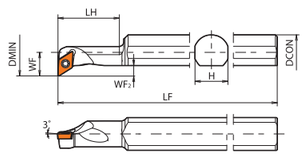

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Insert screw | Wrench | |
| | | R | L | DMIN | DCON | H | LF | LH | WF | | | |
| S10–SCLCR/L | 03–05AE | △ | △ | 5 | 10 | 9 | 100 | 24 | 2.5 | M1.6X3.5 | WR6 | CCGT03** |
| | 03–06AE | △ | △ | 6 | 10 | 9 | 100 | 28 | 3 | | | |
| | 04–07AE | △ | △ | 7 | 10 | 9 | 100 | 32 | 3.5 | M2.0X3.5 | WR6 | CCGT04** |
| | 04–08AE | △ | △ | 8 | 10 | 9 | 100 | 37 | 4 | | | |
| | 06–10AE | △ | △ | 10 | 8 | 7 | 120 | 16 | 5 | M2.5X4.5 | WR8 | CCGT06** |
| | 06–12AE | ▲ | ▲ | 12 | 10 | 9 | 140 | 20 | 6 | | | |
| | 06–14AE | △ | △ | 14 | 12 | 11 | 150 | 24 | 7 | | | |
| | 09–18AE | △ | △ | 18 | 16 | 15 | 180 | 30 | 9 | M4.0X6.5 | WR15 | CCGT09** |
| | 09–22AE | △ | △ | 22 | 20 | 19 | 200 | 36 | 11 | | | |
| | 09–27AE | △ | △ | 27 | 25 | 24 | 250 | 46 | 13.5 | | | |

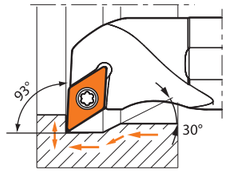
▲Standing inventory △Make-to-order

## Turning of small components

### S-SDUC-A

KARP:93°




| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | DMIN | DCON | H | LF | LH | WF | Insert screw | Wrench | |
| S10L–SDUC | 07–14A | △ | △ | 14 | 10 | 9 | 140 | 19 | 8.7 | M2.5X6.0 | WR8 | DCGT07** |
| S16Q–SDUC | 07–14A | △ | △ | 14 | 16 | 15 | 180 | 28 | 10.8 | | | |
| S12M–SDUC | 07–16A | △ | △ | 16 | 12 | 11 | 150 | 21 | 9.7 | | | |
| S16Q–SDUC | 07–20A | △ | △ | 20 | 16 | 15 | 180 | 21 | 11.7 | | | |
| S20R–SDUC | 11–20A | △ | △ | 20 | 20 | 19 | 200 | 48 | 15.6 | M4.0X6.5 | WR15 | DCGT116** |
| S16Q–SDUC | 11–23A | ▲ | ▲ | 23 | 16 | 15 | 180 | 21 | 14.5 | | | |
| S20R–SDUC | 11–27A | △ | △ | 27 | 20 | 19 | 200 | 23 | 16.5 | | | |
| S25S–SDUC | 11–32A | △ | △ | 32 | 25 | 24 | 250 | 24 | 19 | | | |

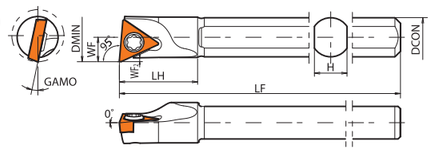
▲Standing inventory △Make-to-order

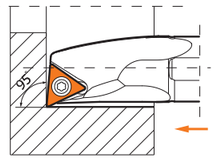


Turning of small components

### S-STLB(P)

KARP:95°



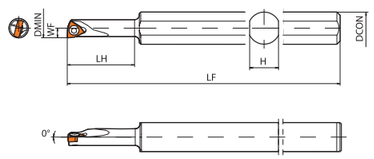



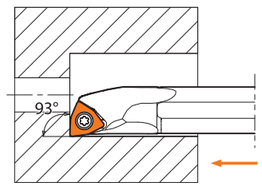

| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | DMIN | DCON | H | LF | LH | WF | Insert screw | Wrench | |
| S06H–STLB | 06–08A | △ | △ | 8 | 6 | 5 | 100 | 12 | 3.8 | M2.0X3.5 | WR6 | TBGT06** |
| S08X–STLP | 08–10A | △ | △ | 10 | 8 | 7 | 120 | 16 | 5 | M2.0X3.5 | WR6 | TPGH08** |
| | 09–10A | △ | △ | 10 | 8 | 7 | 120 | 16 | 5 | M2.5X4.5 | WR8 | TPGH09** |
| S10L–STLP | 09–12A | △ | △ | 12 | 10 | 9 | 140 | 20 | 6.2 | | | |
| | 11–12A | △ | △ | 12 | 10 | 9 | 140 | 20 | 6 | M2.5X4.5 | WR8 | TPGH11** |
| S12M–STLP | 11–14A | ▲ | ▲ | 14 | 12 | 11 | 150 | 24 | 7.2 | | | |
| | 09–16A | △ | △ | 16 | 12 | 11 | 150 | 24 | 8 | M2.5X4.5 | WR8 | TPGH09** |
| S16Q–STLP | 11–18A | △ | △ | 18 | 16 | 15 | 180 | 30 | 9.2 | M2.5X4.5 | WR8 | TPGH11** |
| S20R–STLP | 11–22A | △ | △ | 22 | 20 | 19 | 200 | 36 | 11.2 | | | |

▲Standing inventory △Make-to-order

## Turning of small components

### S-SWUB
KARP:93°




| Model | | Inventory | | Dimension (mm) | | | | | | Accessories | | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | DMIN | DCON | H | LF | LH | WF | Insert screw | Wrench | |
| S10H–SWUBR/L | 06–06A | △ | △ | 6 | 10 | 9 | 100 | 21 | 3 | M2.0X5 | WR6 | WBGT06** |
| | 06–07A | △ | △ | 7 | 10 | 9 | 100 | 25 | 3.5 | | | |

▲Standing inventory △Make-to-order

## Shallow groove insert code key

| TH | F | 16 | R | 100 | - | 005 | □□ |
|---|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ | | ⑥ | ⑦ |

**①** T-shape shallow groove insert

**②** Insert type

| | |
|---|---|
| R | General (10°rake angle) |
| F | Sharp (20°rake angle) |

**③** Inscribed circle diameter(mm)

| | |
|---|---|
| 16 | 9.525 |
| 22 | 12.7 |

**④** Cutting diretion

| | |
|---|---|
| R | righ |
| L | left |

**⑤** Insert width(mm)

| | |
|---|---|
| 100 | 1.0 |

**⑥** Corner ridus(mm)

| | |
|---|---|
| 005 | 0.05 |

**⑦** Chipbreaker

| | |
|---|---|
| default | Straight type |
| R | Round type |

## Shallow groove tools code key

| TH | R | 25 | 25 | R | 22 | - | M | 25 |
|---|---|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ | ⑥ | | ⑦ | ⑧ |

**①** Shallow groove tools

**②** Applicable insert

| | |
|---|---|
| R | General type |
| F | Sharp type |

**③** Corner height(mm)

| | |
|---|---|
| 25 | 25 |

**④** Cutter width(mm)

| | |
|---|---|
| 25 | 25 |

**⑤** Hand of tool

| | |
|---|---|
| R | righ hand |
| L | left hand |

**⑥** Inscribed circle diameter(mm)

| | |
|---|---|
| 16 | 9.525 |
| 22 | 12.7 |

**⑦** Shank length(mm)

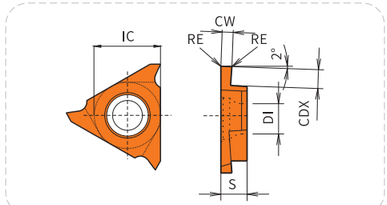
| | |
|---|---|
| F | 120 |
| K | 125 |
| M | 150 |

**⑧** Application(mm)

| | |
|---|---|
| default | General |
| 15 | Width of cut＜2.5 |
| 25 | 2.5≤Width of cut ＜3.5 |
| 35 | 3.5≤Width of cut |

## THR16 series—General type

Working condition: ● Stable ◕ Average ⌗ Tough



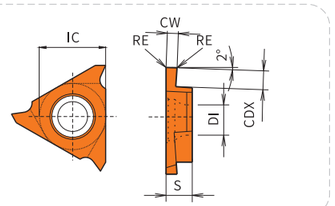

| Workpiece material | | | | | | |
|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | | ● | ● |
| M | Stainless steel | ◕ | ◕ | | | |
| K | Cast iron | | | | | |
| N | Non-ferrous metal | | | ◕ | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | |

| Processing | Insert shape | Type | Dimension (mm) | | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | IC | S | DI | CW | CDX | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| shallow groove machining | | THR16R050–005 | 9.525 | 3.2 | 4.4 | 0.50 | 1.2 | 0.05 | ★ | ★ | | | | THR***R16–K<br>THR***R16–M<br>Page (A135) |
| | | THR16R075–005 | 9.525 | 3.2 | 4.4 | 0.75 | 2.0 | 0.05 | ★ | ★ | | | | |
| | | THR16R100–005 | 9.525 | 3.2 | 4.4 | 1.00 | 2.0 | 0.05 | ★ | ★ | | | | |
| | | THR16R125–020 | 9.525 | 3.2 | 4.4 | 1.25 | 2.0 | 0.2 | ★ | ★ | | | | |
| | | THR16R150–020 | 9.525 | 3.2 | 4.4 | 1.50 | 2.5 | 0.2 | ★ | ★ | | | | |
| | | THR16R175–020 | 9.525 | 3.2 | 4.4 | 1.75 | 2.5 | 0.2 | ★ | ★ | | | | |
| | | THR16R200–020 | 9.525 | 3.2 | 4.4 | 2.00 | 2.5 | 0.2 | ★ | ★ | | | | |
| | | THR16R225–020 | 9.525 | 3.2 | 4.4 | 2.25 | 2.5 | 0.2 | ★ | ★ | | | | |
| | | THR16R250–020 | 9.525 | 3.2 | 4.4 | 2.50 | 2.5 | 0.2 | ★ | ★ | | | | |
| | | THR16R300–020 | 9.525 | 3.2 | 4.4 | 3.00 | 2.5 | 0.2 | ★ | ★ | | | | |
| | | THR16L050–005 | 9.525 | 3.2 | 4.4 | 0.50 | 1.2 | 0.05 | ★ | ★ | | | | THR***L16–K<br>THR***L16–M<br>Page (A135) |
| | | THR16L075–005 | 9.525 | 3.2 | 4.4 | 0.75 | 2.0 | 0.05 | ★ | ★ | | | | |
| | | THR16L100–005 | 9.525 | 3.2 | 4.4 | 1.00 | 2.0 | 0.05 | ★ | ★ | | | | |
| | | THR16L125–020 | 9.525 | 3.2 | 4.4 | 1.25 | 2.0 | 0.2 | ★ | ★ | | | | |
| | | THR16L150–020 | 9.525 | 3.2 | 4.4 | 1.50 | 2.5 | 0.2 | ★ | ★ | | | | |
| | | THR16L175–020 | 9.525 | 3.2 | 4.4 | 1.75 | 2.5 | 0.2 | ★ | ★ | | | | |
| | | THR16L200–020 | 9.525 | 3.2 | 4.4 | 2.00 | 2.5 | 0.2 | ★ | ★ | | | | |
| | | THR16L225–020 | 9.525 | 3.2 | 4.4 | 2.25 | 2.5 | 0.2 | ★ | ★ | | | | |
| | | THR16L250–020 | 9.525 | 3.2 | 4.4 | 2.50 | 2.5 | 0.2 | ★ | ★ | | | | |
| | | THR16L300–020 | 9.525 | 3.2 | 4.4 | 3.00 | 2.5 | 0.2 | ★ | ★ | | | | |

Models not listed in the table, able to customize ★ Recommended grade ☆ Available grade

## THR22 series—General type

Working condition: ● Stable ◕ Average ⌗ Tough




| Workpiece material | | | | | | |
|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | | ● | ● |
| M | Stainless steel | ◕ | ◕ | | | |
| K | Cast iron | | | | | |
| N | Non-ferrous metal | | | ◕ | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | |

| Processing | Insert shape | Type | Dimension (mm) | | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | IC | S | DI | CW | CDX | RE | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| shallow groove machining | | THR22R125–020 | 12.7 | 4.8 | 5.5 | 1.25 | 2.0 | 0.2 | ★ | ★ | | | | THR***R22–K15<br>THR***R22–M15<br>Page (A135) |
| | | THR22R150–020 | 12.7 | 4.8 | 5.5 | 1.50 | 3.5 | 0.2 | ★ | ★ | | | | |
| | | THR22R175–020 | 12.7 | 4.8 | 5.5 | 1.75 | 3.5 | 0.2 | ★ | ★ | | | | |
| | | THR22R200–020 | 12.7 | 4.8 | 5.5 | 2.00 | 3.5 | 0.2 | ★ | ★ | | | | |
| | | THR22R225–020 | 12.7 | 4.8 | 5.5 | 2.25 | 3.5 | 0.2 | ★ | ★ | | | | |
| | | THR22R250–030 | 12.7 | 4.8 | 5.5 | 2.50 | 5.0 | 0.3 | ★ | ★ | | | | THR***R22–K25<br>THR***R22–M25<br>Page (A135) |
| | | THR22R300–030 | 12.7 | 4.8 | 5.5 | 3.00 | 5.0 | 0.3 | ★ | ★ | | | | |
| | | THR22R350–030 | 12.7 | 4.8 | 5.5 | 3.50 | 5.0 | 0.3 | ★ | ★ | | | | THR***R22–K35<br>THR***R22–M35<br>Page (A135) |
| | | THR22R400–040 | 12.7 | 4.8 | 5.5 | 4.00 | 5.0 | 0.4 | ★ | ★ | | | | |
| | | THR22R450–040 | 12.7 | 4.8 | 5.5 | 4.50 | 5.0 | 0.4 | ★ | ★ | | | | |
| | | THR22L125–020 | 12.7 | 4.8 | 5.5 | 1.25 | 2.0 | 0.2 | ★ | ★ | | | | THR***L22–K15<br>THR***L22–M15<br>Page (A135) |
| | | THR22L150–020 | 12.7 | 4.8 | 5.5 | 1.50 | 3.5 | 0.2 | ★ | ★ | | | | |
| | | THR22L175–020 | 12.7 | 4.8 | 5.5 | 1.75 | 3.5 | 0.2 | ★ | ★ | | | | |
| | | THR22L200–020 | 12.7 | 4.8 | 5.5 | 2.00 | 3.5 | 0.2 | ★ | ★ | | | | |
| | | THR22L225–020 | 12.7 | 4.8 | 5.5 | 2.25 | 3.5 | 0.2 | ★ | ★ | | | | |
| | | THR22L250–030 | 12.7 | 4.8 | 5.5 | 2.50 | 5.0 | 0.3 | ★ | ★ | | | | THR***L22–K25<br>THR***L22–M25<br>Page (A135) |
| | | THR22L300–030 | 12.7 | 4.8 | 5.5 | 3.00 | 5.0 | 0.3 | ★ | ★ | | | | |
| | | THR22L350–030 | 12.7 | 4.8 | 5.5 | 3.50 | 5.0 | 0.3 | ★ | ★ | | | | THR***L22–K35<br>THR***L22–M35<br>Page (A135) |
| | | THR22L400–040 | 12.7 | 4.8 | 5.5 | 4.00 | 5.0 | 0.4 | ★ | ★ | | | | |
| | | THR22L450–040 | 12.7 | 4.8 | 5.5 | 4.50 | 5.0 | 0.4 | ★ | ★ | | | | |

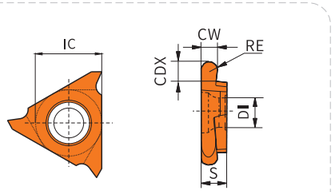
Models not listed in the table, able to customize ★ Recommended grade ☆ Available grade

HUAREAL



# Profile series

Working condition: ● Stable ◕ Average ⌗ Tough




Workpiece material

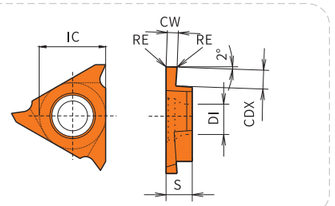
| | | | | | | |
|---|---|---|---|---|---|---|
| P Steel | ● | ●◕ | | ● | ● |
| M Stainless steel | ●◕ | ●◕ | | | |
| K Cast iron | | | | | |
| N Non-ferrous metal | | | ●◕ | | |
| S Heat resistant super alloys Titanium alloy | ● | ● | | | |

| Processing | Insert shape | Type | Dimension (mm) IC | S | DI | CW | CDX | RE | PVD HR1135 | HR7125 | Cemented carbide HRK10 | Cermet HRC10 | HR115C | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| shallow groove machining (profile) | | THR16R200–100R | 9.525 | 3.2 | 4.4 | 2.00 | 2.5 | 1.00 | ★ | ★ | | | | THR***R16–K<br>THR***R16–M<br>Page (A135) |
| | | THR16R300–150R | 9.525 | 3.2 | 4.4 | 3.00 | 2.5 | 1.50 | ★ | ★ | | | | |
| | | THR16L200–100R | 9.525 | 3.2 | 4.4 | 2.00 | 2.5 | 1.00 | ★ | ★ | | | | THR***L16–K<br>THR***L16–M<br>Page (A135) |
| | | THR16L300–150R | 9.525 | 3.2 | 4.4 | 3.00 | 2.5 | 1.50 | ★ | ★ | | | | |
| | | THR22R100–050R | 12.7 | 4.8 | 5.5 | 1.00 | 2.0 | 0.50 | ★ | ★ | | | | THR***R22–K15<br>THR***R22–M15<br>Page (A149) |
| | | THR22R150–075R | 12.7 | 4.8 | 5.5 | 1.50 | 3.5 | 0.75 | ★ | ★ | | | | |
| | | THR22R200–100R | 12.7 | 4.8 | 5.5 | 2.00 | 3.5 | 1.00 | ★ | ★ | | | | |
| | | THR22R250–125R | 12.7 | 4.8 | 5.5 | 2.50 | 4.0 | 1.25 | ★ | ★ | | | | THR***R22–K25<br>THR***R22–M25<br>Page (A135) |
| | | THR22R300–150R | 12.7 | 4.8 | 5.5 | 3.00 | 4.0 | 1.50 | ★ | ★ | | | | |
| | | THR22R400–200R | 12.7 | 4.8 | 5.5 | 4.00 | 5.0 | 2.00 | ★ | ★ | | | | THR***R22–K35<br>THR***R22–M35 Page (A135) |
| | | THR22L100–050R | 12.7 | 4.8 | 5.5 | 1.00 | 2.0 | 0.50 | ★ | ★ | | | | THR***L22–K15<br>THR***L22–M15<br>Page (A135) |
| | | THR22L150–075R | 12.7 | 4.8 | 5.5 | 1.50 | 3.5 | 0.75 | ★ | ★ | | | | |
| | | THR22L200–100R | 12.7 | 4.8 | 5.5 | 2.00 | 3.5 | 1.00 | ★ | ★ | | | | |
| | | THR22L250–125R | 12.7 | 4.8 | 5.5 | 2.50 | 4.0 | 1.25 | ★ | ★ | | | | THR***L22–K25<br>THR***L22–M25<br>Page (A135) |
| | | THR22L300–150R | 12.7 | 4.8 | 5.5 | 3.00 | 4.0 | 1.50 | ★ | ★ | | | | |
| | | THR22L400–200R | 12.7 | 4.8 | 5.5 | 4.00 | 5.0 | 2.00 | ★ | ★ | | | | THR***L22–K35<br>THR***L22–M35 Page (A135) |

Models not listed in the table, able to customize ★ Recommended grade ☆ Available grade

# THF16 Series - Sharp type

Working condition: ● Stable ◕ Average ⌗ Tough



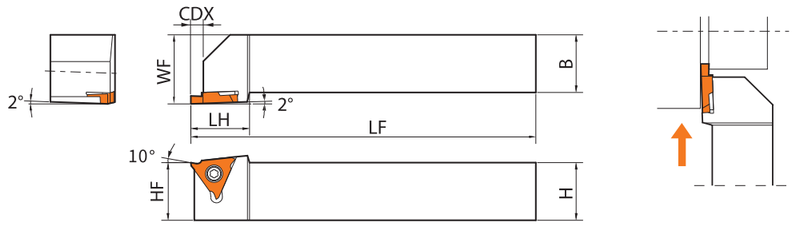

Workpiece material

| | | | | | | |
|---|---|---|---|---|---|---|
| P Steel | ● | ●◕ | | ● | ● |
| M Stainless steel | ●◕ | ●◕ | | | |
| K Cast iron | | | | | |
| N Non-ferrous metal | | | ●◕ | | |
| S Heat resistant super alloys Titanium alloy | ● | ● | | | |

| Processing | Insert shape | Type | Dimension (mm) IC | S | DI | CW | CDX | RE | PVD HR1135 | HR7125 | Cemented carbide HRK10 | Cermet HRC10 | HR115C | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| shallow groove machining | | THF16R025–005 | 9.525 | 3.2 | 4.4 | 0.25 | 0.6 | 0.05 | ★ | ★ | | | | THF***R16–F<br>Page (A136) |
| | | THF16R050–005 | 9.525 | 3.2 | 4.4 | 0.50 | 1.2 | 0.05 | ★ | ★ | | | | |
| | | THF16R075–005 | 9.525 | 3.2 | 4.4 | 0.75 | 2.0 | 0.05 | ★ | ★ | | | | |
| | | THF16R100–005 | 9.525 | 3.2 | 4.4 | 1.00 | 2.0 | 0.05 | ★ | ★ | | | | |
| | | THF16R125–010 | 9.525 | 3.2 | 4.4 | 1.25 | 2.0 | 0.1 | ★ | ★ | | | | |
| | | THF16R150–010 | 9.525 | 3.2 | 4.4 | 1.50 | 2.7 | 0.1 | ★ | ★ | | | | |
| | | THF16R175–010 | 9.525 | 3.2 | 4.4 | 1.75 | 3.0 | 0.1 | ★ | ★ | | | | |
| | | THF16R200–010 | 9.525 | 3.2 | 4.4 | 2.00 | 3.0 | 0.1 | ★ | ★ | | | | |
| | | THF16R225–010 | 9.525 | 3.2 | 4.4 | 2.25 | 3.0 | 0.1 | ★ | ★ | | | | |
| | | THF16R250–010 | 9.525 | 3.2 | 4.4 | 2.50 | 3.0 | 0.1 | ★ | ★ | | | | |
| | | THF16R300–010 | 9.525 | 3.2 | 4.4 | 3.00 | 3.0 | 0.1 | ★ | ★ | | | | |
| | | THF16L025–005 | 9.525 | 3.2 | 4.4 | 0.25 | 0.6 | 0.05 | ★ | ★ | | | | THF***L16–F<br>Page (A136) |
| | | THF16L050–005 | 9.525 | 3.2 | 4.4 | 0.50 | 1.2 | 0.05 | ★ | ★ | | | | |
| | | THF16L075–005 | 9.525 | 3.2 | 4.4 | 0.75 | 2.0 | 0.05 | ★ | ★ | | | | |
| | | THF16L100–005 | 9.525 | 3.2 | 4.4 | 1.00 | 2.0 | 0.05 | ★ | ★ | | | | |
| | | THF16L125–010 | 9.525 | 3.2 | 4.4 | 1.25 | 2.0 | 0.1 | ★ | ★ | | | | |
| | | THF16L150–010 | 9.525 | 3.2 | 4.4 | 1.50 | 2.7 | 0.1 | ★ | ★ | | | | |
| | | THF16L175–010 | 9.525 | 3.2 | 4.4 | 1.75 | 3.0 | 0.1 | ★ | ★ | | | | |
| | | THF16L200–010 | 9.525 | 3.2 | 4.4 | 2.00 | 3.0 | 0.1 | ★ | ★ | | | | |
| | | THF16L225–010 | 9.525 | 3.2 | 4.4 | 2.25 | 3.0 | 0.1 | ★ | ★ | | | | |
| | | THF16L250–010 | 9.525 | 3.2 | 4.4 | 2.50 | 3.0 | 0.1 | ★ | ★ | | | | |
| | | THF16L300–010 | 9.525 | 3.2 | 4.4 | 3.00 | 3.0 | 0.1 | ★ | ★ | | | | |

Models not listed in the table, able to customize ★ Recommended grade ☆ Available grade

## Shallow groove tools



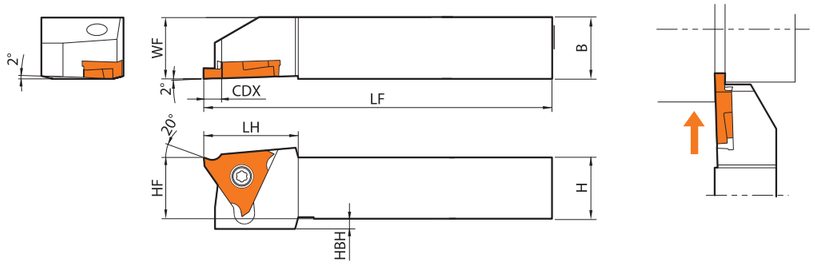



| Model | | Inventory | Dimension (mm) H | HF | B | LF | LH | WF | CDX | Mounting screw | Wrench | Applicable insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| THR | 2020R16–K | ▲ | 20 | 20 | 20 | 125 | 24 | 25 | 2.5 | STH□16 | WR8 | THR16□□ |
| | 2020L16–K | △ | 20 | 20 | 20 | 125 | 24 | 25 | 2.5 | | | |
| | 2525R16–M | ▲ | 25 | 25 | 25 | 150 | 24 | 30 | 2.5 | | | |
| | 2525L16–M | ▲ | 25 | 25 | 25 | 150 | 24 | 30 | 2.5 | | | |
| | 2020R22–K15 | ▲ | 20 | 20 | 20 | 125 | 25.5 | 25 | 4 | STH□22 | WR15 | THR22□□ |
| | 2020L22–K15 | △ | 20 | 20 | 20 | 125 | 25.5 | 25 | 4 | | | |
| | 2525R22–M15 | ▲ | 25 | 25 | 25 | 150 | 25.5 | 30 | 4 | | | |
| | 2525L22–M15 | △ | 25 | 25 | 25 | 150 | 25.5 | 30 | 4 | | | |
| | 2020R22–K25 | ▲ | 20 | 20 | 20 | 125 | 25.5 | 25 | 5.5 | | | |
| | 2020L22–K25 | △ | 20 | 20 | 20 | 125 | 25.5 | 25 | 5.5 | | | |
| | 2525R22–M25 | ▲ | 25 | 25 | 25 | 150 | 25.5 | 30 | 5.5 | | | |
| | 2525L22–M25 | △ | 25 | 25 | 25 | 150 | 25.5 | 30 | 5.5 | | | |
| | 2020R22–K35 | ▲ | 20 | 20 | 20 | 125 | 25.5 | 25 | 5.5 | | | |
| | 2020L22–K35 | △ | 20 | 20 | 20 | 125 | 25.5 | 25 | 5.5 | | | |
| | 2525R22–M35 | ▲ | 25 | 25 | 25 | 150 | 25.5 | 30 | 5.5 | | | |
| | 2525L22–M35 | △ | 25 | 25 | 25 | 150 | 25.5 | 30 | 5.5 | | | |

▲Standing inventory △Make-to-order



## Shallow groove tools






| Model | | Inventory | Dimension (mm) H | HF | HBH | B | LF | LH | WF | CDX | Mounting screw | Wrench | Applicable insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| THF | 1010R16–F | ▲ | 10 | 10 | 4 | 10 | 120 | 18.5 | 10 | 3 | STH□16 | WR15 | THF16□□ |
| | 1010L16–F | ▲ | 10 | 10 | 4 | 10 | 120 | 18.5 | 10 | 3 | | | |
| | 1212R16–F | ▲ | 12 | 12 | 2 | 12 | 120 | 18.5 | 12 | 3 | | | |
| | 1212L16–F | ▲ | 12 | 12 | 2 | 12 | 120 | 18.5 | 12 | 3 | | | |
| | 1616R16–F | ▲ | 16 | 16 | – | 16 | 120 | 18.5 | 16 | 3 | | | |
| | 1616L16–F | ▲ | 16 | 16 | – | 16 | 120 | 18.5 | 16 | 3 | | | |
| | 2020R16–F | ▲ | 20 | 20 | – | 20 | 120 | 18.5 | 20 | 3 | | | |
| | 2020L16–F | ▲ | 20 | 20 | – | 20 | 120 | 18.5 | 20 | 3 | | | |

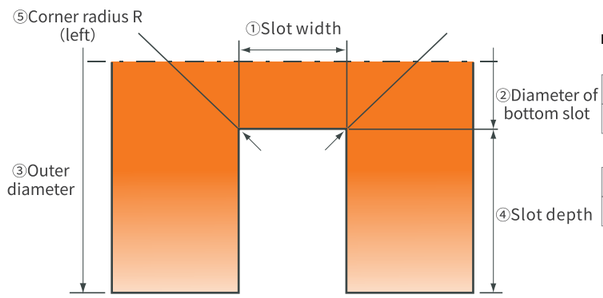
▲Standing inventory △Make-to-order

## Shallow groove insert customization form

### STEP 1

**Chip breaker type confirmation**

#### Type A



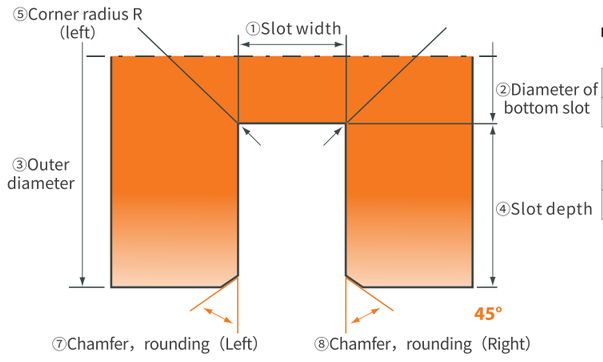

■ Customization form

| Slot width/(mm) | ⩽0.5 | ⩽1.25 |
|---|---|---|
| Slot max/(mm) | ⩽1.2 | ⩽2.0 |

| Slot width/(mm) | ⩽3 | ⩽4.5 |
|---|---|---|
| Slot max/(mm) | ⩽5.0 | ⩽5.0 |

*Corner radius could be accruate to 0.05mm

#### Type B




■ Customization form

| Slot width/(mm) | ⩽0.5 | ⩽1.25 |
|---|---|---|
| Slot max/(mm) | ⩽1.2 | ⩽2.0 |

| Slot width/(mm) | ⩽3 | ⩽4.5 |
|---|---|---|
| Slot max/(mm) | ⩽5.0 | ⩽5.0 |

*Corner radius could be accruate to 0.05mm



## Shallow groove insert customization form

### STEP 2

Fill in the form

| 1 | Slot width | mm（tolerance： ） |
|---|---|---|
| 2 | Diameter of bottom slot | mm（tolerance： ） |
| 3 | Outer diameter | left： （tolerance： ） |
| | | right： （tolerance： ） |
| 4 | Slot depth | left： |
| | | right： |
| 5 | Corner radius | left： |
| | | right： |
| 6 | Chamfer，rounding | left： mm×45° |
| | | right： mm×45° |

### STEP 3

Fill in the form

| workpiece | | cooling type | |
|---|---|---|---|
| cutting parameter | | | |
| worn out standaard | | | |
| tool type | | ☐THF ☐THR | |
| tool size | | tool direction | |

### STEP 4

Fill in the form

| Commpany name | | Occupation | |
|---|---|---|---|
| Name | | Cellphone | |
| Address | | | |

## Recommended cutting parameters for shallow groove insert

| Workpieces | Recommended cutting parameters | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Cutting speed（m/min） | | | | (1)Feed under grooving machining（mm/rev）<br>(2)Feed under plunge turning（mm/rev）<br>(3) Ap under plunge turning（mm） | | | |
| | HR1135 | HR7125 | HRC10 | HRK10 | TH□□ 025-100 | TH□□ 125-200 | TH□□ 225-300 | TH□□ 350-450 |
| Carbon Steel | 80-180 | 80-180 | 80-200 | | (1)0.03-0.08<br>(2)Not suggest<br>(3)Not suggest | (1)0.04-0.09<br>(2) 0.04-0.09<br>(3)max 0.3 | (1)0.05-0.12<br>(2) 0.05-0.09<br>(3)max 0.5 | (1)0.05-0.12<br>(2) 0.05-0.1<br>(3)max 0.8 |
| Alloy Steel | 60-150 | 60-150 | 60-180 | | (1)0.03-0.07<br>(2)Not suggest<br>(3)Not suggest | (1)0.04-0.09<br>(2) 0.04-0.09<br>(3)max 0.3 | (1)0.05-0.1<br>(2) 0.05-0.09<br>(3)max 0.5 | (1)0.05-0.1<br>(2) 0.05-0.1<br>(3)max 0.5 |
| Stainless Steel | 50-150 | 50-130 | | | (1)0.03-0.07<br>(2)Not suggest<br>(3)Not suggest | (1)0.04-0.08<br>(2) 0.04-0.08<br>(3)max 0.3 | (1)0.05-0.09<br>(2) 0.05-0.09<br>(3)max 0.5 | (1)0.05-0.1<br>(2) 0.05-0.1<br>(3)max 0.5 |
| Cast iron | | | | 60-120 | (1)0.03-0.08<br>(2)Not suggest<br>(3)Not suggest | (1)0.04-0.09<br>(2) 0.04-0.09<br>(3)max 0.3 | (1)0.05-0.1<br>(2) 0.05-0.1<br>(3)max 0.5 | (1)0.05-0.12<br>(2) 0.05-0.1<br>(3)max 0.8 |
| Aluminum alloy | | | | 150-400 | (1)0.05-0.12<br>(2)Not suggest<br>(3)Not suggest | (1)0.05-0.15<br>(2) 0.05-0.15<br>(3)max 0.5 | (1)0.08-0.15<br>(2) 0.08-0.15<br>(3)max 0.8 | (1)0.08-0.15<br>(2) 0.08-0.15<br>(3)max 0.8 |
| Quenched steel, High hardness | | 60-120 | | | | (1)0.02-0.05<br>(2)Not suggest<br>(3)Not suggest | (1)0.03-0.07<br>(2) 0.01-0.04<br>(3)max 0.1 | |

Notes:This table is about parameters of the external grooving machining. During internal grooving machining, the cutting speed and feed rate should be lower by about 10%.

## Parting & grooving insert code key for small components

PTA ① | 12 ② | R ③ | 100 ④ - S ⑤ - 16 ⑥ | R ⑦

| ① Insert type | |
|---|---|
| PTA | parting & grooving insert |

| ② APMX（mm） | |
|---|---|
| 12 | 12 |
| 16 | 16 |

| ③ Cutting diretion | |
|---|---|
| R | Right |
| L | Left |

| ④ Cutting edge width（mm） | |
|---|---|
| 100 | 1.0 |

| ⑤ Chipbreaker type | |
|---|---|
| S | S type |

| ⑥ Cutting edge angle | |
|---|---|
| default | 0° |
| 16 | 16° |

| ⑦ Cutting edge incline direction | |
|---|---|
| R | Right |
| L | Left |

## Parting & grooving tool code key for small components

HRPTA ① | 12 ② | 12 ③ | R ④ - 12 ⑤

| ① Tool type | |
|---|---|
| HRPTA | Grooving and cut-off for small components |

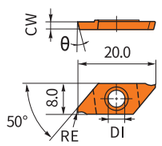
| ② Corner hight（mm） | |
|---|---|
| 12 | 12 |

| ③ Cutter width（mm） | |
|---|---|
| 12 | 12 |

| ④ Hand of tool | |
|---|---|
| R | Right hand |
| L | Left hand |

| ⑤ Cut off diameter maximum | |
|---|---|
| 12 | 12 |
| 16 | 16 |

## PTA12 Series



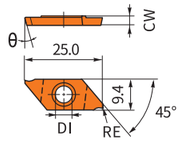

Working condition: ● Stable ◕ Average ⌗ Tough

| Workpiece material | | | | | | | |
|---|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | | ● | ● |
| M | Stainless steel | ◕ | ◕ | | | |
| K | Cast iron | | | | | |
| N | Non-ferrous metal | | | ◕ | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | |

| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CW | θ | RE | DI | T-Max | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| Parting & grooving | | PTA12R050–S | 0.50 | 0° | 0.05 | 4.6 | 2.5 | ★ | ★ | | | | HRPTA***R/L–12 Page (A143) |
| | | PTA12R070–S | 0.70 | 0° | 0.05 | 4.6 | 4 | ★ | ★ | | | | |
| | | PTA12R100–S | 1.00 | 0° | 0.05 | 4.6 | 6 | ★ | ★ | | | | |
| | | PTA12R125–S | 1.25 | 0° | 0.05 | 4.6 | 6 | ★ | ★ | | | | |
| | | PTA12R150–S | 1.50 | 0° | 0.05 | 4.6 | 6 | ★ | ★ | | | | |
| | | PTA12R200–S | 2.00 | 0° | 0.05 | 4.6 | 6 | ★ | ★ | | | | |
| | | PTA12L050–S | 0.50 | 0° | 0.05 | 4.6 | 2.5 | ★ | ★ | | | | |
| | | PTA12L070–S | 0.70 | 0° | 0.05 | 4.6 | 4 | ★ | ★ | | | | |
| | | PTA12L100–S | 1.00 | 0° | 0.05 | 4.6 | 6 | ★ | ★ | | | | |
| | | PTA12L125–S | 1.25 | 0° | 0.05 | 4.6 | 6 | ★ | ★ | | | | |
| | | PTA12L150–S | 1.50 | 0° | 0.05 | 4.6 | 6 | ★ | ★ | | | | |
| | | PTA12L200–S | 2.00 | 0° | 0.05 | 4.6 | 6 | ★ | ★ | | | | |
| | | PTA12R050–S–16R | 0.50 | 16° | 0.05 | 4.6 | 2.5 | ★ | ★ | | | | HRPTA***R/L–12 Page (A143) |
| | | PTA12R070–S–16R | 0.70 | 16° | 0.05 | 4.6 | 4 | ★ | ★ | | | | |
| | | PTA12R100–S–16R | 1.00 | 16° | 0.05 | 4.6 | 5.5 | ★ | ★ | | | | |
| | | PTA12R125–S–16R | 1.25 | 16° | 0.05 | 4.6 | 5.5 | ★ | ★ | | | | |
| | | PTA12R150–S–16R | 1.50 | 16° | 0.05 | 4.6 | 5.5 | ★ | ★ | | | | |
| | | PTA12R200–S–16R | 2.00 | 16° | 0.05 | 4.6 | 5.5 | ★ | ★ | | | | |
| | | PTA12L050–S–16R | 0.50 | 16° | 0.05 | 4.6 | 2.5 | ★ | ★ | | | | |
| | | PTA12L070–S–16R | 0.70 | 16° | 0.05 | 4.6 | 4 | ★ | ★ | | | | |
| | | PTA12L100–S–16R | 1.00 | 16° | 0.05 | 4.6 | 5.5 | ★ | ★ | | | | |
| | | PTA12L125–S–16R | 1.25 | 16° | 0.05 | 4.6 | 5.5 | ★ | ★ | | | | |
| | | PTA12L150–S–16R | 1.50 | 16° | 0.05 | 4.6 | 5.5 | ★ | ★ | | | | |
| | | PTA12L200–S–16R | 2.00 | 16° | 0.05 | 4.6 | 5.5 | ★ | ★ | | | | |

Models not listed in the table, able to customize ★ Recommended grade ☆ Available grade

## PTA16 Series



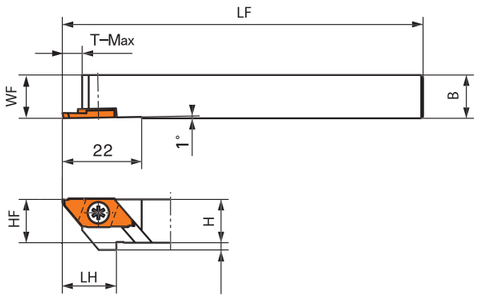

Working condition: ● Stable ◕ Average ⌗ Tough

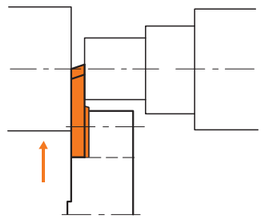
| Workpiece material | | | | | | | |
|---|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | | ● | ● |
| M | Stainless steel | ◕ | ◕ | | | |
| K | Cast iron | | | | | |
| N | Non-ferrous metal | | | ◕ | | |
| S | Heat resistant super alloys Titanium alloy | ● | ● | | | |

| Processing | Insert shape | Type | Dimension (mm) | | | | | PVD | | Cemented carbide | Cermet | | Applicable tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CW | θ | RE | DI | T-Max | HR1135 | HR7125 | HRK10 | HRC10 | HR115C | |
| Parting & grooving | | PTA16R150–S | 1.50 | 0° | 0.05 | 4.6 | 8 | ★ | ★ | | | | HRPTA***R/L–16 Page (A143) |
| | | PTA16R200–S | 2.00 | 0° | 0.05 | 4.6 | 8 | ★ | ★ | | | | |
| | | PTA16R300–S | 3.00 | 0° | 0.05 | 4.6 | 8 | ★ | ★ | | | | |
| | | PTA16L150–S | 1.50 | 0° | 0.05 | 4.6 | 8 | ★ | ★ | | | | |
| | | PTA16L200–S | 2.00 | 0° | 0.05 | 4.6 | 8 | ★ | ★ | | | | |
| | | PTA16L300–S | 3.00 | 0° | 0.05 | 4.6 | 8 | ★ | ★ | | | | |
| | | PTA16R150–S–16R | 1.50 | 16° | 0.05 | 4.6 | 8 | ★ | ★ | | | | HRPTA***R/L–16 Page (A143) |
| | | PTA16R200–S–16R | 2.00 | 16° | 0.05 | 4.6 | 8 | ★ | ★ | | | | |
| | | PTA16R300–S–16R | 3.00 | 16° | 0.05 | 4.6 | 8 | ★ | ★ | | | | |
| | | PTA16L150–S–16R | 1.50 | 16° | 0.05 | 4.6 | 8 | ★ | ★ | | | | |
| | | PTA16L200–S–16R | 2.00 | 16° | 0.05 | 4.6 | 8 | ★ | ★ | | | | |
| | | PTA16L300–S–16R | 3.00 | 16° | 0.05 | 4.6 | 8 | ★ | ★ | | | | |

Models not listed in the table, able to customize ★ Recommended grade ☆ Available grade

## Parting & grooving tools for small components



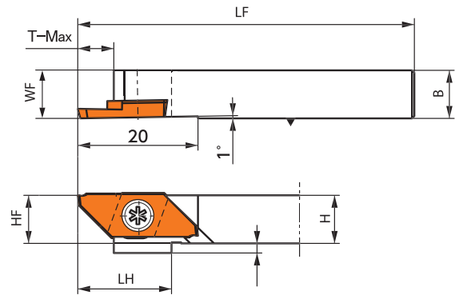
Max grooving diameterΦ12

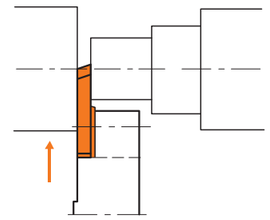
| Model | | Dimension (mm) | | | | | | | | Mounting screw | Wrench | Applicable insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inventory | H | HF | B | LF | LH | WF | T-Max | | | |
| HRPTA | 1010R–12 | ▲ | 10 | 10 | 10 | 120 | 15 | 10 | 6 | STH□16 | WR8 | PTA12□□ |
| | 1010L–12 | △ | 10 | 10 | 10 | 120 | 15 | 10 | 6 | | | |
| | 1212R–12 | ▲ | 12 | 12 | 12 | 120 | 15 | 12 | 6 | | | |
| | 1212L–12 | ▲ | 12 | 12 | 12 | 120 | 15 | 12 | 6 | | | |
| | 1616R–12 | ▲ | 16 | 16 | 16 | 120 | 15 | 16 | 6 | | | |
| | 1616L–12 | △ | 16 | 16 | 16 | 120 | 15 | 16 | 6 | | | |
| | 2020R–12 | ▲ | 20 | 20 | 20 | 120 | 15 | 20 | 6 | | | |
| | 2020L–12 | △ | 20 | 20 | 20 | 120 | 15 | 20 | 6 | | | |

▲Standing inventory △Make-to-order



Parting & grooving tools for small components



Max grooving diameterΦ16

| Model | | Dimension (mm) | | | | | | | | Mounting screw | Wrench | Applicable insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inventory | H | HF | B | LF | LH | WF | T-Max | | | |
| HRPTA | 1010R–16 | ▲ | 10 | 10 | 10 | 120 | 20 | 10 | 8 | STH□16 | WR8 | PTA16□□ |
| | 1010L–16 | △ | 10 | 10 | 10 | 120 | 20 | 10 | 8 | | | |
| | 1212R–16 | ▲ | 12 | 12 | 12 | 120 | 20 | 12 | 8 | | | |
| | 1212L–16 | ▲ | 12 | 12 | 12 | 120 | 20 | 12 | 8 | | | |
| | 1616R–16 | ▲ | 16 | 16 | 16 | 120 | 20 | 16 | 8 | | | |
| | 1616L–16 | △ | 16 | 16 | 16 | 120 | 20 | 16 | 8 | | | |
| | 2020R–16 | ▲ | 20 | 20 | 20 | 120 | 20 | 20 | 8 | | | |
| | 2020L–16 | △ | 20 | 20 | 20 | 120 | 20 | 20 | 8 | | | |

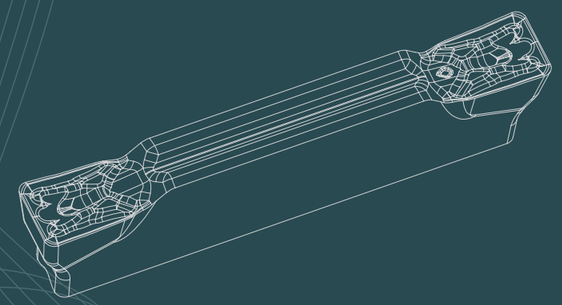
▲Standing inventory △Make-to-order

# Parting and Grooving

# Turning

## Parting and grooving


- Code key of parting and grooving inserts A-147
- Overview of parting and grooving tools A-148
- Parting and grooving inserts A-149
- Parting and grooving tools A-151
- Technical information for parting and grooving A-155

## Code key of grooving inserts

| QC | M | B | 30 | 04 | – | CT |
|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ | | ⑥ |

| ①Insert type | |
|---|---|
| Code | Type |
| QD | Parting insert |
| QC | Grooving insert |
| QP | Profile insert |

| ②Tolerance class | |
|---|---|
| Code | Standard |
| M | M— class tolerance |
| K | K— class tolerance |
| E | E— class tolerance |

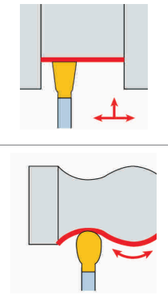
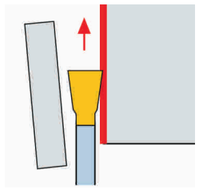
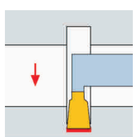
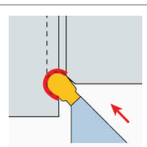
| ③Cutting edge count | |
|---|---|
| Code | Number of cutting edges |
| A | Single insert |
| B | Double inserts |
| C | Triple inserts |

| ④ Cutting edge width | |
|---|---|
| Code | Insert width (mm) |
| 25 | 2.50 |
| 30 | 3.00 |
| 40 | 4.00 |
| 50 | 5.00 |
| 60 | 6.00 |
| 124 | 12.40 |

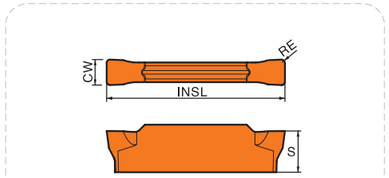
| ⑤ Corner radius | |
|---|---|
| Code | Corner radius (mm) |
| 00 | 0.00 |
| 02 | 0.20 |
| 03 | 0.30 |
| 04 | 0.40 |
| 08 | 0.80 |

| ⑥Chip breaking geometries | |
|---|---|
| Default | Flat |
| CT | CT-type |
| GT | GT-type |
| RM | RM-type |
| AK | AK-type |

## Overview of parting and grooving tools

| Machining form | Diagram | Applicable tools | Applicable inserts | Features |
|---|---|---|---|---|
| External grooving |  | HREH□□ | QCMB□□<br>QCKB□□<br>QPMB□□<br>QPEB□□ | • The multi-purpose cutting tool is compatible with different inserts such as grooving, profile and parting inserts.<br>• The insert can produce either pressing groove or grinding groove, which meet different machining requirements.<br>• The maximum groove depth is 20mm.<br>• With a profiling insert, it can be used to machines a variety of materials. |
| Parting |  | HREH□□ | QCMB□□<br>QCKB□□ | • With our parting inserts, it can be used to cut and process various materials.<br>• Maximum parting diameter: 60mm. |
| Face grooving | | HRFH□□ | QCMB□□<br>QCKB□□<br>QPMB□□ | • The multi-purpose cutting tool is compatible with different inserts such as grooving, profiling and parting inserts.<br>• Groove depth: 10-20mm. |
| Internal grooving and turning |  | HRIV□□ | QCMB□□<br>QCKB□□<br>QPMB□□ | • The multi-purpose cutting tool is compatible with different inserts such as grooving, profile and parting inserts.<br>• Minimum inscribed circle diameter for machining: 25mm.<br>• Maximum groove depth: 6mm. |
| Relief groove machining |  | HREU□□ | QPMB□□ | • The 45°cutting tool structure shall complete a variety of forms of relief groove machining.<br>• Maximum vertical depth of the relief groove: 3.3mm. |

## Parting and grooving insert




Working condition: ● Stable ◕ Average ⌗ Tough

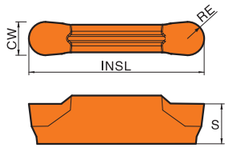
Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ⌗ ⌗ |
| M | Stainless steel | ● ● ⌗ ⌗ |
| K | Cast iron | ● ⌗ |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ● ● |

| Processing | Insert shape | Type | Dimension (mm) | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | INSL | CW | S | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Parting and grooving | | QCMB1502–GT | 16.0 | 1.5 (+0.03 0) | 3.50 | 0.2 (±0.03) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QCMB2002–GT | 16.0 | 2.0 (+0.03 0) | 3.55 | 0.2 (±0.03) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QCMB2502–GT | 18.5 | 2.5 (+0.05 0) | 3.90 | 0.2 (±0.05) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QCMB3002–GT | 21.0 | 3.0 (+0.05 0) | 4.86 | 0.2 (±0.05) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QCMB4002–GT | 21.0 | 4.0 (+0.05 0) | 4.86 | 0.2 (±0.05) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QCMB5003–GT | 26.0 | 5.0 (+0.05 0) | 5.80 | 0.3 (±0.05) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QCMB6003–GT | 26.0 | 6.0 (+0.05 0) | 5.90 | 0.3 (±0.05) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| Grooving | | QCKB2002 | 16.0 | 2.0 (±0.02) | 3.55 | 0.2 (±0.05) | | | | | | | | | | ☆ | ★ | | | | | | |
| | | QCKB3004 | 21.0 | 3.0 (±0.025) | 4.86 | 0.4 (±0.05) | | | | | | | | | | ☆ | ★ | | | | | | |
| | | QCKB4004 | 21.0 | 4.0 (±0.025) | 4.86 | 0.4 (±0.05) | | | | | | | | | | ☆ | ★ | | | | | | |
| | | QCKB5008 | 26.0 | 5.0 (±0.025) | 5.80 | 0.8 (±0.05) | | | | | | | | | | ☆ | ★ | | | | | | |
| Grooving and plunge turning | | QCMB1502–CT | 16.0 | 1.5 (+0.03 0) | 3.50 | 0.2 (±0.03) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QCMB2002–CT | 16.0 | 2.0 (+0.03 0) | 3.55 | 0.2 (±0.03) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QCMB2502–CT | 18.5 | 2.5 (+0.05 0) | 3.90 | 0.2 (±0.05) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QCMB3004–CT | 21.0 | 3.0 (+0.05 0) | 4.86 | 0.4 (±0.05) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QCMB4004–CT | 21.0 | 4.0 (+0.05 0) | 4.86 | 0.4 (±0.05) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QCMB5008–CT | 26.0 | 5.0 (+0.05 0) | 5.80 | 0.8 (±0.05) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |

★ Recommended grade ☆ Available grade

## Profile groove insert




Working condition: ● Stable ◕ Average ⌗ Tough

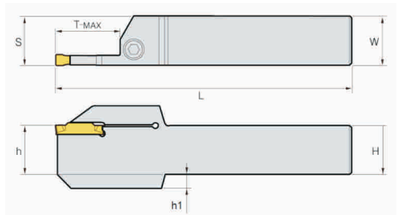
Workpiece material

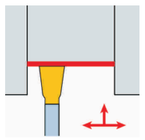
| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ⌗ ⌗ |
| M | Stainless steel | ● ● ⌗ ⌗ |
| K | Cast iron | ● ⌗ |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ● ● |

| Processing | Insert shape | Type | Dimension (mm) | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | INSL | CW | S | RE | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Profiling | | QPMB2010–RM | 16.0 | 2.0 (+0.05 0) | 3.5 | 1.0 (±0.05) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QPMB3015–RM | 21.0 | 3.0 (+0.05 0) | 4.8 | 1.5 (±0.05) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QPMB4020–RM | 21.0 | 4.0 (+0.05 0) | 4.8 | 2.0 (±0.05) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QPMB5025–RM | 26.0 | 5.0 (+0.05 0) | 5.8 | 2.5 (±0.05) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| | | QPMB6030–RM | 26.0 | 6.0 (+0.05 0) | 5.9 | 3.0 (±0.05) | ☆ | | ★ | | ☆ | | | | | ☆ | ★ | | | | | | |
| Aluminum hub groove insert | | QPEB8040–AK | 30.0 | 8.0 (±0.025) | 8.365 | 4.0 (±0.05) | | | | | | | | | | | | | | ★ | ★ | | |

★ Recommended grade ☆ Available grade

## External grooving, parting and turning tools

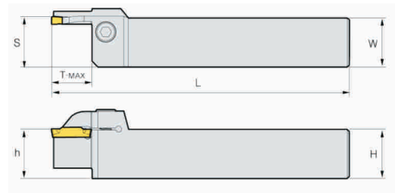


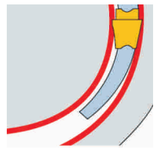



| Type | | Dmension (mm) | | | | | | | Insert screw | Wrench | Applicable inserts |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inventory | H=h | W | L | S | H1 | T-MAX | | | |
| HREHR/L | 1616–1.5–T12 | △ | 16 | 16 | 100 | 16.2 | / | 12 | HHA0512 | WR40L | QCMB15□□ |
| | 2020–1.5–T12 | △ | 20 | 20 | 125 | 20.2 | / | 12 | | | |
| | 2525–1.5–T12 | △ | 25 | 25 | 150 | 25.2 | / | 12 | | | |
| | 1212–2–T08 | △ | 12 | 12 | 100 | 12.2 | / | 8 | HHA0512 | WR40L | QCMB20□□<br>QCKB20□□<br>QPMB20□□ |
| | 1616–2–T08 | △ | 16 | 16 | 100 | 16.2 | / | 8 | | | |
| | 2020–2–T08 | ▲ | 20 | 20 | 125 | 20.2 | / | 8 | | | |
| | 2525–2–T08 | ▲ | 25 | 25 | 150 | 25.2 | / | 8 | | | |
| | 1616–2–T12 | △ | 16 | 16 | 100 | 16.2 | / | 12 | | | |
| | 2020–2–T12 | △ | 20 | 20 | 125 | 20.2 | / | 12 | | | |
| | 2525–2–T12 | ▲ | 25 | 25 | 150 | 25.2 | / | 12 | | | |
| | 1616–2.5–T17 | △ | 16 | 16 | 100 | 16.3 | / | 17 | HHA0512 | WR40L | QCMB25□□ |
| | 2020–2.5–T17 | △ | 20 | 20 | 125 | 20.3 | / | 17 | | | |
| | 2525–2.5–T17 | △ | 25 | 25 | 150 | 25.3 | / | 17 | | | |
| | 1616–3–T10 | △ | 16 | 16 | 100 | 16.4 | / | 10 | HHA0512 | WR40L | QCMB30□□<br>QCKB30□□<br>QPMB30□□ |
| | 2020–3–T10 | ▲ | 20 | 20 | 125 | 20.4 | / | 10 | | | |
| | 2525–3–T10 | ▲ | 25 | 25 | 150 | 25.4 | / | 10 | | | |
| | 1616–3–T13 | △ | 16 | 16 | 100 | 16.4 | / | 13 | | | |
| | 2020–3–T13 | ▲ | 20 | 20 | 125 | 20.4 | / | 13 | | | |
| | 2525–3–T13 | ▲ | 25 | 25 | 150 | 25.4 | / | 13 | | | |
| | 1616–3–T20 | △ | 16 | 16 | 100 | 16.4 | / | 20 | | | |
| | 2020–3–T20 | △ | 20 | 20 | 125 | 20.4 | / | 20 | | | |
| | 2525–3–T20 | △ | 25 | 25 | 150 | 25.4 | / | 20 | | | |
| | 2020–4–T10 | ▲ | 20 | 20 | 125 | 20.4 | / | 10 | HHA0616 | WR50L | QCMB40□□<br>QCKB40□□<br>QPMB40□□ |
| | 2525–4–T10 | ▲ | 25 | 25 | 150 | 25.4 | / | 10 | | | |
| | 3232–4–T10 | △ | 32 | 32 | 150 | 32.4 | / | 10 | | | |
| | 2020–4–T15 | △ | 20 | 20 | 125 | 20.4 | / | 15 | | | |
| | 2525–4–T15 | ▲ | 25 | 25 | 150 | 25.4 | / | 15 | | | |
| | 2020–4–T20 | △ | 20 | 20 | 125 | 20.4 | / | 20 | | | |
| | 2525–4–T20 | △ | 25 | 25 | 150 | 25.4 | / | 20 | | | |
| | 3232–4–T20 | △ | 32 | 32 | 170 | 32.4 | / | 20 | | | |
| | 2020–5–T15 | △ | 20 | 20 | 150 | 20.5 | / | 15 | HHA0616 | WR50L | QCMB50□□<br>QCKB50□□<br>QPMB50□□ |
| | 2020–5–T23 | △ | 20 | 20 | 150 | 20.5 | / | 23 | | | |
| | 2525–5–T15 | ▲ | 25 | 25 | 150 | 25.5 | / | 15 | | | |
| | 2525–5–T23 | △ | 25 | 25 | 150 | 25.5 | / | 23 | | | |
| | 3232–5–T15 | △ | 32 | 32 | 170 | 32.5 | / | 15 | | | |
| | 3232–5–T23 | △ | 32 | 32 | 170 | 32.5 | / | 23 | | | |
| | 2525–6–T15 | ▲ | 25 | 25 | 150 | 25.6 | / | 15 | HHA0616 | WR50L | QCMB60□□<br>QPMB60□□ |
| | 2525–6–T23 | △ | 25 | 25 | 150 | 25.6 | / | 23 | | | |
| | 3232–6–T15 | △ | 32 | 32 | 170 | 32.6 | / | 15 | | | |
| | 3232–6–T23 | △ | 32 | 32 | 170 | 32.6 | / | 23 | | | |

▲Standing inventory △Make-to-order

## 90° end face grooving tool

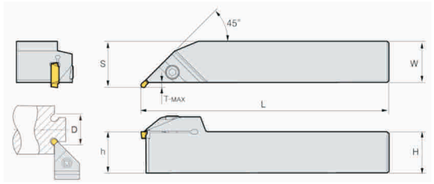


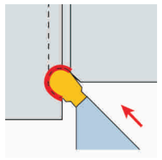



| Type | | Dimension (mm) | | | | | | ΦD | | Insert screw | Wrench | Applicable inserts |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inventory | H=h | W | L | S | T-MAX | Min | Max | | | |
| HRFHR/L | 325–34/50–T10 | △ | 25 | 25 | 150 | 25.5 | 10 | 34 | 50 | HHA0512 | WR40L | QCMB30□□<br>QCKB30□□<br>QPMB30□□ |
| | 325–44/70–T15 | ▲ | 25 | 25 | 150 | 25.5 | 15 | 44 | 70 | | | |
| | 325–64/100–T15 | △ | 25 | 25 | 150 | 25.5 | 15 | 64 | 100 | | | |
| | 425–40/60–T10 | △ | 25 | 25 | 150 | 25.6 | 10 | 40 | 60 | HHA0616 | WR50L | QCMB40□□<br>QCKB40□□<br>QPMB40□□ |
| | 425–44/70–T15 | ▲ | 25 | 25 | 150 | 25.6 | 15 | 44 | 70 | | | |
| | 425–84/92–T15 | △ | 25 | 25 | 150 | 25.6 | 15 | 84 | 92 | | | |
| | 425–60/120–T15 | ▲ | 25 | 25 | 150 | 25.6 | 15 | 60 | 120 | | | |
| | 425–112/200–T15 | △ | 25 | 25 | 150 | 25.6 | 15 | 112 | 200 | | | |

▲Standing inventory △Make-to-order

## Relief groove tool

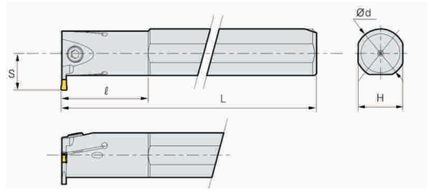


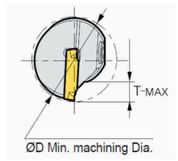



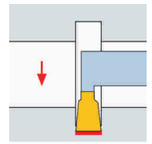
| Type | | Dimension (mm) | | | | | | | Insert screw | Wrench | Applicable inserts |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inventory | H=h | W | L | S | ΦD Max | T-MAX | | | |
| HREUR/L | 2020–3 | △ | 20 | 20 | 125 | 23 | 40 | 2.8 | HHA0512 | WR40L | QPMB30□□ |
| | 2525–3 | ▲ | 25 | 25 | 150 | 28 | 40 | 2.8 | | | |
| | 3232–3 | △ | 32 | 32 | 170 | 35 | 40 | 2.8 | | | |
| | 2020–4 | ▲ | 20 | 20 | 125 | 23 | 40 | 2.8 | HHA0616 | WR50L | QPMB40□□ |
| | 2525–4 | ▲ | 25 | 25 | 150 | 28 | 40 | 2.8 | | | |
| | 3232–4 | △ | 32 | 32 | 170 | 35 | 40 | 2.8 | | | |
| | 2020–5 | ▲ | 20 | 20 | 125 | 23.5 | 50 | 3.3 | HHA0616 | WR50L | QPMB50□□ |
| | 3232–5 | △ | 32 | 32 | 170 | 35.5 | 50 | 3.3 | | | |
| | 2020–6 | △ | 20 | 20 | 125 | 23.5 | 50 | 3.3 | HHA0616 | WR50L | QPMB60□□ |
| | 2525–6 | ▲ | 25 | 25 | 150 | 28.5 | 50 | 3.3 | | | |

▲Standing inventory △Make-to-order

## Internal grooving and turning tools



| Type | | Dimension (mm) | | | | | | | | Insert screw | Wrench | Applicable inserts |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inventory | ΦD | Φd | L | ℓ | T-MAX | H | S |  |  |  |
| HRIVR/L | 2016–1.5 | △ | 20 | 16 | 125 | 35 | 3.5 | 15 | 11.3 | HHB0410 | WR30L | QCMB15□□ |
| | 2520–1.5 | △ | 25 | 20 | 150 | 45 | 3.5 | 18 | 13.1 | HHA0512 | WR40L | |
| | 2925–1.5 | △ | 29 | 25 | 200 | 45 | 3.5 | 23 | 16.2 | | | |
| | 2016–2 | △ | 20 | 16 | 125 | 35 | 4.5 | 15 | 12.4 | HHB0410 | WR30L | QCMB20□□ QCKB20□□ QPMB20□□ |
| | 2520–2 | ▲ | 25 | 20 | 150 | 45 | 4.5 | 18 | 14.0 | HHA0512 | WR40L | |
| | 2925–2 | △ | 29 | 25 | 200 | 45 | 4.5 | 23 | 17.2 | | | |
| | 2016–2.5 | ▲ | 20 | 16 | 125 | 35 | 4.5 | 15 | 12.5 | HHB0410 | WR30L | QCMB25□□ |
| | 2520–2.5 | △ | 25 | 20 | 150 | 45 | 4.5 | 18 | 15.1 | HHA0512 | WR40L | |
| | 2925–2.5 | △ | 29 | 25 | 200 | 45 | 4.5 | 23 | 18.2 | | | |
| | 2520–3 | ▲ | 25 | 20 | 150 | 45 | 5 | 18 | 15.6 | HHA0512 | WR40L | QCMB30□□ QCKB30□□ QPMB30□□ |
| | 3125–3 | △ | 31 | 25 | 200 | 45 | 6 | 23 | 18.9 | | | |
| | 3732–3 | △ | 37 | 32 | 250 | 65 | 6 | 30 | 21.5 | | | |
| | 2520–4 | △ | 35 | 20 | 150 | 45 | 6 | 18 | 15.6 | HHA0512 | WR40L | QCMB40□□ QCKB40□□ QPMB40□□ |
| | 3125–4 | △ | 31 | 25 | 200 | 45 | 6 | 23 | 18.9 | | | |
| | 3732–4 | ▲ | 37 | 32 | 250 | 65 | 6 | 30 | 21.5 | | | |
| | 3125–5 | △ | 31 | 25 | 200 | 45 | 8 | 23 | 19.4 | BHA0616 | WR50L | QCMB50□□ QCKB50□□ QPMB50□□ |
| | 3732–5 | △ | 37 | 32 | 250 | 65 | 8 | 30 | 21.5 | | | |
| | 3125–6 | △ | 31 | 25 | 200 | 45 | 8 | 23 | 19.4 | | | QCMB60□□ QPMB60□□ |
| | 3732–6 | △ | 37 | 32 | 250 | 65 | 8 | 30 | 21.5 | | | |

▲Standing inventory △Make-to-order

## Cutting speed recommendations for parting and grooving

| ISO | Classification of materials | | | Hardness of Brinell (HB) | Tensile strength ($N/mm^2$) | Cutting Speed Recommendations (m/min) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | HR8225 | | | HR7115 | | | HR7125 | | | HR7225 | | | HR6115 | | |
| | | | | | | Feed (mm/rev) | | | | | | | | | | | | | | |
| | | | | | | 0.1 | 0.3 | 0.5 | 0.1 | 0.3 | 0.5 | 0.1 | 0.3 | 0.5 | 0.1 | 0.3 | 0.5 | 0.1 | 0.3 | 0.5 |
| P | Unalloyed steel | C≤0.25% | Annealing | 125 | 428 | 280 | 200 | 130 | | | | 260 | 180 | 120 | 260 | 180 | 120 | | | |
| | | 0.25<C≤0.55% | Annealing | 190 | 639 | 240 | 160 | 115 | | | | 220 | 150 | 105 | 200 | 140 | 105 | | | |
| | | 0.25<C≤0.55% | Quenching and tempering | 210 | 708 | 130 | 115 | 100 | | | | 120 | 110 | 100 | 120 | 110 | 100 | | | |
| | | C>0.55% | Annealing | 190 | 639 | 145 | 130 | 115 | | | | 130 | 120 | 110 | 130 | 120 | 110 | | | |
| | | C>0.55% | Quenching and tempering | 300 | 1013 | 115 | 100 | 80 | | | | 110 | 95 | 70 | 110 | 95 | 70 | | | |
| | | Short chip steel | Annealing | 220 | 745 | 130 | 115 | 100 | | | | 120 | 105 | 90 | 120 | 105 | 90 | | | |
| | Low-alloyed steel | Annealing | | 175 | 591 | 280 | 200 | 130 | | | | 170 | 135 | 120 | 170 | 135 | 120 | | | |
| | | Quenching and tempering | | 300 | 1013 | 115 | 100 | 80 | | | | 105 | 90 | 70 | 105 | 90 | 70 | | | |
| | | Quenching and tempering | | 380 | 1282 | 170 | 90 | 70 | | | | 160 | 80 | 60 | 160 | 80 | 60 | | | |
| | | Quenching and tempering | | 430 | 430 | | | | | | | | | | | | | | | |
| | High-alloyed steel and high alloy tool steel | Annealing | | 200 | 675 | | | | | | | | | | | | | | | |
| | | Quenching and tempering | | 300 | 1013 | | | | | | | | | | | | | | | |
| | | Quenching and tempering | | 400 | 1361 | | | | | | | | | | | | | | | |
| M | Stainless steel | Ferrite/martensite, annealing | | 200 | 675 | | | | | | | 200 | 150 | 105 | 200 | 150 | 105 | | | |
| | | Martensite, quenching and tempering | | 330 | 1114 | | | | | | | 150 | 115 | 70 | 150 | 115 | 70 | | | |
| | Stainless steel | Austenite, quenching | | 200 | 675 | | | | | | | 165 | 135 | 105 | 185 | 155 | 125 | | | |
| | | Austenite, precipitation hardening stainless steel (PH stainless steel) | | 300 | 1013 | | | | | | | 155 | 120 | 80 | 165 | 135 | 95 | | | |
| | | Austenite- ferrite, duplex stainless steel | | 230 | 778 | | | | | | | 135 | 110 | 85 | 145 | 110 | 85 | | | |
| K | Malleable cast iron | Ferrite | | 200 | 400 | | | | | | | | | | | | | 220 | 160 | 80 |
| | | Pearlite | | 260 | 700 | | | | | | | | | | | | | 115 | 90 | 65 |
| | Grey cast iron | Low tensile strength | | 180 | 200 | | | | | | | | | | | | | 260 | 220 | 150 |
| | | High tensile strength/austenite | | 245 | 350 | | | | | | | | | | | | | 240 | 200 | 130 |
| | Nodular iron | Ferrite | | 155 | 400 | | | | | | | | | | | | | 160 | 130 | 80 |
| | | Pearlite | | 265 | 700 | | | | | | | | | | | | | 145 | 110 | 80 |
| | Compacted graphite iron GGV (CGI) | | | 230 | 400 | | | | | | | | | | | | | 150 | 120 | 90 |
| S | Iron-based alloy | Iron-based | Annealing | 200 | 680 | | | | 60 | 50 | 40 | | | | | | | | | |
| | | | Aged | 280 | 940 | | | | 60 | 50 | 40 | | | | | | | | | |
| | | Nickle-based or Cobalt-based | Annealing | 250 | 840 | | | | 50 | 40 | 30 | | | | | | | | | |
| | | | Aged | 350 | 1180 | | | | 50 | 40 | 30 | | | | | | | | | |
| | | | Casting | 320 | 1080 | | | | 50 | 40 | 30 | | | | | | | | | |
| | Cobalt-based | Cobalt-based | | 200 | 680 | | | | 200 | 160 | 120 | | | | | | | | | |
| | | α phase& β phase alloy，Aged | | 375 | 1260 | | | | 80 | 60 | 40 | | | | | | | | | |
| | | β Phase alloy | | 410 | 1400 | | | | 60 | 50 | 40 | | | | | | | | | |
| | Nickel-based alloy | 1177 | | 300 | 1010 | | | | 40 | 35 | 30 | | | | | | | | | |
| | Titanium alloy | 1262 | | 300 | 1010 | | | | 160 | 140 | 100 | | | | | | | | | |

Notes: 1. Cutting parameters are suitable for wet cutting.

2. For internal and section machining, it is recommended to reduce the cutting speed by 30%-50% Precautions for Parting and Grooving:

## Precautions for parting and grooving:

### Parting

- When the insert gets close to the center of the workpiece, the feed rate should be reduced by 30% for longer tool service life and good surface quality.
- If allowed, the overhang should be minimized to ensure good stability.

### External grooving and turning, Profiling

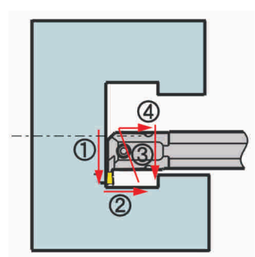
- Pass sequence: When cutting depth > 0.5mm, radial feed (the maximum cutting depth can reach 0.75 x insert width S) → radial return about 0.1mm → axial pass → oblique return → axial pass → radial machining to the required depth.

### Face grooving and turning

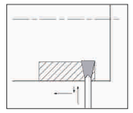
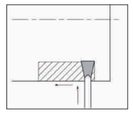
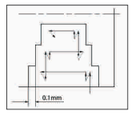
- Finish machining (multi-groove cutting)
  Cutting inwards from the largest diameter, and the insert is slightly offset towards the central insert when returning the insert.
- Recess turning
  Axial turning depth: ≦0.75 xS (insert width)
  If the groove width is greater than the depth, recess turning is recommended.
  If the groove depth is greater than the width, multi-recess cutting is recommended.
- Finish machining
  Machine the bottom and outer diameter edge in a finished way, and then the inner diameter to the required size.

### Internal grooving and turning

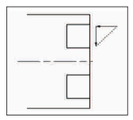
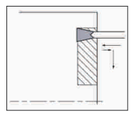
- Please follow the machining sequence as shown.
  In order to facilitate cutting outflow, please always feed outward from the far end face side.



## Precautions for external parting, grooving and turning

| S/N | Machining subjects | Precautions | Diagram |
|---|---|---|---|
| 1 | Grooving first and then transverse turning | When roughing (groove depth > 0.5mm), please do not adopt transverse feed machining immediately after grooving. Instead, return the insert about 0.1mm before starting transverse feed machining. |  |
| | | When finishing (groove depth < 0.5mm), the corner is subjected to small force, and transverse feed machining can be carried out immediately after grooving. |  |
| 2 | Groove width expanding machining | Please stagger them into step shape for machining. |  |
| | Finishing | (1) When machining towards the center side without using a center fixing, please lower the feeding speed.<br>(2) A cutting depth more than 0.5mm on one side can effectively improve chip disposal. | |

## Precautions for face grooving

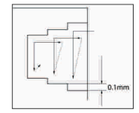
| S/N | Machining subjects | Precautions | Diagram |
|---|---|---|---|
| 1 | Precautions for cutter bar selection | (1) Choose the model that fits the groove width of the cut material.<br>(2) Check the groove depth.<br>(3) It is recommended to mount the cutter bar facing downwards (reversed). | |
| | | Perform transverse feed machining from the outer section to the inner end face with good chip discharge. |  |
| 2 | Face turning | When roughing (groove depth > 0.5mm), please do not feed transversely immediately after grooving. Instead, return the insert about 0.1mm before starting transverse feed machining. |  |
| | | When finishing (groove depth < 0.5mm), the corner is subjected to small force, and transverse feed machining can be carried out immediately after grooving. (No need to stop the knife) | |



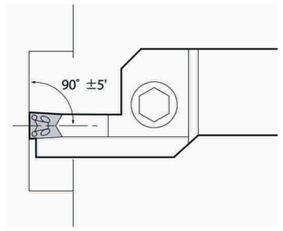




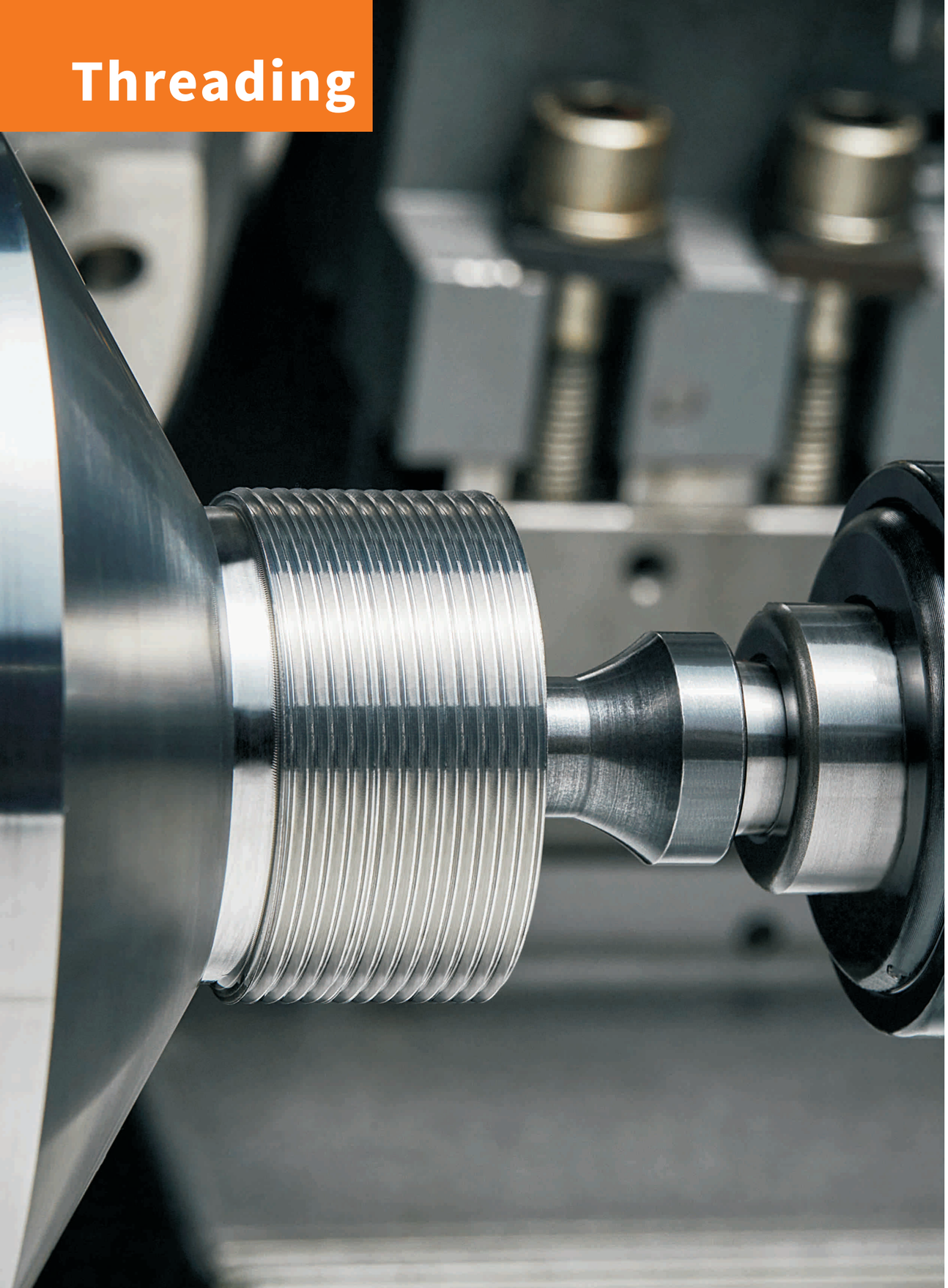
## Precautions for face grooving

| S/N | Machining subjects | Precautions | Diagram |
|---|---|---|---|
| 3 | End face groove expansion machining | During rough machining, please stagger them into step shape for machining. |  |
| | | Finish machining: When the cutting depth is set to 0.5mm or above on one side, the chip disposal performs well. | |

## FAQs of parting and grooving

| Condition | Countermeasures |
|---|---|
| There is white turbidity at the bottom of the face | (1) Increase the cutting speed only in the finish machining.<br>(2) When method 1 does not work, please readjust the parallelism of the insert and the corner.<br>Correction method: Adjust the cutter bar to within ±5° tolerance of the perpendicularity between the cut-in angle and the material to be cut.<br>  |
| When grooving, the tool gets entangled with chips. | (1) Install the cutter bar facing downwards (reversed).<br>Please spray the coolant from the rear side of the insert to the corner.<br>(2) When expanding the groove, please process it shallowly and extensively as a whole. (Deep recess machining cannot be done at the same time) |
| The insert collapses during the transverse feed machining. | Please replace the outside-inside machining by the inside-outside machining. |
| The recesses cannot be accessed vertically. | Please correct the parallelism of the corner<br>Reduce the feeding speed. |

# Threading

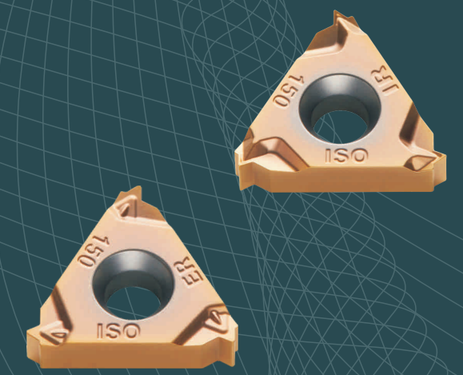


A

## Turning

### Thread turning


- Code key of thread insert A-161
- Overview of threading A-162
- Thread insert A-163
- Thread tools A-182
- Technical information for threading A-184

## Code key of thread inserts

| 16 | E | R | 150 | ISO | — | P |
|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ | | ⑥ |

| ① Insert size (inch) | |
|---|---|
| Code | Inscribed circle diameter |
| 11 | Φ6.35 |
| 16 | Φ9.525 |
| 22 | Φ12.70 |

| ② Cutting type | |
|---|---|
| Code | Type |
| E | External threading |
| I | Internal threading |

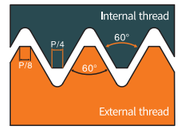
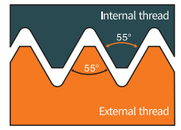
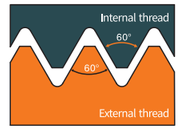
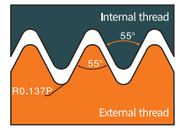
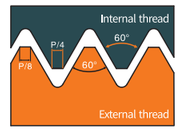
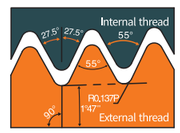
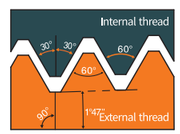
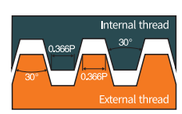
| ③ Cutting direction | |
|---|---|
| Code | Direction |
| R | Right |
| L | Left |

| ④Thread pitch | | |
|---|---|---|
| Full form (indicated by pitch × 100) | | |
| mm | TPI | |
| 0.35-9.0 | 72-2 | |
| V-profile (pitch indicated by letters) | | |
| | mm | TPI |
| A | 0.5-1.5 | 48-16 |
| AG | 0.5-3.0 | 48-8 |
| G | 1.75-3.0 | 14-8 |
| N | 3.5-5.0 | 7-5 |
| Q | 5.5-6.0 | 41/2-4 |

| ⑤Thread type | |
|---|---|
| Code | Type |
| ISO | ISO metric thread |
| UN | UN thread |
| W | Whitworth thread |
| BSPT | BSPT |
| NPT | NPT |
| TR | 30°standard trapzoidal thread |

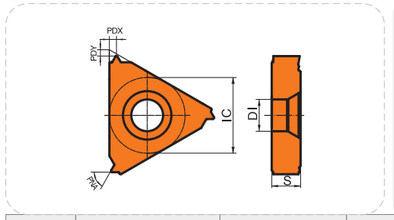
| ⑥Shaping method | |
|---|---|
| Code | Type |
| default | Molded groove |
| P | Grinding groove |

## Overview of threading

| Industry | Diagram | Thread type | Thread profile | Insert shape | pitch | number of teeth |
|---|---|---|---|---|---|---|
| General industry |   | ISO metric thread | ISO Metric 60° thread | | 1–6 | 4–25 |
| General industry |   | Universal thread | 55 ° universal pitch thread | | 0.5–5 | 5–51 |
| |   | | 60 ° universal pitch thread | | | |
| General industry |   | Whitworth thread | W | | | 8–28 |
| Aerospace industry equipemt |   | UN thread | UN | | | 5–28 |
| Pipe thread for gas, heating and tap water |   | BSPT | BSPT | | | 11–28 |
| For Pipeline connected with gas and tap water faucets |   | NPT | NPT | | | 8–27 |
| Transimition & Transportation equipment |   | 30°Standard trapezoidal thread | TR | | 1.5–6.0 | |

# ISO metric 60° thread (Molded)

Standard: R262（DIN 13）
Tolerance class: 6g/6H




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

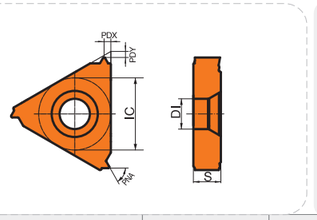
| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| External threading | | 16ER100ISO | 1.00 | 9.525 | 0.7 | 0.7 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER125ISO | 1.25 | 9.525 | 0.9 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER150ISO | 1.50 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER175ISO | 1.75 | 9.525 | 1.2 | 0.9 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER200ISO | 2.00 | 9.525 | 1.3 | 1.0 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER250ISO | 2.50 | 9.525 | 1.5 | 1.2 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER300ISO | 3.00 | 9.525 | 1.6 | 1.3 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER350ISO | 3.50 | 12.700 | 2.3 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER400ISO | 4.00 | 12.700 | 2.3 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER450ISO | 4.50 | 12.700 | 2.4 | 1.7 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER500ISO | 5.00 | 12.700 | 2.4 | 1.7 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER550ISO | 5.50 | 12.700 | 2.5 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER600ISO | 6.00 | 12.700 | 2.7 | 1.7 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |

★ Recommended grade ☆ Available grade



# ISO metric 60° thread (Molded)

Standard: R262（DIN 13）
Tolerance class: 6g/6H




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Internal threading | | 11IR100ISO | 1.00 | 6.35 | 0.7 | 0.7 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 11IR125ISO | 1.25 | 6.35 | 0.9 | 0.8 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 11IR150ISO | 1.50 | 6.35 | 1.0 | 0.8 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16IR100ISO | 1.00 | 9.525 | 0.7 | 0.7 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16IR125ISO | 1.25 | 9.525 | 0.9 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16IR150ISO | 1.50 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16IR175ISO | 1.75 | 9.525 | 1.2 | 0.9 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16IR200ISO | 2.00 | 9.525 | 1.3 | 1.0 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16IR250ISO | 5.50 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16IR300ISO | 3.00 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22IR350ISO | 3.50 | 12.700 | 2.3 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22IR400ISO | 4.00 | 12.700 | 2.3 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22IR450ISO | 4.50 | 12.700 | 2.4 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22IR500ISO | 5.00 | 12.700 | 2.4 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22IR550ISO | 5.50 | 12.700 | 2.5 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22IR600ISO | 6.00 | 12.700 | 2.5 | 1.8 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |

★ Recommended grade ☆ Available grade

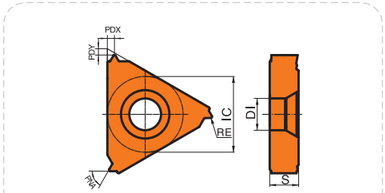
HUAREAL



# Universal thread (Molded)

Standard: B.S.84:1956,DIN 259,ISO228/1:1982
Tolerance class: Medium, A-class

Working condition: ● Stable ◕ Average ⌗ Tough



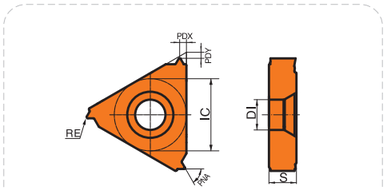

Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | RE | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| External threading | | 16ERA55 | 0.5–1.5 | 9.525 | 0.9 | 0.8 | 3.52 | 0.05 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ERG55 | 1.75–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.23 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ERAG55 | 0.5–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.06 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22ERN55 | 3.5–5.0 | 12.700 | 2.5 | 1.7 | 4.65 | 0.51 | 5.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ERA60 | 0.5–1.5 | 9.525 | 0.9 | 0.8 | 3.52 | 0.06 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ERG60 | 1.75–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.18 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ERAG60 | 0.5–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.07 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22ERN60 | 3.5–5.0 | 12.700 | 2.5 | 1.7 | 4.65 | 0.51 | 5.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |

★ Recommended grade ☆ Available grade

Working condition: ● Stable ◕ Average ⌗ Tough




Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

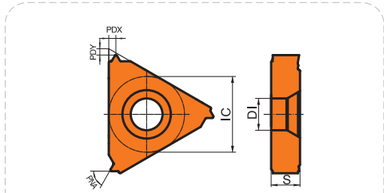
| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | RE | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Internal threading | | 11IRA55 | 0.5–1.5 | 6.350 | 0.9 | 0.8 | 3.05 | 0.05 | 3.2 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IRA55 | 0.5–1.5 | 9.525 | 0.9 | 0.8 | 3.52 | 0.05 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IRG55 | 1.75–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.21 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IRAG55 | 0.5–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.06 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IRN55 | 3.5–5.0 | 12.700 | 2.5 | 1.7 | 4.65 | 0.26 | 5.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IRA60 | 0.5–1.5 | 6.350 | 0.9 | 0.8 | 3.05 | 0.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IRA60 | 0.5–1.5 | 9.525 | 0.9 | 0.8 | 3.52 | 0.05 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IRG60 | 1.75–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.10 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IRAG60 | 0.5–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.08 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IRN60 | 3.5–5.0 | 12.700 | 2.5 | 1.7 | 4.65 | 0.26 | 5.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |

★ Recommended grade ☆ Available grade

# Whiteworth thread (Molded)

Standard: B.S.84:1956,DIN 259,ISO228/1:1982
Tolerance class: Medium, A-class

Working condition: ● Stable ◕ Average ⌗ Tough



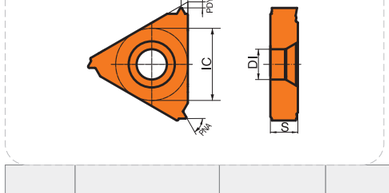

Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| External threading | | 16ER8W | 8 | 9.525 | 1.5 | 1.2 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER11W | 11 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER12W | 12 | 9.525 | 1.4 | 1.1 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER14W | 14 | 9.525 | 1.2 | 1.0 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER19W | 19 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |

★ Recommended grade ☆ Available grade

Working condition: ● Stable ◕ Average ⌗ Tough




Workpiece material

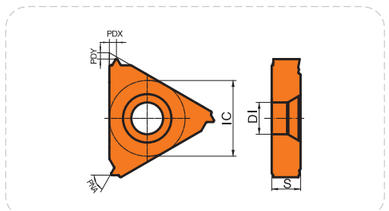
| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Internal threading | | 16IR8W | 8 | 9.525 | 1.5 | 1.2 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR11W | 11 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR12W | 12 | 9.525 | 1.4 | 1.1 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR14W | 14 | 9.525 | 1.2 | 1.0 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR19W | 19 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |

★ Recommended grade ☆ Available grade

## UN united thread (Molded)

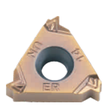
Standard: ANSI B1.1:74
Tolerance class: 2A/2B




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

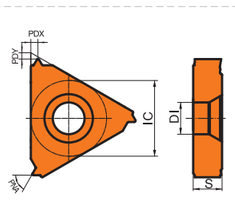
| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| External threading |  | 16ER8UN | 8 | 9.525 | 1.7 | 1.2 | 3.52 | 4.0 | 60° | | | | | | | | | | ☆ | ★ | | | | | |
| | | 16ER12UN | 12 | 9.525 | 1.4 | 1.1 | 3.52 | 4.0 | 60° | | | | | | | | | | ☆ | ★ | | | | | |
| | | 16ER14UN | 14 | 9.525 | 1.2 | 1.0 | 3.52 | 4.0 | 60° | | | | | | | | | | ☆ | ★ | | | | | |
| | | 16ER16UN | 16 | 9.525 | 1.1 | 0.9 | 3.52 | 4.0 | 60° | | | | | | | | | | ☆ | ★ | | | | | |
| | | 16ER18UN | 18 | 9.525 | 1.1 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | ☆ | ★ | | | | | |
| | | 16ER20UN | 20 | 9.525 | 1.1 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | ☆ | ★ | | | | | |

★ Recommended grade ☆ Available grade

## BSPT (Molded)

Standard: B.S.21:1985
Tolerance standard: BSPT



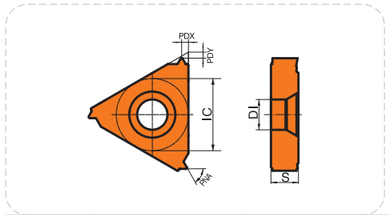

Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| External threading | | 16ER11BSPT | 11 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER14BSPT | 14 | 9.525 | 1.2 | 1.0 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER19BSPT | 19 | 9.525 | 0.9 | 0.8 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |

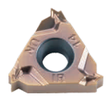
★ Recommended grade ☆ Available grade



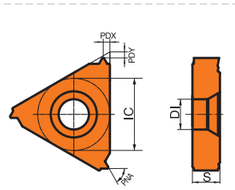

Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Internal threading |  | 16IR8UN | 8 | 9.525 | 1.7 | 1.2 | 3.52 | 4.0 | 60° | | | | | | | | | | ☆ | ★ | | | | | |
| | | 16IR12UN | 12 | 9.525 | 1.4 | 1.1 | 3.52 | 4.0 | 60° | | | | | | | | | | ☆ | ★ | | | | | |
| | | 16IR14UN | 14 | 9.525 | 1.2 | 1.0 | 3.52 | 4.0 | 60° | | | | | | | | | | ☆ | ★ | | | | | |
| | | 16IR16UN | 16 | 9.525 | 1.1 | 0.9 | 3.52 | 4.0 | 60° | | | | | | | | | | ☆ | ★ | | | | | |
| | | 16IR18UN | 18 | 9.525 | 1.1 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | ☆ | ★ | | | | | |
| | | 16IR20UN | 20 | 9.525 | 1.1 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | ☆ | ★ | | | | | |

★ Recommended grade ☆ Available grade




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

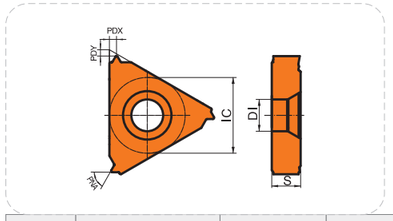
| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Internal threading | | 16IR11BSPT | 11 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR14BSPT | 14 | 9.525 | 1.2 | 1.0 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR19BSPT | 19 | 9.525 | 0.9 | 0.8 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |

★ Recommended grade ☆ Available grade

# NPT (Molded)

Standard: USAS B2.1:1968
Tolerance standard: American Standard NPT Thread



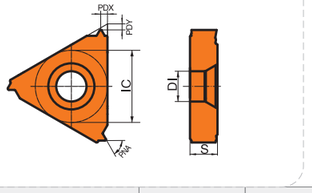

Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | CVD | | | | | | PVD | | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | |
| P | Steel | ● | ● | ◕ ⌗ | ◕ ⌗ | ⌗ | | ● | | | ● | | | | | | ● ● | | |
| M | Stainless steel | | | | | | ● | | | | ● ● | | | | | | | | |
| K | Cast iron | | | | | | ● ● | | | | | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | | | | ● ● | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | ● ● | | | | | | | | | | |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| External threading | | 16ER115NPT | 11.5 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER14NPT | 14.0 | 9.525 | 1.2 | 0.9 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER18NPT | 18.0 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

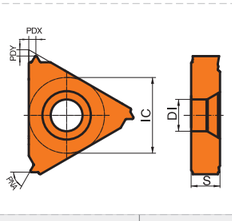
| | | CVD | | | | | | PVD | | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | |
| P | Steel | ● | ● | ◕ ⌗ | ◕ ⌗ | ⌗ | | ● | | | ● | | | | | | ● ● | | |
| M | Stainless steel | | | | | | ● | | | | ● ● | | | | | | | | |
| K | Cast iron | | | | | | ● ● | | | | | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | | | | ● ● | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | ● ● | | | | | | | | | | |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Internal threading | | 16IR115NPT | 11.5 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16IR14NPT | 14.0 | 9.525 | 1.2 | 0.9 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16IR18NPT | 18.0 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

# ISO metric 60° thread (Grinding)

Standard: R262 (DIN 13)
Tolerance class: 6g/6H




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | CVD | | | | | | PVD | | | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | |
| P | Steel | ● | ● | ◕ ⌗ | ◕ ⌗ | ⌗ | | ● | | | ● | | | | | | ● ● | | |
| M | Stainless steel | | | | | | ● | | | | ● ● | | | | | | | | |
| K | Cast iron | | | | | | ● ● | | | | | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | | | | ● ● | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | ● ● | | | | | | | | | | |

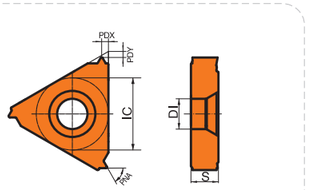
| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| External threading | | 16ER100ISO–P | 1.00 | 9.525 | 0.7 | 0.7 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16EL100ISO–P | 1.00 | 9.525 | 0.7 | 0.7 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER125ISO–P | 1.25 | 9.525 | 0.9 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16EL125ISO–P | 1.25 | 9.525 | 0.9 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER150ISO–P | 1.50 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16EL150ISO–P | 1.50 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER175ISO–P | 1.75 | 9.525 | 1.2 | 0.9 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16EL175ISO–P | 1.75 | 9.525 | 1.2 | 0.9 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER200ISO–P | 2.00 | 9.525 | 1.3 | 1.0 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16EL200ISO–P | 2.00 | 9.525 | 1.3 | 1.0 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER250ISO–P | 2.50 | 9.525 | 1.5 | 1.2 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16EL250ISO–P | 2.50 | 9.525 | 1.5 | 1.2 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER300ISO–P | 3.00 | 9.525 | 1.6 | 1.3 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16EL300ISO–P | 3.00 | 9.525 | 1.6 | 1.3 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER350ISO–P | 3.50 | 12.700 | 2.3 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22EL350ISO–P | 3.50 | 12.700 | 2.3 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER400ISO–P | 4.00 | 12.700 | 2.3 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22EL400ISO–P | 4.00 | 12.700 | 2.3 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER450ISO–P | 4.50 | 12.700 | 2.4 | 1.7 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22EL450ISO–P | 4.50 | 12.700 | 2.4 | 1.7 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER500ISO–P | 5.00 | 12.700 | 2.4 | 1.7 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22EL500ISO–P | 5.00 | 12.700 | 2.4 | 1.7 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER550ISO–P | 5.50 | 12.700 | 2.6 | 1.7 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22EL550ISO–P | 5.50 | 12.700 | 2.6 | 1.7 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER600ISO–P | 6.00 | 12.700 | 2.7 | 1.7 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22EL600ISO–P | 6.00 | 12.700 | 2.7 | 1.7 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |

★ Recommended grade ☆ Available grade

# ISO metric 60° thread (Grinding)

Standard: R262（DIN 13）
Tolerance class: 6g/6H

Working condition: ● Stable ◕ Average ⌗ Tough




Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| | | 11IR100ISO-P | 1.00 | 6.35 | 0.7 | 0.7 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IL100ISO-P | 1.00 | 6.35 | 0.7 | 0.7 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IR125ISO-P | 1.25 | 6.35 | 0.9 | 0.8 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IL125ISO-P | 1.25 | 6.35 | 0.9 | 0.8 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IR150ISO-P | 1.50 | 6.35 | 1.0 | 0.8 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IL150ISO-P | 1.50 | 6.35 | 1.0 | 0.8 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IR175ISO-P | 1.75 | 6.35 | 1.2 | 0.9 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IL175ISO-P | 1.75 | 6.35 | 1.2 | 0.9 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IR200ISO-P | 2.00 | 6.35 | 1.3 | 0.9 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IL200ISO-P | 2.00 | 6.35 | 1.3 | 0.9 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IR250ISO-P | 2.50 | 6.35 | 1.5 | 1.0 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IL250ISO-P | 2.50 | 6.35 | 1.5 | 1.0 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| Internal threading | | 16IR100ISO-P | 1.00 | 9.525 | 0.7 | 0.7 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IL100ISO-P | 1.00 | 9.525 | 0.7 | 0.7 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR125ISO-P | 1.25 | 9.525 | 0.9 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IL125ISO-P | 1.25 | 9.525 | 0.9 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR150ISO-P | 1.50 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IL150ISO-P | 1.50 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR175ISO-P | 1.75 | 9.525 | 1.2 | 0.9 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IL175ISO-P | 1.75 | 9.525 | 1.2 | 0.9 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR200ISO-P | 2.00 | 9.525 | 1.3 | 1.0 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IL200ISO-P | 2.00 | 9.525 | 1.3 | 1.0 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR250ISO-P | 2.50 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IL250ISO-P | 2.50 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR300ISO-P | 3.00 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IL300ISO-P | 3.00 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |

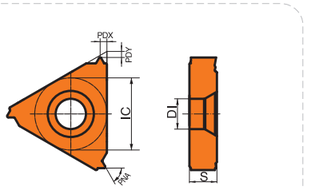
★ Recommended grade ☆ Available grade



# ISO metric 60° thread (Grinding)

Standard: R262（DIN 13）
Tolerance class: 6g/6H

Working condition: ● Stable ◕ Average ⌗ Tough




Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Internal threading | | 22IR350ISO-P | 3.50 | 12.700 | 2.3 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IL350ISO-P | 3.50 | 12.700 | 2.3 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IR400ISO-P | 4.00 | 12.700 | 2.3 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IL400ISO-P | 4.00 | 12.700 | 2.3 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IR450ISO-P | 4.50 | 12.700 | 2.4 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IL450ISO-P | 4.50 | 12.700 | 2.4 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IR500ISO-P | 5.00 | 12.700 | 2.4 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IL500ISO-P | 5.00 | 12.700 | 2.4 | 1.6 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IR550ISO-P | 5.50 | 12.700 | 2.5 | 1.7 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IL550ISO-P | 5.50 | 12.700 | 2.5 | 1.7 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IR600ISO-P | 6.00 | 12.700 | 2.5 | 1.8 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IL600ISO-P | 6.00 | 12.700 | 2.5 | 1.8 | 4.65 | 5.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |

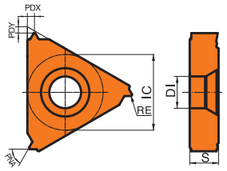
★ Recommended grade ☆ Available grade

HUAREAL



# Universal thread (Grinding)

Standard:B.S.84:1956,DIN 259,IS0228/1:1982
Tolerance class:Medium,A-class




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ● ● |
| M | Stainless steel | ● ● ● ● ● |
| K | Cast iron | ● ● |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ● ● |

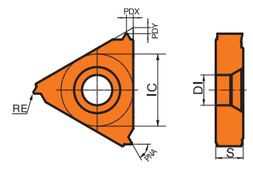
| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | RE | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| External threading | | 16ERA55–P | 0.5–1.5 | 9.525 | 0.9 | 0.8 | 3.52 | 0.05 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ELA55–P | 0.5–1.5 | 9.525 | 0.9 | 0.8 | 3.52 | 0.05 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ERG55–P | 1.75–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.23 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ELG55–P | 1.75–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.23 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ERAG55–P | 1.75–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.23 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22ERN55–P | 3.5–5.0 | 12.700 | 2.5 | 1.7 | 3.52 | 0.44 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22ELN55–P | 3.5–5.0 | 12.700 | 2.5 | 1.7 | 3.52 | 0.44 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ERA60–P | 0.5–1.5 | 9.525 | 0.9 | 0.8 | 3.52 | 0.06 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ELA60–P | 0.5–1.5 | 9.525 | 0.9 | 0.8 | 3.52 | 0.06 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ERG60–P | 1.75–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.18 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ELG60–P | 1.75–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.18 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ERAG60–P | 0.5–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.07 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ELAG60–P | 0.5–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.07 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22ERN60–P | 3.5–5.0 | 12.700 | 2.5 | 1.7 | 3.52 | 0.51 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22ELN60–P | 3.5–5.0 | 12.700 | 2.5 | 1.7 | 3.52 | 0.51 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |

★ Recommended grade ☆ Available grade



# Universal thread (Grinding)

Standard:B.S.84:1956,DIN 259,IS0228/1:1982
Tolerance class:Medium,A-class




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ● ● |
| M | Stainless steel | ● ● ● ● ● |
| K | Cast iron | ● ● |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ● ● |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | RE | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Internal threading | | 16IRA55–P | 0.5–1.5 | 9.525 | 0.9 | 0.8 | 3.52 | 0.05 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ILA55–P | 0.5–1.5 | 9.525 | 0.9 | 0.8 | 3.52 | 0.05 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IRG55–P | 1.75–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.21 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ILG55–P | 1.75–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.21 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IRAG55–P | 1.75–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.21 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IRN55–P | 3.5–5.0 | 9.525 | 2.5 | 1.7 | 3.52 | 0.43 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ILN55–P | 3.5–5.0 | 9.525 | 2.5 | 1.7 | 3.52 | 0.43 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IRA60–P | 0.5–1.5 | 9.525 | 0.9 | 0.8 | 3.52 | 0.05 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ILA60–P | 0.5–1.5 | 9.525 | 0.9 | 0.8 | 3.52 | 0.05 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IRG60–P | 1.75–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.10 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ILG60–P | 1.75–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.10 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IRAG60–P | 0.5–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.08 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ILAG60–P | 0.5–3.0 | 9.525 | 1.7 | 1.2 | 3.52 | 0.08 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IRN60–P | 3.5–5.0 | 9.525 | 2.5 | 1.7 | 3.52 | 0.26 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22ILN60–P | 3.5–5.0 | 9.525 | 2.5 | 1.7 | 3.52 | 0.26 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |

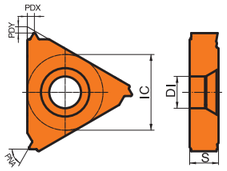
★ Recommended grade ☆ Available grade

HUAREAL



# Whiteworth thread (Grinding)

Standard: B.S.84:1956,DIN 259,ISO228/1:1982
Tolerance class: Medium,A-class




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | Working condition |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ⌗ ● ● ● ● ● ● |
| M | Stainless steel | ● ● ● ◕ ◕ |
| K | Cast iron | ● ◕ ⌗ |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ● ● |

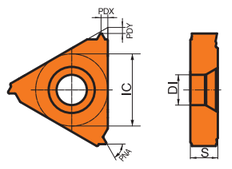
| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| External threading | | 16ER8W–P | 8 | 9.525 | 1.5 | 1.2 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER9W–P | 9 | 9.525 | 1.7 | 1.2 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER10W–P | 10 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER11W–P | 11 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER12W–P | 12 | 9.525 | 1.4 | 1.1 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER14W–P | 14 | 9.525 | 1.2 | 1.0 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER16W–P | 16 | 9.525 | 1.1 | 0.9 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER18W–P | 18 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER19W–P | 19 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER20W–P | 20 | 9.525 | 0.9 | 0.8 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER26W–P | 26 | 9.525 | 0.8 | 0.7 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER28W–P | 28 | 9.525 | 0.7 | 0.6 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |

★ Recommended grade ☆ Available grade



# Whiteworth thread (Grinding)

Standard: B.S.84:1956,DIN 259,ISO228/1:1982
Tolerance class: Medium,A-class




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | Working condition |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ⌗ ● ● ● ● ● ● |
| M | Stainless steel | ● ● ● ◕ ◕ |
| K | Cast iron | ● ◕ ⌗ |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ● ● |

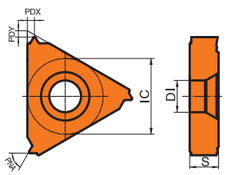
| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Internal threading | | 11IR14W–P | 14 | 6.350 | 1.0 | 0.8 | 3.05 | 3.2 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IR19W–P | 19 | 6.350 | 1.2 | 1.0 | 3.05 | 3.2 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR8W–P | 8 | 9.525 | 1.5 | 1.2 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR9W–P | 9 | 9.525 | 1.7 | 1.2 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR10W–P | 10 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR11W–P | 11 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR12W–P | 12 | 9.525 | 1.4 | 1.1 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR14W–P | 14 | 9.525 | 1.2 | 1.0 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR16W–P | 16 | 9.525 | 1.1 | 0.9 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR18W–P | 18 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR19W–P | 19 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR20W–P | 20 | 9.525 | 0.9 | 0.8 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR26W–P | 26 | 9.525 | 0.8 | 0.7 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR28W–P | 28 | 9.525 | 0.7 | 0.6 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |

★ Recommended grade ☆ Available grade

## UN united thread (Gridning)

Standard: ANSI B1.1:74
Tolerance class: 2A/2B

Working condition: ● Stable ◕ Average ⌗ Tough




| Workpiece material | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ● ● |
| M | Stainless steel | ● ● ● ● ● |
| K | Cast iron | ● ● |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ● ● |

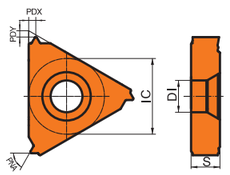
| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| External threading | | 16ER8UN–P | 8 | 9.525 | 1.7 | 1.2 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER12UN–P | 12 | 9.525 | 1.4 | 1.1 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER14UN–P | 14 | 9.525 | 1.2 | 1.0 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER16UN–P | 16 | 9.525 | 1.1 | 0.9 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER18UN–P | 18 | 9.525 | 1.1 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER20UN–P | 20 | 9.525 | 1.1 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |

★ Recommended grade ☆ Available grade

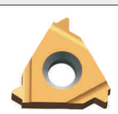
## BSPT (Grinding)

Standard: B.S.21:1985
Tolerance class: BSPT

Working condition: ● Stable ◕ Average ⌗ Tough

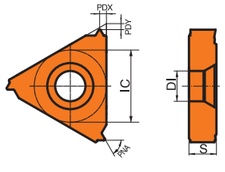



| Workpiece material | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ● ● |
| M | Stainless steel | ● ● ● ● ● |
| K | Cast iron | ● ● |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ● ● |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| External threading |  | 16ER11BSPT–P | 11 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER14BSPT–P | 14 | 9.525 | 1.2 | 1.0 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER19BSPT–P | 19 | 9.525 | 0.9 | 0.8 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16ER28BSPT–P | 28 | 9.525 | 0.6 | 0.6 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |

★ Recommended grade ☆ Available grade

Working condition: ● Stable ◕ Average ⌗ Tough

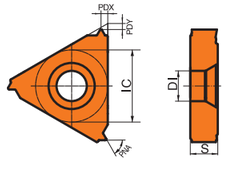



| Workpiece material | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ● ● |
| M | Stainless steel | ● ● ● ● ● |
| K | Cast iron | ● ● |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ● ● |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Internal threading | | 11IR14UN–P | 14 | 6.35 | 1 | 0.8 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IR18UN–P | 18 | 6.35 | 1 | 0.8 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IR20UN–P | 20 | 6.35 | 1 | 0.8 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR8UN–P | 8 | 9.525 | 1.7 | 1.2 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR12UN–P | 12 | 9.525 | 1.4 | 1.1 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR14UN–P | 14 | 9.525 | 1.2 | 1.0 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR16UN–P | 16 | 9.525 | 1.1 | 0.9 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR18UN–P | 18 | 9.525 | 1.1 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR20UN–P | 20 | 9.525 | 1.1 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ | ★ | | | | |

★ Recommended grade ☆ Available grade

Working condition: ● Stable ◕ Average ⌗ Tough




| Workpiece material | | |
|---|---|---|
| P | Steel | ● ● ◕ ◕ ⌗ ● ● ● ● ● |
| M | Stainless steel | ● ● ● ● ● |
| K | Cast iron | ● ● |
| N | Non-ferrous metal | ● ● |
| S | Heat resistant super alloys Titanium alloy | ● ● ● ● |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Internal threading | | 11IR14BSPT–P | 14 | 6.35 | 1.2 | 0.8 | 3.05 | 3.2 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IR19BSPT–P | 19 | 6.35 | 1.0 | 0.8 | 3.05 | 3.2 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 11IR28BSPT–P | 28 | 6.35 | 0.8 | 0.6 | 3.05 | 3.2 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR11BSPT–P | 11 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR14BSPT–P | 14 | 9.525 | 1.2 | 1.0 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR19BSPT–P | 19 | 9.525 | 0.9 | 0.8 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR28BSPT–P | 28 | 9.525 | 0.6 | 0.6 | 3.52 | 4.0 | 55° | | | | | | | | | | | | ☆ | ★ | | | | |

★ Recommended grade ☆ Available grade

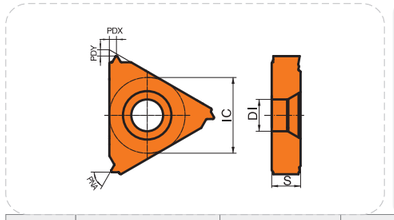
HUAREAL



## NPT (Grinding)

Standard: USAS B2.1:1968
Tolerance class : NPT

Working condition: ● Stable ◕ Average ⌗ Tough



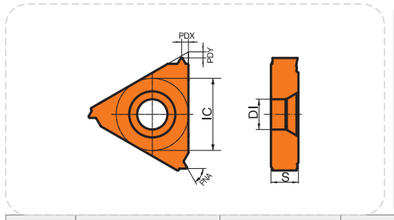

Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| External threading | | 16ER8NPT–P | 8 | 9.525 | 1.8 | 1.3 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER115NPT–P | 11.5 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER14NPT–P | 14 | 9.525 | 1.2 | 0.9 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER18NPT–P | 18 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER27NPT–P | 27 | 9.525 | 0.8 | 0.7 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |

★ Recommended grade ☆ Available grade

Working condition: ● Stable ◕ Average ⌗ Tough




Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

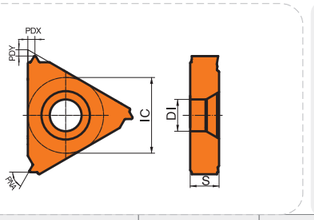
| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| Internal threading | | 11IR14NPT–P | 14 | 6.35 | 1.2 | 0.9 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 11IR18NPT–P | 18 | 6.35 | 1.0 | 0.8 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 11IR27NPT–P | 27 | 6.35 | 0.8 | 0.6 | 3.05 | 3.2 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16IR8NPT–P | 8 | 9.525 | 1.8 | 1.3 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16IR115NPT–P | 11.5 | 9.525 | 1.5 | 1.1 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16IR14NPT–P | 14 | 9.525 | 1.2 | 0.9 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16IR18NPT–P | 18 | 9.525 | 1.0 | 0.8 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16IR27NPT–P | 27 | 9.525 | 0.8 | 0.7 | 3.52 | 4.0 | 60° | | | | | | | | | | | | ☆ ★ | | | | |

★ Recommended grade ☆ Available grade

## 30°Standard trapezoidal thread

Standard: DIN103-2-1977
Tolerance class: 7e7H screw thread

Working condition: ● Stable ◕ Average ⌗ Tough



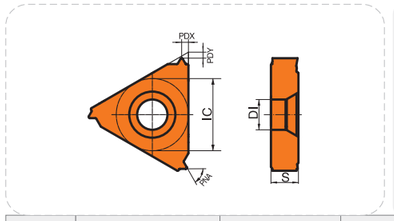

Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) | | | | | | CVD | | | | | | PVD | | | | | | Cemented carbide | | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IC | PDX | PDY | S | DI | PNA | HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | HRK10 | HRK20 | HRC10 | HR115C |
| External threading | | 16ER150TR–P | 1.50 | 9.53 | 0.80 | 0.70 | 3.52 | 4.00 | 30° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16EL150TR–P | 1.50 | 9.53 | 0.80 | 0.70 | 3.52 | 4.00 | 30° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER200TR–P | 2.00 | 9.53 | 1.30 | 1.10 | 3.52 | 4.00 | 30° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16EL200TR–P | 2.00 | 9.53 | 1.30 | 1.10 | 3.52 | 4.00 | 30° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16ER300TR–P | 3.00 | 9.53 | 1.30 | 1.10 | 3.52 | 4.00 | 30° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 16EL300TR–P | 3.00 | 9.53 | 1.30 | 1.10 | 3.52 | 4.00 | 30° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER400TR–P | 4.00 | 12.70 | 2.30 | 1.80 | 4.65 | 5.00 | 30° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22EL400TR–P | 4.00 | 12.70 | 2.30 | 1.80 | 4.65 | 5.00 | 30° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER500TR–P | 5.00 | 12.70 | 2.30 | 1.80 | 4.65 | 5.00 | 30° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22EL500TR–P | 5.00 | 12.70 | 2.30 | 1.80 | 4.65 | 5.00 | 30° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22ER600TR–P | 6.00 | 12.70 | 2.30 | 1.90 | 4.65 | 5.00 | 30° | | | | | | | | | | | | ☆ ★ | | | | |
| | | 22EL600TR–P | 6.00 | 12.70 | 2.30 | 1.90 | 4.65 | 5.00 | 30° | | | | | | | | | | | | ☆ ★ | | | | |

★ Recommended grade ☆ Available grade

## 30°Standard trapezoidal thread




Working condition: ● Stable ◕ Average ⌗ Tough

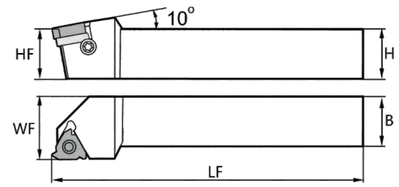
Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

| Processing | Insert shape | Type | Pitch/ number of teeth | Dimension (mm) IC | PDX | PDY | S | DI | PNA | CVD HR8105 | HR8115 | HR8125 | HR8225 | HR8135 | HR6115 | PVD HR1135 | HR9105 | HR7115 | HR7125 | HR7225 | HR5125 | HR5225 | Cemented carbide HRK10 | HRK20 | Cermet HRC10 | HR115C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal threading | | 16IR150TR–P | 1.50 | 9.53 | 0.80 | 0.70 | 3.52 | 4.00 | 30° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IL150TR–P | 1.50 | 9.53 | 0.80 | 0.70 | 3.52 | 4.00 | 30° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR200TR–P | 2.00 | 9.53 | 1.30 | 1.10 | 3.52 | 4.00 | 30° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IL200TR–P | 2.00 | 9.53 | 1.30 | 1.10 | 3.52 | 4.00 | 30° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IR300TR–P | 3.00 | 9.53 | 1.30 | 1.10 | 3.52 | 4.00 | 30° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 16IL300TR–P | 3.00 | 9.53 | 1.30 | 1.10 | 3.52 | 4.00 | 30° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IR400TR–P | 4.00 | 12.70 | 2.30 | 1.80 | 4.65 | 5.00 | 30° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IL400TR–P | 4.00 | 12.70 | 2.30 | 1.80 | 4.65 | 5.00 | 30° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IR500TR–P | 5.00 | 12.70 | 2.30 | 1.80 | 4.65 | 5.00 | 30° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IL500TR–P | 5.00 | 12.70 | 2.30 | 1.80 | 4.65 | 5.00 | 30° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IR600TR–P | 6.00 | 12.70 | 2.30 | 1.90 | 4.65 | 5.00 | 30° | | | | | | | | | | | | ☆ | ★ | | | | |
| | | 22IL600TR–P | 6.00 | 12.70 | 2.30 | 1.90 | 4.65 | 5.00 | 30° | | | | | | | | | | | | ☆ | ★ | | | | |

★ Recommended grade ☆ Available grade

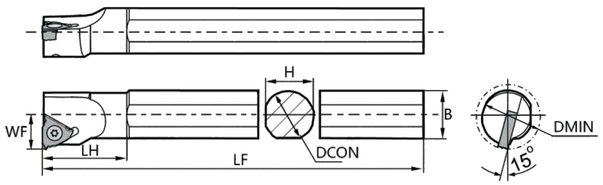
## External threading tools




| Type | | Inventoty | Dimension (mm) H | HF | B | LF | WF | Accessories Insert screw | Shim | Shim screw | Wrench | Matching insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SWR | 2020K16 | △ | 20 | 20 | 20 | 125 | 25 | M3.5 × 12 | HT16–□□M | HM4 × 8C | WR15 | 16□□ |
| | 2525M16 | ▲ | 25 | 25 | 25 | 150 | 32 | | | | | |
| | 3232P16 | △ | 32 | 32 | 32 | 170 | 40 | | | | | |
| | 2525M22 | ▲ | 25 | 25 | 25 | 150 | 32 | M5 × 17 | HT22–□□M | HM5 × 8.5 | WR20 | 22□□ |
| | 3232P22 | △ | 32 | 32 | 32 | 170 | 40 | | | | | |
| SWL | 2020K16 | △ | 20 | 20 | 20 | 125 | 25 | M3.5 × 12 | HT16–□□M | HM4 × 8C | WR15 | 16□□ |
| | 2525M16 | ▲ | 25 | 25 | 25 | 150 | 32 | | | | | |
| | 3232P16 | △ | 32 | 32 | 32 | 170 | 40 | | | | | |
| | 2525M22 | ▲ | 25 | 25 | 25 | 150 | 32 | M5 × 17 | HT22–□□M | HM5 × 8.5 | WR20 | 22□□ |
| | 3232P22 | △ | 32 | 32 | 32 | 170 | 40 | | | | | |

★ Recommended grade ☆ Available grade

# Internal threading tools



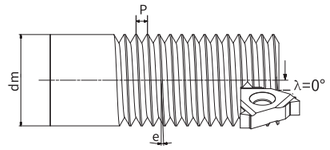

| Type | | Inventoty | Dimension (mm) | | | | | | | Accessories | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DCON | LF | B | DMIN | WF | H | LH | Insert screw | Shim | Shim screw | Wrench | Matching insert |
| SWR | 0016K11 | △ | 16 | 125 | 16 | 12 | 10 | 15 | 20.9 | M2.5 × 6.5 | – | – | WR07 | 11□□ |
| | 0016M11 | ▲ | 16 | 150 | 15.5 | 16 | 10.5 | 15 | 25.9 | | | | | |
| | 0016M16 | △ | 16 | 150 | 15.5 | 20 | 12 | 15 | 27 | M3.5 × 8 | | | WR15 | 16□□ |
| | 0020M16 | △ | 20 | 150 | 19 | 25 | 14 | 18 | 28.7 | M3.5 × 12 | HT16–□□M | HM4 × 8 | | |
| | 0020Q16 | △ | 20 | 180 | 19 | 25 | 14 | 18 | 34 | | | | | |
| | 0025M16 | ▲ | 25 | 150 | 24 | 32 | 17 | 23 | 28.8 | | | | | |
| | 0032R16 | △ | 32 | 200 | 31 | 40 | 22 | 30 | 30.9 | | | | | |
| | 0032S16 | △ | 32 | 250 | 31 | 40 | 22 | 30 | 30.9 | | | | | |
| | 0020Q22 | △ | 20 | 180 | 21.5 | 25 | 15 | 18 | 35 | M5 × 10 | – | – | WR20 | 22□□ |
| | 0025R22 | ▲ | 25 | 200 | 24 | 32 | 19 | 23 | 39 | M5 × 17 | HT22–□□M | HM4 × 8 | | |
| | 0032S22 | △ | 32 | 250 | 31 | 40 | 22 | 30 | 36.4 | | | | | |
| SWL | 0016K11 | △ | 16 | 125 | 16 | 12 | 10 | 15 | 20.9 | M2.5 × 6.5 | – | – | WR07 | 11□□ |
| | 0016M11 | ▲ | 16 | 150 | 15.5 | 16 | 10.5 | 15 | 25.9 | | | | | |
| | 0016M16 | △ | 16 | 150 | 15.5 | 20 | 12 | 15 | 27 | M3.5 × 8 | | | WR15 | 16□□ |
| | 0020M16 | △ | 20 | 150 | 19 | 25 | 14 | 18 | 28.7 | M3.5 × 12 | HT16–□□M | HM4 × 8 | | |
| | 0020Q16 | △ | 20 | 180 | 19 | 25 | 14 | 18 | 34 | | | | | |
| | 0025M16 | ▲ | 25 | 150 | 24 | 32 | 17 | 23 | 28.8 | | | | | |
| | 0032R16 | △ | 32 | 200 | 31 | 40 | 22 | 30 | 30.9 | | | | | |
| | 0032S16 | △ | 32 | 250 | 31 | 40 | 22 | 30 | 30.9 | | | | | |
| | 0020Q22 | △ | 20 | 180 | 21.5 | 25 | 15 | 18 | 35 | M5 × 10 | – | – | WR20 | 22□□ |
| | 0025R22 | ▲ | 25 | 200 | 24 | 32 | 19 | 23 | 39 | M5 × 17 | HT22–□□M | HM4 × 8 | | |
| | 0032S22 | △ | 32 | 250 | 31 | 40 | 22 | 30 | 36.4 | | | | | |

★ Recommended grade ☆ Available grade

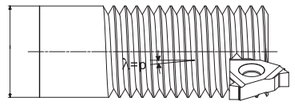
# Selection of shim and helix angle

The helix angle is dependent on and related to the diameter and pitch of the thread. During thread turning, due to the influence of the helix Angle, it will cause the change of the cutting position of base surface, so that the rake angle and clerance shows different cutting factor. The larger the helix angle, the effect musch more obvious. Therefore, the influence of helix angle must be considered for better machining outcome.

e =Helix angle




λ =inclnation angle




Helix angle < clearance angle of tools. Better switch shim, the different between helix angle and inclnationangle of shim adjust to 0°- 2° 。

Spl：P=1.5、d2=24mm
Helix angle1.14°-（2°~0°）=inclnation angle（-0.86°~1.14°）apply standard 1° shim。

**Specification table of shim**

| pitch | insert size | Inclination angle | Shim |
|---|---|---|---|
| 0.5-3.0 | 16 | 0 | HT16-00M |
| | | 1 | HT16-01M |
| | | 2 | HT16-02M |
| | | 3 | HT16-03M |
| 3.5-6.0 | 22 | 0 | HT22-00M |
| | | 1 | HT22-01M |
| | | 2 | HT22-02M |
| | | 3 | HT22-03M |

Note: The standard of shim is 1°for threading tool
(MT16–01M 或 MT22–01M )

$$e = \arctan \frac{p}{d_2 \times \pi}$$

P= **pitch**

$d_2$= **diameter of thread**

**The most common angle of inclination is 1°**
**Clearance calculation**
**Clearance calculation formula**

$$\beta = \arctan (\tan\theta \times \tan\alpha)$$

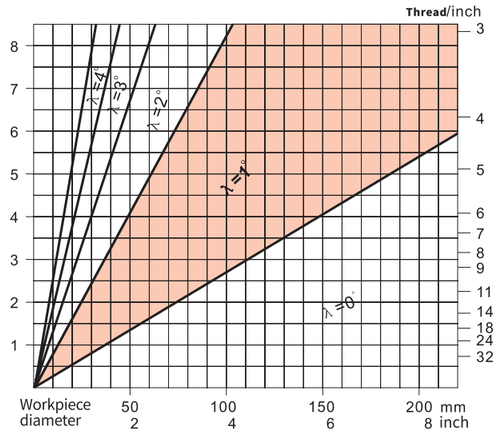
2θ=**thread tooth angle**

α= **Rake angle of tool. External thread 10°**，Internal thread 15°

**The following table is used for specific values**

| thread tooth angle 2θ | β | |
|---|---|---|
| | internal thread | external thread |
| 60° | 5.8° | 8.79° |
| 55° | 5.24° | 7.94° |
| 30° | 2.7° | 4.1° |

**Selection of shim**



## Cutting speed recommendations for threading

| Workpiece materials | | | | Hardness of Brinell (HB) | Tensile strength ($N/mm^2$) | Application scope of Huareal turning grade (HR5225) | |
|---|---|---|---|---|---|---|---|
| ISO | Classification of materials | | | | | Cutting speed Vc (m/min) | |
| | | | | | | HR5125 | HR5225 |
| P | Unalloyed steel | C≤0.25% | Annealing | 125 | 428 | 160-180 | 168-185 |
| | | 0.25<C≤0.55% | Annealing | 190 | 639 | 150-160 | 155-165 |
| | | 0.25<C≤0.55% | Quenching and tempering | 210 | 708 | 145-155 | 155-165 |
| | | C>0.55% | Annealing | 190 | 639 | 135-150 | 140-155 |
| | | C>0.55% | Quenching and tempering | 300 | 1013 | 120-140 | 125-140 |
| | Low-alloyed steel | Annealing | | 175 | 591 | 120-140 | 130-145 |
| | | Quenching and tempering | | 300 | 1013 | 90-110 | 95-115 |
| | | Quenching and tempering | | 380 | 1282 | 80-100 | 85-100 |
| | | Quenching and tempering | | 430 | 430 | 70-95 | 80-95 |
| | High-alloyed steel | Annealing | | 200 | 675 | 90-120 | 98-125 |
| | | Quenching and tempering | | 300 | 1013 | 80-100 | 85-110 |
| M | Stainless steel | Austenite | | 180 | 675 | 120-140 | 120-140 |
| | | Martensite/ferrite | | 200 | 778 | 140-180 | 145-180 |
| K | Malleable cast iron | Ferrite | | 200 | 400 | 120-145 | 130-145 |
| | | Pearlite | | 260 | 700 | 80-115 | 85-120 |
| | Grey cast iron | Low tensile strength | | 180 | 200 | 115-150 | 110-160 |
| | | High tensile strength/austenite | | 245 | 350 | 90-115 | 90-125 |
| | Nodular iron | Ferrite | | 155 | 400 | 110-130 | 110-140 |
| | | Pearlite | | 265 | 700 | 90-115 | 95-120 |
| N | Wrought aluminum alloy | Non-aging | | 60 | — | 1000-1400 | 1100-1500 |
| | | Aged | | 100 | 340 | 500-600 | 550-650 |
| | Foundry aluminum alloy | Non-aging | | 75 | 260 | 450-500 | 450-550 |
| | | Aged | | 90 | 310 | 300-400 | 320-450 |
| S | Nickel-based alloy | Nickel-based | Annealing | 200 | 680 | 35-50 | 35-55 |
| | | | Aged | 280 | 940 | 25-35 | 25-40 |
| | | Nickel-based or cobalt-based | Annealing | 250 | 840 | 20-30 | 22-35 |
| | | | Aged | 350 | 1180 | 10-25 | 10-30 |
| | | | Casting | 320 | 1080 | 10-20 | 10-25 |
| | Titanium alloy | 1262 | | 300 | 1010 | 20-25 | 20-30 |
| H | Hardened steel | Quenching and tempering | | 50HRC | | 60-70 | 60-75 |
| | | Quenching and tempering | | 55HRC | | 40-50 | 45-55 |
| | | Quenching and tempering | | 60HRC | | 30-40 | 30-48 |

## Feed rate recommendation table

### ISO Metric 60° external thread

| Pitch (mm) | Total cutting depth | Steps of machining | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 0.50 | 0.31 | 0.10 | 0.08 | 0.07 | 0.06 | | | | | | | | | | |
| 0.75 | 0.46 | 0.16 | 0.14 | 0.10 | 0.06 | | | | | | | | | | |
| 1.00 | 0.61 | 0.18 | 0.15 | 0.12 | 0.10 | 0.06 | | | | | | | | | |
| 1.25 | 0.77 | 0.19 | 0.17 | 0.14 | 0.11 | 0.10 | 0.06 | | | | | | | | |
| 1.50 | 0.92 | 0.22 | 0.21 | 0.17 | 0.14 | 0.12 | 0.06 | | | | | | | | |
| 1.75 | 1.07 | 0.22 | 0.21 | 0.16 | 0.13 | 0.11 | 0.09 | 0.09 | 0.06 | | | | | | |
| 2.00 | 1.23 | 0.24 | 0.23 | 0.17 | 0.16 | 0.14 | 0.12 | 0.11 | 0.06 | | | | | | |
| 2.50 | 1.53 | 0.26 | 0.23 | 0.19 | 0.17 | 0.15 | 0.13 | 0.12 | 0.11 | 0.11 | 0.06 | | | | |
| 3.00 | 1.84 | 0.27 | 0.25 | 0.20 | 0.18 | 0.16 | 0.14 | 0.13 | 0.12 | 0.12 | 0.11 | 0.10 | 0.06 | | |
| 3.50 | 2.15 | 0.33 | 0.30 | 0.24 | 0.21 | 0.18 | 0.17 | 0.15 | 0.14 | 0.14 | 0.12 | 0.11 | 0.06 | | |
| 4.00 | 2.45 | 0.34 | 0.31 | 0.24 | 0.22 | 0.19 | 0.17 | 0.16 | 0.14 | 0.14 | 0.13 | 0.12 | 0.12 | 0.11 | 0.06 |
| 4.50 | 2.76 | 0.38 | 0.34 | 0.28 | 0.24 | 0.22 | 0.20 | 0.18 | 0.16 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.06 |
| 5.00 | 3.07 | 0.42 | 0.38 | 0.32 | 0.27 | 0.24 | 0.22 | 0.20 | 0.18 | 0.18 | 0.17 | 0.16 | 0.15 | 0.12 | 0.06 |
| 5.50 | 3.35 | 0.43 | 0.40 | 0.38 | 0.36 | 0.32 | 0.28 | 0.24 | 0.20 | 0.16 | 0.16 | 0.15 | 0.14 | 0.12 | 0.06 |
| 6.00 | 3.82 | 0.44 | 0.42 | 0.40 | 0.38 | 0.34 | 0.30 | 0.30 | 0.28 | 0.25 | 0.18 | 0.17 | 0.16 | 0.12 | 0.06 |

### ISO Metric 60° internal thread

| Pitch (mm) | Total cutting depth | Steps of machining | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 0.50 | 0.29 | 0.09 | 0.07 | 0.07 | 0.06 | | | | | | | | | | |
| 0.75 | 0.43 | 0.15 | 0.13 | 0.09 | 0.06 | | | | | | | | | | |
| 1.00 | 0.58 | 0.17 | 0.15 | 0.11 | 0.09 | 0.06 | | | | | | | | | |
| 1.25 | 0.72 | 0.18 | 0.16 | 0.12 | 0.11 | 0.09 | 0.06 | | | | | | | | |
| 1.50 | 0.87 | 0.21 | 0.20 | 0.16 | 0.13 | 0.11 | 0.06 | | | | | | | | |
| 1.75 | 1.01 | 0.21 | 0.20 | 0.15 | 0.12 | 0.10 | 0.09 | 0.08 | 0.06 | | | | | | |
| 2.00 | 1.15 | 0.24 | 0.22 | 0.18 | 0.14 | 0.12 | 0.10 | 0.09 | 0.06 | | | | | | |
| 2.50 | 1.44 | 0.25 | 0.24 | 0.21 | 0.15 | 0.13 | 0.12 | 0.10 | 0.09 | 0.09 | 0.06 | | | | |
| 3.00 | 1.73 | 0.26 | 0.25 | 0.22 | 0.17 | 0.14 | 0.13 | 0.12 | 0.11 | 0.10 | 0.09 | 0.08 | 0.06 | | |
| 3.50 | 2.02 | 0.32 | 0.30 | 0.23 | 0.19 | 0.17 | 0.15 | 0.14 | 0.13 | 0.12 | 0.11 | 0.10 | 0.06 | | |
| 4.00 | 2.31 | 0.33 | 0.31 | 0.24 | 0.22 | 0.18 | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.11 | 0.10 | 0.10 | 0.06 |
| 4.50 | 2.60 | 0.36 | 0.33 | 0.28 | 0.24 | 0.21 | 0.19 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.11 | 0.06 |
| 5.00 | 2.89 | 0.41 | 0.38 | 0.32 | 0.27 | 0.24 | 0.21 | 0.18 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.06 |
| 5.50 | 3.15 | 0.42 | 0.35 | 0.3 | 0.28 | 0.26 | 0.24 | 0.22 | 0.2 | 0.2 | 0.2 | 0.16 | 0.14 | 0.12 | 0.06 |
| 6.00 | 3.54 | 0.43 | 0.38 | 0.35 | 0.32 | 0.3 | 0.28 | 0.28 | 0.26 | 0.22 | 0.2 | 0.18 | 0.16 | 0.12 | 0.06 |

HUAREAL



## Feed rate recommendation table

### Whitworth external thread

| Pitch (number of teeth/inch) | Total cutting depth | Steps of machining | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 28 | 0.58 | 0.17 | 0.14 | 0.11 | 0.10 | 0.06 | | | | | | | | | |
| 26 | 0.63 | 0.18 | 0.15 | 0.13 | 0.11 | 0.06 | | | | | | | | | |
| 20 | 0.81 | 0.20 | 0.18 | 0.14 | 0.12 | 0.11 | 0.06 | | | | | | | | |
| 19 | 0.86 | 0.21 | 0.19 | 0.15 | 0.13 | 0.12 | 0.06 | | | | | | | | |
| 18 | 0.90 | 0.25 | 0.19 | 0.15 | 0.13 | 0.12 | 0.06 | | | | | | | | |
| 16 | 1.02 | 0.21 | 0.18 | 0.15 | 0.13 | 0.11 | 0.09 | 0.09 | 0.06 | | | | | | |
| 14 | 1.16 | 0.23 | 0.21 | 0.17 | 0.14 | 0.12 | 0.12 | 0.11 | 0.06 | | | | | | |
| 12 | 1.36 | 0.27 | 0.25 | 0.20 | 0.16 | 0.15 | 0.14 | 0.13 | 0.06 | | | | | | |
| 11 | 1.48 | 0.27 | 0.24 | 0.20 | 0.17 | 0.15 | 0.14 | 0.13 | 0.12 | 0.06 | | | | | |
| 10 | 1.63 | 0.27 | 0.25 | 0.20 | 0.17 | 0.15 | 0.15 | 0.13 | 0.13 | 0.12 | 0.06 | | | | |
| 9 | 1.81 | 0.28 | 0.26 | 0.21 | 0.18 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.06 | | | |
| 8 | 2.03 | 0.30 | 0.27 | 0.22 | 0.19 | 0.17 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.06 | | |
| 7 | 2.32 | 0.34 | 0.32 | 0.26 | 0.22 | 0.20 | 0.18 | 0.17 | 0.16 | 0.15 | 0.14 | 0.12 | 0.06 | | |
| 6 | 2.71 | 0.35 | 0.33 | 0.27 | 0.23 | 0.21 | 0.20 | 0.19 | 0.17 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.06 |
| 5 | 3.25 | 0.42 | 0.40 | 0.35 | 0.29 | 0.26 | 0.24 | 0.22 | 0.20 | 0.19 | 0.18 | 0.17 | 0.15 | 0.12 | 0.06 |

### Whitworth internal thread

| Pitch (number of teeth/inch) | Total cutting depth | Steps of machining | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 28 | 0.58 | 0.17 | 0.14 | 0.11 | 0.10 | 0.06 | | | | | | | | | |
| 26 | 0.63 | 0.18 | 0.15 | 0.13 | 0.11 | 0.06 | | | | | | | | | |
| 20 | 0.81 | 0.20 | 0.18 | 0.14 | 0.12 | 0.11 | 0.06 | | | | | | | | |
| 19 | 0.86 | 0.21 | 0.19 | 0.15 | 0.13 | 0.12 | 0.06 | | | | | | | | |
| 18 | 0.90 | 0.25 | 0.19 | 0.15 | 0.13 | 0.12 | 0.06 | | | | | | | | |
| 16 | 1.02 | 0.21 | 0.18 | 0.15 | 0.13 | 0.11 | 0.09 | 0.09 | 0.06 | | | | | | |
| 14 | 1.16 | 0.23 | 0.21 | 0.17 | 0.14 | 0.12 | 0.12 | 0.11 | 0.06 | | | | | | |
| 12 | 1.36 | 0.27 | 0.25 | 0.20 | 0.16 | 0.15 | 0.14 | 0.13 | 0.06 | | | | | | |
| 11 | 1.48 | 0.27 | 0.24 | 0.20 | 0.17 | 0.15 | 0.14 | 0.13 | 0.12 | 0.06 | | | | | |
| 10 | 1.63 | 0.27 | 0.25 | 0.20 | 0.17 | 0.15 | 0.15 | 0.13 | 0.13 | 0.12 | 0.06 | | | | |
| 9 | 1.81 | 0.28 | 0.26 | 0.21 | 0.18 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.06 | | | |
| 8 | 2.03 | 0.30 | 0.27 | 0.22 | 0.19 | 0.17 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.06 | | |
| 7 | 2.32 | 0.34 | 0.32 | 0.26 | 0.22 | 0.20 | 0.18 | 0.17 | 0.16 | 0.15 | 0.14 | 0.12 | 0.06 | | |
| 6 | 2.71 | 0.35 | 0.33 | 0.27 | 0.23 | 0.21 | 0.20 | 0.19 | 0.17 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.06 |
| 5 | 3.25 | 0.42 | 0.40 | 0.35 | 0.29 | 0.26 | 0.24 | 0.22 | 0.20 | 0.19 | 0.18 | 0.17 | 0.15 | 0.12 | 0.06 |



## Feed rate recommendation table

### UN external thread

| Pitch (number of teeth/inch) | Total cutting depth | Steps of machining | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 28 | 0.58 | 0.17 | 0.14 | 0.11 | 0.10 | 0.06 | | | | | | | | | |
| 26 | 0.63 | 0.18 | 0.15 | 0.13 | 0.11 | 0.06 | | | | | | | | | |
| 20 | 0.81 | 0.20 | 0.18 | 0.14 | 0.12 | 0.11 | 0.06 | | | | | | | | |
| 19 | 0.86 | 0.21 | 0.19 | 0.15 | 0.13 | 0.12 | 0.06 | | | | | | | | |
| 18 | 0.90 | 0.25 | 0.19 | 0.15 | 0.13 | 0.12 | 0.06 | | | | | | | | |
| 16 | 1.02 | 0.21 | 0.18 | 0.15 | 0.13 | 0.11 | 0.09 | 0.09 | 0.06 | | | | | | |
| 14 | 1.16 | 0.23 | 0.21 | 0.17 | 0.14 | 0.12 | 0.12 | 0.11 | 0.06 | | | | | | |
| 12 | 1.36 | 0.27 | 0.25 | 0.20 | 0.16 | 0.15 | 0.14 | 0.13 | 0.06 | | | | | | |
| 11 | 1.48 | 0.27 | 0.24 | 0.20 | 0.17 | 0.15 | 0.14 | 0.13 | 0.12 | 0.06 | | | | | |
| 10 | 1.63 | 0.27 | 0.25 | 0.20 | 0.17 | 0.15 | 0.15 | 0.13 | 0.13 | 0.12 | 0.06 | | | | |
| 9 | 1.81 | 0.28 | 0.26 | 0.21 | 0.18 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.06 | | | |
| 8 | 2.03 | 0.30 | 0.27 | 0.22 | 0.19 | 0.17 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.06 | | |
| 7 | 2.32 | 0.34 | 0.32 | 0.26 | 0.22 | 0.20 | 0.18 | 0.17 | 0.16 | 0.15 | 0.14 | 0.12 | 0.06 | | |
| 6 | 2.71 | 0.35 | 0.33 | 0.27 | 0.23 | 0.21 | 0.20 | 0.19 | 0.17 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.06 |
| 5 | 3.25 | 0.42 | 0.40 | 0.35 | 0.29 | 0.26 | 0.24 | 0.22 | 0.20 | 0.19 | 0.18 | 0.17 | 0.15 | 0.12 | 0.06 |

### UN internal thread

| Pitch (number of teeth/inch) | Total cutting depth | Steps of machining | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 28 | 0.58 | 0.17 | 0.14 | 0.11 | 0.10 | 0.06 | | | | | | | | | |
| 26 | 0.63 | 0.18 | 0.15 | 0.13 | 0.11 | 0.06 | | | | | | | | | |
| 20 | 0.81 | 0.20 | 0.18 | 0.14 | 0.12 | 0.11 | 0.06 | | | | | | | | |
| 19 | 0.86 | 0.21 | 0.19 | 0.15 | 0.13 | 0.12 | 0.06 | | | | | | | | |
| 18 | 0.90 | 0.25 | 0.19 | 0.15 | 0.13 | 0.12 | 0.06 | | | | | | | | |
| 16 | 1.02 | 0.21 | 0.18 | 0.15 | 0.13 | 0.11 | 0.09 | 0.09 | 0.06 | | | | | | |
| 14 | 1.16 | 0.23 | 0.21 | 0.17 | 0.14 | 0.12 | 0.12 | 0.11 | 0.06 | | | | | | |
| 12 | 1.36 | 0.27 | 0.25 | 0.20 | 0.16 | 0.15 | 0.14 | 0.13 | 0.06 | | | | | | |
| 11 | 1.48 | 0.27 | 0.24 | 0.20 | 0.17 | 0.15 | 0.14 | 0.13 | 0.12 | 0.06 | | | | | |
| 10 | 1.63 | 0.27 | 0.25 | 0.20 | 0.17 | 0.15 | 0.15 | 0.13 | 0.13 | 0.12 | 0.06 | | | | |
| 9 | 1.81 | 0.28 | 0.26 | 0.21 | 0.18 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.06 | | | |
| 8 | 2.03 | 0.30 | 0.27 | 0.22 | 0.19 | 0.17 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.06 | | |
| 7 | 2.32 | 0.34 | 0.32 | 0.26 | 0.22 | 0.20 | 0.18 | 0.17 | 0.16 | 0.15 | 0.14 | 0.12 | 0.06 | | |
| 6 | 2.71 | 0.35 | 0.33 | 0.27 | 0.23 | 0.21 | 0.20 | 0.19 | 0.17 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.06 |
| 5 | 3.25 | 0.42 | 0.40 | 0.35 | 0.29 | 0.26 | 0.24 | 0.22 | 0.20 | 0.19 | 0.18 | 0.17 | 0.15 | 0.12 | 0.06 |

## Feed rate recommendation table

### BSPT - external thread

| Pitch (number of teeth/inch) | Total cutting depth | Steps of machining | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 28 | 0.58 | 0.17 | 0.14 | 0.11 | 0.10 | 0.06 | | | | | | | | | |
| 19 | 0.86 | 0.22 | 0.19 | 0.15 | 0.12 | 0.12 | 0.06 | | | | | | | | |
| 14 | 1.16 | 0.24 | 0.20 | 0.17 | 0.14 | 0.12 | 0.12 | 0.11 | 0.06 | | | | | | |
| 11 | 1.48 | 0.25 | 0.23 | 0.21 | 0.18 | 0.16 | 0.14 | 0.13 | 0.12 | 0.06 | | | | | |

### BSPT - internal thread

| Pitch (number of teeth/inch) | Total cutting depth | Steps of machining | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 19 | 0.86 | 0.22 | 0.19 | 0.15 | 0.12 | 0.12 | 0.06 | | | | | | | | |
| 14 | 1.16 | 0.24 | 0.20 | 0.17 | 0.14 | 0.12 | 0.12 | 0.11 | 0.06 | | | | | | |
| 11 | 1.48 | 0.25 | 0.23 | 0.21 | 0.18 | 0.16 | 0.14 | 0.13 | 0.12 | 0.06 | | | | | |

### NPT - external thread

| Pitch (number of teeth/inch) | Total cutting depth | Steps of machining | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 27 | 0.66 | 0.15 | 0.13 | 0.12 | 0.11 | 0.09 | 0.06 | | | | | | | | | |
| 18 | 1.01 | 0.20 | 0.16 | 0.14 | 0.13 | 0.12 | 0.11 | 0.09 | 0.06 | | | | | | | |
| 14 | 1.33 | 0.23 | 0.19 | 0.16 | 0.14 | 0.13 | 0.12 | 0.11 | 0.10 | 0.09 | 0.06 | | | | | |
| 11.5 | 1.64 | 0.24 | 0.19 | 0.17 | 0.15 | 0.15 | 0.13 | 0.13 | 0.12 | 0.11 | 0.10 | 0.09 | 0.06 | | | |
| 8 | 2.42 | 0.33 | 0.28 | 0.23 | 0.20 | 0.18 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.11 | 0.11 | 0.10 | 0.06 |

### NPT - internal thread

| Pitch (number of teeth/inch) | Total cutting depth | Steps of machining | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 27 | 0.66 | 0.15 | 0.13 | 0.12 | 0.11 | 0.09 | 0.06 | | | | | | | | | |
| 18 | 1.01 | 0.20 | 0.16 | 0.14 | 0.13 | 0.12 | 0.11 | 0.09 | 0.06 | | | | | | | |
| 14 | 1.33 | 0.23 | 0.19 | 0.16 | 0.14 | 0.13 | 0.12 | 0.11 | 0.10 | 0.09 | 0.06 | | | | | |
| 11.5 | 1.64 | 0.24 | 0.19 | 0.17 | 0.15 | 0.15 | 0.13 | 0.13 | 0.12 | 0.11 | 0.10 | 0.09 | 0.06 | | | |
| 8 | 2.42 | 0.33 | 0.28 | 0.23 | 0.20 | 0.18 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.11 | 0.11 | 0.10 | 0.06 |



## Feed rate recommendation table

### ISO 30°trapezoidal- external thread

| Pitch (mm) | Total cutting depth | Steps of machining | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 1.5 | 0.91 | 0.23 | 0.21 | 0.17 | 0.13 | 0.11 | 0.06 | | | | | | | | |
| 2 | 1.26 | 0.29 | 0.25 | 0.22 | 0.18 | 0.14 | 0.12 | 0.06 | | | | | | | |
| 3 | 1.77 | 0.32 | 0.31 | 0.25 | 0.20 | 0.18 | 0.17 | 0.15 | 0.13 | 0.06 | | | | | |
| 4 | 2. 26 | 0.33 | 0.32 | 0.25 | 0.22 | 0.21 | 0.17 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.06 | | |
| 5 | 2.75 | 0.35 | 0.32 | 0.26 | 0.24 | 0.22 | 0.21 | 0.19 | 0.19 | 0.17 | 0.15 | 0.14 | 0.13 | 0.12 | 0.06 |
| 6 | 3.52 | 0.37 | 0.35 | 0.34 | 0.33 | 0.32 | 0.31 | 0.27 | 0.26 | 0.25 | 0.24 | 0.16 | 0.14 | 0.12 | 0.06 |

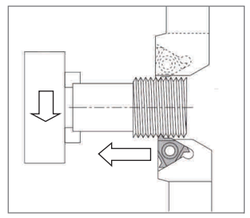
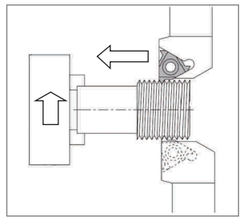
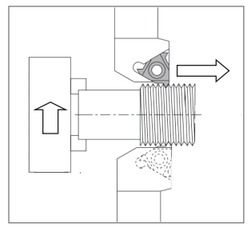
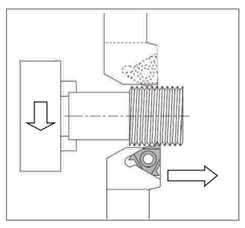
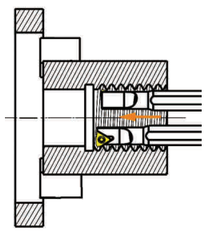
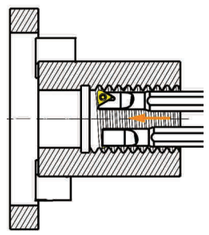
### ISO 30°trapezoidal- internal thread

| Pitch (mm) | Total cutting depth | Steps of machining | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 1.5 | 0.90 | 0.23 | 0.20 | 0.17 | 0.13 | 0.11 | 0.06 | | | | | | | | |
| 2 | 1.25 | 0.29 | 0.25 | 0.21 | 0.18 | 0.14 | 0.12 | 0.06 | | | | | | | |
| 3 | 1.75 | 0.32 | 0.30 | 0.24 | 0.20 | 0.18 | 0.17 | 0.15 | 0.13 | 0.06 | | | | | |
| 4 | 2. 26 | 0.33 | 0.32 | 0.25 | 0.22 | 0.21 | 0.17 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.06 | | |
| 5 | 2.75 | 0.35 | 0.32 | 0.26 | 0.24 | 0.22 | 0.21 | 0.19 | 0.19 | 0.17 | 0.15 | 0.14 | 0.13 | 0.12 | 0.06 |
| 6 | 3.52 | 0.37 | 0.35 | 0.34 | 0.33 | 0.32 | 0.31 | 0.27 | 0.26 | 0.25 | 0.24 | 0.16 | 0.14 | 0.12 | 0.06 |

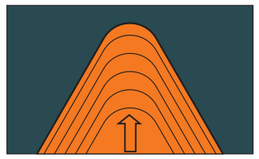
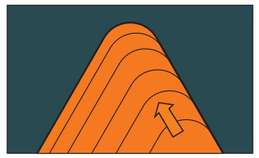
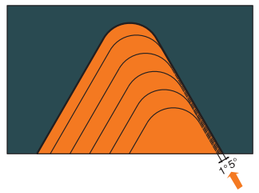
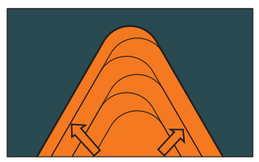
## Features of thread turning insert

- ◆ Precision molded and sophistication grinded inserts are available.
- ◆ Strict size control ensures a smaller range of size fluctuations from insert to insert and aconsistent quality.
- ◆ The unique edge with small arc corners can realize more specialized and rationalized machining.
- ◆ The inserts are equipped with chipbreakers to improve chip handling capability during machining and provide excellent machining stability.
- ◆ HR5225 and HR5125 dedicated for thread turning can ensure that the insert can effectively resist plastic deformation and wear during threading.

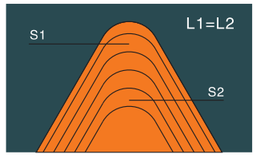
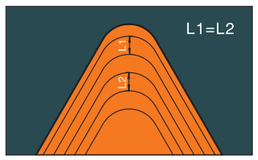
## Machining type of thread tools

| 1. External threading with dextral thread | 2. External threading with sinistral thread |
|---|---|
|  |  |
|  |  |
| **3. Internal threading with dextral thread** | **4. Internal threading with sinistral thread** |
|  |  |

## Threading (crosscutting) method

| Graph | Machining method | Features | |
|---|---|---|---|
| | | Advantage | Disadvantage |
|  | Radial crosscutting (vertical feeding) | • Easiest to use (standard procedure for threading)<br>• High versatility (easy to change conditions such as cutting depth)<br>• Average wear on the rear insert face of the left and right cutting edges | • It is difficult to dispose chips.<br>• Vibrations tend to occur in the second half of machining (due to increased cutting edge contact length).<br>• It is not suitable for large pitch machining.<br>• There is a heavy load for the Corner radius (R) (because chips from both left and right sides will gather at the top) |
|  | Tooth side feeding (One-way feeding) | • Relatively easy to use (standard procedure for threading)<br>• The cutting forces can be reduced.<br>• It is especially suitable for large pitch or materials prone to squeezing and cracking<br>• Its chip handling performance is excellent. (Because it can control chip discharge direction). | • The right rear insert face is badly worn (because the cutting depth on the right side is always zero).<br>• It is difficult to change the cutting depth (NC program is required). |
|  | Modified crosscutting of tooth side (One-way modified feeding) | • Its rear insert face wear can be effectively controlled.<br>• The cutting forces can be reduced.<br>• It is especially suitable for large pitch or materials prone to squeezing and cracking<br>• Its chip handling performance is excellent (because it can control chip discharge direction). | • It is difficult to program the machining (some machines can use standard methods directly)<br>• It is difficult to change the cutting depth (NC program is required). |
|  | Alternating crosscutting (Staggered feeding) | • Average wear on the rear insert face of the left and right cutting edges (Due to the staggered use of cutting edge)<br>• The cutting forces can be reduced.<br>• It is especially suitable for large pitch or materials prone to squeezing and cracking | • It is difficult to program the machining (some machines can use standard methods directly)<br>• It is difficult to change the cutting depth (NC program is required).<br>• It is difficult to dispose chips (because they are discharged from both sides and may get tangled sometimes.) |

## Cutting depth of threading

| Machining method | Features | |
|---|---|---|
| | Advantage | Disadvantage |
|  Fixed cutting area | • Easy to use (standard procedure for threading)<br>• It has good vibration resistance (to keep cutting force stable). | • The last chip is resistant to breaking (because the chip thickness becomes very thin).<br>• The calculation of cutting depth when the number of machining steps is changed is slightly complicated. |
|  Fixed cutting depth | • It can reduce the load in the first half of the corner radius R.<br>• It is easy to adjust the performance of chip handling (chip thickness can be set at will).<br>• The calculation of cutting depth when the number of machining steps is changed is easy.<br>• It maintains good chip handling performance through whole machining. | • Vibrations tend to occur in the second half of machining (cutting force rises)<br>• Sometimes it is necessary to change the NC (it is more common for fixed areas). |

## Wiper edge

| Without wiper edge | With wiper edge | With semi-wiper edge (trapezoidal thread only) |
|---|---|---|
| • One insert can machine different pitches.<br>• The corner radius R is less than that of a wiper edge insert, resulting in a short tool service life.<br>• Additional finishing is required. | • No burrs will appear on the thread teeth.<br>• Different inserts are required for different pitches and shapes. | • No burrs will appear on the thread teeth.<br>• Different inserts are required for different pitches and shapes.<br>• Additional finishing is required. |
| | | |

## Overview of indexable milling inserts

| Type | Material | ISO | CVD coating | | PVD coating | | | | | | | | | Carbide | Cermet | ISO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 | |
| P | Unalloyed steel/Alloy steel | P01 | | | | | | | | | | | | | | P01 |
| | | P05 | | | | HR5210 | | | | | | | | | | P05 |
| | | P10 | | | HR5110 | | | | | | | | | | | P10 |
| | | P15 | | | | | | HR5220 | | | | | | | HRC10 | P15 |
| | | P20 | | | | | HR5120 | | | | | | | | | P20 |
| | | P25 | | | | | | | HR5130 | | HR7130 | | | | | P25 |
| | | P30 | | HR8140 | | | | | | HR530 | | | HR7240 | | | P30 |
| | | P35 | | | | | | | | | | HR7140 | | | | P35 |
| | | P40 | | | | | | | | | | | | | | P40 |
| | | P45 | | | | | | | | | | | | | | P45 |
| | | P50 | | | | | | | | | | | | | | P50 |
| M | Stainless steel | M05 | | | | HR5210 | | | | | | | | | | M05 |
| | | M10 | | | HR5110 | | | | | | | | | | | M10 |
| | | M15 | | | | | | HR5220 | | | | | | | | M15 |
| | | M20 | | | | | HR5120 | | | | | | | | | M20 |
| | | M25 | | | | | | | HR5130 | | | | | | | M25 |
| | | M30 | | | | | | | | HR530 | | | HR7240 | | | M30 |
| | | M35 | | | | | | | | | | HR7140 | | | | M35 |
| | | M40 | | | | | | | | | | | | | | M40 |
| | | M45 | | | | | | | | | | | | | | M45 |
| K | Cast iron | K01 | | | | | | | | | | | | | | K01 |
| | | K05 | | | | | | | | | | | | | | K05 |
| | | K10 | | | | HR5210 | | | | | | | | | | K10 |
| | | K15 | | | HR5110 | | | | | | | | | | | K15 |
| | | K20 | | | | | | HR5220 | | | | | | | | K20 |
| | | K25 | HR6130 | | | | HR5120 | | | | | | | | | K25 |
| | | K30 | | | | | | | HR5130 | | | | | | | K30 |
| | | K35 | | | | | | | | | | | | | | K35 |
| | | K40 | | | | | | | | | | | | | | K40 |
| | | K45 | | | | | | | | | | | | | | K45 |
| | | K50 | | | | | | | | | | | | | | K50 |
| N | Aluminum/aluminum alloy | N01 | | | | | | | | | | | | | | N01 |
| | | N05 | | | | | | | | | | | | | | N05 |
| | | N10 | | | | | | | | | | | | HRK10 | | N10 |
| | | N15 | | | | | | | | | | | | | | N15 |
| | | N20 | | | | | | | | | | | | | | N20 |
| | | N25 | | | | | | | | | | | | | | N25 |
| | | N30 | | | | | | | | | | | | | | N30 |
| S | Heat resistant super alloys Titanium alloy | S01 | | | | | | | | | | | | | | S01 |
| | | S05 | | | | | | | | | | | | | | S05 |
| | | S10 | | | | | | | | | | | HR7240 | | | S10 |
| | | S15 | | | | | | | | | | HR7140 | | | | S15 |
| | | S20 | | | | | | | | | | | | | | S20 |
| | | S25 | | | | | | | | | | | | | | S25 |
| | | S30 | | | | | | | | | | | | | | S30 |
| | | S40 | | | | | | | | | | | | | | S40 |

# B Milling

## Indexable milling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# Code key of indexable milling inserts

| C | FM | 1 | 45 | L | - | 063 | A |
|---|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ | | ⑥ | ⑦ |

| 22 | I | 05 | L | - | S | N | 10 |
|---|---|---|---|---|---|---|---|
| ⑧ | ⑨ | ⑩ | ⑪ | | ⑫ | ⑬ | ⑭ |

| ① Tool type | |
|---|---|
| C | Disc-type tools |
| S | Rod-type tools |

| ② Usage | |
|---|---|
| FM | Face milling |
| TM | Groove milling |
| SM | Square shoulder milling |
| PM | Profile milling |
| CM | Chamfer milling |
| EM | High feed |
| HM | Helical end milling |

| ③ Type | |
|---|---|
| 1 | Type 1 |
| 2 | Type 2 |
| … | … |

| ④ Entering angle | |
|---|---|
| 45 | 45° |
| 60 | 60° |
| 75 | 75° |
| 90 | 90° |
| 00 | Exception |

| ⑤ Cutting direction | |
|---|---|
| R | Default |
| L | Left |

| ⑥ Outside diameter | |
|---|---|
| 016 | Ø 16mm |
| 020 | Ø 20mm |
| 025 | Ø 25mm |
| 032 | Ø 32mm |
| 040 | Ø 40mm |
| 050 | Ø 50mm |
| 063 | Ø 63mm |
| 080 | Ø 80mm |
| 100 | Ø 100mm |
| 125 | Ø 125mm |

| ⑦ Interface type | |
|---|---|
| A | A-type interface |
| B | B-type interface |
| C | C-type interface |
| D | D-type interface |
| G | Straight shank |
| X | Flat shank |
| BT | BT taper shank |
| JT | JT taper shank |
| MT | Morse taper shank |
| XPX | Compound shank |
| HSK | Short taper shank |

| ⑧Sizes of tool installation parts | |
|---|---|
| 16 | Ø 16mm |
| 22 | Ø 22mm |
| 27 | Ø 27mm |
| 32 | Ø 32mm |
| 40 | Ø 40mm |
| 60 | Ø 60mm |

| ⑨ Unit | |
|---|---|
| Inch | I |
| Metric | Default |

| ⑩Number of tooth | |
|---|---|
| 02 | Two teeth |
| 03 | Three teeth |
| 04 | Four teeth |
| … | … |

| ⑪Length type | |
|---|---|
| Cutterhead style | Omit |
| Shank style | Omit |
| S | Short |
| L | Long |
| XL | Lengthened |

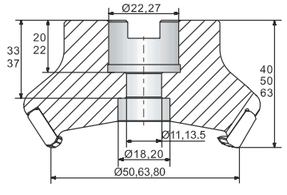
| ⑫Insert shape | |
|---|---|
| A | 85° |
| H | |
| L | |
| O | |
| R | |
| S | |
| T | |
| W | 80° |
| Others | |

| ⑬Insert clearance angle | |
|---|---|
| A | 3° |
| B | 5° |
| C | 7° |
| D | 15° |
| E | 20° |
| F | 25° |
| G | 30° |
| N | 0° |
| P | 11° |
| O | Others |

| ⑭Cutting edge length | |
|---|---|
| 09 | 9mm |
| 10 | 10mm |
| 12 | 12mm |
| 15 | 15mm |
| 19 | 19mm |
| Others | |

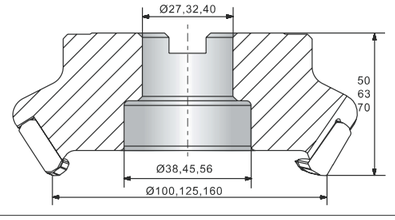
## Structure of tool installation part (Sleeve structure)

A-type interface



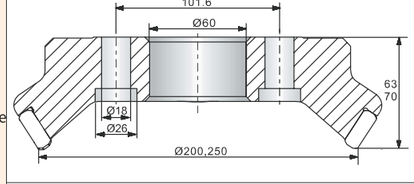

ϕ200-ϕ250 sleeve face milling tools specified in GB5342-96

B-type interface



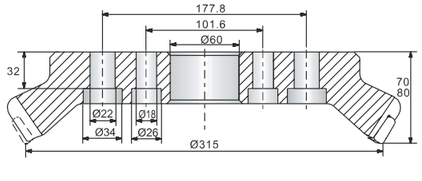

ϕ100-ϕ160 sleeve face milling tools specified in GB5342-96

C-type interface



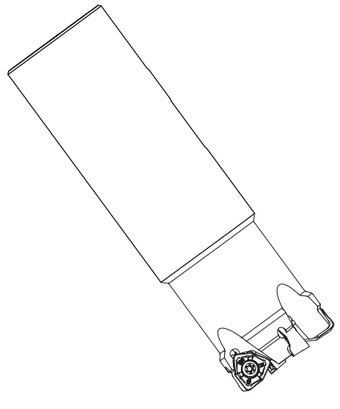

ϕ200-ϕ250 sleeve face milling tools specified in GB5342-96

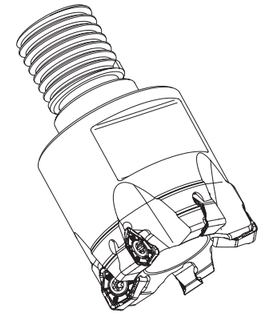
D-type interface

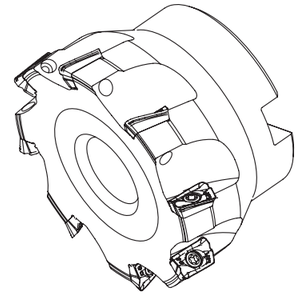



Sleeve face milling tools with ϕ315 and above specified in GB5342-96

See the technical data of the tool system section for the connection of flat shank, straight and taper shank.



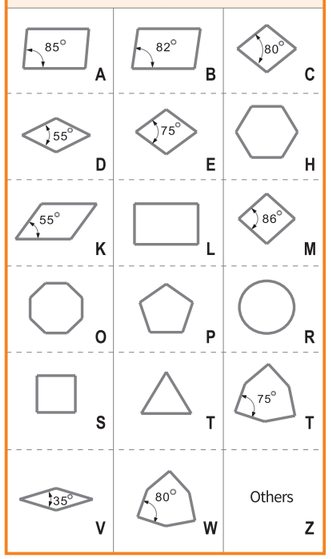




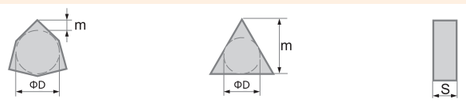
# Code key of indexable milling inserts

| A | P | M | T | 16 | 05 | PD | E | R | - | FM |
|---|---|---|---|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ | | ⑩ |

## ① Shape code




## ③ Tolerance (mm)




| Class | Corner height (m) | Inscribed circle (ΦD) | Thickness (S) |
|---|---|---|---|
| A | ±0.005 | ±0.025 | ±0.025 |
| F | ±0.005 | ±0.013 | ±0.025 |
| C | ±0.013 | ±0.025 | ±0.025 |
| H | ±0.013 | ±0.013 | ±0.025 |
| E | ±0.025 | ±0.025 | ±0.025 |
| G | ±0.025 | ±0.025 | ±0.13 |
| J | ±0.005 | ±0.05-±0.13 | ±0.025 |
| K | ±0.013 | ±0.05-±0.13 | ±0.025 |
| L | ±0.025 | ±0.05-±0.13 | ±0.025 |
| M | ±0.08-±0.18 | ±0.05-±0.13 | ±0.13 |
| N | ±0.08-±0.18 | ±0.05-±0.13 | ±0.025 |
| U | ±0.13-±0.38 | ±0.08-±0.25 | ±0.13 |

◆ M-class tolerance requirements (distinguished by shape and inscribed circle size)
◆ Corner height (m) tolerance

| Inscribed circle | Regular triangle | Square | 80° Rhombus | 55° Rhombus | 35° Rhombus | Circular |
|---|---|---|---|---|---|---|
| 6.35 | ±0.08 | ±0.08 | ±0.08 | ±0.11 | ±0.16 | --- |
| 9.525 | ±0.08 | ±0.08 | ±0.08 | ±0.11 | ±0.16 | --- |
| 12.7 | ±0.13 | ±0.13 | ±0.13 | ±0.15 | --- | --- |
| 15.875 | ±0.15 | ±0.15 | ±0.15 | ±0.18 | --- | --- |
| 19.05 | ±0.15 | ±0.15 | ±0.15 | ±0.18 | --- | --- |
| 25.4 | --- | ±0.18 | --- | --- | --- | --- |

◆ Inscribed circle (ΦD) tolerance

| Inscribed circle | Regular triangle | Square | 80° Rhombus | 55° Rhombus | 35° Rhombus | Circular |
|---|---|---|---|---|---|---|
| 6.35 | ±0.05 | ±0.05 | ±0.05 | ±0.05 | ±0.05 | --- |
| 9.525 | ±0.05 | ±0.05 | ±0.05 | ±0.05 | ±0.05 | ±0.05 |
| 12.7 | ±0.08 | ±0.08 | ±0.08 | ±0.08 | --- | ±0.08 |
| 15.875 | ±0.10 | ±0.10 | ±0.10 | ±0.10 | --- | ±0.10 |
| 19.05 | ±0.10 | ±0.10 | ±0.10 | ±0.10 | --- | ±0.10 |
| 25.4 | --- | ±0.13 | --- | --- | --- | ±0.13 |

## ⑤ Cutting edge length

| Inscribed circle diameter (mm) | Insert shape C | D | R | S | T | V | W | K |
|---|---|---|---|---|---|---|---|---|
| 32.00 | | | 32 | | | | | |
| 31.75 | | | 31 | | | | | |
| 25.40 | | | 25 | 25 | | | | |
| 25.00 | 25 | 25 | 25 | | | | | |
| 20.00 | | | 20 | | | | | |
| 19.05 | 19 | | 19 | 19 | 33 | | | |
| 16.00 | | 19 | 16 | | | | | |
| 15.875 | 16 | | 15 | 15 | 27 | | | |
| 12.70 | 12 | 15 | 12 | 15 | 22 | 22 | 08 | |
| 12.00 | | | 12 | | | | | |
| 10.00 | | | 10 | | | | | |
| 9.525 | 09 | 11 | 09 | 19 | 16 | 16 | 06 | 16 |
| 8.00 | | | 08 | | | | | |
| 6.35 | 06 | 07 | | | 11 | 11 | | |
| 6.00 | | | 06 | | | | | |
| 5.56 | | | | | 09 | | | |
| 5.50 | | | 05 | | | | | |
| 3.97 | | | | | 06 | | | |

## ⑥ Insert thickness

| Code | Thickness(mm) |
|---|---|
| 12 | 12.70 |
| 10 | 11.11 |
| T9 | 9.72 |
| 09 | 9.52 |
| 07 | 7.94 |
| T6 | 6.75 |
| 06 | 6.35 |
| T5 | 5.95 |
| 05 | 5.56 |
| T4 | 4.96 |
| 04 | 4.76 |
| T3 | 3.97 |
| 03 | 3.18 |
| T2 | 2.58 |
| 02 | 2.38 |
| T1 | 1.98 |
| 01 | 1.59 |
| T0 | 0.99 |
| 00 | 0.79 |

## ② Cutting edge clearance angle major

| Code | Clearance angle | Code | Clearance angle |
|---|---|---|---|
| A | 3° | B | 5° |
| C | 7° | D | 15° |
| E | 20° | F | 25° |
| G | 30° | N | 0° |
| P | 11° | O | Others |

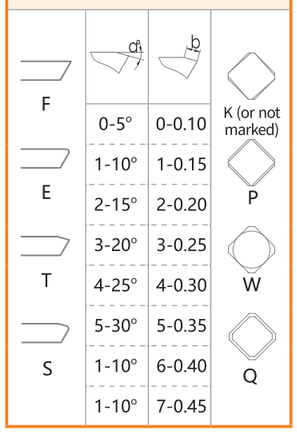
## ④ Chipbreaker and clamping form

| Code | Hole | Chipbreaker | Sectional view | Code | Hole | Chipbreaker | Sectional view |
|---|---|---|---|---|---|---|---|
| B | Y | N/A | >65° | N | N/A | N/A | |
| H | Y | Single-sided | >65° | R | N/A | Single-sided | |
| C | Y | N/A | >65° | F | N/A | Double-sided | |
| J | Y | Double-sided | >65° | A | Y | N/A | |
| W | Y | N/A | ≤65° | M | Y | Single-sided | |
| T | Y | Single-sided | ≤65° | G | Y | Double-sided | |
| Q | Y | N/A | ≤65° | X | --- | --- | Exception |
| U | Y | Double-sided | ≤65° | | | | |

## ⑦ Wiper edge

| | | | |
|---|---|---|---|
| A | 45° | A | 3° |
| D | 60° | B | 5° |
| E | 75° | C | 7° |
| F | 85° | D | 15° |
| P | 90° | E | 20° |
| Z | Others | F | 25° |
| | | G | 30° |
| | | N | 0° |
| | | P | 11° |
| | | Z | Others |

## ⑧ Cutting edge form




| | | |
|---|---|---|
| F | 0-5° | 0-0.10 |
| E | 1-10° | 1-0.15 |
| | 2-15° | 2-0.20 |
| T | 3-20° | 3-0.25 |
| | 4-25° | 4-0.30 |
| S | 5-30° | 5-0.35 |
| | 1-10° | 6-0.40 |
| | 1-10° | 7-0.45 |

## ⑨ Cutting direction

| Code | Direction |
|---|---|
| R | Right |
| L | Left |
| N | Two-way |

## ⑩ Chipbreaker code

## Indexable milling insert overview

| Grade type | Grade | ISO | Color | Coating type | Coating Composition | Characteristics |
|---|---|---|---|---|---|---|
| Coated Carbide | HR6130 | ISO P<br>ISO K | Black&<br>Yellow | CVD | TiN+MT-TiCN+Al2O3 | Suitable for rough and semi-finishing milling of ISO P and ISO K.<br><br>The use of high strength composite coating, taking into account the requirements of wear resistance and strength for milling machining. At the mean time, the new post-treatment process effectively improves the toughness of the insert. |
| | HR8140 | ISO P | Black&<br>Yellow | CVD | TiN+MT-TiCN+Al2O3 | Most apply for heavy milling of ISO P material<br><br>The use of CVD thin coating design, taking into account the requirements of wear resistance and strength for milling machining. At the mean time, with excellent resistance to high temperature plastic deformation of the matrix, both high hardness and stable performance characteristics. |
| | HR5110 | ISO P<br>ISO H | Bronze | PVD | TiAlN+CrAlN +TiSiN | Suitable for milling of ISO H material (45-55HRC)<br><br>Fine-grain cemented carbide matrix with a new nano gradient composite structure coating, the product surface is smooth, with small friction coefficient, the nano hardness is high, and the oxidation resistance is excellent. |
| | HR5210 | ISO P<br>ISO H | Rainbow<br>color | PVD | AlTiN+TiSiN | Suitable for milling of ISO H materials (50-65HRC)<br><br>The uniformly distributed ultrafine nanoparticles matrix combined with a wear-resistant coating, shows accountable thermal stability and oxidation resistance, greatly improve the red hardness of the coating, with the ability to withstand high cutting temperatures, and adapt to machining of high hardness materials. |
| | HR5120 | ISO P<br>ISO M<br>ISO K | Bronze | PVD | TiAlN+CrAlN +TiSiN | Suitable for milling of ISO P, M, K materials, especially for machining of materials with hardness of 35-50 HRC:<br><br>With excellent wear resistance and toughness and the latest multi-component nano coating,shows excellent high temperature hardness. |
| | HR5220 | ISO P<br>ISO M<br>ISO K | Bronze | PVD | AlTiN+TiSiN | Suitable for milling of ISO P, M, K materials, especially for machining of materials with hardness of 40-45 HRC:<br><br>Apply for AlTiN and TiSiN double-layer coating structure has good strength, toughness and wear resistance, reduces the extension of longitudinal cracks, and effectively improves the chipping resistance of the coating. |
| Coated Carbide | HR5130 | ISO P<br>ISO M<br>ISO K | Gray | PVD | AlTiN | Suitable for milling of ISO P, M, materials, especially for machining of materials with hardness below 30 HRC:<br><br>The special proportion of the matrix effectively improves the wear resistance and toughness and reduces the risk of breakage. Combined with the latest nano coatings, the overall performance is excellent in high feed milling. |
| | HR530 | ISO P<br>ISO M | Gray | PVD | AlTiN/AlCrN | Aiming for milling of mild steel and stainless steel.<br><br>The new nano-multilayer composite coating technology greatly improves wear resistance. The toughness matrix with a new coating process, allowing higher cutting speed and feed, excellent film-matrix adhesion strength, effectively reduce the risk of insert breakge. |
| | HR7130 | ISO P | Purple Gray | PVD | TiAlN | Generally used for heavy milling of ISO P material<br><br>Adopting thick PVD coating design, with good wear resistance and impact resistance; high temperature resistance, high hardness and high stability. |
| | HR7140 | ISO M<br>ISO S | Gray | PVD | AlCrN | Suitabel for milling of stainless steel,Titannium alloy and high temperature alloy.<br><br>Special microelement matrix, with good toughness and high temperature performance. |
| | HR7240 | ISO M<br>ISO S | Bronze | PVD | AlCrN | Suitable for milling of stainless steel, titanium alloy and high-temp alloy.<br><br>The new composition and matrix structure design, high temperature resistance and toughness are taken into account, and its wear resistance is further improved. |
| Cermet | HRC10 | ISO P | Bronze | PVD | TiAlSiN | Suitable for finshing and semi-finishing milling of ISO P material.<br><br>With high thermal stability and wear resistance, excellent thermal shock resistance, the new high tungsten, high nitrogen fine particle matrix supplemented by high tantalum and niobium content, great high temperature resistance and collapse resistance perofrmance. |

# Overview of indexable milling tools

| Machining form | Series/shape | Cutting edge angle | Applicable inserts | Insert shape | Usage and features | Page |
|---|---|---|---|---|---|---|
| Face milling tool | CFM143 | KAPR=43° | OD□□0605 | | ◎ Light and fast in cutting, it is cost-effective with unilateral octagonal inserts;<br>◎ It is suitable for face milling P, M, K and other materials. | B13–B14 |
| | CFM145 | KAPR=45° | SNGX1005ANR–GM<br>SNGX1005ANR–GE | | ◎ Supported by grinding level/precision molded level quadrilateral negative angle inserts, cutting can be finished in a light and fast manner;<br>◎ Tools with either sparse or dense tooth structure are suitable for different working conditions and machining efficiency requirements.<br>◎ It is suitable for face milling P, M, K and other materials and the first choice of general machining. | B15–B16 |
| | CFM245 | KAPR=45° | SEET13T3–GM<br>SEMT13T3AGTN–FM | | ◎ Supported by grinding level/precision molded level quadrilateral 20° clearance angle inserts, the cutting force is decreased;<br>◎ They are convenient to clamp with screwing down construction, thus suitable for light cutting. | B17–B18 |
| | CFM345 | KAPR=45° | SZMX1206ANR–GM | | ◎ It is equipped with self-developed new structured groove inserts, ensuring both high machining efficiency and long service life.<br>◎ It is suitable for machining P, M, K and other materials and the first choice for roughing. | B19–B20 |
| | CFM445 | KAPR=45° | SEEN1203AFTN<br>SEKR1203AFTN<br>SEMR1203AFTN | | ◎ With 20° clearance angle cutting inserts, the milling tool is for multiple purposes and can finish cutting in a light and fast manner.<br>◎ It is suitable for face milling of P, M, K and other materials. | B21–B22 |
| | CFM645 | KAPR=45° | HNMX0906ANSN–M | | ◎ Cost-effective face milling tool series<br>◎ It has double-sided high strength hexagonal insert with 12 cutting edges. | B23–B24 |
| | CFM745 | KAPR=45° | XN□□0705<br>XN□□0906 | | ◎ Cost-effective face milling tools series<br>◎ It has double-sided heptagon insert with 14 cutting edges. | B25–B26 |



Overview of indexable milling tools

| Machining form | Series/shape | Cutting edge angle | Applicable inserts | Insert shape | Usage and features | Page |
|---|---|---|---|---|---|---|
| Square shoulder milling tool | CSM188 | KAPR=88° | SNGX1005ZNN–GM<br>SNMX100512–GM | | ◎ Supported by grinding level/precision molded level quadrilateral negative angle inserts, the cutting process proceeds stably.<br>◎ It is suitable for general face milling of P, M, K and other materials, being both cost-effective and multi-functional. | B27–B29 |
| | SSM188 | | | | | |
| | CSM190 | KAPR=90° | AOKT06□□<br>AOKT11□□<br>AOKT16□□ | | ◎ High-precision shoulder milling tool series<br>◎ It is a 90° shoulder milling tool with a helical edge design providing low cutting forces.<br>◎ The tool is available in diameters ϕ11-ϕ80.<br>◎ It is suitable for side milling, groove milling, Ramp Milling and other multifunctional machining of P-, M-, K- and S-type materials, and it is a preferred tool for shoulder milling. | B30–B34 |
| | SSM190 | | | | | |
| | KH | | | | | |
| | CSM290 | KAPR=90° | APKT11□□<br>APKT16□□ | | ◎ Square shoulder milling tool series with high performance. It is suitable for milling mild steel, stainless steel, titanium alloy, high-temp alloy, etc.<br>◎ The tool is available in diameters ϕ16-ϕ80, with a 90° cutting edge angle structure.<br>◎ It is suitable for shoulder milling, groove milling, Ramp Milling , face milling and other machining. | B35–B37 |
| | SSM290 | | | | | |
| | CSM390 | KAPR=90° | ZNMU0403□□<br>ZNMU0806□□ | | ◎ Cost-effective shoulder milling cutter series. It has 6 edges on both sides.<br>◎ The tool's locating is stable. As a result, the cutting process is reliable.<br>◎ There are rod-shaped, sleeve-type cutterhead and replaceable tools for option. | B38–B42 |
| | SSM390 | | | | | |
| | KH | | | | | |

# Overview of indexable milling tools

| Machining form | Series/shape | Cutting edge angle | Applicable inserts | Insert shape | Usage and features | Page |
|---|---|---|---|---|---|---|
| Square shoulder milling tool | CSM590 | KAPR=90° | APMT11□□<br>APGT11□□<br>APMT16□□<br>APGT16□□ | | ◎ Universal shoulder milling tool series<br>◎ It is suitable for shoulder milling, groove milling, Ramp Milling and face milling of P, K and N materials. | B43–B45 |
| | SSM590 | | | | | |
| Profile milling tool | CPM100 | / | RC□□ | | ◎ It is suitable for machining P, M, K and other materials.<br>◎ It is of different diameters and can be used for machining planes, curved surfaces and cavities. | B46–B47 |
| | SPM100 | | | | | |
| | CPM200 | / | RP□□ | | ◎ It is suitable for machining P, M, K and other materials.<br>◎ It is of different diameters and can be used for machining planes, curved surfaces and cavities. | B48–B50 |
| | SPM200 | | | | | |





Overview of indexable milling tools

| Machining form | Series/shape | Cutting edge angle | Applicable inserts | Insert shape | Usage and features | Page |
|---|---|---|---|---|---|---|
| Profile milling tool | CPM300 | / | RD□□ | | ◎ It is suitable for the machining of P, K<br>◎ materials and hardened materials. It is of different diameters and can be used for machining flat, curved surfaces and cavities. | B51–B54 |
| | SPM300 | | | | | |
| High-feed milling tool | CEM100 | / | SD□□ | | ◎ It is suitable for cavity milling and face milling of P, K and other materials, which can realize high Feed rate, and can also be used for insert milling.<br>◎ The tool is available in diameters Φ20-Φ160mm. | B57–B59 |
| | SEM100 | | | | | |
| Helical end mill | CHM190 | KAPR=90° | SP12□□<br>AP15□□ | | ◎ Large cutting depth milling tools are made of steel, alloy steel and cast iron.<br>◎ The tool is available in diameters ϕ 63 mm and ϕ 80 mm with BT and JT interface. | B62–B63 |

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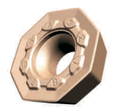
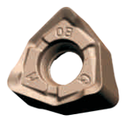
# Overview of indexable milling inserts

| Insert shape | Insert model | Page |
|---|---|---|
| | APMT1135PDER-HM<br>APMT1605PDER-HM | B45 |
| | APGT1135PDFR-AK<br>APGT1604PDFR-AK | B45 |
| | APKT113604PEER-FM<br>APKT1136PEER-FM<br>APKT113612PEER-FM<br>APKT113620PEER-FM<br>APKT1605PDER-FM<br>APKT160512PDER-FM<br>APKT160520PDER-FM | B37 |
| | SPMT120408-MM<br>APMT150412-MM<br>SPHX120408T21<br>APHX1504 | B63 |
| | AOKT060202PEER-VM<br>AOKT060204PEER-VM<br>AOKT060208PEER-VM<br>AOKT113504PEER-VM<br>AOKT113508PEER-VM<br>AOKT113512PEER-VM<br>AOKT113516PEER-VM<br>AOKT160408PEER-VM<br>AOKT160412PEER-VM<br>AOKT160416PEER-VM | B33 |

| Insert shape | Insert model | Page |
|---|---|---|
| | HNMX0906ANSN-M | B24 |
| | LNKU0303ZNR-MH<br>LNKU0303ZNR-LH | B71 |
|  | ODKT0605ADN<br>ODMT060508-R | B14 |
| | RCKT10T3MO-FM<br>RCKT1204MO-FM<br>RCKT1606MO-FM<br>RCKT2006MO-FM | B47 |
| | RDMW0602MO<br>RDMW0802MO<br>RDMW10T3MO<br>RDMW1204MO<br>RDMW1605MO | B53 |
| | RDKW10T3MO<br>RDKW1204MO<br>RDKW1604MO | B53 |
| | RPMT08T2MO-HM<br>RPMW1003MO<br>RPMT1204MO-HM | B50 |

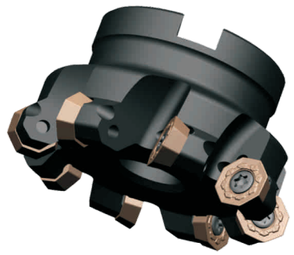
| Insert shape | Insert model | Page |
|---|---|---|
| | RPKT10T3MO-MS<br>RPKT1204MO-MS<br>RPKT1606MO-MS | B50 |
| | RPMT08T2MO-SM<br>RPMT10T3MO-SM<br>RPMT1204MO-SM<br>RPMT1606MO-SM | B50 |
| | SDMT1205ZTN-FM<br>SDMT1505ZTN-FM | B59 |
| | SDMW1205ZTN<br>SDMW1505ZTN | B59 |
| | SEET13T3-GM<br>SEMT13T3AGTN-FM | B18 |
| | SEKR1203AFTN<br>SEMR1203AFTN | B22 |
| | SEEN1203AFTN | B22 |
| | SPKN1504EDTL<br>SPKN1504EDTR | |

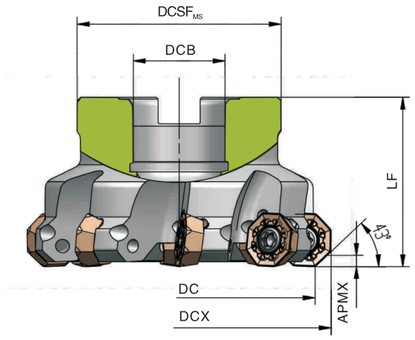
| Insert shape | Insert model | Page |
|---|---|---|
| | SNGX1005ANR-GM | B16 |
| | SNGX1005ANR-GE | B16 |
| | SNGX1005ZNN-GM<br>SNMX100512-GM | B29 |
| | SZMX1206ANR-GM | B20 |
| | XNMX070508-M<br>XNMX0705ANN-M<br>XNGX0705ANN-R<br>XNMX090612-M<br>XNGX0906-W | B26 |
|  | ZNMU040308PNR-GM<br>ZNMU080608PNR-GM<br>ZNMU080608PNR-GL<br>ZNMU080608PNR-GR<br>ZNMU080616PNR-GR | B42 |

# Face milling

## CFM143 series

**KAPR=43°**



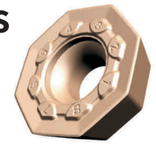


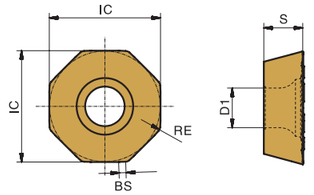

| Tool specification | Number of edges | Inventory | Dmension (mm) | | | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCB | DCSF$_{MS}$ | DCX | LF | | | | | |
| CFM143–040A1603–OD06 | 3 | △ | 40 | 16 | 35 | 50 | 40 | 4 | A | OD□□ | M50130 | HTT20IP |
| CFM143–050A2204–OD06 | 4 | △ | 50 | 22 | 47 | 60 | 40 | 4 | | | | |
| CFM143–063A2205–OD06 | 5 | △ | 63 | 22 | 47 | 72 | 40 | 4 | | | | |
| CFM143–080A2706–OD06 | 6 | ▲ | 80 | 27 | 62 | 90 | 50 | 4 | | | | |
| CFM143–100A3207–OD06 | 7 | ▲ | 100 | 32 | 77 | 110 | 50 | 4 | | | | |
| CFM143–125B4008–OD06 | 8 | △ | 125 | 40 | 90 | 135 | 63 | 4 | B | | | |
| CFM143–160C4010–OD06 | 10 | △ | 160 | 40 | 92 | 170 | 63 | 4 | C | | | HAT20IP |
| CFM143–200C6012–OD06 | 12 | △ | 200 | 60 | 175 | 210 | 63 | 4 | | | | |

▲Standing inventory △Make-to-order

# Applicable inserts

## OD□□






Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P | Steel | ● | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | | | ● |
| | M | Stainless steel | | | ● | | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ● | |
| | K | Cast iron | ◕ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | |
| | N | Non-ferrous metal | | | | | | | | | | | ● | |
| | S | Heat resistant super alloys Titanium alloy | | | | | | | | | | ⌗ | ● | |

| Type | Dimension (mm) | | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IC | S | D1 | BS | RE | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| ODKT0605ADN | 15.875 | 5.56 | 5.5 | 1.2 | 0.8 | 4 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |
| ODMT060508–R | 15.875 | 5.56 | 5.5 | 1.2 | 0.8 | 4 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |

★ Recommended grade ☆ Available grade

## Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting data | |
|---|---|---|---|---|---|
| | | | | Cutting speed vc (m/min) | Feed rate fz(mm/z) |
| P | Low-carbon steel, mild steel | ≤180 | HR5120 | 270(220–350) | 0.3(0.1–0.5) |
| | | | HR5220 | 240(200–320) | |
| | | | HR5130 | 220(200–320) | |
| | High-carbon steel, alloy steel | 180–280 | HR5110 | 240(200–320) | 0.2(0.1–0.4) |
| | | | HR5120 | 200(160–280) | |
| | | | HR5220 | 200(160–280) | |
| | | | HR5130 | 200(160–260) | |
| | Alloy tool steel | 280–350 | HR5110 | 220(170–340) | 0.15(0.1–0.3) |
| | | | HR5210 | 200(150–280) | |
| | | | HR5120 | 180(150–250) | |
| | | | HR5220 | 180(150–250) | |
| M | Stainless steel | ≤270 | HR5120 | 180(120–240) | 0.2(0.1–0.3) |
| | | | HR5130 | 150(120–180) | |
| K | Cast iron | 180–250 | HR6130 | 280(180–320) | 0.2(0.1–0.4) |
| | | | HR5110 | 200(150–250) | |
| | | | HR5120 | 200(150–250) | |

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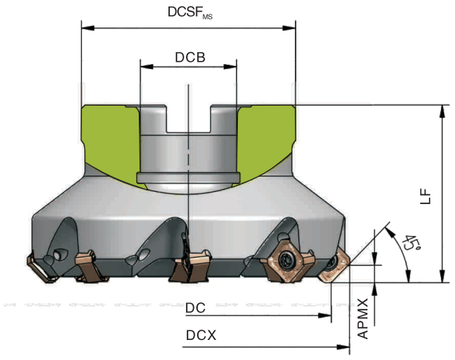
# Face milling

## CFM145 series

**KAPR=45°**

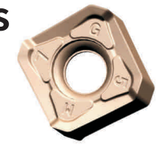


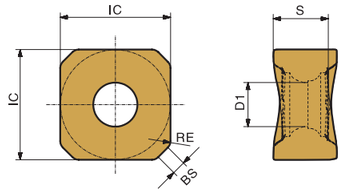

| Tool specification | Number of edges | Inventory | Dmension (mm) | | | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCB | DCSF$_{MS}$ | DCX | LF | | | | | |
| CFM145–050A2204–SN10 | 4 | ▲ | 50 | 22 | 47 | 60.5 | 40 | 4.7 | A | SNGX□□ | M35100 | HTT10IP |
| CFM145–050A2205–SN10 | 5 | △ | 50 | 22 | 47 | 60.5 | 40 | 4.7 | | | | |
| CFM145–063A2205–SN10 | 5 | △ | 63 | 22 | 47 | 73.5 | 40 | 4.7 | | | | |
| CFM145–063A2206–SN10 | 6 | ▲ | 63 | 22 | 47 | 73.5 | 40 | 4.7 | | | | |
| CFM145–080A2706–SN10 | 6 | △ | 80 | 27 | 62 | 90.5 | 50 | 4.7 | | | | |
| CFM145–080A2708–SN10 | 8 | ▲ | 80 | 27 | 62 | 90.5 | 50 | 4.7 | | | | |
| CFM145–100A3206–SN10 | 6 | △ | 100 | 32 | 77 | 110.5 | 50 | 4.7 | | | | |
| CFM145–100A3208–SN10 | 8 | ▲ | 100 | 32 | 77 | 110.5 | 50 | 4.7 | | | | |
| CFM145–100A3210–SN10 | 10 | △ | 100 | 32 | 77 | 110.5 | 50 | 4.7 | | | | |
| CFM145–125B4008–SN10 | 8 | △ | 125 | 40 | 90 | 135.5 | 63 | 4.7 | B | | | |
| CFM145–125B4010–SN10 | 10 | △ | 125 | 40 | 90 | 135.5 | 63 | 4.7 | | | | |
| CFM145–125B4012–SN10 | 12 | △ | 125 | 40 | 90 | 135.5 | 63 | 4.7 | | | | |
| CFM145–160C4008–SN10 | 8 | △ | 160 | 40 | 92 | 170.5 | 63 | 4.7 | C | | | HAT10IP |
| CFM145–160C4012–SN10 | 12 | ▲ | 160 | 40 | 92 | 170.5 | 63 | 4.7 | | | | |
| CFM145–160C4014–SN10 | 14 | △ | 160 | 40 | 92 | 170.5 | 63 | 4.7 | | | | |

▲Standing inventory △Make-to-order

# Applicable inserts

## SN□□






Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | |
|---|---|---|---|
| | P | Steel | ● ⌗ ● ● ◕ ◕ ⌗◕ ◕ ⌗ ● |
| | M | Stainless steel | ● ◕ ◕ ⌗◕ ⌗ ● |
| | K | Cast iron | ◕ ⌗ ● ● ◕ ◕ ⌗◕ |
| | N | Non-ferrous metal | ● |
| | S | Heat resistant super alloys Titanium alloy | ⌗ ● |

| Type | Dimension (mm) | | | | | APMX (mm) | CVD | | PVD | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IC | S | D1 | BS | RE | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| SNGX1005ANR–GM | 10.0 | 5.0 | 4.0 | 1.2 | 0.8 | 4.7 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |
| SNGX1005ANR–GE | 10.0 | 5.0 | 4.0 | 1.2 | 0.8 | 4.7 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |

★ Recommended grade ☆ Available grade

## Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting data | |
|---|---|---|---|---|---|
| | | | | Cutting speed vc (m/min) | Feed rate fz(mm/z) |
| P | Low-carbon steel, mild steel | ≤180 | HR5120 | 270(220–350) | 0.3(0.1–0.5) |
| | | | HR5220 | 240(200–320) | |
| | | | HR5130 | 220(200–320) | |
| | High-carbon steel, alloy steel | 180–280 | HR5110 | 240(200–320) | 0.2(0.1–0.4) |
| | | | HR5120 | 200(160–280) | |
| | | | HR5220 | 200(160–280) | |
| | | | HR5130 | 200(160–260) | |
| | Alloy tool steel | 280–350 | HR5110 | 220(170–340) | 0.15(0.1–0.3) |
| | | | HR5210 | 200(150–280) | |
| | | | HR5120 | 180(150–250) | |
| | | | HR5220 | 180(150–250) | |
| M | Stainless steel | ≤270 | HR5120 | 180(120–240) | 0.2(0.1–0.3) |
| | | | HR5130 | 150(120–180) | |
| K | Cast iron | 180–250 | HR6130 | 280(180–320) | 0.2(0.1–0.4) |
| | | | HR5110 | 200(150–250) | |
| | | | HR5120 | 200(150–250) | |

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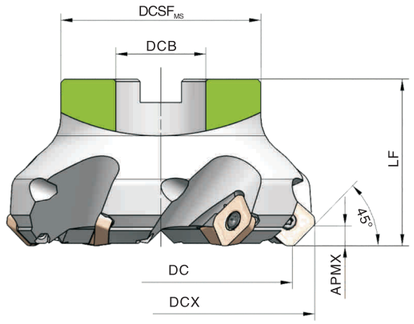
# Face milling

## CFM245series

**KAPR=45°**

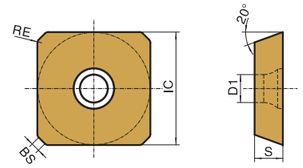



| Tool specification | Number of edges | Inventory | Dmension (mm) | | | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCB | DCSF MS | DCX | LF | | | | | |
| CFM245–050A2203–SE13 | 3 | △ | 50 | 22 | 47 | 61 | 40 | 6 | A | SEET□□ | M35100 | HTT10IP |
| CFM245–050A2204–SE13 | 4 | △ | 50 | 22 | 47 | 61 | 40 | 6 | | | | |
| CFM245–063A2204–SE13 | 4 | △ | 63 | 22 | 47 | 74 | 40 | 6 | | | | |
| CFM245–063A2205–SE13 | 5 | ▲ | 63 | 22 | 47 | 74 | 40 | 6 | | | | |
| CFM245–080A2704–SE13 | 4 | △ | 80 | 27 | 62 | 91 | 50 | 6 | | | | |
| CFM245–080A2706–SE13 | 6 | ▲ | 80 | 27 | 62 | 91 | 50 | 6 | | | | |
| CFM245–100A3205–SE13 | 5 | △ | 100 | 32 | 77 | 107 | 50 | 6 | | | | |
| CFM245–100A3207–SE13 | 7 | △ | 100 | 32 | 77 | 111 | 50 | 6 | | | | |
| CFM245–125B4006–SE13 | 6 | △ | 125 | 40 | 90 | 136 | 63 | 6 | B | | | |
| CFM245–125B4008–SE13 | 8 | △ | 125 | 40 | 90 | 136 | 63 | 6 | | | | |
| CFM245–160C4010–SE13 | 10 | △ | 160 | 40 | 92 | 171 | 63 | 6 | C | | | HAT10IP |
| CFM245–160C4012–SE13 | 12 | △ | 160 | 40 | 92 | 171 | 63 | 6 | | | | |
| CFM245–200C6014–SE13 | 14 | △ | 200 | 60 | 175 | 211 | 63 | 6 | | | | |
| CFM245–200C6018–SE13 | 18 | △ | 200 | 60 | 175 | 211 | 63 | 6 | | | | |

▲Standing inventory △Make-to-order

# Applicable inserts

## SE□□




Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P | Steel | ● | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | | | ● |
| | M | Stainless steel | | | ● | | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ● | |
| | K | Cast iron | ◕ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | |
| | N | Non-ferrous metal | | | | | | | | | | | ● | |
| | S | Heat resistant super alloys Titanium alloy | | | | | | | | | | ⌗ | ● | |

| Type | Dimension (mm) | | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IC | S | D1 | BS | RE | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| SEET13T3–GM | 13.4 | 3.97 | 4.1 | 1.4 | 1.5 | 6 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |
| SEMT13T3AGTN–FM | 13.4 | 3.97 | 4.1 | 1.4 | 1.5 | 6 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |

★ Recommended grade ☆ Available grade

## Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting data | |
|---|---|---|---|---|---|
| | | | | Cutting speed vc (m/min) | Feed rate fz(mm/z) |
| P | Low-carbon steel, mild steel | ≤180 | HR5120 | 270(220–350) | 0.3(0.1–0.5) |
| | | | HR5220 | 240(200–320) | |
| | | | HR5130 | 220(200–320) | |
| | High-carbon steel, alloy steel | 180–280 | HR5110 | 240(200–320) | 0.2(0.1–0.4) |
| | | | HR5120 | 200(160–280) | |
| | | | HR5220 | 200(160–280) | |
| | | | HR5130 | 200(160–260) | |
| | Alloy tool steel | 280–350 | HR5110 | 220(170–340) | 0.15(0.1–0.3) |
| | | | HR5210 | 200(150–280) | |
| | | | HR5120 | 180(150–250) | |
| | | | HR5220 | 180(150–250) | |
| M | Stainless steel | ≤270 | HR5120 | 180(120–240) | 0.2(0.1–0.3) |
| | | | HR5130 | 150(120–180) | |
| K | Cast iron | 180–250 | HR6130 | 280(180–320) | 0.2(0.1–0.4) |
| | | | HR5110 | 200(150–250) | |
| | | | HR5120 | 200(150–250) | |

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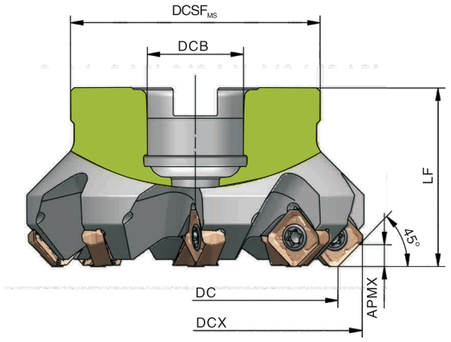
# Face milling

## CFM345series

**KAPR=45°**

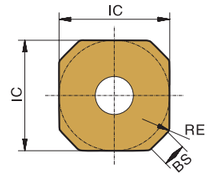


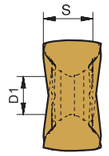

| Tool specification | Number of edges | Inventory | Dmension (mm) | | | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCB | DCSF$_{MS}$ | DCX | LF | | | | | |
| CFM345–050A2204–SZ12 | 4 | ▲ | 50 | 22 | 47 | 63.7 | 40 | 6 | A | SZMX□□ | M40100<br>M40110 | HTT15IP |
| CFM345–050A2205–SZ12 | 5 | △ | 50 | 22 | 47 | 63.7 | 40 | 6 | | | | |
| CFM345–063A2205–SZ12 | 5 | ▲ | 63 | 22 | 47 | 76.7 | 40 | 6 | | | | |
| CFM345–063A2206–SZ12 | 6 | △ | 63 | 22 | 47 | 76.7 | 40 | 6 | | | | |
| CFM345–080A2706–SZ12 | 6 | ▲ | 80 | 27 | 62 | 93.7 | 50 | 6 | | | | |
| CFM345–080A2708–SZ12 | 8 | △ | 80 | 27 | 62 | 93.7 | 50 | 6 | | | | |
| CFM345–100A3206–SZ12 | 6 | △ | 100 | 32 | 77 | 113.7 | 50 | 6 | | | | |
| CFM345–100A3208–SZ12 | 8 | △ | 100 | 32 | 77 | 113.7 | 50 | 6 | | | | |
| CFM345–100A3210–SZ12 | 10 | ▲ | 100 | 32 | 77 | 113.7 | 50 | 6 | | | | |
| CFM345–125B4008–SZ12 | 8 | △ | 125 | 40 | 90 | 138.7 | 63 | 6 | B | | | |
| CFM345–125B4010–SZ12 | 10 | ▲ | 125 | 40 | 90 | 138.7 | 63 | 6 | | | | |
| CFM345–125B4012–SZ12 | 12 | △ | 125 | 40 | 90 | 138.7 | 63 | 6 | | | | |
| CFM345–160C4008–SZ12 | 8 | △ | 160 | 40 | 92 | 173.7 | 63 | 6 | C | | | HAT15IP |
| CFM345–160C4012–SZ12 | 12 | ▲ | 160 | 40 | 92 | 173.7 | 63 | 6 | | | | |
| CFM345–160C4014–SZ12 | 14 | △ | 160 | 40 | 92 | 173.7 | 63 | 6 | | | | |

▲Standing inventory △Make-to-order

# Applicable inserts

## SZMX □□




Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | |
|---|---|---|---|
| | P | Steel | ● ⌗ ● ● ◕ ◕ ◕ ◕ ⌗ ● |
| | M | Stainless steel | ● ◕ ◕ ◕ ⌗ ◕ ⌗ ● |
| | K | Cast iron | ◕ ⌗ ● ● ◕ ◕ ⌗ |
| | N | Non-ferrous metal | ● |
| | S | Heat resistant super alloys Titanium alloy | ⌗ ● |

| Type | Dimension (mm) | | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IC | S | D1 | BS | RE | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| SZMX1206ANR–GM | 13.4 | 6.0 | 4.6 | 1.4 | 0.8 | 6 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |

★ Recommended grade ☆ Available grade

## Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting data | |
|---|---|---|---|---|---|
| | | | | Cutting speed vc (m/min) | Feed rate fz(mm/z) |
| P | Low-carbon steel, mild steel | ≤180 | HR5120 | 270(220–350) | 0.3(0.1–0.5) |
| | | | HR5220 | 240(200–320) | |
| | | | HR5130 | 220(200–320) | |
| | High-carbon steel, alloy steel | 180–280 | HR5110 | 240(200–320) | 0.2(0.1–0.4) |
| | | | HR5120 | 200(160–280) | |
| | | | HR5220 | 200(160–280) | |
| | | | HR5130 | 200(160–260) | |
| | Alloy tool steel | 280–350 | HR5110 | 220(170–340) | 0.15(0.1–0.3) |
| | | | HR5210 | 200(150–280) | |
| | | | HR5120 | 180(150–250) | |
| | | | HR5220 | 180(150–250) | |
| M | Stainless steel | ≤270 | HR5120 | 180(120–240) | 0.2(0.1–0.3) |
| | | | HR5130 | 150(120–180) | |
| K | Cast iron | 180–250 | HR6130 | 280(180–320) | 0.2(0.1–0.4) |
| | | | HR5110 | 200(150–250) | |
| | | | HR5120 | 200(150–250) | |

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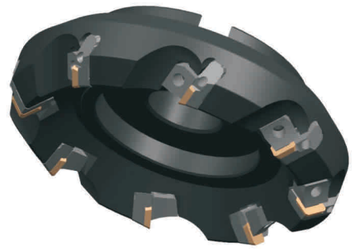
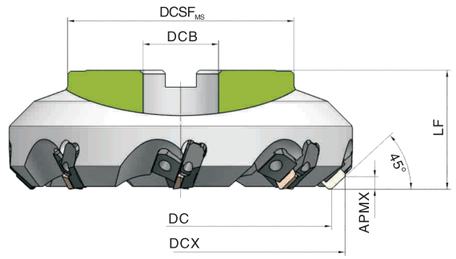
# Face milling

## CFM445series

**KAPR=45°**





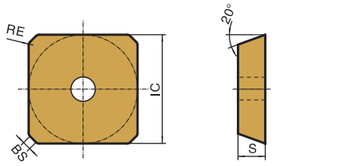

| Tool specification | Number of edges | Inventory | Dmension (mm) | | | | | APMX (mm) | Interface form | Applicable inserts |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCB | DCSF$_{MS}$ | DCX | LF | | | |
| CFM445–080A2704–SE12 | 4 | ▲ | 80 | 27 | 62 | 103 | 50 | 5.5 | A | SE□R1203□ |
| CFM445–100A3205–SE12 | 5 | ▲ | 100 | 32 | 77 | 122 | 50 | 5.5 | | |
| CFM445–125B4006–SE12 | 6 | △ | 125 | 40 | 90 | 147 | 63 | 5.5 | B | |
| CFM445–160C4008–SE12 | 8 | △ | 160 | 40 | 92 | 181 | 63 | 5.5 | C | |
| CFM445–200C6010–SE12 | 10 | △ | 200 | 60 | 175 | 221 | 63 | 5.5 | | |
| CFM445–250C6012–SE12 | 12 | △ | 250 | 60 | 210 | 270 | 63 | 5.5 | | |
| CFM445–315D6015–SE12 | 15 | △ | 315 | 60 | 250 | 353 | 63 | 5.5 | D | |

▲Standing inventory △Make-to-order

| Insert | Toolholder | Brale | Screw | Clamping screw | Wrench |
|---|---|---|---|---|---|
| SE□□12 | HSERR/L | H05R/L | HM8×21 | HOM5×15.4 | HT20T<br>HH40T |

# Applicable inserts

## SE□□




Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | Steel | Stainless steel | Cast iron | Non-ferrous metal | Heat resistant super alloys Titanium alloy |
|---|---|---|---|---|---|---|---|
| | | P | ● ⌗ ● ● ◕ ◕ ⌗◕ ◕ ⌗ | | | | |
| | | M | | ● ● ◕ ◕ ⌗◕ ◕ ⌗ ● | | | |
| | | K | ◕● ⌗ ● ● ◕ ◕ ⌗◕ | | | | |
| | | N | | | | ● | |
| | | S | | | | | ⌗ ● |

| Type | Dimension (mm) | | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IC | S | D1 | BS | RE | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| SEEN1203AFTN | 12.7 | 3.18 | 2.5 | 1.2 | 0.8 | 5.5 | | | | | | | | | | | | | ★ |
| SEKR1203AFTN | 12.7 | 3.18 | 2.5 | 1.3 | 1.6 | 5.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |
| SEMR1203AFTN | 12.7 | 3.18 | 2.5 | 1.3 | 1.6 | 5.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |

★ Recommended grade ☆ Available grade

## Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting data | |
|---|---|---|---|---|---|
| | | | | Cutting speed vc (m/min) | Feed rate fz(mm/z) |
| P | Low-carbon steel, mild steel | ≤180 | HR5120 | 270(220–350) | 0.3(0.1–0.5) |
| | | | HR5220 | 240(200–320) | |
| | | | HR5130 | 220(200–320) | |
| | High-carbon steel, alloy steel | 180–280 | HR5110 | 240(200–320) | 0.2(0.1–0.4) |
| | | | HR5120 | 200(160–280) | |
| | | | HR5220 | 200(160–280) | |
| | | | HR5130 | 200(160–260) | |
| | Alloy tool steel | 280–350 | HR5110 | 220(170–340) | 0.15(0.1–0.3) |
| | | | HR5210 | 200(150–280) | |
| | | | HR5120 | 180(150–250) | |
| | | | HR5220 | 180(150–250) | |
| M | Stainless steel | ≤270 | HR5120 | 180(120–240) | 0.2(0.1–0.3) |
| | | | HR5130 | 150(120–180) | |
| K | Cast iron | 180–250 | HR6130 | 280(180–320) | 0.2(0.1–0.4) |
| | | | HR5110 | 200(150–250) | |
| | | | HR5120 | 200(150–250) | |

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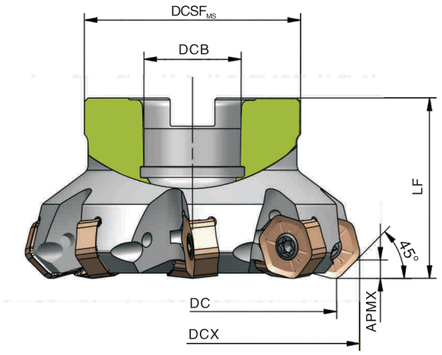
# Face milling

## CFM645series

**KAPR=45°**

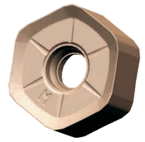


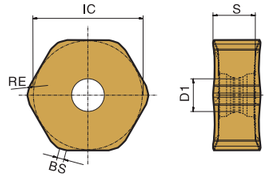

| Tool specification | Number of edges | Inventory | Dmension (mm) | | | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCB | DCSF$_{MS}$ | DCX | LF | | | | | |
| CFM645-050A2204-HN09 | 4 | △ | 50 | 22 | 47 | 61.7 | 40 | 5 | A | HNMX0906□□ | M45110 | HTT15IP |
| CFM645-063A2206-HN09 | 6 | △ | 63 | 22 | 47 | 74.7 | 40 | 5 | | | | |
| CFM645-080A2706-HN09 | 6 | △ | 80 | 27 | 62 | 91.7 | 50 | 5 | | | | |
| CFM645-080A2708-HN09 | 8 | ▲ | 80 | 27 | 62 | 91.7 | 50 | 5 | | | | |
| CFM645-100A3206-HN09 | 6 | △ | 100 | 32 | 77 | 111.7 | 50 | 5 | | | | |
| CFM645-100A3208-HN09 | 8 | ▲ | 100 | 32 | 77 | 111.7 | 50 | 5 | | | | |
| CFM645-100A3210-HN09 | 10 | △ | 100 | 32 | 77 | 111.7 | 50 | 5 | | | | |
| CFM645-125B4006-HN09 | 6 | △ | 125 | 40 | 90 | 136.7 | 63 | 5 | B | | | |
| CFM645-125B4008-HN09 | 8 | △ | 125 | 40 | 90 | 136.7 | 63 | 5 | | | | |
| CFM645-125B4010-HN09 | 10 | △ | 125 | 40 | 90 | 136.7 | 63 | 5 | | | | |
| CFM645-125B4012-HN09 | 12 | △ | 125 | 40 | 90 | 136.7 | 63 | 5 | | | | |
| CFM645-160C4008-HN09 | 8 | △ | 160 | 40 | 92 | 171.7 | 63 | 5 | C | | | HAT15IP |
| CFM645-160C4012-HN09 | 12 | ▲ | 160 | 40 | 92 | 171.7 | 63 | 5 | | | | |
| CFM645-160C4014-HN09 | 14 | △ | 160 | 40 | 92 | 171.7 | 63 | 5 | | | | |
| CFM645-200C6010-HN09 | 10 | △ | 200 | 60 | 175 | 211.7 | 63 | 5 | | | | |
| CFM645-250C6014-HN09 | 14 | △ | 250 | 60 | 210 | 261.7 | 63 | 5 | | | | |
| CFM645-315D6016-HN09 | 16 | △ | 315 | 60 | 250 | 326.7 | 80 | 5 | | | | |

▲Standing inventory △Make-to-order

# Applicable inserts

## HNMX □□






Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | |
|---|---|---|---|
| | P | Steel | ● ⌗ ● ● ◕ ◕ ◕⌗ ◕ ⌗ ● |
| | M | Stainless steel | ● ◕ ◕⌗ ◕ ⌗ ● |
| | K | Cast iron | ◕● ⌗ ● ● ◕ ◕ ◕⌗ |
| | N | Non-ferrous metal | ● |
| | S | Heat resistant super alloys Titanium alloy | ⌗ ● |

| Type | Dimension (mm) | | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IC | S | D1 | BS | RE | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| HNMX0906ANSN-M | 16.5 | 6.34 | 4.9 | 1.0 | 1.2 | 5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |
| HNMX0906ANSN-R | 16.5 | 6.34 | 4.9 | 1.0 | 1.2 | 5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |

★ Recommended grade ☆ Available grade

## Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting data | |
|---|---|---|---|---|---|
| | | | | Cutting speed vc (m/min) | Feed rate fz(mm/z) |
| P | Low-carbon steel, mild steel | ≤180 | HR5120 | 270(220-350) | 0.3(0.1-0.5) |
| | | | HR5220 | 240(200-320) | |
| | | | HR5130 | 220(200-320) | |
| | High-carbon steel, alloy steel | 180-280 | HR5110 | 240(200-320) | 0.2(0.1-0.4) |
| | | | HR5120 | 200(160-280) | |
| | | | HR5220 | 200(160-280) | |
| | | | HR5130 | 200(160-260) | |
| | Alloy tool steel | 280-350 | HR5110 | 220(170-340) | 0.15(0.1-0.3) |
| | | | HR5210 | 200(150-280) | |
| | | | HR5120 | 180(150-250) | |
| | | | HR5220 | 180(150-250) | |
| M | Stainless steel | ≤270 | HR5120 | 180(120-240) | 0.2(0.1-0.3) |
| | | | HR5130 | 150(120-180) | |
| K | Cast iron | 180-250 | HR6130 | 280(180-320) | 0.2(0.1-0.4) |
| | | | HR5110 | 200(150-250) | |
| | | | HR5120 | 200(150-250) | |

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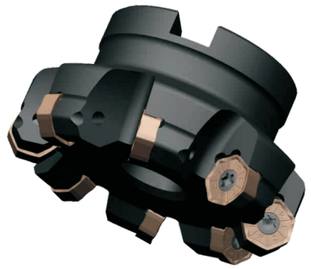
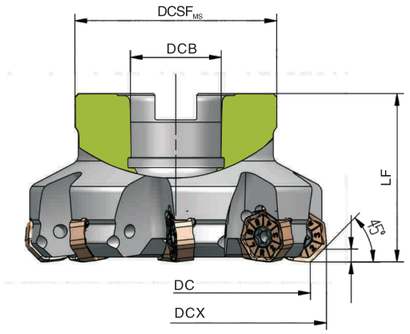
# Face milling

## CFM745series

**KAPR=45°**



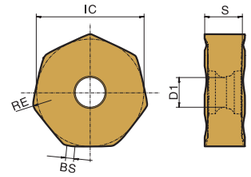



| Tool specification | Number of edges | Inventory | Dmension (mm) | | | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCB | DCSF$_{MS}$ | DCX | LF | | | | | |
| CFM745–040A1603–XN07 | 3 | △ | 40 | 16 | 35 | 49.6 | 40 | 4.4 | A | XN□**X**0705□□ | M35120 | HTT15IP |
| CFM745–050A2204–XN07 | 4 | ▲ | 50 | 22 | 47 | 59.6 | 40 | 4.4 | | | | |
| CFM745–050A2205–XN07 | 5 | △ | 50 | 22 | 47 | 59.6 | 40 | 4.4 | | | | |
| CFM745–063A2205–XN07 | 5 | ▲ | 63 | 22 | 47 | 72.6 | 40 | 4.4 | | | | |
| CFM745–063A2206–XN07 | 6 | △ | 63 | 22 | 47 | 72.6 | 40 | 4.4 | | | | |
| CFM745–080A2706–XN07 | 6 | △ | 80 | 27 | 62 | 89.6 | 50 | 4.4 | | | | |
| CFM745–080A2707–XN07 | 7 | ▲ | 80 | 27 | 62 | 89.6 | 50 | 4.4 | | | | |
| CFM745–100A3207–XN07 | 7 | ▲ | 100 | 32 | 77 | 109.6 | 50 | 4.4 | | | | |
| CFM745–100A3208–XN07 | 8 | △ | 100 | 32 | 77 | 109.6 | 50 | 4.4 | | | | |
| CFM745–125B4008–XN07 | 8 | △ | 125 | 40 | 90 | 134.6 | 63 | 4.4 | B | | | |
| CFM745–125B4010–XN07 | 10 | △ | 125 | 40 | 90 | 134.6 | 63 | 4.4 | | | | |
| CFM745–160C4011–XN07 | 11 | △ | 160 | 40 | 92 | 169.6 | 63 | 4.4 | C | | | HAT15IP |
| CFM745–160C4012–XN07 | 12 | △ | 160 | 40 | 92 | 169.6 | 63 | 4.4 | | | | |
| CFM745–063A2205–XN09 | 5 | △ | 63 | 22 | 47 | 79 | 50 | 50 | A | XN□X0906□□ | M50130 | HTT20IP |
| CFM745–080A2706–XN09 | 6 | △ | 80 | 27 | 62 | 93 | 50 | 50 | | | | |
| CFM745–100A3207–XN09 | 7 | △ | 100 | 32 | 77 | 113 | 50 | 50 | | | | |
| CFM745–100A3208–XN09 | 8 | △ | 100 | 32 | 77 | 113 | 50 | 50 | | | | |
| CFM745–125B4008–XN09 | 8 | △ | 125 | 40 | 90 | 138 | 63 | 63 | B | | | |
| CFM745–125B4010–XN09 | 10 | △ | 125 | 40 | 90 | 138 | 63 | 63 | | | | |
| CFM745–160C4009–XN09 | 9 | △ | 160 | 40 | 92 | 173 | 63 | 63 | C | | | HAT20IP |
| CFM745–160C4010–XN09 | 10 | △ | 160 | 40 | 92 | 173 | 63 | 63 | | | | |
| CFM745–200C6012–XN09 | 12 | △ | 200 | 60 | 175 | 213 | 63 | 63 | | | | |

▲Standing inventory △Make-to-order

# Applicable inserts

## XN □□




Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P | Steel | ● | ⌗ | ● | ● | ◕ | ◕ | ◕⌗ | ◕ | ⌗ | | | | | | ● |
| | | M | Stainless steel | | | ● | | ◕ | ◕ | ◕⌗ | ◕ | | ⌗ | ● | | | | |
| | | K | Cast iron | ◕ | ⌗ | ● | ● | ◕ | ◕ | ◕⌗ | | | | | | | | |
| | | N | Non-ferrous metal | | | | | | | | | | | | ● | | | |
| | | S | Heat resistant super alloys Titanium alloy | | | | | | | | | | ⌗ | ● | | | | |

| Type | Dimension (mm) | | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IC | S | D1 | BS | RE | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| XNMX070508–M | 14.5 | 5.02 | 4.0 | 1.0 | 0.8 | 4.4 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | ★ | | | |
| XNMX0705ANN–M | 14.5 | 5.02 | 4.0 | 1.0 | 0.8 | 4.4 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | ★ | | | |
| XNGX0705ANN–R | 14.5 | 5.02 | 4.0 | 1.0 | 0.8 | 4.4 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |
| XNMX090612–M | 19.05 | 6.22 | 5.5 | 1.0 | 1.2 | 6.0 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |
| XNGX0906–W | 19.05 | 6.28 | 2.8 | 2.0 | 1.2 | 6.0 | ★ | | | | ★ | | | | | | | | |

★ Recommended grade ☆ Available grade

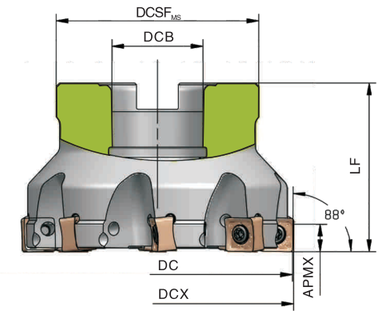
## Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting data | |
|---|---|---|---|---|---|
| | | | | Cutting speed vc (m/min) | Feed rate fz(mm/z) |
| P | Low-carbon steel, mild steel | ≤180 | HR5120 | 270(220–350) | 0.3(0.1–0.5) |
| | | | HR5220 | 240(200–320) | |
| | | | HR5130 | 220(200–320) | |
| | High-carbon steel, alloy steel | 180–280 | HR5110 | 240(200–320) | 0.2(0.1–0.4) |
| | | | HR5120 | 200(160–280) | |
| | | | HR5220 | 200(160–280) | |
| | | | HR5130 | 200(160–260) | |
| | Alloy tool steel | 280–350 | HR5110 | 220(170–340) | 0.15(0.1–0.3) |
| | | | HR5210 | 200(150–280) | |
| | | | HR5120 | 180(150–250) | |
| | | | HR5220 | 180(150–250) | |
| M | Stainless steel | ≤270 | HR5120 | 180(120–240) | 0.2(0.1–0.3) |
| | | | HR5130 | 150(120–180) | |
| K | Cast iron | 180–250 | HR6130 | 280(180–320) | 0.2(0.1–0.4) |
| | | | HR5110 | 200(150–250) | |
| | | | HR5120 | 200(150–250) | |

## Square shoulder milling

### CSM188 series

KAPR=88°



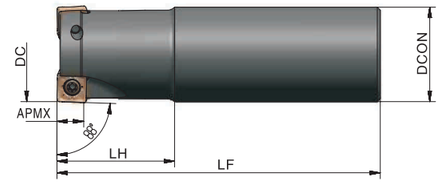

| Tool specification and model | Number of edges | Inventory | Dimension (mm) | | | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCB | DCSF$_{MS}$ | DCX | LF | | | | | |
| CSM188–050A2204–SN10 | 4 | ▲ | 50 | 22 | 47 | 50.7 | 40 | 8 | A | SN□X1005□ | M35100 | HTT10IP |
| CSM188–050A2205–SN10 | 5 | △ | 50 | 22 | 47 | 50.7 | 40 | 8 | | | | |
| CSM188–063A2205–SN10 | 5 | ▲ | 63 | 22 | 47 | 63.7 | 40 | 8 | | | | |
| CSM188–063A2206–SN10 | 6 | △ | 63 | 22 | 47 | 63.7 | 40 | 8 | | | | |
| CSM188–080A2706–SN10 | 6 | ▲ | 80 | 27 | 62 | 80.7 | 50 | 8 | | | | |
| CSM188–080A2708–SN10 | 8 | △ | 80 | 27 | 62 | 80.7 | 50 | 8 | | | | |
| CSM188–100A3206–SN10 | 6 | △ | 100 | 32 | 77 | 100.7 | 50 | 8 | | | | |
| CSM188–100A3208–SN10 | 8 | ▲ | 100 | 32 | 77 | 100.7 | 50 | 8 | | | | |
| CSM188–100A3211–SN10 | 11 | △ | 100 | 32 | 77 | 100.7 | 50 | 8 | | | | |
| CSM188–125B4008–SN10 | 8 | △ | 125 | 40 | 90 | 125.7 | 63 | 8 | B | | | |
| CSM188–125B4010–SN10 | 10 | ▲ | 125 | 40 | 90 | 125.7 | 63 | 8 | | | | |
| CSM188–125B4014–SN10 | 14 | △ | 125 | 40 | 90 | 125.7 | 63 | 8 | | | | |
| CSM188–160C4008–SN10 | 8 | △ | 160 | 40 | 92 | 160.7 | 63 | 8 | C | | | HTA10IP |
| CSM188–160C4012–SN10 | 12 | △ | 160 | 40 | 92 | 160.7 | 63 | 8 | | | | |
| CSM188–160C4014–SN10 | 14 | △ | 160 | 40 | 92 | 160.7 | 63 | 8 | | | | |

▲Standing inventory △Make-to-order

## Square shoulder milling

### SFM188 series

KAPR=88°

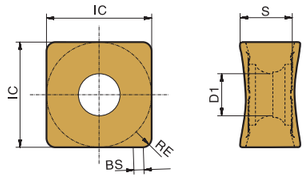



| Tool specification | Number of edges | Inventory | Dmension (mm) | | | | APMX (mm) | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCON | LF | LH | | | | |
| SSM188–032G3202–SN10 | 2 | ▲ | 32 | 32 | 110 | 32.8 | 8 | SN□X1005□ | M35100 | HTT10IP |
| SSM188–032G3203–SN10 | 3 | △ | 32 | 32 | 110 | 32.8 | 8 | | | |
| SSM188–040G3203–SN10 | 3 | △ | 40 | 32 | 110 | 40.8 | 8 | | | |
| SSM188–040G3204–SN10 | 4 | △ | 40 | 32 | 110 | 40.8 | 8 | | | |

▲Standing inventory △Make-to-order

## Applicable inserts

SN □□




Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P | Steel | ● | ⌗ | ● | ● | ◕ | ◕ | ◕⌗ | ◕ | ⌗ | | | | ● |
| | | M | Stainless steel | | | ● | | ◕ | ◕ | ◕⌗ | ◕ | | ⌗ | ● | | |
| | | K | Cast iron | ◕⌗ | ⌗ | ● | ● | ◕ | ◕ | ◕⌗ | | | | | | |
| | | N | Non-ferrous metal | | | | | | | | | | | | ● | |
| | | S | Heat resistant super alloys Titanium alloy | | | | | | | | | | ⌗ | ● | | |

| Type | Dimension (mm) | | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IC | S | D1 | BS | RE | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| SNGX1005ZNN–GM | 10.0 | 5.0 | 4.0 | 1.0 | 0.8 | 8 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |
| SNMX100512–GM | 10.0 | 5.0 | 4.0 | \ | 1.2 | 8 | ★ | | ☆ | ☆ | ★ | ★ | ★ | | | | | | |

★ Recommended grade ☆ Available grade

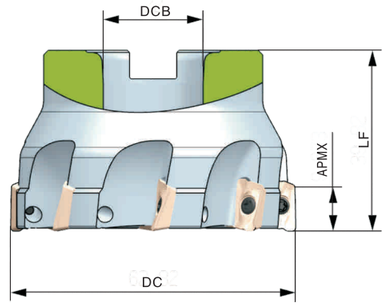
### Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting data | |
|---|---|---|---|---|---|
| | | | | Cutting speed vc (m/min) | Feed rate fz(mm/z) |
| P | Low-carbon steel, mild steel | ≤180 | HR5120 | 270(220–350) | 0.3(0.1–0.5) |
| | | | HR5220 | 240(200–320) | |
| | | | HR5130 | 220(200–320) | |
| | High-carbon steel, alloy steel | 180–280 | HR5110 | 240(200–320) | 0.2(0.1–0.4) |
| | | | HR5120 | 200(160–280) | |
| | | | HR5220 | 200(160–280) | |
| | | | HR5130 | 200(160–260) | |
| | Alloy tool steel | 280–350 | HR5110 | 220(170–340) | 0.15(0.1–0.3) |
| | | | HR5210 | 200(150–280) | |
| | | | HR5120 | 180(150–250) | |
| | | | HR5220 | 180(150–250) | |
| M | Stainless steel | ≤270 | HR5120 | 180(120–240) | 0.2(0.1–0.3) |
| | | | HR5130 | 150(120–180) | |
| K | Cast iron | 180–250 | HR6130 | 280(180–320) | 0.2(0.1–0.4) |
| | | | HR5110 | 200(150–250) | |
| | | | HR5120 | 200(150–250) | |

## Square shoulder milling

### CSM190 series

KAPR=90°



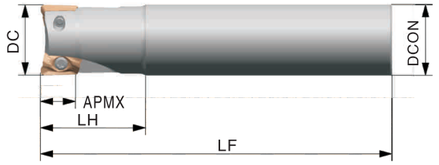

| Tool specification | Number of edges | Inventory | Dimension (mm) | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCB | LF | | | | | |
| CSM190–040A1605–AO11 | 5 | △ | 40 | 16 | 40 | 9.5 | A | AOKT11□□ | M25065 | HFT08IP |
| CSM190–050A2206–AO11 | 6 | ▲ | 50 | 22 | 40 | 9.5 | | | | |
| CSM190–063A2207–AO11 | 7 | ▲ | 63 | 22 | 40 | 9.5 | | | | |
| CSM190–050A2204–AO16 | 4 | △ | 50 | 22 | 40 | 14.5 | | AOKT16□□ | M40100 | HTT15IP |
| CSM190–063A2205–AO16 | 5 | ▲ | 63 | 22 | 40 | 14.5 | | | | |
| CSM190–080A2706–AO16 | 6 | ▲ | 80 | 27 | 50 | 14.5 | | | | |

▲Standing inventory △Make-to-order

## Square shoulder milling

### SSM190 series

KAPR=90°



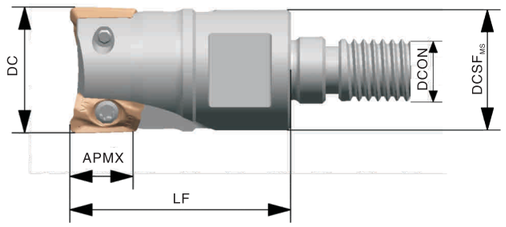

| Tool specification | Number of edges | Inventory | Dimension (mm) | | | | APMX (mm) | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCON | LF | LH | | | | |
| SSM190–016G1602–AO11 | 2 | ▲ | 16 | 16 | 130 | 40 | 9.5 | AOKT11□□ | M25065 | HFT08IP |
| SSM190–016G1602L–AO11 | 2 | △ | 16 | 16 | 160 | 40 | 9.5 | | | |
| SSM190–017G1602–AO11 | 2 | ▲ | 17 | 16 | 130 | 40 | 9.5 | | | |
| SSM190–017G1602L–AO11 | 2 | △ | 17 | 16 | 160 | 40 | 9.5 | | | |
| SSM190–020G2002–AO11 | 2 | ▲ | 20 | 20 | 130 | 40 | 9.5 | | | |
| SSM190–020G2002L–AO11 | | △ | 20 | 20 | 160 | 40 | 9.5 | | | |
| SSM190–021G2002L–AO11 | 2 | △ | 21 | 20 | 160 | 50 | 9.5 | | | |
| SSM190–021G2002–AO11 | 2 | ▲ | 21 | 20 | 130 | 50 | 9.5 | | | |
| SSM190–025G2503–AO11 | 3 | ▲ | 25 | 25 | 120 | 50 | 9.5 | | | |
| SSM190–025G2503L–AO11 | 3 | △ | 25 | 25 | 160 | 50 | 9.5 | | | |
| SSM190–025G2502–AO16 | 2 | ▲ | 25 | 25 | 160 | 50 | 14.5 | AOKT16□□ | M40090 | HTT15IP |
| SSM190–025G2502L–AO16 | 2 | △ | 25 | 25 | 200 | 50 | 14.5 | | | |
| SSM190–026G2502–AO16 | 2 | ▲ | 26 | 25 | 160 | 50 | 14.5 | | | |
| SSM190–026G2502L–AO16 | 2 | △ | 26 | 25 | 200 | 50 | 14.5 | | | |
| SSM190–032G3202–AO16 | 2 | ▲ | 32 | 32 | 160 | 80 | 14.5 | | | |
| SSM190–032G3202L–AO16 | 2 | △ | 32 | 32 | 200 | 80 | 14.5 | | | |

▲Standing inventory △Make-to-order

## Square shoulder milling

### KH- series

KAPR=90°



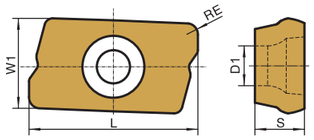

| Tool specification | Number of edges | Inventory | Dmension (mm) | | | | APMX (mm) | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | $DCSF_{MS}$ | LF | DCON | | | | |
| KH–1102–AOKT06–M05 | 2 | △ | 11 | 9 | 18 | 5 | 4.5 | AOKT06□□ | M18036 | HFT05IP |
| KH–1303–AOKT06–M06 | 3 | △ | 13 | 11 | 18 | 6 | 4.5 | | | |
| KH–1503–AOKT06–M08 | 3 | △ | 15 | 14 | 22 | 8 | 4.5 | | | |
| KH–1704–AOKT06–M08 | 4 | △ | 17 | 14 | 22 | 8 | 4.5 | | | |
| KH–1702–AOKT11–M08 | 2 | △ | 17 | 14 | 25 | 8 | 9.5 | AOKT11□□ | M25065 | HFT08IP |
| KH–2102–AOKT11–M10 | 2 | △ | 21 | 18 | 30 | 10 | 9.5 | | | |
| KH–2603–AOKT11–M12 | 3 | △ | 26 | 23 | 35 | 12 | 9.5 | | | |
| KH–3304–AOKT11–M16 | 4 | △ | 33 | 29 | 40 | 16 | 9.5 | | | |

▲Standing inventory △Make-to-order

HUAREAL

# Applicable inserts

## AO□□




Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | |
|---|---|---|---|
| | P | Steel | ● ⌗ ● ● ◕ ◕ ⌗ ◕ ⌗ ● |
| | M | Stainless steel | ● ● ◕ ◕ ⌗ ◕ ◕ ◕ |
| | K | Cast iron | ● ⌗ ● ● ◕ ◕ ⌗ |
| | N | Non-ferrous metal | ◕ |
| | S | Heat resistant super alloys Titanium alloy | ◕ ◕ |

| Type | Dimension (mm) | | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | W1 | S | D1 | RE | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| AOKT060202PEER-VM | 7.61 | 4.20 | 2.38 | 2.10 | 0.20 | 4.5 | | | | | ★ | ★ | ★ | ☆ | | | | | ☆ |
| AOKT060204PEER-VM | 7.61 | 4.20 | 2.38 | 2.10 | 0.40 | 4.5 | | | | | ★ | ★ | ★ | ☆ | | | | | ☆ |
| AOKT060208PEER-VM | 7.61 | 4.20 | 2.38 | 2.10 | 0.80 | 4.5 | | | | | ★ | ★ | ★ | ☆ | | | | | ☆ |
| AOKT113504PEER-VM | 11.75 | 6.42 | 3.50 | 2.80 | 0.40 | 9.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| AOKT113508PEER-VM | 11.75 | 6.42 | 3.50 | 2.80 | 0.80 | 9.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| AOKT113512PEER-VM | 11.75 | 6.42 | 3.50 | 2.80 | 1.20 | 9.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| AOKT113516PEER-VM | 11.75 | 6.42 | 3.50 | 2.80 | 1.60 | 9.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| AOKT1135120PEER-VM | 11.75 | 6.42 | 3.50 | 2.80 | 2.00 | 9.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| AOKT113532PEER-VM | 11.75 | 6.42 | 3.50 | 2.80 | 3.20 | 9.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| AOKT160408PEER-VM | 17.65 | 9.64 | 4.76 | 4.40 | 0.80 | 14.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| AOKT160412PEER-VM | 17.65 | 9.64 | 4.76 | 4.40 | 1.20 | 14.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| AOKT160416PEER-VM | 17.65 | 9.64 | 4.76 | 4.40 | 1.60 | 14.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |

▲Standing inventory △Make-to-order

## Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting data | |
|---|---|---|---|---|---|
| | | | | Cutting speed vc (m/min) | Feed rate fz(mm/z) |
| P | Low-carbon steel, mild steel | ≤180HB | HR5120 | 280(220–340) | 0.2(0.1–0.3) |
| | | | HR5130 | 180(120–250) | |
| | | | HR530 | 180(120–250) | |
| | High-carbon steel, alloy steel | 180–280HB | HR5110 | 240(180–300) | 0.2(0.1–0.3) |
| | | | HR5120 | 200(140–260) | |
| | | | HR5220 | 200(140–260) | |
| | | | HR5130 | 160(100–220) | |
| | Alloy tool steel | 280–350HB | HR5110 | 220(140–280) | 0.15(0.1–0.25) |
| | | | HR5210 | 160(100–220) | |
| | | | HR5120 | 160(100–220) | |
| | | | HR5220 | 120(80–180) | |
| M | Stainless steel | ≤270HB | HR5120 | 180(100–260) | 0.2(0.1–0.3) |
| | | | HR5130 | 140(80–200) | |
| | | | HR530 | 140(80–200) | |
| K | Cast iron | 180–250HB | HR6130 | 250(150–320) | 0.2(0.1–0.3) |
| | | | HR5210 | 180(150–250) | |
| | | | HR5220 | 180(150–250) | |
| H | Hardened material | 45–55HRC | HR5220 | 150(100–250) | 0.2(0.1–0.3) |
| | | ≥55HRC | HR5210 | 120(80–200) | |

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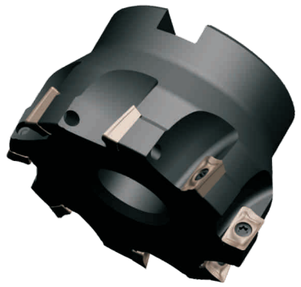
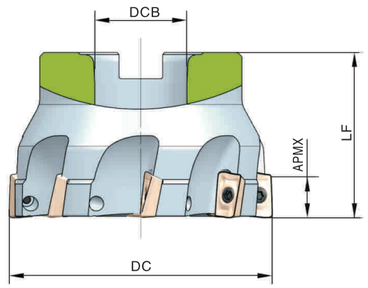
## Square shoulder milling

### CSM290 series

KAPR=90°





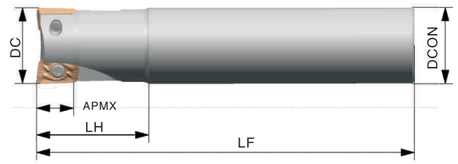

| Tool specification | Number of edges | Inventory | Dimension (mm) | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCB | LF | | | | | |
| CSM290–050A2206–AP11 | 6 | △ | 50 | 22 | 40 | 9.5 | A | APKT11 | M25065 | HAT08IP HFT08IP |
| CSM290–063A2207–AP11 | 7 | ▲ | 63 | 22 | 40 | 9.5 | | | | |
| CSM290–080A2708–AP11 | 8 | △ | 80 | 27 | 50 | 9.5 | | | | |
| CSM290–100B3210–AP11 | 10 | △ | 100 | 32 | 50 | 9.5 | B | | | |
| CSM290–050A2204–AP16 | 4 | △ | 50 | 22 | 40 | 14.5 | A | APKT16 | M40100 | HTT15IP |
| CSM290–063A2205–AP16 | 5 | ▲ | 63 | 22 | 40 | 14.5 | | | | |
| CSM290–080A2706–AP16 | 6 | ▲ | 80 | 27 | 50 | 14.5 | | | | |
| CSM290–100B3208–AP16 | 8 | △ | 100 | 32 | 50 | 14.5 | B | | | |
| CSM290–125B4010–AP16 | 10 | △ | 125 | 40 | 63 | 14.5 | | | | |

▲Standing inventory △Make-to-order

## Square shoulder milling

### SSM290 series

KAPR=90°



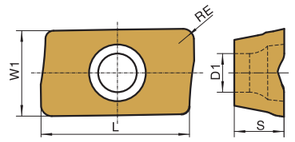

M2.5x6.5 HAT08IP

| Tool specification | Number of edges | Inventory | Dmension (mm) | | | | APMX (mm) | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCON | LF | LH | | | | |
| SSM290–016G1602–AP11 | 2 | ▲ | 16 | 16 | 130 | 40 | 9.5 | APKT11 | M25065 | HFT08IP |
| SSM290–016G1602L–AP11 | 2 | △ | 16 | 16 | 160 | 50 | 9.5 | | | |
| SSM290–020G2002–AP11 | 2 | ▲ | 20 | 20 | 130 | 40 | 9.5 | | | |
| SSM290–020G2002L–AP11 | 2 | △ | 20 | 20 | 160 | 50 | 9.5 | | | |
| SSM290–025G2503–AP11 | 3 | ▲ | 25 | 25 | 130 | 40 | 9.5 | | | |
| SSM290–025G2503L–AP11 | 3 | △ | 25 | 25 | 160 | 50 | 9.5 | | | |
| SSM290–032G3204–AP11 | 4 | △ | 32 | 32 | 130 | 40 | 9.5 | | | |
| SSM290–032G3204L–AP11 | 4 | △ | 32 | 32 | 160 | 50 | 9.5 | | | |
| SSM290–025G2502–AP16 | 2 | ▲ | 25 | 25 | 160 | 50 | 14.5 | APKT16 | M40090 | HTT15IP |
| SSM290–025G2502L–AP16 | 2 | △ | 25 | 25 | 200 | 75 | 14.5 | | | |
| SSM290–032G3202–AP16 | 2 | △ | 32 | 32 | 160 | 50 | 14.5 | | | |
| SSM290–032G3202L–AP16 | 2 | △ | 32 | 32 | 200 | 80 | 14.5 | | | |
| SSM290–040G3204–AP16 | 4 | △ | 40 | 32 | 160 | 50 | 14.5 | | | |
| SSM290–040G3204L–AP16 | 4 | △ | 40 | 32 | 200 | 80 | 14.5 | | | |

▲Standing inventory △Make-to-order

# Applicable inserts

## AP□□




Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P | Steel | ● | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | | | | ● |
| | M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ◕ | ◕ | | |
| | K | Cast iron | ● | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | |
| | N | Non-ferrous metal | | | | | | | | | | | | ◕ | |
| | S | Heat resistant super alloys Titanium alloy | | | | | | | | | | ◕ | ◕ | | |

| Type | Dimension (mm) | | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | W1 | S | D1 | RE | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| APKT113604PEER–FM | 11.30 | 6.25 | 3.60 | 2.80 | 0.40 | 9.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| APKT1136PEER–FM | 11.30 | 6.25 | 3.60 | 2.80 | 0.80 | 9.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| APKT113612PEER–FM | 11.30 | 6.25 | 3.60 | 2.80 | 1.20 | 9.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| APKT113620PEER–FM | 11.30 | 6.25 | 3.60 | 2.80 | 2.00 | 9.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| APKT1605PDER–FM | 17.42 | 9.33 | 5.20 | 4.50 | 0.80 | 14.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| APKT160512PDER–FM | 17.42 | 9.33 | 5.20 | 4.50 | 1.20 | 14.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| APKT160520PDER–FM | 17.42 | 9.33 | 5.20 | 4.50 | 2.00 | 14.5 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |

★ Recommended grade ☆ Available grade

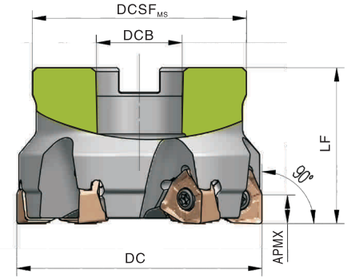
### Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting data | |
|---|---|---|---|---|---|
| | | | | Cutting speed vc (m/min) | Feed rate fz(mm/z) |
| P | Low-carbon steel, mild steel | ≤180HB | HR5120 | 280(220–340) | 0.2(0.1–0.3) |
| | | | HR5130 | 180(120–250) | |
| | | | HR530 | 180(120–250) | |
| | High-carbon steel, alloy steel | 180–280HB | HR5110 | 240(180–300) | 0.2(0.1–0.3) |
| | | | HR5120 | 200(140–260) | |
| | | | HR5220 | 200(140–260) | |
| | | | HR5130 | 160(100–220) | |
| | Alloy tool steel | 280–350HB | HR5110 | 220(140–280) | 0.15(0.1–0.25) |
| | | | HR5210 | 160(100–220) | |
| | | | HR5120 | 160(100–220) | |
| | | | HR5220 | 120(80–180) | |
| M | Stainless steel | ≤270HB | HR5120 | 180(100–260) | 0.2(0.1–0.3) |
| | | | HR5130 | 140(80–200) | |
| | | | HR530 | 140(80–200) | |
| K | Cast iron | 180–250HB | HR6130 | 250(150–320) | 0.2(0.1–0.3) |
| | | | HR5210 | 180(150–250) | |
| | | | HR5220 | 180(150–250) | |
| H | Hardened material | 45–55HRC | HR5220 | 150(100–250) | 0.2(0.1–0.3) |
| | | ≥55HRC | HR5210 | 120(80–200) | |

# Square shoulder milling

## CSM390 series

**KAPR=90°**




| Tool specification | Number of edges | Inventory | Dimension (mm) | | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCB | DCSF$_{MS}$ | LF | | | | | |
| CSM390–040A1605–ZN04 | 5 | △ | 40 | 16 | 35 | 40 | 4.2 | A | ZNMU0403□□ | M25065 | HAT08IP |
| CSM390–040A1607–ZN04 | 7 | △ | 40 | 16 | 35 | 40 | 4.2 | | | | |
| CSM390–050A2206–ZN04 | 6 | △ | 50 | 22 | 47 | 40 | 4.2 | | | | |
| CSM390–050A2208–ZN04 | 8 | △ | 50 | 22 | 47 | 40 | 4.2 | | | | |
| CSM390–063A2207–ZN04 | 7 | △ | 63 | 22 | 47 | 40 | 4.2 | | | | |
| CSM390–063A2210–ZN04 | 10 | △ | 63 | 22 | 47 | 40 | 4.2 | | | | |
| CSM390–050A2204–ZN08 | 4 | ▲ | 50 | 22 | 47 | 40 | 7.3 | | ZNMU0806□□ | M40110 | HTT15IP |
| CSM390–050A2205–ZN08 | 5 | △ | 50 | 22 | 47 | 40 | 7.3 | | | | |
| CSM390–063A2205–ZN08 | 5 | ▲ | 63 | 22 | 47 | 40 | 7.3 | | | | |
| CSM390–063A2206–ZN08 | 6 | △ | 63 | 22 | 47 | 40 | 7.3 | | | | |
| CSM390–080A2706–ZN08 | 6 | ▲ | 80 | 27 | 62 | 50 | 7.3 | | | | |
| CSM390–080A2707–ZN08 | 7 | △ | 80 | 27 | 62 | 50 | 7.3 | | | | |
| CSM390–080A2709–ZN08 | 9 | △ | 80 | 27 | 62 | 50 | 7.3 | | | | |
| CSM390–100A3207–ZN08 | 7 | ▲ | 100 | 32 | 77 | 50 | 7.3 | | | | |
| CSM390–100A3208–ZN08 | 8 | △ | 100 | 32 | 77 | 50 | 7.3 | | | | |
| CSM390–100A3211–ZN08 | 11 | △ | 100 | 32 | 77 | 50 | 7.3 | | | | |
| CSM390–125B4008–ZN08 | 8 | ▲ | 125 | 40 | 90 | 63 | 7.3 | B | | | |
| CSM390–125B4011–ZN08 | 11 | ▲ | 125 | 40 | 90 | 63 | 7.3 | | | | |
| CSM390–125B4014–ZN08 | 14 | △ | 125 | 40 | 90 | 63 | 7.3 | | | | |
| CSM390–160C4010–ZN08 | 10 | △ | 160 | 40 | 92 | 63 | 7.3 | C | | | HAT15IP |
| CSM390–160C4012–ZN08 | 12 | ▲ | 160 | 40 | 92 | 63 | 7.3 | | | | |
| CSM390–160C4016–ZN08 | 16 | △ | 160 | 40 | 92 | 63 | 7.3 | | | | |
| CSM390–200C6012–ZN08 | 12 | △ | 200 | 60 | 175 | 63 | 7.3 | | | | |
| CSM390–200C6016–ZN08 | 16 | △ | 200 | 60 | 175 | 63 | 7.3 | | | | |
| CSM390–250C6014–ZN08 | 14 | △ | 250 | 60 | 210 | 63 | 7.3 | | | | |
| CSM390–250C6018–ZN08 | 18 | △ | 250 | 60 | 210 | 63 | 7.3 | | | | |

▲Standing inventory △Make-to-order

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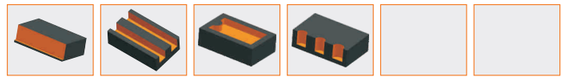
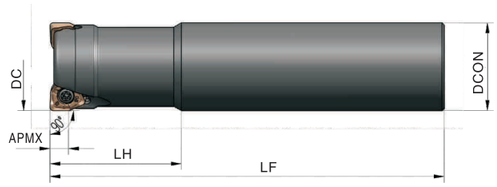
## Square shoulder milling

### SSM390series



**KAPR=90°**



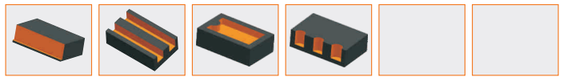

| Tool specification | Number of edges | Inventory | Dmension (mm) | | | | APMX (mm) | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCON | LF | LH | | | | |
| SSM390–018G1602L–ZN04 | 2 | △ | 18 | 16 | 150 | 30 | 4.2 | ZNMU0403□□ | M25065 | HFT08IP |
| SSM390–020G2002L–ZN04 | 2 | ▲ | 20 | 20 | 150 | 30 | 4.2 | | | |
| SSM390–020G2003L–ZN04 | 3 | △ | 20 | 20 | 150 | 30 | 4.2 | | | |
| SSM390–021G2002L–ZN04 | 2 | ▲ | 21 | 20 | 150 | 30 | 4.2 | | | |
| SSM390–021G2003L–ZN04 | 3 | △ | 21 | 20 | 150 | 30 | 4.2 | | | |
| SSM390–025G2502L–ZN04 | 2 | ▲ | 25 | 25 | 170 | 30 | 4.2 | | | |
| SSM390–025G2503L–ZN04 | 3 | ▲ | 25 | 25 | 170 | 30 | 4.2 | | | |
| SSM390–025G2504L–ZN04 | 4 | △ | 25 | 25 | 170 | 30 | 4.2 | | | |
| SSM390–025G2505L–ZN04 | 5 | △ | 25 | 25 | 170 | 30 | 4.2 | | | |
| SSM390–026G2502L–ZN04 | 2 | ▲ | 26 | 25 | 170 | 30 | 4.2 | | | |
| SSM390–026G2503L–ZN04 | 3 | △ | 26 | 25 | 170 | 30 | 4.2 | | | |
| SSM390–032G3202L–ZN04 | 2 | ▲ | 32 | 32 | 200 | 30 | 4.2 | | | |
| SSM390–032G3203L–ZN04 | 3 | ▲ | 32 | 32 | 200 | 30 | 4.2 | | | |
| SSM390–032G3204L–ZN04 | 4 | △ | 32 | 32 | 200 | 30 | 4.2 | | | |
| SSM390–032G3205L–ZN04 | 5 | △ | 32 | 32 | 200 | 30 | 4.2 | | | |
| SSM390–032G3206L–ZN04 | 6 | △ | 32 | 32 | 200 | 30 | 4.2 | | | |
| SSM390–035G3202L–ZN04 | 2 | ▲ | 35 | 32 | 200 | 30 | 4.2 | | | |
| SSM390–035G3203L–ZN04 | 3 | ▲ | 35 | 32 | 200 | 30 | 4.2 | | | |
| SSM390–035G3204L–ZN04 | 4 | △ | 35 | 32 | 200 | 30 | 4.2 | | | |
| SSM390–040G3204L–ZN04 | 4 | △ | 40 | 32 | 200 | 30 | 4.2 | | | |
| SSM390–040G3205L–ZN04 | 5 | △ | 40 | 32 | 200 | 30 | 4.2 | | | |
| SSM390–040G3206L–ZN04 | 6 | △ | 40 | 32 | 200 | 30 | 4.2 | | | |

▲Standing inventory △Make-to-order

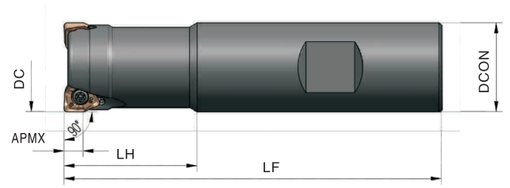


## Square shoulder milling

### SSM390series



**KAPR=90°**

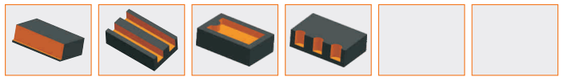



| Tool specification | Number of edges | Inventory | Dimension (mm) | | | | APMX (mm) | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCON | LF | LH | | | | |
| SSM390–020X2002–ZN04 | 2 | △ | 20 | 20 | 90 | 30 | 4.2 | ZNMU0403□□ | M25065 | HFT08IP |
| SSM390–020X2003–ZN04 | 3 | △ | 20 | 20 | 90 | 30 | 4.2 | | | |
| SSM390–025X2502–ZN04 | 2 | ▲ | 25 | 25 | 100 | 30 | 4.2 | | | |
| SSM390–025X2503–ZN04 | 3 | ▲ | 25 | 25 | 100 | 30 | 4.2 | | | |
| SSM390–025X2504–ZN04 | 4 | △ | 25 | 25 | 100 | 30 | 4.2 | | | |
| SSM390–025X2505–ZN04 | 5 | △ | 25 | 25 | 100 | 30 | 4.2 | | | |
| SSM390–032X3202–ZN04 | 2 | ▲ | 32 | 32 | 110 | 30 | 4.2 | | | |
| SSM390–032X3203–ZN04 | 3 | ▲ | 32 | 32 | 110 | 30 | 4.2 | | | |
| SSM390–032X3204–ZN04 | 4 | △ | 32 | 32 | 110 | 30 | 4.2 | | | |
| SSM390–032X3205–ZN04 | 5 | △ | 32 | 32 | 110 | 30 | 4.2 | | | |
| SSM390–032X3206–ZN04 | 6 | △ | 32 | 32 | 110 | 30 | 4.2 | | | |

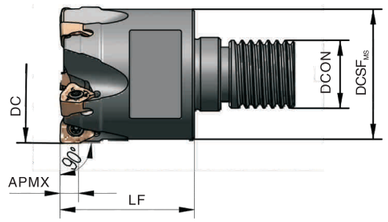
▲Standing inventory △Make-to-order

# Square shoulder milling

## KH-series



**KAPR=90°**

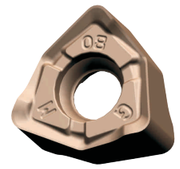


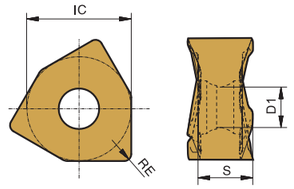

| Tool specification | Number of edges | Inventory | Dmension (mm) | | | | APMX (mm) | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCSFMS | LF | DCON | | | | |
| KH–2002–ZN04–M10 | 2 | △ | 20 | 18 | 30 | 10 | 4.2 | ZNMU0403□□ | M25065 | HFT08IP |
| KH–2003–ZN04–M10 | 3 | △ | 20 | 18 | 30 | 10 | 4.2 | | | |
| KH–2502–ZN04–M12 | 2 | △ | 25 | 23 | 30 | 12 | 4.2 | | | |
| KH–2503–ZN04–M12 | 3 | △ | 25 | 23 | 30 | 12 | 4.2 | | | |
| KH–2504–ZN04–M12 | 4 | △ | 25 | 23 | 30 | 12 | 4.2 | | | |
| KH–2505–ZN04–M12 | 5 | △ | 25 | 23 | 30 | 12 | 4.2 | | | |
| KH–3202–ZN04–M16 | 2 | △ | 32 | 30 | 40 | 16 | 4.2 | | | |
| KH–3203–ZN04–M16 | 3 | △ | 32 | 30 | 40 | 16 | 4.2 | | | |
| KH–3204–ZN04–M16 | 4 | △ | 32 | 30 | 40 | 16 | 4.2 | | | |
| KH–3205–ZN04–M16 | 5 | △ | 32 | 30 | 40 | 16 | 4.2 | | | |
| KH–3206–ZN04–M16 | 6 | △ | 32 | 30 | 40 | 16 | 4.2 | | | |

▲Standing inventory △Make-to-order

# Applicable inserts

## ZN□□






Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P | Steel | ● | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | | | ● |
| | M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ◕ | ◕ | |
| | K | Cast iron | ● | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | |
| | N | Non-ferrous metal | | | | | | | | | | | ◕ | |
| | S | Heat resistant super alloys Titanium alloy | | | | | | | | | ◕ | ◕ | | |

| Type | Dimension (mm) | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IC | S | D1 | RE | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| ZNMU040308PNR–GM | 7.00 | 3.65 | 2.80 | 0.80 | 4.2 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| ZNMU080608PNR–GM | 12.00 | 6.35 | 4.60 | 0.80 | 7.3 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| ZNMU080608PNR–GL | 12.00 | 6.35 | 4.60 | 0.80 | 7.3 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| ZNMU080608PNR–GR | 12.00 | 6.35 | 4.60 | 0.80 | 7.3 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |
| ZNMU080616PNR–GR | 12.00 | 6.35 | 4.60 | 1.60 | 7.3 | ★ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | ☆ |

★ Recommended grade ☆ Available grade

### Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting data | |
|---|---|---|---|---|---|
| | | | | Cutting speed vc (m/min) | Feed rate fz(mm/z) |
| P | Low-carbon steel, mild steel | ≤180HB | HR5120 | 280(220–340) | 0.2(0.1–0.3) |
| | | | HR5130 | 180(120–250) | |
| | | | HR530 | 180(120–250) | |
| | High-carbon steel, alloy steel | 180–280HB | HR5110 | 240(180–300) | 0.2(0.1–0.3) |
| | | | HR5120 | 200(140–260) | |
| | | | HR5220 | 200(140–260) | |
| | | | HR5130 | 160(100–220) | |
| | Alloy tool steel | 280–350HB | HR5110 | 220(140–280) | 0.15(0.1–0.25) |
| | | | HR5210 | 160(100–220) | |
| | | | HR5120 | 160(100–220) | |
| | | | HR5220 | 120(80–180) | |
| M | Stainless steel | ≤270HB | HR5120 | 180(100–260) | 0.2(0.1–0.3) |
| | | | HR5130 | 140(80–200) | |
| | | | HR530 | 140(80–200) | |
| K | Cast iron | 180–250HB | HR6130 | 250(150–320) | 0.2(0.1–0.3) |
| | | | HR5210 | 180(150–250) | |
| | | | HR5220 | 180(150–250) | |
| H | Hardened material | 45–55HRC | HR5220 | 150(100–250) | 0.2(0.1–0.3) |
| | | ≥55HRC | HR5210 | 120(80–200) | |

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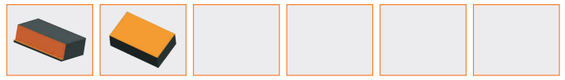
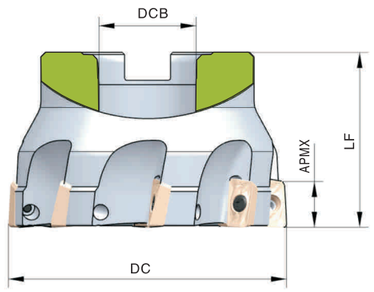
## Square shoulder milling

### CSM590series



**KAPR=90°**



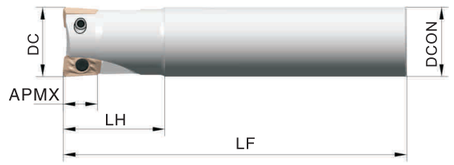

| Tool specification | Number of edges | Inventory | Dmension (mm) | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCB | LF | | | | | |
| CSM590–050A2206–AP11 | 6 | △ | 50 | 22 | 40 | 9.5 | A | APMT11□□<br>APGT11□□ | M25065 | HAT08IP |
| CSM590–063A2208–AP11 | 8 | △ | 63 | 22 | 40 | 9.5 | | | | |
| CSM590–080A2708–AP11 | 8 | ▲ | 80 | 27 | 50 | 9.5 | | | | |
| CSM590–100B3210–AP11 | 10 | △ | 100 | 32 | 50 | 9.5 | | | | |
| CSM590–050A2205–AP16 | 5 | △ | 50 | 22 | 40 | 14.5 | B | APMT16□□<br>APGT16□□ | M40100 | HTT15IP |
| CSM590–063A2206–AP16 | 6 | △ | 63 | 22 | 40 | 14.5 | | | | |
| CSM590–080A2707–AP16 | 7 | △ | 80 | 27 | 50 | 14.5 | | | | |
| CSM590–100B3208–AP16 | 8 | △ | 100 | 32 | 50 | 14.5 | | | | |
| CSM590–125B4010–AP16 | 10 | △ | 125 | 40 | 63 | 14.5 | | | | |

▲Standing inventory △Make-to-order

## Square shoulder milling

### SSM590series

**KAPR=90°**




| Tool specification | Number of edges | Inventory | Dimension (mm) | | | | APMX (mm) | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DCON | LF | LH | | | | |
| SSM590–016G1602–AP11 | 2 | △ | 16 | 16 | 130 | 40 | 9.5 | APMT11□□<br>APGT11□□ | M25065 | HFT08IP |
| SSM590–016G1602L–AP11 | 2 | △ | 16 | 16 | 160 | 50 | 9.5 | | | |
| SSM590–020G2002–AP11 | 2 | △ | 20 | 20 | 130 | 40 | 9.5 | | | |
| SSM590–020G2002L–AP11 | 2 | △ | 20 | 20 | 160 | 50 | 9.5 | | | |
| SSM590–025G2503–AP11 | 3 | ▲ | 25 | 25 | 130 | 40 | 9.5 | | | |
| SSM590–025G2503L–AP11 | 3 | △ | 25 | 25 | 160 | 50 | 9.5 | | | |
| SSM590–032G3204–AP11 | 4 | △ | 32 | 32 | 130 | 40 | 9.5 | | | |
| SSM590–032G3204L–AP11 | 4 | △ | 32 | 32 | 160 | 50 | 9.5 | | | |
| SSM590–025G2502–AP16 | 2 | ▲ | 25 | 25 | 160 | 50 | 15 | APMT16□□<br>APGT16□□ | M40090 | HFT15IP |
| SSM590–025G2502L–AP16 | 2 | △ | 25 | 25 | 200 | 75 | 15 | | | |
| SSM590–032G3202–AP16 | 2 | △ | 32 | 32 | 160 | 50 | 15 | | | |
| SSM590–032G3202L–AP16 | 2 | △ | 32 | 32 | 200 | 80 | 15 | | | |
| SSM590–040G3204–AP16 | 4 | △ | 40 | 32 | 160 | 50 | 15 | | | |
| SSM590–040G3204L–AP16 | 4 | △ | 40 | 32 | 200 | 80 | 15 | | | |

▲Standing inventory △Make-to-order

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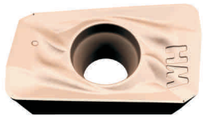
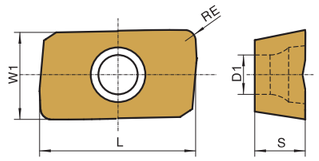
# Applicable inserts

## AP□□






Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | |
| | | M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | |
| | | K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | |
| | | N | Non-ferrous metal | | | | | | | | | | | | ◕ | |
| | | S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | |

| Type | Dmension (mm) | | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | W1 | S | D1 | RE | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| APMT1135PDER-HM | 11.30 | 6.25 | 3.50 | 2.80 | 0.80 | 9.5 | ★ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |
| APMT1605PDER-HM | 17.25 | 9.25 | 5.22 | 4.40 | 0.80 | 14.5 | ★ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |
| APGT1135PDFR-AK | 11.30 | 6.25 | 3.50 | 2.80 | 0.80 | 9.5 | | | | | | | | | | | | ☆ | |
| APGT1604PDFR-AK | 17.25 | 9.25 | 4.76 | 4.40 | 0.80 | 14.5 | | | | | | | | | | | | ☆ | |

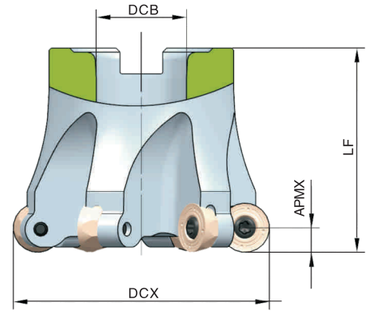
★ Recommended grade ☆ Available grade

### Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting data | |
|---|---|---|---|---|---|
| | | | | Cutting speed vc (m/min) | Feed rate fz(mm/z) |
| P | Low-carbon steel, mild steel | ≤180HB | HR5120 | 280(220–340) | 0.2(0.1–0.3) |
| | | | HR5130 | 180(120–250) | |
| | | | HR530 | 180(120–250) | |
| | High-carbon steel, alloy steel | 180–280HB | HR5110 | 240(180–300) | 0.2(0.1–0.3) |
| | | | HR5120 | 200(140–260) | |
| | | | HR5220 | 200(140–260) | |
| | | | HR5130 | 160(100–220) | |
| | Alloy tool steel | 280–350HB | HR5110 | 220(140–280) | 0.15(0.1–0.25) |
| | | | HR5210 | 160(100–220) | |
| | | | HR5120 | 160(100–220) | |
| | | | HR5220 | 120(80–180) | |
| M | Stainless steel | ≤270HB | HR5120 | 180(100–260) | 0.2(0.1–0.3) |
| | | | HR5130 | 140(80–200) | |
| | | | HR530 | 140(80–200) | |
| K | Cast iron | 180–250HB | HR6130 | 250(150–320) | 0.2(0.1–0.3) |
| | | | HR5210 | 180(150–250) | |
| | | | HR5220 | 180(150–250) | |
| H | Hardened material | 45–55HRC | HR5220 | 150(100–250) | 0.2(0.1–0.3) |
| | | ≥55HRC | HR5210 | 120(80–200) | |

# Profile milling

## CPM100 series




| Tool specification | Number of edges | Inventory | Dimension (mm) | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DCX | DCB | LF | | | | | |
| CPM100-063A2204-RC12 | 4 | △ | 63 | 22 | 40 | 6 | A | RC□□12 | M40100 | HTT15IP |
| CPM100-080B2705-RC16 | 5 | ▲ | 80 | 27 | 50 | 8 | B | RC□□16 | M50130 | HTT20IP |
| CPM100-100B3206-RC16 | 6 | △ | 100 | 32 | 50 | 8 | | | | |
| CPM100-125B4007-RC20 | 7 | △ | 125 | 40 | 63 | 10 | | RC□□20 | M60160 | HTT15IP HTT20IP |
| CPM100-160B4008-RC20 | 8 | △ | 160 | 40 | 63 | 10 | | | | |

▲Standing inventory △Make-to-order

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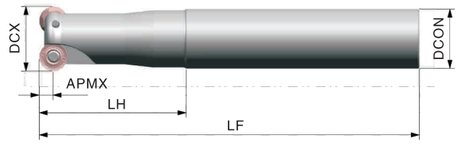
## Profile milling

### SPM100 series

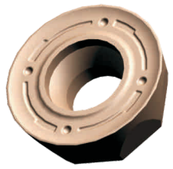


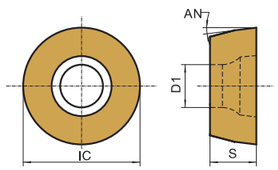

| Tool specification | Number of edges | Inventory | Dimension (mm) | | | | APMX (mm) | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DCX | DCON | LF | LH | | | | |
| SPM100–025G2502–RC10 | 2 | ▲ | 25 | 25 | 100 | 30 | 5 | RC□□10 | M40090 | HTT15IP |
| SPM100–032G3203–RC10 | 3 | ▲ | 32 | 32 | 120 | 35 | 5 | | | |
| SPM100–040G4003–RC12 | 3 | △ | 40 | 40 | 120 | 40 | 6 | RC□□12 | M40090 | HTT15IP |

▲Standing inventory △Make-to-order

## Applicable insert

RC□□






Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | |
| | | M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | |
| | | K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | |
| | | N | Non-ferrous metal | | | | | | | | | | | ◕ | |
| | | S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | |

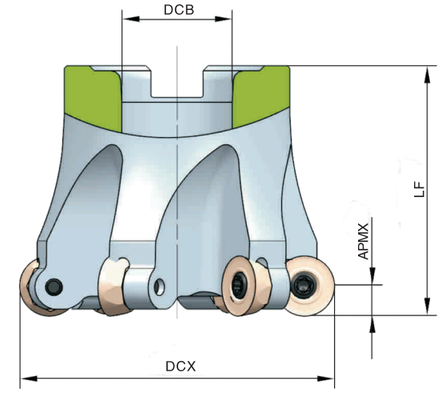
| Type | Dimension (mm) | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IC | S | D1 | AN | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| RCKT10T3MO–FM | 10.00 | 3.97 | 4.40 | 7° | 5 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |
| RCKT1204MO–FM | 12.00 | 4.76 | 4.40 | 7° | 6 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |
| RCKT1606MO–FM | 16.00 | 6.35 | 5.50 | 7° | 8 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |
| RCKT2006MO–FM | 20.00 | 6.35 | 6.55 | 7° | 10 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |

★ Recommended grade ☆ Available grade



## Profile milling

### CPM200 series




| Tool specification | Number of edges | Inventory | Dimension (mm) | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DCX | DCB | LF | | | | | |
| CPM200–050A2204–RP12 | 4 | △ | 50 | 22 | 40 | 6 | A | RP□□12 | M40100 | HTT15IP |
| CPM200–063A2205–RP12 | 5 | ▲ | 63 | 22 | 40 | 6 | | | | |
| CPM200–080B2706–RP12 | 6 | ▲ | 80 | 27 | 50 | 6 | B | | | |
| CPM200–063A2204–RP16 | 4 | ▲ | 63 | 22 | 40 | 8 | A | RP□□16 | M50130 | HTT20IP |
| CPM200–080B2705–RP16 | 5 | ▲ | 80 | 27 | 50 | 8 | B | | | |
| CPM200–100B3206–RP16 | 6 | △ | 100 | 32 | 50 | 8 | | | | |
| CPM200–125B4007–RP16 | 7 | △ | 125 | 40 | 63 | 8 | | | | |

▲Standing inventory △Make-to-order

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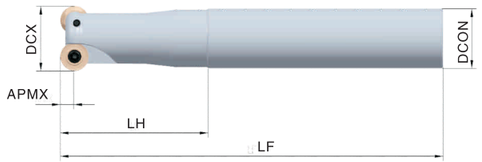
# Profile milling

## SPM200 series

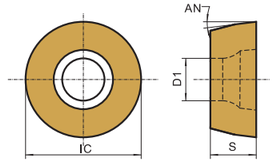



| Tool specification | Number of edges | Inventory | Dimension (mm) | | | | APMX (mm) | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DCX | DCON | LF | LH | | | | |
| SPM200–025G2503–RP08 | 3 | ▲ | 25 | 25 | 100 | 30 | 4 | RP□□08 | M30075 | HFT09IP |
| SPM200–032G3204–RP08 | 4 | ▲ | 32 | 32 | 120 | 35 | 4 | | | |
| SPM200–025G2502–RP10 | 2 | ▲ | 25 | 25 | 100 | 30 | 5 | RP□□10(SM) | M40090 | HTT15IP |
| SPM200–032G3203–RP10 | 3 | ▲ | 32 | 32 | 120 | 35 | 5 | RP□□10(MS) | M40090 | HTT15IP |
| SPM200–040G3203–RP12 | 3 | △ | 40 | 32 | 120 | 40 | 6 | RP□□12 | M40090 | HTT20IP |

▲Standing inventory △Make-to-order

# Applicable inserts

## RP□□




Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | |
| | M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | |
| | K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | |
| | N | Non-ferrous metal | | | | | | | | | | | ◕ | |
| | S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | |

| Type | Dimension (mm) | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IC | S | D1 | AN | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| RPMT08T2MO–HM | 8.00 | 2.78 | 3.40 | 11° | 4 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |
| RPMW1003MO | 10.00 | 3.18 | 4.50 | 11° | 5 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |
| RPMT1204MO–HM | 12.00 | 4.76 | 4.40 | 11° | 6 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |

▲Standing inventory △Make-to-order

# Turbine blade milling

Working condition: ● Stable ◕ Average ⌗ Tough

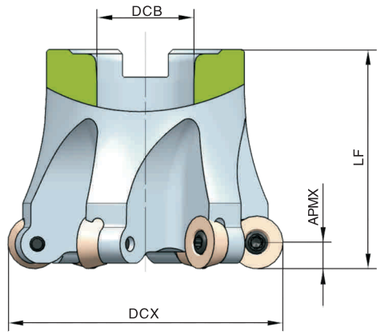
| Applicable inserts | Workpiece material | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | |
| | M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | |
| | K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | |
| | N | Non-ferrous metal | | | | | | | | | | | ◕ | |
| | S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | |

| Type | Dimension (mm) | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IC | S | D1 | AN | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| RPKT10T3MO–MS | 10.00 | 3.97 | 3.40 | 11° | 5 | | | | | | | | | | ★ | ★ | | |
| RPKT1204MO–MS | 12.00 | 4.76 | 4.40 | 11° | 6 | | | | | | | | | | ★ | ★ | | |
| RPKT1606MO–MS | 16.00 | 6.35 | 5.50 | 11° | 8 | | ★ | | | | | | | | ★ | ★ | | |
| RPMT08T2MO–SM | 8.00 | 2.78 | 3.40 | 11° | 4 | | | | | | | | | | ★ | ★ | | |
| RPMT10T3MO–SM | 10.00 | 3.97 | 4.40 | 11° | 5 | | | | | | | | | | ★ | ★ | | |
| RPMT1204MO–SM | 12.00 | 4.76 | 4.40 | 11° | 6 | | | | | | | | | | ★ | ★ | | |
| RPMT1606MO–SM | 16.00 | 6.35 | 5.50 | 11° | 8 | | ★ | | | | | | | | ★ | ★ | | |

▲Standing inventory △Make-to-order

## Profile milling

### CPM300 series




| Tool specification | Number of edges | Inventory | Dimension (mm) | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DCX | DCB | LF | | | | | |
| CPM300–050A2204–RD12 | 4 | △ | 50 | 22 | 40 | 6 | A | RD□□12 | M40100 | HTT15IP |
| CPM300–063A2205–RD12 | 5 | ▲ | 63 | 22 | 40 | 6 | | | | |
| CPM300–080B2705–RD16 | 5 | ▲ | 80 | 27 | 50 | 8 | B | RD□□16 | M50130 | HTT20IP<br>HAT20IP |
| CPM300–100B3206–RD16 | 6 | △ | 100 | 32 | 50 | 8 | | | | |
| CPM300–125B4007–RD16 | 7 | △ | 125 | 40 | 63 | 8 | | | | |
| CPM300–160B4008–RD16 | 8 | △ | 160 | 40 | 63 | 8 | | | | |

▲Standing inventory △Make-to-order

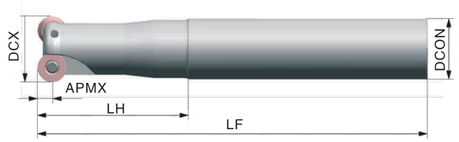




A General turning
Turing of small components
Parting and grooving
Threading
B
Indexable milling
Solid carbide end mill
C
Short hole drill
Solid carbide drill

## Profile milling

### SPM300 series




| Tool specification | Number of edges | Inventory | Dimension (mm) | | | | APMX (mm) | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DCX | DCON | LF | LH | | | | |
| SPM300–020G2003–RD06 | 3 | △ | 20 | 20 | 100 | 30 | 3 | RD□□06 | M22065 | HFT07IP |
| SPM300–020G2002–RD08 | 2 | △ | 20 | 20 | 100 | 30 | 4 | RD□□08 | M30075 | HFT09IP |
| SPM300–025G2502–RD10 | 2 | ▲ | 25 | 25 | 100 | 30 | 5 | RD□□10 | M40084 | HFT15IP |
| SPM300–032G3203–RD10 | 3 | ▲ | 32 | 32 | 120 | 35 | 5 | | | |
| SPM300–040G3203–RD12 | 3 | △ | 40 | 32 | 120 | 40 | 6 | RD□□12 | M40090 | HTT15IP |

▲Standing inventory △Make-to-order

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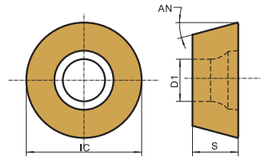
# Applicable inserts

## RD□□




Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | Working condition |
|---|---|---|---|
| | P | Steel | ⌗ ⌗ ● ● ◕ ◕ ⌗ ◕ ⌗ ⌗ ⌗ |
| | M | Stainless steel | ● ● ◕ ◕ ⌗ ◕ ⌗ ⌗ ⌗ |
| | K | Cast iron | ⌗ ⌗ ● ● ◕ ◕ ⌗ |
| | N | Non-ferrous metal | ◕ |
| | S | Heat resistant super alloys Titanium alloy | |

| Type | Dimension (mm) | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IC | S | D1 | AN | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| RDMW0602MO | 6.00 | 2.38 | 2.50 | 15° | 3 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |
| RDMW0802MO | 8.00 | 2.38 | 3.40 | 15° | 4 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |
| RDMW10T3MO | 10.00 | 3.97 | 4.50 | 15° | 5 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |
| RDMW1204MO | 12.00 | 4.76 | 5.50 | 15° | 6 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |
| RDMW1605MO | 16.00 | 5.56 | 5.50 | 15° | 8 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |
| RDKW10T3MO | 10.00 | 3.97 | 4.50 | 15° | 5 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |
| RDKW1204MO | 12.00 | 4.76 | 4.40 | 15° | 6 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |
| RDKW1604MO | 16.00 | 4.76 | 5.50 | 15° | 8 | ☆ | | ☆ | ★ | ★ | ★ | ★ | ☆ | | | | | |

★ Recommended grade ☆ Available grade

## Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting data | Tool specification | | |
|---|---|---|---|---|---|---|---|
| | | | | | Ø20 | Ø25 | Ø32 |
| P | Low-carbon steel, mild steel | ≤180HB | HR5120 HR5220 HR5130 HR530 | $v_c$(m/min) | 100–200 | 100–200 | 100–200 |
| | | | | $f_z$(mm/z) | 0.2–0.3 | 0.25–0.35 | 0.25–0.35 |
| | | | | ap(mm) | 1.25 | 1.5 | 2 |
| | | | | ae(mm) | 1.25 | 1.5 | 2 |
| | High-carbon steel, alloy steel | 180–280HB | HR5110 HR5210 HR5120 HR5220 | $v_c$(m/min) | 80–180 | 80–180 | 80–180 |
| | | | | $f_z$(mm/z) | 0.2–0.3 | 0.25–0.35 | 0.25–0.35 |
| | | | | ap(mm) | 1.25 | 1.5 | 2 |
| | | | | ae(mm) | 1.25 | 1.5 | 2 |
| | Alloy tool steel | 280–350HB | HR5110 HR5210 HR5120 HR5220 | $v_c$(m/min) | 60–150 | 60–150 | 60–150 |
| | | | | $f_z$(mm/z) | 0.2–0.3 | 0.25–0.35 | 0.25–0.35 |
| | | | | ap(mm) | 1.25 | 1.5 | 2 |
| | | | | ae(mm) | 1.25 | 1.5 | 2 |
| M | Stainless steel | ≤180HB | HR5120 HR5130 HR530 | $v_c$(m/min) | 70–150 | 70–150 | 70–150 |
| | | | | $f_z$(mm/z) | 0.1–0.25 | 0.2–0.3 | 0.2–0.3 |
| | | | | ap(mm) | 1 | 1.25 | 1.5 |
| | | | | ae(mm) | 1 | 1.25 | 1.5 |
| K | Cast iron | 180–250HB | HR6130 HR5110 HR5120 HR5220 | $v_c$(m/min) | 160–300 | 160–300 | 160–300 |
| | | | | $f_z$(mm/z) | 0.25–0.35 | 0.3–0.4 | 0.3–0.4 |
| | | | | ap(mm) | 1.8 | 2 | 2.5 |
| | | | | ae(mm) | 1.8 | 2 | 2.5 |
| S | Heat resistant super alloy titanium alloy | ≤400HB | HR7140 HR7240 | $v_c$(m/min) | 40–120 | 40–120 | 40–120 |
| | | | | $f_z$(mm/z) | 0.25–0.35 | 0.3–0.5 | 0.3–0.5 |
| | | | | ap(mm) | 0.3 | 0.5 | 0.8 |
| | | | | ae(mm) | 1 | 1.25 | 1.5 |
| H | Hardened steel | 50–65HRC | HR6130 HR5110 HR5120 HR5220 | $v_c$(m/min) | 80–160 | 80–160 | 80–160 |
| | | | | $f_z$(mm/z) | 0.2–0.5 | 0.3–0.6 | 0.4–0.8 |
| | | | | ap(mm) | 0.2 | 0.3 | 0.5 |
| | | | | ae(mm) | 1 | 1.25 | 1.5 |

## Technical data of application of profile milling tools

◆ Conversion factor for feed rate (based on the benchmark of cutting depth)

| Model | Maximum cutting depth ap | Conversion factor for feed rate ap/(mm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 4.0 | 5.0 |
| R□□08□□ | 4 | 1.7 | 1.3 | 1.1 | 1(Benchmark) | 0.9 | 0.8 | 0.7 | 0.7 |
| R□□10□□ | 5 | 1.9 | 1.4 | 1.2 | 1 | 1(Benchmark) | 0.9 | 0.8 | 0.7 |
| R□□12□□ | 6 | 2.1 | 1.5 | 1.3 | 1.1 | 1 | 1(Benchmark) | 0.9 | 0.8 |
| R□□16□□ | 8 | 2.4 | 1.7 | 1.4 | 1.3 | 1.1 | 1.1 | 1(Benchmark) | 0.9 |
| R□□20□□ | 10 | 2.5 | 1.8 | 1.5 | 1.4 | 1.2 | 1.1 | 1 | 1(Benchmark) |

Calculation example:

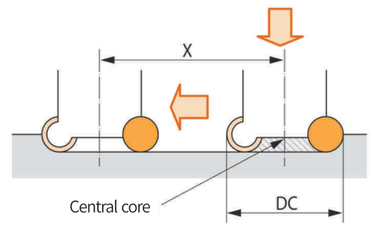
The recommended feed rate for RCKT10T3MO-FM to process 45# steel is 0.2mm/r. When ap=1mm, the corresponding recommendation for feed rate is:

f=1.4*0.2mm/r=0.28mm/r

◆ Recommended machining parameters for ramp milling, helical milling, drill-milling, etc.

| Tool specification | | | Ramp milling | | Helical milling | | Drill-milling | |
|---|---|---|---|---|---|---|---|---|
| Insert | Tool diameter (mm) | Cutting depth maximum (mm) | Ramping angle maximum | Cutting length (mm) | Machined hole diameter minimum (mm) | Machined hole diameter maximum (mm) | Machining depth maximum (mm) | Machining diameter minimum (mm) |
| R08 | 16 | 4 | 8° | 28 | 20 | 30 | 0.7 | 9 |
| | 20 | | 9° | 25 | 26 | 38 | 1.4 | 13 |
| | 25 | | 5° | 45 | 36 | 48 | 1.4 | 18 |
| R10 | 25 | 5 | 5° | 28 | 33 | 48 | 0.6 | 16 |
| | 32 | | 6° | 47 | 47 | 62 | 1.9 | 23 |
| | 40 | | 4° | 71 | 63 | 78 | 1.9 | 31 |
| | 63 | | 3° | 95 | 109 | 124 | 1.9 | 54 |
| R12 | 40 | 6 | 5° | 68 | 59 | 78 | 2.4 | 29 |
| | 63 | | 2° | 171 | 105 | 124 | 2.4 | 52 |
| | 80 | | 2° | 171 | 139 | 158 | 2.4 | 69 |
| | 100 | | 1° | 171 | 179 | 198 | 2.4 | 89 |
| R16 | 63 | 8 | 4° | 114 | 97 | 124 | 3.4 | 48 |
| | 80 | | 3° | 152 | 131 | 158 | 3.4 | 65 |
| | 100 | | 2° | 229 | 171 | 198 | 3.4 | 85 |
| | 125 | | 1° | 458 | 221 | 248 | 3.4 | 110 |

◆ Precautions for drill-milling

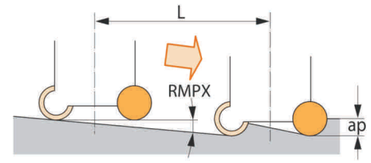



When transverse feed machining after drill-milling:

① The feed rate of the table should be reduced to that of half of the general horizontal machining until the central section is completely removed.

② The cutting length minimum X for flattening the bottom is shown in the table above.

◆ Precautions for ramp milling




Please set the angle of machining below RMPX.

Set the feed rate below 70% of the standard.

◆ Precautions for helical machining

① Please set the feed rate per revolution of the helical machining below the cutting depth ap maximum.

② The axial angle created by the trajectory of the tool center should not exceed the inclination angle RMPX maximum for machining.

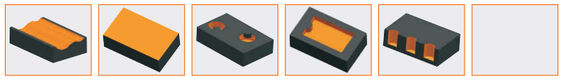
③ Set the feed rate below 70% of the standard.

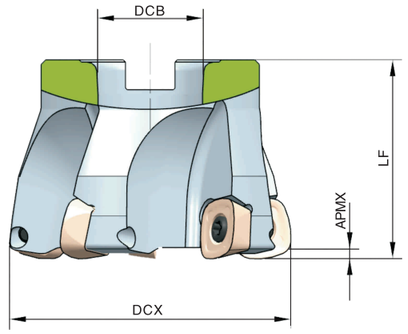
◆ Recommended maximum cutting depth (ap) and applicable teeth number

| Teeth number of cutterhead | R08 | R10 | R12 | R16 | R20 |
|---|---|---|---|---|---|
| ⩽3 | ap=2.0-4.0mm | ap=2.5-5.0 mm | ap=3.0-6.0 mm | ap=4.0-8.0 mm | ap=5.0-10.0 mm |
| >3 | ap<2.0 mm | ap<2.5 mm | ap<6.0 mm | ap<4.0 mm | ap<5.0 mm |

## Millings with high feed

### CEM100 series



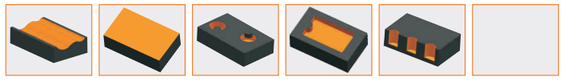


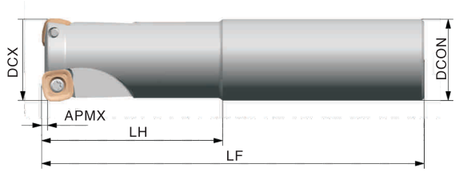

| Tool specification | Number of edges | Inventory | Dimension (mm) | | | APMX (mm) | Interface form | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DCX | DCB | LF | | | | | |
| CEM100–050A2204–SD12 | 4 | △ | 50 | 22 | 40 | 2.3 | A | SD□□12 | M40100 | HTT15IP |
| CEM100–063A2705–SD12 | 5 | ▲ | 63 | 27 | 40 | 2.3 | | | | |
| CEM100–080A2706–SD12 | 6 | △ | 80 | 27 | 50 | 2.3 | | | | |
| CEM100–063A2704–SD15 | 4 | ▲ | 63 | 27 | 40 | 2.9 | | SD□□15 | M50130 | HTT20IP |
| CEM100–080A3205–SD15 | 5 | △ | 80 | 32 | 50 | 2.9 | | | | |
| CEM100–100A3206–SD15 | 6 | △ | 100 | 32 | 50 | 2.9 | | | | |

▲Standing inventory △Make-to-order

## Millings with high feed

### SEM100 series






| Tool specification | Number of edges | Inventory | Dimension (mm) | | | | APMX (mm) | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | DCX | DCB | LF | LH | | | | |
| SEM100–032G3202–SD12 | 2 | ▲ | 32 | 32 | 150 | 70 | 2.3 | SD□□12 | M40090 | HTT15IP |
| SEM100–040G4003–SD12 | 3 | △ | 40 | 40 | 150 | 70 | 2.3 | | | |
| SEM100–040G4002–SD15 | 2 | ▲ | 40 | 40 | 200 | 70 | 2.9 | SD□□15 | M50130 | HTT20IP |

▲Standing inventory △Make-to-order

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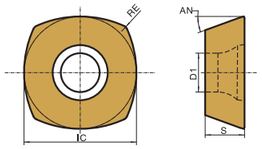
# Applicable inserts

## SD□□




Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | |
| | M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | |
| | K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | |
| | N | Non-ferrous metal | | | | | | | | | | | | ◕ | |
| | S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | |

| Type | Dimension (mm) | | | | | APMX (mm) | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IC | S | D1 | AN | RE | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| SDMT1205ZTN–FM | 12.700 | 5.56 | 4.6 | 15° | 3.00 | 2.3 | ☆ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | |
| SDMT1505ZTN–FM | 15.875 | 5.56 | 5.5 | 15° | 0.80 | 2.9 | ☆ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | |
| SDMW1205ZTN | 12.700 | 5.56 | 4.6 | 15° | 3.00 | 2.3 | ☆ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | |
| SDMW1505ZTN | 15.875 | 5.56 | 5.5 | 15° | 0.80 | 2.9 | ☆ | | ☆ | ☆ | ★ | ★ | ★ | ☆ | | | | | |

★ Recommended grade ☆ Available grade

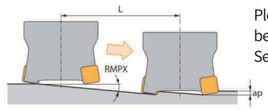
## Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting speed vc (m/min) | Ø20 / Ø25 | | Ø30 / Ø35 | | Ø40 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Axial cutting depth (mm) | Feed rate per tooth (mm) | Axial cutting depth (mm) | Feed rate per tooth (mm) | Axial cutting depth (mm) | Feed rate per tooth (mm) |
| P | Low-carbon steel, mild steel | ≤180 | HR5120 | 200(120–220) | 0.3–1.5 | 0.6–1.2 | 0.3–1.2 | 0.5–1.4 | 0.3–1.5 | 0.8–1.5 |
| | | | HR5220 | 200(120–220) | 0.3–1.5 | 0.6–1.2 | 0.3–1.2 | 0.5–1.4 | 0.3–1.5 | 0.8–1.5 |
| | | | HR5130 | 160(80–180) | 0.2–1.2 | 0.6–1.2 | 0.2–1.0 | 0.5–1.4 | 0.2–1.2 | 0.6–1.5 |
| | | | HR530 | 160(80–180) | 0.2–1.2 | 0.6–1.2 | 0.2–1.0 | 0.5–1.4 | 0.2–1.2 | 0.6–1.5 |
| | High-carbon steel, alloy steel Alloy tool steel | 180–350 | HR5110 | 120(80–220) | 0.1–0.5 | 0.3–0.7 | 0.1–0.5 | 0.4–0.8 | 0.15–0.6 | 0.5–1.0 |
| | | | HR5120 | 120(80–220) | 0.1–0.5 | 0.3–0.7 | 0.1–0.5 | 0.4–0.8 | 0.15–0.6 | 0.5–1.0 |
| | | | HR5210 | 150(100–250) | 0.2–0.8 | 0.3–0.8 | 0.2–1.0 | 0.4–1.0 | 0.2–1.0 | 0.5–1.0 |
| | | | HR5220 | 150(100–250) | 0.2–0.8 | 0.3–0.8 | 0.2–1.0 | 0.4–1.0 | 0.2–1.0 | 0.5–1.0 |
| M | Stainless steel | ≤180 | HR5120 | 150(80–190) | 0.3–1.0 | 0.6–1.0 | 0.3–1.2 | 0.6–1.2 | 0.3–1.2 | 0.5–1.6 |
| | | | HR5130 | 150(80–190) | 0.3–1.0 | 0.6–1.0 | 0.3–1.2 | 0.6–1.2 | 0.3–1.2 | 0.5–1.6 |
| | | | HR530 | 180(80–190) | 0.3–1.0 | 0.5–1.2 | 0.2–1.0 | 0.5–1.4 | 0.2–1.2 | 0.8–1.6 |
| K | Cast iron | 180–250 | HR6130 | 250(80–190) | 0.3–1.0 | 0.5–1.2 | 0.2–1.0 | 0.5–1.4 | 0.2–1.2 | 0.8–1.6 |
| | | | HR5110 | 180(80–190) | 0.3–1.0 | 0.5–1.2 | 0.2–1.0 | 0.5–1.4 | 0.2–1.2 | 0.8–1.6 |
| | | | HR5120 | 180(80–190) | 0.3–1.0 | 0.5–1.2 | 0.2–1.0 | 0.5–1.4 | 0.2–1.2 | 0.8–1.6 |
| | | | HR5220 | 180(80–190) | 0.3–1.0 | 0.5–1.2 | 0.2–1.0 | 0.5–1.4 | 0.2–1.2 | 0.8–1.6 |

## Technical information of application of high feed milling tools （C/SEM100）

### ◆ Ramp milling angle and cutting length

| Type | Tool diameter mm | 32 | 40 | 50 | 63 | 80 | 100 |
|---|---|---|---|---|---|---|---|
| SD□□12□□ | Maximum ramping angle (RMPX) | 3.5° | 2.8° | 2.5° | 1.7° | 1° | |
| SD□□15□□ | Maximum ramping angle (RMPX) | | 2.5° | 2.2° | 1.5° | 0.8° | 0.5° |
| | Cutting length (L) | ap/ tanRMPX | | | | | |

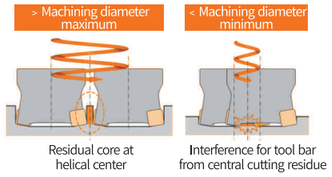



Please set the angle of ramping machining below RMPX.
Set the feed rate below 70% of the standard.

Figure Illustration of ramp milling

### ◆ Precautions for helical machining

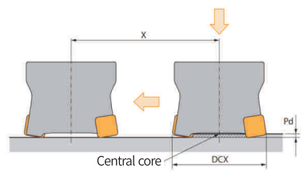
Please conduct helical machining within the range of maximum and minimum machining diameters.




| Tool model | Machining diameter minimum | Machining diameter maximum |
|---|---|---|
| C/SEM100**12 | 2*DC-16 | 2*DC-2 |
| C/SEM100**15 | 2*DC-26 | 2*DC-2 |

Notes: ① The sinking depth (h) per circle is lower than the longitudinal cutting depth maximum (APMX);
② Set the table feed below 50% of the recommended value.

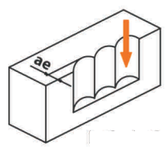
### ◆ Precautions for drill-milling




| Tool model | Drilling depth maximum | Cutting length minimum for bottom flattening |
|---|---|---|
| C/SEM100**SD12 | 1.5mm | Tool diameterDc-16 |
| C/SEM100**SD15 | 2mm | Tool diameterDc-25 |

Notes: When transverse feed machining after drilling:
① The feed rate should be reduced to that of half of the general horizontal machining until the core is completely removed.
② When drilling holes, set the axial feed rate per revolution below f=0.2 (mm/rev).

### ◆ Sidewall drill-milling



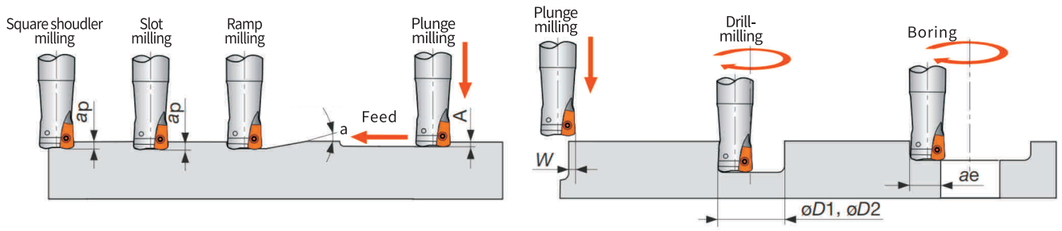

Notes: The recommended feed of sidewall milling is below 0.2 mm/z.

| Insert model | Crosscutting depth maximum (ae) |
|---|---|
| SD**12 | 10mm |
| SD**15 | 12mm |

Setting approximate R angle–in writing program

| Model | Cutting edge angle | Approximate R angle | Cutting residual amount (K/mm) | Inclination angle maximum during contour machining |
|---|---|---|---|---|
| C/SEM100**SD12 | 10° | 3.0 | 0.85 | 90° |
| C/SEM100**SD15 | 10° | 3.5 | 1.37 | 90° |

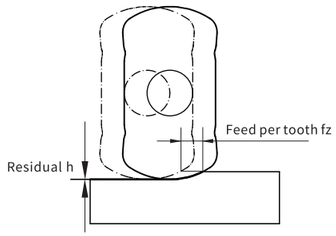
## Technical information of application of high feed milling tools （C/SEM200）




| Insert type | Tools diameter | D=16mm | D=20mm | D=25mm | D=32mm | D=40mm | D=50mm | D=63mm |
|---|---|---|---|---|---|---|---|---|
| LNKU0303 | Max ramping angle a | 1.7° | 1.3° | 0.9° | 0.7° | 0.5° | 0.4° | 0.3° |
| | Max depth of plunge milling A | 0.3mm | 0.3mm | 0.3mm | 0.3mm | 0.3mm | 0.3mm | 0.3mm |
| | Max width of plunge milling W | 3mm | 3mm | 3mm | 3mm | 3mm | 3mm | 3mm |
| | Min diamtetr of hole D1 | 23mm | 31mm | 41mm | 54mm | 70mm | 90mm | 105mm |
| | Max diameter of hol D2 | 30mm | 38mm | 48mm | 62mm | 78mm | 98mm | 113mm |

### ◆ The formula of cutting length L base on max inclination angle L=max.ap/tan（a）

### ◆ Residual of face milling

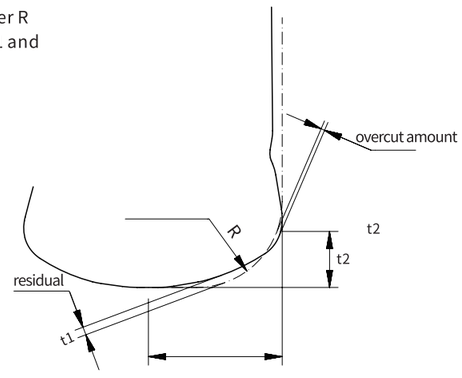



| Insert type | Feed per toothfz (mm/z) | Residual h(mm) |
|---|---|---|
| LNU0303□□ | 0.5 | 0.014 |
| | 0.8 | 0.035 |
| | 1.0 | 0.055 |
| | 1.2 | 0.08 |
| | 1.5 | 0.125 |

### ◆Tool geometry during programming

When programming, the corner radius should be set to R=1.5mm. If a larger R setting, overcut may occur. The table below shows the residual amount t1 and the overcut amount t2.

| APMX | RE | Programming R seting | Residual t1 | Overcut t2 |
|---|---|---|---|---|
| 1.0mm | 1.2mm | 1.0 | 0.045mm | |
| 1.0mm | 1.2mm | 1.5 | 0.035 | |
| 1.0mm | 1.2mm | 2.0 | 0.2mm | 0.1mm |
| 1.0mm | 1.2mm | 2.5 | 0.08mm | 0.29mm |

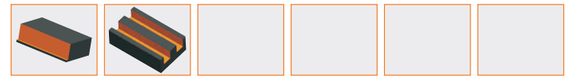


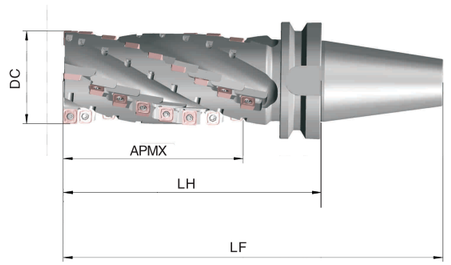



## Helical end milling

### CHM190 series

KAPR=90°





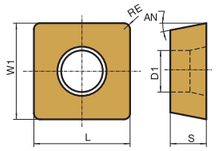

| Tool specification | Number of slots | Inventory | Dimension (mm) DC | LH | LF | APMX (mm) | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|
| CHM190–063JT5004–SP12 | 4 | △ | 63 | 165 | 266.75 | 104 | SP□□12 AP□□15 | M50130 | HAT20IP |
| CHM190–063JT50L04–SP12 | 4 | △ | 63 | 195 | 296.75 | 134 | | | |
| CHM190–080JT5004–SP12 | 4 | △ | 80 | 165 | 266.75 | 104 | | | |
| CHM190–080JT50L04–SP12 | 4 | △ | 80 | 205 | 306.75 | 144 | | | |
| CHM190–063BT5004–SP12 | 4 | △ | 63 | 165 | 266.75 | 104 | | | |
| CHM190–063BT50L04–SP12 | 4 | △ | 63 | 195 | 296.75 | 134 | | | |
| CHM190–080BT5004–SP12 | 4 | △ | 80 | 165 | 266.75 | 104 | | | |
| CHM190–080BT50L04–SP12 | 4 | △ | 80 | 205 | 306.75 | 144 | | | |

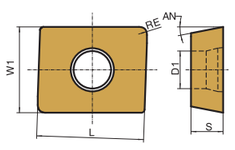
▲Standing inventory △Make-to-order

HUAREAL

# Applicable inserts

SP□□
AP□□






Working condition: ● Stable ◕ Average ⌗ Tough

| Applicable inserts | Workpiece material | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | |
| | | M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | |
| | | K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | |
| | | N | Non-ferrous metal | | | | | | | | | | | ◕ | | |
| | | S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | |

| Type | Dimension (mm) | | | | | AN | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | W1 | S | D1 | RE | | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| SPMT120408–MM | 12.700 | 12.70 | 4.76 | 5.50 | 0.80 | 11° | ★ | | | ☆ | ☆ | ★ | ★ | ☆ | | | | | |
| APMT150412–MM | 15.865 | 12.69 | 4.76 | 5.56 | 1.20 | 11° | ★ | | | ☆ | ☆ | ★ | ★ | ☆ | | | | | |
| SPHX120408T21 | 12.700 | 12.70 | 4.76 | 5.50 | 0.80 | 11° | ★ | | | ☆ | ☆ | ★ | ★ | ☆ | | | | | |
| APHX1504 | 15.875 | 12.70 | 4.76 | 5.70 | 0.40 | 11° | ★ | | | ☆ | ☆ | ★ | ★ | ☆ | | | | | |

★ Recommended grade ☆ Available grade

## Recommended cutting parameters

| Workpiece material | | Hardness (HB) | Insert grade | Cutting data | |
|---|---|---|---|---|---|
| | | | | Cutting speed $v_c$ (m/min) | Feed rate $f_z$(mm/z) |
| P | Low-carbon steel, mild steel | ≤180 | HR5110 | 130(60–150) | 0.25(0.1–0.35) |
| | | | HR5120 | 140(70–170) | 0.3(0.15–0.4) |
| | | | HR5130 | 140(70–170) | 0.3(0.15–0.4) |
| | High-carbon steel, alloy steel | 180–280 | HR5110 | 120(60–150) | 0.2(0.1–0.35) |
| | | | HR5120 | 130(60–170) | 0.25(0.15–0.35) |
| | | | HR5130 | 140(70–170) | 0.25(0.15–0.35) |
| | Alloy tool steel | 280–350 | HR5110 | 100(60–150) | 0.15(0.08–0.25) |
| | | | HR5120 | 110(70–170) | 0.2(0.1–0.35) |
| | | | HR5130 | 120(70–170) | 0.2(0.1–0.35) |
| M | Stainless steel | ≤270 | HR5110 | 140(110–200) | 0.2(0.1–0.3) |
| | | | HR5120 | 120(100–200) | 0.2(0.1–0.3) |
| | | | HR5130 | 120(100–200) | 0.2(0.1–0.3) |
| K | Cast iron | 180–250 | HR5110 | 170(90–200) | 0.2(0.1–0.35) |
| | | | HR5120 | 130(90–200) | 0.25(0.15–0.35) |
| | | | HR5130 | 130(100–210) | 0.25(0.15–0.35) |

# Code key of heavy milling inserts

| L | N | E | H | 15 | 12 | 07 | - | 2R45 |
|---|---|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | | ⑧ |

## ① Insert shape

| C | F | G | L | S | X | Others |
|---|---|---|---|---|---|---|
| 80° | 78° | 70° | | | | Z |

## ② Clearance angle major

| N | Q | T | Others |
|---|---|---|---|
| 0° | 17° | 23° | O |

## ③ Tolerance class

| C: | E: | R: |
|---|---|---|
| ± 0.013<br>± 0.025 | ± 0.025 | Blank |

## ④ Clamping form

| | | | | | |
|---|---|---|---|---|---|
| B 40° | D 60° | F 78° | H 82° | V X° | Others<br>(Special requirements such as different clamping forms or hole diameter)<br>X |
| J 60° | L 78° | N 82° | R R | Y X° | |
| S 60° | U 78° | W 82° | P R R | Z X° | |

## ⑤ Length

L

L

Integer of length

## ⑥ Width

W

W

Integer of width

## ⑦ Thickness

S

S

Integer of thickness

Corresponding sizes of the size codes of length, width and thickness

| Code | 03 | 03A | 04 | 05 | 05A | 05B | 06 | 06A | 06B | 06C | 06D | 06E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | 3.80 | 3.97 | 4.76 | 5.00 | 5.95 | 5.80 | 6.35 | 6.00 | 6.94 | 6.84 | 6.55 | 6.70 |
| Code | 07 | 07A | 07B | 07C | 07D | 07E | 07F | 07G | 08 | 08A | 09 | 09A |
| Size | 7.94 | 7.05 | 7.15 | 7.24 | 7.35 | 7.60 | 7.50 | 7.82 | 8.50 | 8.00 | 9.52 | |
| Code | 09B | 10 | 11 | 11A | 11B | 11C | 12 | 12A | 12B | 12C | 13 | 13A |
| Size | 9.43 | 10.00 | 11.50 | 11.11 | 11.90 | 11.00 | 12.70 | 12.00 | 12.40 | 12.80 | 13.50 | 13.00 |
| Code | 13B | 13C | 14 | 14A | 14B | 14C | 15 | 15A | 15B | 15C | 15D | 15E |
| Size | 13.85 | 13.75 | 14.29 | 14.20 | 14.50 | 14.05 | 15.87 | 15.00 | 15.10 | 15.28 | 15.50 | 15.78 |
| Code | 15F | 15G | 16 | 16A | 16B | 16C | 17 | 17A | 18 | 18A | 18B | 19 |
| Size | 15.68 | 15.40 | 16.30 | 16.00 | 16.50 | 16.78 | 17.50 | 17.00 | 18.47 | 18.00 | 18.35 | 19.05 |
| Code | 20 | 22 | 23 | 25 | 26 | 28 | | | | | | |
| Size | 20.00 | 22.80 | 23.99 | 25.00 | 26.50 | 28.57 | | | | | | |

Notes: Coding principle: Add zero before Single-digit integer and take the two-digit integer as code;
for sizes that differ in decimal bits, letters A, B, C, etc. are added to distinguish them.

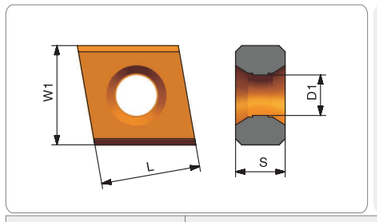
## ⑧ Eigenvalue or code

| | | |
|---|---|---|
| 2R 2R** | 4** 4** | DR DR** |
| 4R 4R** | 4R 4R**H | NR NR** |
| 4A 4A** | 4A 4A**M | 2NR 2NR** |

* "(L)" before the feature codes means that the eigenvalue is on the length side, "(S)" means that the eigenvalue is on the thickness side, and no letter means that the eigenvalue is on the width (W) side.
* "(R)" after the feature code indicates the right knife, "(L)" indicates the left knife, and no letter indicates that there is no distinction between left and right.
* Other feature codes may also be compiled according to other features of products.

Groove code

## Heavy milling inserts

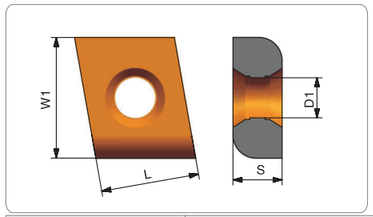



Working condition: ● Stable ◕ Average ⌗ Tough

| Workpiece material | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | CNEF121206–405 | 12.7 | 12.70 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | CNEF121206–408 | 12.7 | 12.70 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | CNEL161406–408 | 16.3 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | | | | | | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade




Working condition: ● Stable ◕ Average ⌗ Tough

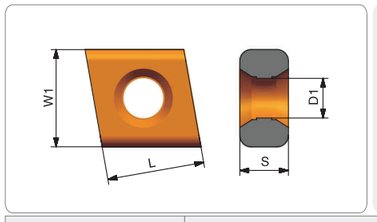
| Workpiece material | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | | | | | | | | | | | | | | | | | | |
| | CNEF161406–2R30 | 16.3 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | CNEF161406–2R50 | 16.3 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | | | | | | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade



## Heavy milling inserts

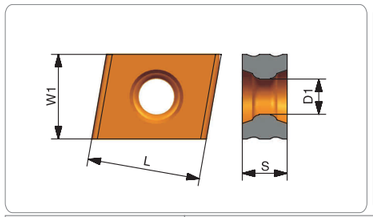



Working condition: ● Stable ◕ Average ⌗ Tough

| Workpiece material | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | CNEF161406–4R10 | 16.3 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | CNEF161406–4R15 | 16.3 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | CNEF161406–4R30 | 16.3 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | | | | | | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade



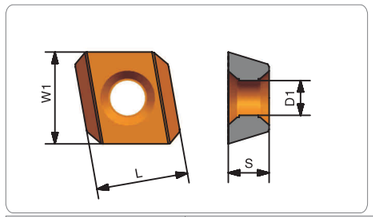

Working condition: ● Stable ◕ Average ⌗ Tough

| Workpiece material | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | | | | | | | | | | | | | | | | | | |
| | CNER16A12A06–L2M | 16.00 | 12.00 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | CNEF161406–L2M | 16.30 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | | | | | | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

## Heavy milling inserts



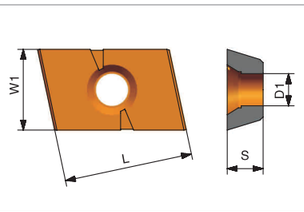

Working condition: ● Stable ◕ Average ⌗ Tough

| Workpiece material | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | | ◕ | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | CQEH141406--R02R | 14.29 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | CQER11A11A04-R01R | 11.10 | 11.10 | 4.76 | 5.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade

## Heavy milling inserts




Working condition: ● Stable ◕ Average ⌗ Tough

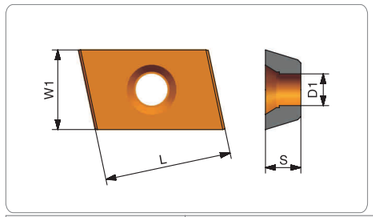
| Workpiece material | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | | ◕ | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | FQEW221406-R04R | 22.8 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade



## Heavy milling inserts



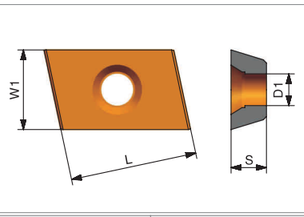

Working condition: ● Stable ◕ Average ⌗ Tough

| Workpiece material | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | | ◕ | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | FQES190906-2R30R | 19.05 | 9.525 | 6.35 | 4.4 | | ☆ | | | | | | | ★ | | | | |
| | FQES190906-2R40R | 19.05 | 9.525 | 6.35 | 4.4 | | ☆ | | | | | | | ★ | | | | |
| | FQES190906-2R45R | 19.05 | 9.525 | 6.35 | 4.4 | | ☆ | | | | | | | ★ | | | | |
| | FQES190906-2R50R | 19.05 | 9.525 | 6.35 | 4.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade

## Heavy milling inserts



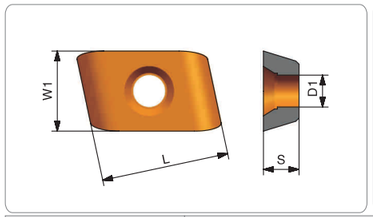

Working condition: ● Stable ◕ Average ⌗ Tough

| Workpiece material | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | | ◕ | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | FQEP120904-210L | 12.70 | 9.525 | 4.76 | 4.4 | | ☆ | | | | | | | ★ | | | | |
| | FQEP120904-210R | 12.70 | 9.525 | 4.76 | 4.4 | | ☆ | | | | | | | ★ | | | | |
| | FQEP120904-2R05L | 12.70 | 9.525 | 4.76 | 4.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade

## Heavy milling inserts



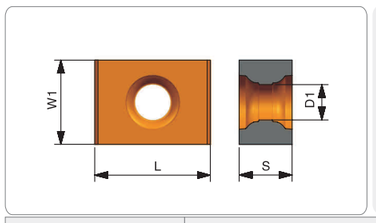

Working condition: ● Stable ◕ Average ⌗ Tough

| Workpiece material | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | FQES190906–4RXR | 19.05 | 9.525 | 6.35 | 4.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade

Working condition: ● Stable ◕ Average ⌗ Tough




| Workpiece material | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | |

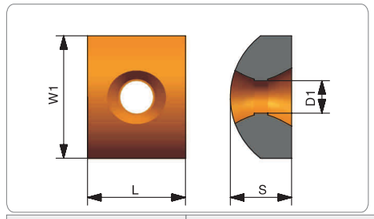
| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | LNED150906–408 | 15.875 | 9.525 | 6.35 | 4.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–404 | 15.875 | 12.70 | 7.94 | 5.5 | | ☆ | | | | | | | ★ | | | | |
| | LNER151208B–408 | 15.875 | 12.70 | 7.82 | 5.5 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–400 | 15.875 | 12.70 | 7.94 | 5.5 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–408 | 15.875 | 12.70 | 7.94 | 5.5 | | ☆ | | | | | | | ★ | | | | |
| | LNEF191206–405 | 19.05 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNEL191207–400 | 19.05 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNEL191406–402 | 19.05 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191406–400 | 19.05 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191406–405 | 19.05 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191406–408 | 19.05 | 14.29 | 6.35 | 5.5 | | ☆ | | | | | | | ★ | | | | |
| | LNER191406–410 | 19.05 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191407A–406 | 19.05 | 14.29 | 7.05 | 5.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade





## Heavy milling inserts



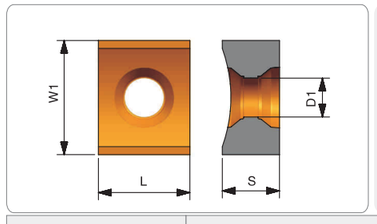

Working condition: ● Stable ◕ Average ⌗ Tough

| Workpiece material | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | LNER151207–DR100 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–DR115 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–DR130 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–DR145 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–DR160 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–DR190 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–DR200 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–DR250 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–DR400 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–DR800 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade

Working condition: ● Stable ◕ Average ⌗ Tough



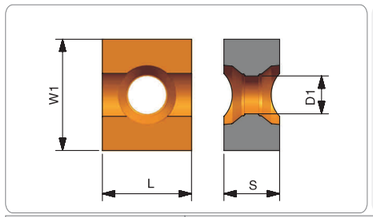

| Workpiece material | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | LNER151207–NR100 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–NR130 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–NR140 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–NR150 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–NR190 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–NR200 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–NR800 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–NR3000 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade

## Heavy milling inserts

Working condition: ● Stable ◕ Average ⌗ Tough




Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

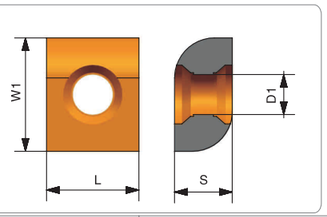
| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | LNEN151207–2NR100 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNEN151207–2NR130 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNEN151207–2NR140 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNEN151207–2NR190 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade



Heavy milling inserts

Working condition: ● Stable ◕ Average ⌗ Tough




Workpiece material

| | |
|---|---|
| P | Steel |
| M | Stainless steel |
| K | Cast iron |
| N | Non-ferrous metal |
| S | Heat resistant super alloys Titanium alloy |

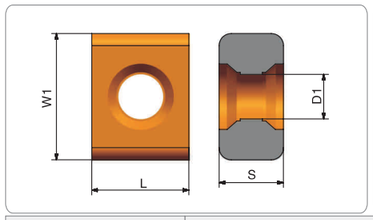
| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | LNER151207–2R20 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–2R30 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–2R35 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–2R40 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–2R45 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–2R50 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207A–2R50 | 15.875 | 12.70 | 7.05 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–2R55 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER15C1207–2R50 | 15.28 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER15F1207–2R50 | 15.68 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191406–2R30 | 19.05 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191406–2R35 | 19.05 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER190906–2R50 | 19.05 | 9.525 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191407–2R60 | 19.05 | 14.29 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191406–2R30M22 | 19.05 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191406–2R46M15 | 19.05 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191407–2R60M15 | 19.05 | 14.29 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191407–2R70M20 | 19.05 | 14.29 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191408–2R70M20 | 19.05 | 14.29 | 8.50 | 5.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade

HUAREAL



## Heavy milling inserts




Working condition: ● Stable ◕ Average ⌗ Tough

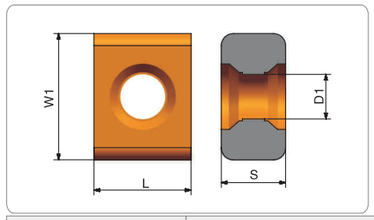
Workpiece material

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | LNER151206–4R10 | 15.875 | 12.70 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151206B–4R20 | 15.875 | 12.70 | 6.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–4R10 | 15.875 | 12.70 | 7.94 | 5.5 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–4R20 | 15.875 | 12.70 | 7.94 | 5.5 | | ☆ | | | | | | | ★ | | | | |
| | LNER191406–4R02 | 19.05 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191406–4R12 | 19.05 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191406–4R20 | 19.05 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER191406–4R24 | 19.05 | 14.29 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade

## Heavy milling inserts




Working condition: ● Stable ◕ Average ⌗ Tough

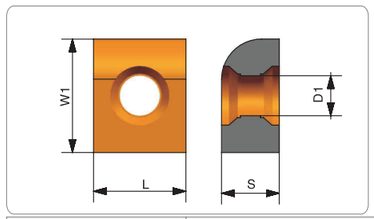
Workpiece material

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | LNER151206–4R30 | 15.875 | 12.70 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151206–4R40 | 15.875 | 12.70 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151206–4R50 | 15.875 | 12.70 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151206–4R55 | 15.875 | 12.70 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151206–4R65 | 15.875 | 12.70 | 6.35 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–4R40 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | LNER151207–4R50 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade

## Heavy milling inserts




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | |

Dimension (mm)

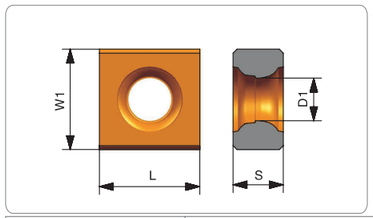
| Insert shape | Type | | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | LNER151207–1R30M20 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

HUAREAL



## Heavy milling inserts

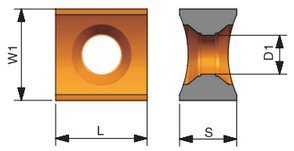



Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | |

## Heavy milling inserts




Working condition: ● Stable ◕ Average ⌗ Tough

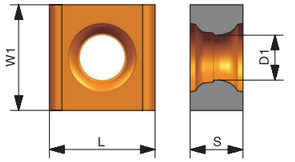
Workpiece material

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | SNER121207–2NR80 | 12.70 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade

## Heavy milling inserts



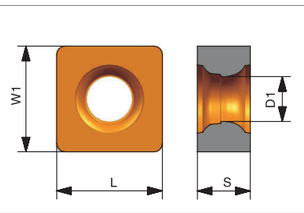

Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | SNED121206–4R20 | 12.70 | 12.70 | 6.35 | 5.5 | | ☆ | | | | | | | ★ | | | | |
| | SNEH151507–4R20 | 15.875 | 15.875 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | SNER121206–4R25 | 12.70 | 12.70 | 6.35 | 4.4 | | ☆ | | | | | | | ★ | | | | |
| | SNEY090904–4R30H | 9.525 | 9.525 | 4.76 | 4.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade



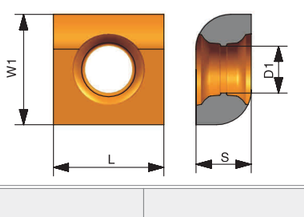

Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | SNED121206–S4R02 | 12.70 | 12.70 | 6.35 | 5.5 | | ☆ | | | | | | | ★ | | | | |
| | SNED121206–S4R08 | 12.70 | 12.70 | 6.35 | 5.5 | | ☆ | | | | | | | ★ | | | | |
| | SNEY090904–S4R04 | 9.525 | 9.525 | 4.76 | 4.4 | | ☆ | | | | | | | ★ | | | | |
| | | | | | | | | | | | | | | | | | | |

★ Recommended grade ☆ Available grade




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

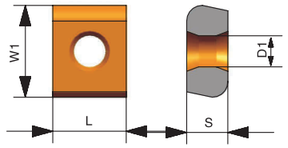
| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | ◕ | | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | SNEN151507–2R20 | 15.875 | 15.875 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | SNEN151507–2R30 | 15.875 | 15.875 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | SNEN151507–2R40 | 15.875 | 15.875 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | SNEN151507–2R50 | 15.875 | 15.875 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | SNEN151507–2R60 | 15.875 | 15.875 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade

HUAREAL

## Heavy milling inserts




Working condition: ● Stable ◕ Average ⌗ Tough

Workpiece material

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | ◕ | ⌗ | ⌗ | ⌗ | | | | |
| M | Stainless steel | | | ● | ● | ◕ | ◕ | ⌗ | ◕ | | ⌗ | ⌗ | | | | |
| K | Cast iron | ⌗ | ⌗ | ● | ● | ◕ | ◕ | ⌗ | | | | | | | | |
| N | Non-ferrous metal | | | | | | | | | | | | | ◕ | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | CVD | | PVD | | | | | | | | Cemented carbide | Cermet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | W1 | S | D1 | HR6130 | HR8140 | HR5110 | HR5210 | HR5120 | HR5220 | HR5130 | HR530 | HR7130 | HR7140 | HR7240 | HRK10 | HRC10 |
| | ZNER12A1106–L2R15 | 12.00 | 11.50 | 6.35 | 4.4 | | ☆ | | | | | | | ★ | | | | |
| | ZNER12B11C06–2R30 | 12.40 | 11.00 | 6.35 | 4.4 | | ☆ | | | | | | | ★ | | | | |
| | ZNER13C11C06–2R30 | 13.75 | 11.00 | 6.35 | 4.4 | | ☆ | | | | | | | ★ | | | | |
| | ZNER14A1206–2R25 | 14.20 | 12.70 | 6.35 | 4.4 | | ☆ | | | | | | | ★ | | | | |
| | ZNER191408–2R50 | 19.05 | 14.29 | 8.50 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | ZNEB151207B–2R40 | 15.875 | 12.70 | 7.14 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | ZNEN151207–2R45 | 15.875 | 12.70 | 7.94 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | ZNEN151208B–2R45 | 15.875 | 12.70 | 8.14 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | ZNEN16A1408–2R50 | 16.00 | 14.00 | 8.50 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | ZNEN16A1408–2R55 | 16.00 | 14.00 | 8.50 | 5.4 | | ☆ | | | | | | | ★ | | | | |
| | ZNEJ151206–2R35 | 15.875 | 12.70 | 6.35 | 4.4 | | ☆ | | | | | | | ★ | | | | |

★ Recommended grade ☆ Available grade

# Selection guidance of solid carbide end mills

Product type

**Series B - basic end mills**

**Two-flute flat end mill (short flute structure)**

Machining form

Product specification drawing

**B2L···LG**

Side machining | Bottom machining | Slot milling

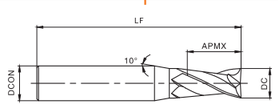



Figure 1

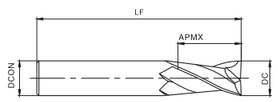



Figure 2

B Series | 30° | DC≤12 0,–0.02 DC>12 0,–0.03 | 45°

Product outline drawing

| Type | Basic dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B2L0300LG–4 | 3.0 | 4 | 12 | 75 | 2 | Figure 1 | ● |
| B2L0400LG–4 | 4.0 | 4 | 15 | 75 | 2 | Figure 2 | ○ |
| B2L0300LG | 3.0 | 6 | 12 | 75 | 2 | Figure 1 | ○ |
| B2L0400LG | 4.0 | 6 | 15 | 75 | 2 | Figure 1 | ● |
| B2L0500LG | 5.0 | 6 | 20 | 75 | 2 | Figure 1 | ● |
| B2L0600LG | 6.0 | 6 | 20 | 75 | 2 | Figure 2 | ● |
| B2L0800LG | 8.0 | 8 | 25 | 100 | 2 | Figure 2 | ● |
| B2L1000LG | 10.0 | 10 | 30 | 100 | 2 | Figure 2 | ● |
| B2L1200LG | 12.0 | 12 | 35 | 100 | 2 | Figure 2 | ● |
| B2L1400LG | 14.0 | 14 | 40 | 100 | 2 | Figure 2 | ● |
| B2L1600LG | 16.0 | 16 | 50 | 150 | 2 | Figure 2 | ● |
| B2L2000LG | 20.0 | 20 | 55 | 150 | 2 | Figure 2 | ● |

●Running stock ○Make-to-order

Product specification

Basic size

Pattern

Inventory information

Helical angle, insert diameter tolerance, etc.

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ✹ | ✹ | ✹ | ✲ | ✹ | | | ✲ | ✲ | ✲ | | |

✹ Fit well ✲ Applicable

Range of workpiece materials

## B Milling

**Solid carbide end mills**


- Selection guidance of solid carbide end mills ---------- B-83
- Code key of solid carbide end mills ---------- B-85
- Overview of solid carbide end mills ---------- B-86
- Details and recommended parameters of solid carbide end mills ----- B-88
  - Series M - Micro end mills ---------- B-88
  - Series B - basic end mills ---------- B-100
  - Series P - high performance end mills ---------- B-146
  - Series X - special end mills ---------- B-188
- Non-standard customization of solid carbide end mills ---------- B-196

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# Code key of solid carbide end mills

| B | 4 | S | 1000 | R0500 | B | L | G | - | 4 |
|---|---|---|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | | ⑨ |

| ① Product series | |
|---|---|
| M | Micro mills |
| B | Basic type |
| P | High performance type |
| X | Special type |

| ② Number of edges | |
|---|---|
| 2 | Two flutes |
| 3 | Three flutes |
| 4 | Four flutes |
| ... | |

| ③ Length | |
|---|---|
| S | Short |
| L | Long |
| E | Extra long |
| P | Necking |

| ④ Tool diameter | |
|---|---|
| 10 00 | Φ10mm |
| Default | Ball nose mill |

| ⑤ Corner radius | |
|---|---|
| R05 00 | R5.0mm |
| Default | Flat end mill |

| ⑥ Tool type | |
|---|---|
| default | Flat end |
| | Radius |
| B | Ball nose |
| W | Corrugated edge |

| ⑦ Helical angle | |
|---|---|
| L | Little helical angle |
| N | Normal helical angle |
| H | Large helical angle |
| O | Special helical angle |

| ⑧ Application fields | |
|---|---|
| G | General |
| M | Stainless steel machining |
| N | Aluminum alloy machining |
| S | High-temp alloy and titanium alloy machining |
| H | High hardness material machining |

| ⑨ shank diameter | |
|---|---|
| 4 | shank diameter 4mm |

# Overview of solide carbide end mills

| Lineup | Shape | Number of Tooth | Model | Size range | Workpiece: P: Carbon steel | P: Alloy steel | P: High-alloyed steel and tool steel | M: Stainless steel | K: Cast iron | N: Non-ferrous alloy | N: Aluminum alloy | S: High-temp alloy | S: Titanium alloy | H: Hardened steel: < 54HRC | H: Hardened steel: 54--60 HRC | H: Hardened steel: > 60HRC | page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Micro mills | flat end | 2 | M2S...LG | Φ0.3—Φ3 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B106 |
| | | | M2S...LH | Φ0.3—Φ3 | ☼ | ☼ | ☼ | | ☀ | | | | | ☀ | ☀ | ☀ | B108 |
| | Ball nose | 2 | M2S...BLG | Φ0.3—Φ3 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B110 |
| | | | M2S...BLH | Φ0.3—Φ3 | ☼ | ☼ | ☼ | | ☀ | | | | | ☀ | ☀ | ☀ | B112 |
| | Alluminum alloy mill | 2 | M2S...LN | Φ0.3—Φ3 | | | | | | ☼ | ☀ | | | | | | B114 |
| | | | M2S...BLN | Φ0.3—Φ3 | | | | | | ☼ | ☀ | | | | | | B116 |
| Basic mill | Flat | 2 | B2S···LG | Φ3—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B118 |
| | | | B2L···LG | Φ3—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B120 |
| | | 3 | B3S···NG | Φ3—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B122 |
| | | | B3L···NG | Φ3—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B124 |
| | | 4 | B4S···LG | Φ1—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B126 |
| | | | B4L···LG | Φ3—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B130 |
| | | | B4S···HG | Φ1—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B132 |
| | | | B4L···HG | Φ3—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B136 |
| | | 6 | B6S···HG | Φ6—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B138 |
| | | | B6L···HG | Φ6—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B140 |
| | Radius | 2 | B2S···R···LG | Φ3—Φ12 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B142 |
| | | 4 | B4S···R···LG | Φ3—Φ12 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B144 |
| | Ball nose | 2 | B2S···BLG | Φ1—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | ☼ | | B146 |
| | | | B2L···BLG | Φ2—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | ☼ | | B148 |
| | | 4 | B4S···BLG | Φ3—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B150 |
| | | | B4L···BLG | Φ3—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B152 |
| | Aluminum alloy mill | 2 | B2S···HN | Φ3—Φ20 | | | | | | ☼ | ☀ | | | | | | B154 |
| | | 3 | B2L···HN | Φ3—Φ20 | | | | | | ☼ | ☀ | | | | | | B156 |
| | | 2 | B3S···HN | Φ3—Φ20 | | | | | | ☼ | ☀ | | | | | | B158 |
| | | 3 | B3L···HN | Φ3—Φ20 | | | | | | ☼ | ☀ | | | | | | B160 |
| | | 3 | B2S···BLN | Φ2—Φ12 | | | | | | ☼ | ☀ | | | | | | B162 |
| High performance mill | Flat | 4 | P4S···LG | Φ1—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B164 |
| | | | P4P···LG | Φ6—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B166 |
| | | | P4S···NG | Φ1—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B168 |
| | | | P4P···NG | Φ6—Φ20 | ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | | B170 |
| | | | P4S···NS | Φ1—Φ20 | ☼ | ☼ | ☼ | ☀ | | | | ☀ | ☀ | | | | B172 |
| | | | P4P···NS | Φ6—Φ20 | ☼ | ☼ | ☼ | ☀ | | | | ☀ | ☀ | | | | B174 |
| | | | P4S···HH | Φ1—Φ20 | ☼ | ☼ | ☼ | | | | | | | | | | B176 |
| | | | P4P···HH | Φ6—Φ20 | ☼ | ☼ | ☼ | | | | | | | | | | B178 |

☀ Fit well ☼ Applicable

# Overview of solid carbide end mills

| Lineup | Shape | Number of Tooth | Model | Size range | Workpiece: P Carbon steel | P Alloy steel | P High-alloyed steel and tool steel | M Stainless steel | K Cast iron | N Non-ferrous alloy | N Aluminum alloy | S High-temp alloy | S Titanium alloy | H Hardened steel < 54HRC | H Hardened steel 54--60 HRC | H Hardened steel > 60HRC | page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High performance mill | Radius | 4 | P4S···R···LG | Φ3—Φ20 | ✹ | ✹ | ✹ | ☼ | | | | ☼ | ☼ | | | | B180 |
| | | | P4P···R···LG | Φ6—Φ20 | ✹ | ✹ | ✹ | ☼ | | | | ☼ | ☼ | | | | B182 |
| | | | P4S···R···NG | Φ3—Φ20 | ✹ | ✹ | ✹ | ☼ | | | | ☼ | ☼ | | | | B184 |
| | | | P4P···R···NG | Φ6—Φ20 | ✹ | ✹ | ✹ | ☼ | | | | ☼ | ☼ | | | | B186 |
| | | | P4S···R···NS | Φ3—Φ20 | ☼ | ☼ | ☼ | ✹ | | | | ✹ | ✹ | | | | B188 |
| | | | P4P···R···NS | Φ6—Φ20 | ☼ | ☼ | ☼ | ✹ | | | | ✹ | ✹ | | | | B190 |
| | | | P4S···R···HH | Φ3—Φ20 | ☼ | ☼ | ☼ | | ☼ | | | | | ✹ | ✹ | ✹ | B192 |
| | | | P4P···R···HH | Φ6—Φ20 | ☼ | ☼ | ☼ | | ☼ | | | | | ✹ | ✹ | ✹ | B194 |
| | Ball nose | 2 | P2S···BLG | Φ1—Φ20 | ✹ | ✹ | ✹ | ✹ | ✹ | | | | | ☼ | | | B196 |
| | | | P2S···BLH | Φ1—Φ20 | ☼ | ☼ | ☼ | ☼ | ☼ | | | ☼ | ☼ | ✹ | ✹ | ✹ | B198 |
| | | | P2P···BLG | Φ1—Φ20 | ✹ | ✹ | ✹ | ✹ | ✹ | | | ☼ | ☼ | ☼ | ☼ | | B200 |
| | | | P2P···BLH | Φ1—Φ20 | ☼ | ☼ | ☼ | | ☼ | | | | | ✹ | ✹ | ✹ | B202 |
| | | 4 | P4S···BNS | Φ3—Φ20 | ☼ | ☼ | ☼ | ✹ | | | | ✹ | ✹ | | | | B204 |
| Special type | Flat | 3 | X3S...WLN | Φ6—Φ20 | | | | | | | ✹ | | | | | | B206 |
| | | 4 | X4S...WNG | Φ6—Φ20 | ✹ | ✹ | ✹ | ☼ | ✹ | | | | | ☼ | | | B208 |
| | | | X4S...HG | Φ4—Φ20 | ✹ | ✹ | ✹ | ✹ | ✹ | | | ✹ | ✹ | ✹ | ✹ | | B210 |
| | Radius | 4 | X4S...R...HG | Φ6—Φ20 | ✹ | ✹ | ✹ | ✹ | ✹ | | | ✹ | ✹ | ✹ | ✹ | | B212 |

✹ Fit well ☼ Applicable

# Series M - - Micro end mill

## Two-flute flat end mill (General machining)

### M2S···LG

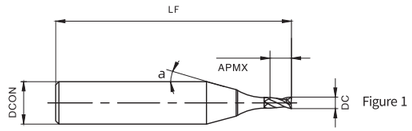
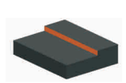
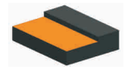


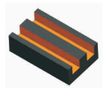

Figure 1



Side machining



Bottom machining



Slot milling

| Type | Dimension (mm) DC | DCON | APMX | LF | a (°) | ZEFP | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| M2S0030LG | 0.3 | 4 | 0.6 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0040LG | 0.4 | 4 | 0.8 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0050LG | 0.5 | 4 | 1.0 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0060LG | 0.6 | 4 | 1.2 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0070LG | 0.7 | 4 | 1.4 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0080LG | 0.8 | 4 | 1.6 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0090LG | 0.9 | 4 | 1.8 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0100LG | 1.0 | 4 | 2.0 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0110LG | 1.1 | 4 | 2.2 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0120LG | 1.2 | 4 | 2.4 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0130LG | 1.3 | 4 | 2.6 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0140LG | 1.4 | 4 | 2.8 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0150LG | 1.5 | 4 | 3.0 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0160LG | 1.6 | 4 | 3.2 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0170LG | 1.7 | 4 | 3.4 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0180LG | 1.8 | 4 | 3.6 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0190LG | 1.9 | 4 | 3.8 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0200LG | 2.0 | 4 | 4.0 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0210LG | 2.1 | 4 | 4.2 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0220LG | 2.2 | 4 | 4.4 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0230LG | 2.3 | 4 | 4.6 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0240LG | 2.4 | 4 | 4.8 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0250LG | 2.5 | 4 | 5.0 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0260LG | 2.6 | 4 | 5.2 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0270LG | 2.7 | 4 | 5.4 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0280LG | 2.8 | 4 | 5.6 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0290LG | 2.9 | 4 | 5.8 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0300LG | 3.0 | 4 | 6.0 | 50 | 10 | 2 | Figure 1 | ○ |

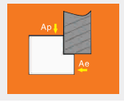
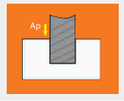
●Standing inventory ○Make-to-order

| P Carbon steel | P Alloy steel | P High-alloyed steel | M Stainless steel | K Cast iron | N Non-ferrous alloy | N Aluminum alloy | S High-temp alloy | S Titanium alloy | H <54HRC | H 54--60HRC | H ⩾60HRC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ✹ | ✹ | ✹ | ☼ | ✹ | | | ☼ | ☼ | ☼ | | |

✹ Fit well ☼ Applicable

## Recommended cutting conditions——M2S···LG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 40 | 60 | 80 |
| | Alloy steel | < 1200 | < 350 | 30 | 50 | 70 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 30 | 50 | 70 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 30 | 45 | 60 |
| | Martensite stainless steel | < 820 | < 240 | 25 | 40 | 50 |
| K | Gray cast iron | – | < 280 | 40 | 70 | 100 |
| | Nodular iron | – | < 320 | 30 | 60 | 90 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | 30 | 60 | 90 |
| | Hardened steel | – | 54–60HRC | 20 | 40 | 60 |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | |  Slot milling | | |
| Diameter （mm） | ap | ae | $f_z$ ( mm/r ) | ap | ae | $f_z$ ( mm/r ) |
| 0.3≤Dc<1 | – | – | – | 0.05Dc | 1Dc | 0.002–0.008 |
| 1≤Dc≤3 | – | – | – | 0.15Dc | 1Dc | 0.006–0.03 |

(1) This series of tools is a good solution for slot milling;
(2) Before slot milling, please reduce the cutting speed (rotating speed) to 50%-70% of the value indicated in the table above, and the feed rate (feed rate) to 40%-60%.
(3) Before vertical feed machining, decrease the feed rate to below 1/3 of the standard value in the above table.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(5) The tool overhang is as short as possible without affecting the use.



## Series M - - Micro end mill

### Two-flute flat end mill (high hardness machining)

**M2S···LH**

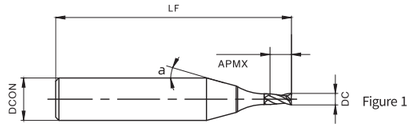
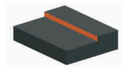
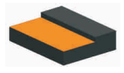
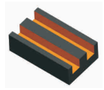
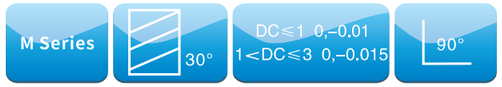


Figure 1


Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | a (°) | ZEFP | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | | | | |
| M2S0030LH | 0.3 | 4 | 0.6 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0040LH | 0.4 | 4 | 0.8 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0050LH | 0.5 | 4 | 1.0 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0060LH | 0.6 | 4 | 1.2 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0070LH | 0.7 | 4 | 1.4 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0080LH | 0.8 | 4 | 1.6 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0090LH | 0.9 | 4 | 1.8 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0100LH | 1.0 | 4 | 2.0 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0110LH | 1.1 | 4 | 2.2 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0120LH | 1.2 | 4 | 2.4 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0130LH | 1.3 | 4 | 2.6 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0140LH | 1.4 | 4 | 2.8 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0150LH | 1.5 | 4 | 3.0 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0160LH | 1.6 | 4 | 3.2 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0170LH | 1.7 | 4 | 3.4 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0180LH | 1.8 | 4 | 3.6 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0190LH | 1.9 | 4 | 3.8 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0200LH | 2.0 | 4 | 4.0 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0210LH | 2.1 | 4 | 4.2 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0220LH | 2.2 | 4 | 4.4 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0230LH | 2.3 | 4 | 4.6 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0240LH | 2.4 | 4 | 4.8 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0250LH | 2.5 | 4 | 5.0 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0260LH | 2.6 | 4 | 5.2 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0270LH | 2.7 | 4 | 5.4 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0280LH | 2.8 | 4 | 5.6 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0290LH | 2.9 | 4 | 5.8 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0300LH | 3.0 | 4 | 6.0 | 50 | 10 | 2 | Figure 1 | ○ |

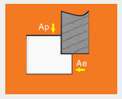
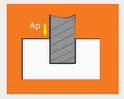
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54–60HRC | ⩾60HRC |
| ☼ | ☼ | ☼ | | ☼ | | | | | ✹ | ✹ | ✹ |

✹ Fit well ☼ Applicable

## Recommended cutting conditions——M2S···LH

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | – | – | – |
| | Alloy steel | < 1200 | < 350 | – | – | – |
| | High-alloyed steel and tool steel | < 1400 | < 380 | – | – | – |
| M | Austenite and ferrite stainless steel | < 680 | <220 | – | – | – |
| | Martensite stainless steel | < 820 | < 240 | – | – | – |
| K | Gray cast iron | – | < 280 | – | – | – |
| | Nodular iron | – | < 320 | – | – | – |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | 40 | 70 | 100 |
| | Hardened steel | – | 54–60HRC | 30 | 55 | 80 |
| | Hardened steel | – | > 60 HRC | 20 | 40 | 60 |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | |  Slot milling | | |
| Diameter （mm） | ap | ae | $f_z$ ( mm/r ) | ap | ae | $f_z$ ( mm/r ) |
| 0.3≤Dc<1 | – | – | – | 0.01Dc | 1Dc | 0.0015–0.005 |
| 1≤Dc≤3 | – | – | – | 0.02Dc | 1Dc | 0.004–0.015 |

(1) The lower of cutting depth, the higher of feed and speed.
(2) Ocne the machine rigidity is poor,and with abnormal sound or viberation when processing.Decrease the cutting speed and feed as same ration.

## Series M - - Micro end mill

### Two-flute ball nose end mill （general machining)

**M2S···BLG**

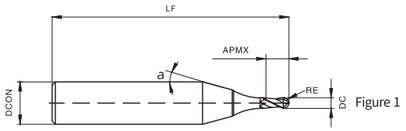
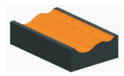
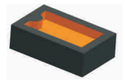
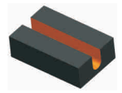


Figure 1


Profile milling


Cavity machining


slot machining

| Type | Dimension (mm) | | | | | a ( ° ) | ZEFP | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | | | | |
| M2SR0015BLG | 0.3 | 4 | 0.3 | 50 | 0.15 | 15 | 2 | Figure 1 | ○ |
| M2SR0020BLG | 0.4 | 4 | 0.4 | 50 | 0.2 | 15 | 2 | Figure 1 | ○ |
| M2SR0025BLG | 0.5 | 4 | 0.5 | 50 | 0.25 | 15 | 2 | Figure 1 | ○ |
| M2SR0030BLG | 0.6 | 4 | 0.6 | 50 | 0.3 | 15 | 2 | Figure 1 | ○ |
| M2SR0035BLG | 0.7 | 4 | 0.7 | 50 | 0.35 | 15 | 2 | Figure 1 | ○ |
| M2SR0040BLG | 0.8 | 4 | 0.8 | 50 | 0.4 | 15 | 2 | Figure 1 | ○ |
| M2SR0045BLG | 0.9 | 4 | 0.9 | 50 | 0.45 | 15 | 2 | Figure 1 | ○ |
| M2SR0050BLG | 1.0 | 4 | 1.0 | 50 | 0.5 | 15 | 2 | Figure 1 | ○ |
| M2SR0060BLG | 1.2 | 4 | 1.2 | 50 | 0.6 | 30 | 2 | Figure 1 | ○ |
| M2SR0070BLG | 1.4 | 4 | 1.4 | 50 | 0.7 | 30 | 2 | Figure 1 | ○ |
| M2SR0075BLG | 1.5 | 4 | 1.5 | 50 | 0.75 | 30 | 2 | Figure 1 | ○ |
| M2SR0080BLG | 1.6 | 4 | 1.6 | 50 | 0.8 | 30 | 2 | Figure 1 | ○ |
| M2SR0090BLG | 1.8 | 4 | 1.8 | 50 | 0.9 | 30 | 2 | Figure 1 | ○ |
| M2SR0100BLG | 2.0 | 4 | 2.0 | 50 | 1.0 | 30 | 2 | Figure 1 | ○ |
| M2SR0125BLG | 2.5 | 4 | 2.5 | 50 | 1.25 | 10 | 2 | Figure 1 | ○ |
| M2SR0150BLG | 3.0 | 4 | 3.0 | 50 | 1.5 | 10 | 2 | Figure 1 | ○ |

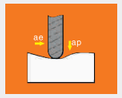
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54–60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——M2S···BLG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 40 | 100 | 180 |
| | Alloy steel | < 1200 | < 350 | 30 | 90 | 160 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 30 | 80 | 120 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 50 | 75 | 100 |
| | Martensite stainless steel | < 820 | < 240 | 40 | 60 | 80 |
| K | Gray cast iron | – | < 280 | 50 | 110 | 180 |
| | Nodular iron | – | < 320 | 40 | 90 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | 40 | 60 | 80 |
| | Hardened steel | – | 54–60HRC | 20 | 40 | 60 |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Profile milling | | | | | |
| Diameter （mm） | ap | ae | $f_z$ | | | |
| Dc＜1 | 0.025Dc | 0.1Dc | 0.015–0.025 | | | |
| 1≤Dc≤3 | 0.025Dc | 0.1Dc | 0.02–0.05 | | | |

(1) Air cooling or spray cooling is recommended.

(2) Ocne the machine rigidity is poor,and with abnormal sound or viberation when processing.Decrease the cutting speed and feed as same ration.

(3) Ensure the tool is as short as possible without interference.

## Series M - - Micro end mill

### Two-flute ball nose end mill （High hardness machining）

**M2S···BLH**

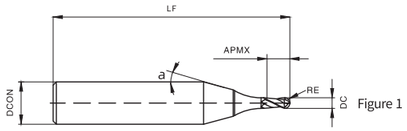
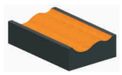
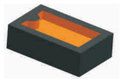


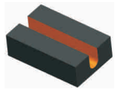

Figure 1



Profile milling



Cavity machining



slot machining

| Type | Dimension (mm) | | | | | a (°) | ZEFP | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | | | | |
| M2SR0015BLH | 0.3 | 4 | 0.2 | 50 | 0.15 | 15 | 2 | Figure 1 | ○ |
| M2SR0020BLH | 0.4 | 4 | 0.3 | 50 | 0.2 | 15 | 2 | Figure 1 | ○ |
| M2SR0025BLH | 0.5 | 4 | 0.35 | 50 | 0.25 | 15 | 2 | Figure 1 | ○ |
| M2SR0030BLH | 0.6 | 4 | 0.45 | 50 | 0.3 | 15 | 2 | Figure 1 | ○ |
| M2SR0035BLH | 0.7 | 4 | 0.5 | 50 | 0.35 | 15 | 2 | Figure 1 | ○ |
| M2SR0040BLH | 0.8 | 4 | 0.6 | 50 | 0.4 | 15 | 2 | Figure 1 | ○ |
| M2SR0045BLH | 0.9 | 4 | 0.65 | 50 | 0.45 | 15 | 2 | Figure 1 | ○ |
| M2SR0050BLH | 1.0 | 4 | 0.75 | 50 | 0.5 | 15 | 2 | Figure 1 | ○ |
| M2SR0060BLH | 1.2 | 4 | 0.9 | 50 | 0.6 | 30 | 2 | Figure 1 | ○ |
| M2SR0070BLH | 1.4 | 4 | 1.0 | 50 | 0.7 | 30 | 2 | Figure 1 | ○ |
| M2SR0075BLH | 1.5 | 4 | 1.1 | 50 | 0.75 | 30 | 2 | Figure 1 | ○ |
| M2SR0080BLH | 1.6 | 4 | 1.2 | 50 | 0.8 | 30 | 2 | Figure 1 | ○ |
| M2SR0090BLH | 1.8 | 4 | 1.35 | 50 | 0.9 | 30 | 2 | Figure 1 | ○ |
| M2SR0100BLH | 2.0 | 4 | 1.5 | 50 | 1.0 | 30 | 2 | Figure 1 | ○ |
| M2SR0125BLH | 2.5 | 4 | 2.3 | 50 | 1.25 | 10 | 2 | Figure 1 | ○ |
| M2SR0150BLH | 3.0 | 4 | 2.5 | 50 | 1.5 | 10 | 2 | Figure 1 | ○ |

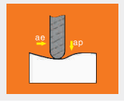
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☼ | ☼ | ☼ | | ✹ | | | | | ✹ | ✹ | ✹ |

✹ Fit well ☼ Applicable

## Recommended cutting conditions——M2S···BLH

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | – | – | – |
| | Alloy steel | < 1200 | < 350 | – | – | – |
| | High-alloyed steel and tool steel | < 1400 | < 380 | – | – | – |
| M | Austenite and ferrite stainless steel | < 680 | <220 | – | – | – |
| | Martensite stainless steel | < 820 | < 240 | – | – | – |
| K | Gray cast iron | – | < 280 | – | – | – |
| | Nodular iron | – | < 320 | – | – | – |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | 40 | 70 | 100 |
| | Hardened steel | – | 54–60HRC | 30 | 55 | 80 |
| | Hardened steel | – | > 60 HRC | 20 | 40 | 60 |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method | |  | Profile milling | | | |
| Diameter （mm） | ap | ae | $f_z$ | | | |
| Dc | 0.05Dc | 0.1Dc | 0.004–0.03 | | | |

(1) Air cooling or spray cooling is recommended.

(2) Ocne the machine rigidity is poor,and with abnormal sound or viberation when processing.Decrease the cutting speed and feed as same ration.

(3) Ensure the tool is as short as possible without interference.



## Series M - - Micro end mill

### Two-flute flat end mill（aluminum alloy machining）

**M2S···LN**

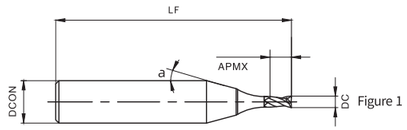
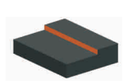
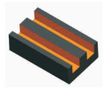



Figure 1



Side machining

Bottom machining



Slot milling

| Type | Dimension (mm) | | | | a (°) | ZEFP | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | | | | |
| M2S0030LN | 0.3 | 4 | 0.6 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0040LN | 0.4 | 4 | 0.8 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0050LN | 0.5 | 4 | 1.0 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0060LN | 0.6 | 4 | 1.2 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0070LN | 0.7 | 4 | 1.4 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0080LN | 0.8 | 4 | 1.6 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0090LN | 0.9 | 4 | 1.8 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0100LN | 1.0 | 4 | 2.0 | 50 | 15 | 2 | Figure 1 | ○ |
| M2S0110LN | 1.1 | 4 | 2.2 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0120LN | 1.2 | 4 | 2.4 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0130LN | 1.3 | 4 | 2.6 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0140LN | 1.4 | 4 | 2.8 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0150LN | 1.5 | 4 | 3.0 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0160LN | 1.6 | 4 | 3.2 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0170LN | 1.7 | 4 | 3.4 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0180LN | 1.8 | 4 | 3.6 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0190LN | 1.9 | 4 | 3.8 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0200LN | 2.0 | 4 | 4.0 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0210LN | 2.1 | 4 | 4.2 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0220LN | 2.2 | 4 | 4.4 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0230LN | 2.3 | 4 | 4.6 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0240LN | 2.4 | 4 | 4.8 | 50 | 30 | 2 | Figure 1 | ○ |
| M2S0250LN | 2.5 | 4 | 5.0 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0260LN | 2.6 | 4 | 5.2 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0270LN | 2.7 | 4 | 5.4 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0280LN | 2.8 | 4 | 5.6 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0290LN | 2.9 | 4 | 5.8 | 50 | 10 | 2 | Figure 1 | ○ |
| M2S0300LN | 3.0 | 4 | 6.0 | 50 | 10 | 2 | Figure 1 | ○ |

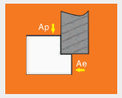
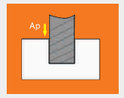
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54–60HRC | ⩾60HRC |
| | | | | | ☼ | ✹ | | | | | |

✹ Fit well ☼ Applicable

## Recommended cutting conditions——M2S···LN

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | – | – | – |
| | Alloy steel | < 1200 | < 350 | – | – | – |
| | High-alloyed steel and tool steel | < 1400 | < 380 | – | – | – |
| M | Austenite and ferrite stainless steel | < 680 | <220 | – | – | – |
| | Martensite stainless steel | < 820 | < 240 | – | – | – |
| K | Gray cast iron | – | < 280 | – | – | – |
| | Nodular iron | – | < 320 | – | – | – |
| N | Non-ferrous alloy | < 250 | < 110 | 80 | 160 | 350 |
| | Aluminum alloy | < 530 | < 130 | 120 | 200 | 300 |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | – | – | – |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | |  Slot milling | | |
| Diameter （mm） | ap | ae | $f_z$ ( mm/r ) | ap | ae | $f_z$ ( mm/r ) |
| Dc<1 | – | – | – | 0.03Dc | Dc | 0.02–0.04 |
| 1≤Dc≤3 | – | – | – | 0.06Dc | Dc | 0.04–0.12 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

(1) Water-soluable cutting fluid reuqired。

## Series M - - Micro end mill

### Two-flute ball nose end mill(aluminum alloy machining)

**M2S···BLN**

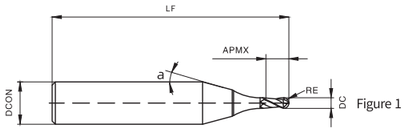
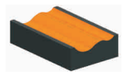
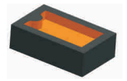
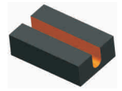


Figure 1


Profile milling


Cavity machining


slot machining

| Type | Dimension (mm) | | | | | a ( ° ) | ZEFP | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | | | | |
| M2SR0015BLN | 0.3 | 4 | 0.3 | 50 | 0.15 | 15 | 2 | Figure 1 | ○ |
| M2SR0020BLN | 0.4 | 4 | 0.4 | 50 | 0.2 | 15 | 2 | Figure 1 | ○ |
| M2SR0025BLN | 0.5 | 4 | 0.5 | 50 | 0.25 | 15 | 2 | Figure 1 | ○ |
| M2SR0030BLN | 0.6 | 4 | 0.6 | 50 | 0.3 | 15 | 2 | Figure 1 | ○ |
| M2SR0035BLN | 0.7 | 4 | 0.7 | 50 | 0.35 | 15 | 2 | Figure 1 | ○ |
| M2SR0040BLN | 0.8 | 4 | 0.8 | 50 | 0.4 | 15 | 2 | Figure 1 | ○ |
| M2SR0045BLN | 0.9 | 4 | 0.9 | 50 | 0.45 | 15 | 2 | Figure 1 | ○ |
| M2SR0050BLN | 1.0 | 4 | 1.0 | 50 | 0.5 | 15 | 2 | Figure 1 | ○ |
| M2SR0060BLN | 1.2 | 4 | 1.2 | 50 | 0.6 | 30 | 2 | Figure 1 | ○ |
| M2SR0070BLN | 1.4 | 4 | 1.4 | 50 | 0.7 | 30 | 2 | Figure 1 | ○ |
| M2SR0075BLN | 1.5 | 4 | 1.5 | 50 | 0.75 | 30 | 2 | Figure 1 | ○ |
| M2SR0080BLN | 1.6 | 4 | 1.6 | 50 | 0.8 | 30 | 2 | Figure 1 | ○ |
| M2SR0090BLN | 1.8 | 4 | 1.8 | 50 | 0.9 | 30 | 2 | Figure 1 | ○ |
| M2SR0100BLN | 2.0 | 4 | 2.0 | 50 | 1.0 | 30 | 2 | Figure 1 | ○ |
| M2SR0125BLN | 2.5 | 4 | 2.5 | 50 | 1.25 | 10 | 2 | Figure 1 | ○ |
| M2SR0150BLN | 3.0 | 4 | 3.0 | 50 | 1.5 | 10 | 2 | Figure 1 | ○ |

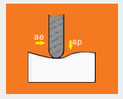
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| | | | | | ☼ | ☀ | | | | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——M2S···BLN

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | – | – | – |
| | Alloy steel | < 1200 | < 350 | – | – | – |
| | High-alloyed steel and tool steel | < 1400 | < 380 | – | – | – |
| M | Austenite and ferrite stainless steel | < 680 | <220 | – | – | – |
| | Martensite stainless steel | < 820 | < 240 | – | – | – |
| K | Gray cast iron | – | < 280 | – | – | – |
| | Nodular iron | – | < 320 | – | – | – |
| N | Non-ferrous alloy | < 250 | < 110 | 80 | 160 | 350 |
| | Aluminum alloy | < 530 | < 130 | 120 | 200 | 300 |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | – | – | – |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method | |  | Profile milling | | | |
| Diameter （mm） | ap | ae | $f_z$ ( mm/r ) | | | |
| Dc<1 | 0.01Dc | - | 0.015–0.025 | | | |
| 1≤Dc≤3 | 0.02Dc | - | 0.02–0.05 | | | |

(1) Water-soluable cutting fluid reuqired。

## Series B--Basic end mills

### Two-flute flat end mill (short flute structure)

**B2S···LG**

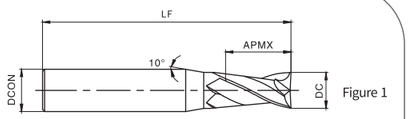



Figure 1

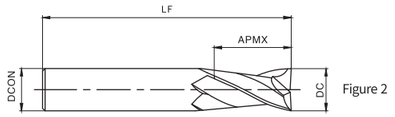
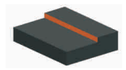
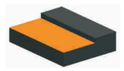


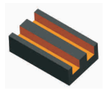

Figure 2



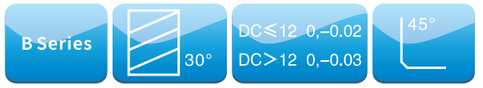
Side machining



Bottom machining



Slot milling




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B2S0300LG–4 | 3.0 | 4 | 8 | 50 | 2 | Figure 1 | ● |
| B2S0350LG–4 | 3.5 | 4 | 10 | 50 | 2 | Figure 1 | ○ |
| B2S0400LG–4 | 4.0 | 4 | 11 | 50 | 2 | Figure 1 | ● |
| B2S0300LG | 3.0 | 6 | 8 | 50 | 2 | Figure 1 | ○ |
| B2S0350LG | 3.5 | 6 | 10 | 50 | 2 | Figure 1 | ● |
| B2S0400LG | 4.0 | 6 | 11 | 50 | 2 | Figure 1 | ○ |
| B2S0450LG | 4.5 | 6 | 11 | 50 | 2 | Figure 1 | ● |
| B2S0500LG | 5.0 | 6 | 13 | 50 | 2 | Figure 1 | ● |
| B2S0550LG | 5.5 | 6 | 16 | 50 | 2 | Figure 1 | ● |
| B2S0600LG | 6.0 | 6 | 16 | 50 | 2 | Figure 1 | ○ |
| B2S0700LG | 7.0 | 8 | 20 | 60 | 2 | Figure 1 | ● |
| B2S0800LG | 8.0 | 8 | 20 | 60 | 2 | Figure 1 | ● |
| B2S0900LG | 9.0 | 10 | 22 | 75 | 2 | Figure 1 | ● |
| B2S1000LG | 10.0 | 10 | 25 | 75 | 2 | Figure 1 | ● |
| B2S1200LG | 12.0 | 12 | 30 | 75 | 2 | Figure 1 | ● |
| B2S1400LG | 14.0 | 14 | 32 | 75 | 2 | Figure 1 | ● |
| B2S1600LG | 16.0 | 16 | 45 | 100 | 2 | Figure 1 | ● |
| B2S1800LG | 18.0 | 18 | 45 | 100 | 2 | Figure 1 | ● |
| B2S2000LG | 20.0 | 20 | 45 | 100 | 2 | Figure 1 | ● |

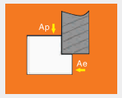
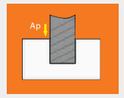
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B2S···LG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |   Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.02 |
| 3.5 | 3.5 | 1.1 | 0.025 | 2.6 | 3.5 | 0.025 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 4.5 | 4.5 | 1.4 | 0.035 | 3.4 | 4.5 | 0.03 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.03 |
| 5.5 | 5.5 | 1.7 | 0.040 | 4.0 | 5.5 | 0.035 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 7.0 | 7.0 | 2.1 | 0.050 | 5.3 | 7.0 | 0.04 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.05 |
| 9.0 | 9.0 | 2.7 | 0.065 | 6.7 | 9.0 | 0.055 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.06 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.07 |
| 14.0 | 14.0 | 4.2 | 0.100 | 10.5 | 14.0 | 0.085 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 18.0 | 18.0 | 5.4 | 0.130 | 13.5 | 18.0 | 0.105 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.12 |

(1) This series of tools is a good solution for slot milling;
(2) Before slot milling, please reduce the cutting speed (rotating speed) to 50%-70% of the value indicated in the table above, and the feed rate (feed rate) to 40%-60%.
(3) Before vertical feed machining, decrease the feed rate to below 1/3 of the standard value in the above table.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(5) The tool overhang is as short as possible without affecting the use.



## Series B--Basic end mills

### Two-flute flat end mill (long flute structure)

**B2L···LG**

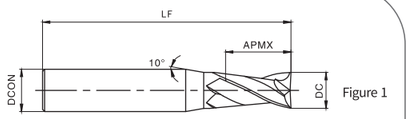


Figure 1

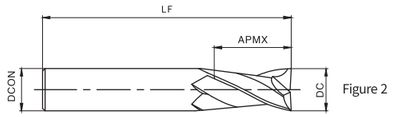
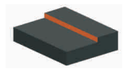
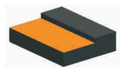
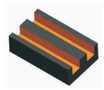
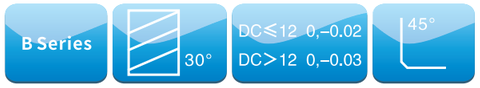


Figure 2


Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B2L0300LG–4 | 3.0 | 4 | 12 | 75 | 2 | Figure 1 | ● |
| B2L0400LG–4 | 4.0 | 4 | 15 | 75 | 2 | Figure 2 | ○ |
| B2L0300LG | 3.0 | 6 | 12 | 75 | 2 | Figure 1 | ○ |
| B2L0400LG | 4.0 | 6 | 15 | 75 | 2 | Figure 1 | ● |
| B2L0500LG | 5.0 | 6 | 20 | 75 | 2 | Figure 1 | ● |
| B2L0600LG | 6.0 | 6 | 20 | 75 | 2 | Figure 2 | ● |
| B2L0800LG | 8.0 | 8 | 25 | 100 | 2 | Figure 2 | ● |
| B2L1000LG | 10.0 | 10 | 30 | 100 | 2 | Figure 2 | ● |
| B2L1200LG | 12.0 | 12 | 35 | 100 | 2 | Figure 2 | ● |
| B2L1400LG | 14.0 | 14 | 40 | 100 | 2 | Figure 2 | ● |
| B2L1600LG | 16.0 | 16 | 50 | 150 | 2 | Figure 2 | ● |
| B2L2000LG | 20.0 | 20 | 55 | 150 | 2 | Figure 2 | ● |

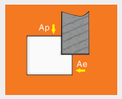
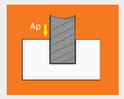
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B2L···LG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

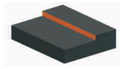
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | |  Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.030 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 14.0 | 14.0 | 4.2 | 0.100 | 10.5 | 14.0 | 0.085 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

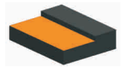
(1) This series of tools is a good solution for slot milling;
(2) Before slot milling, please reduce the cutting speed (rotating speed) to 50%-70% of the value indicated in the table above, and the feed rate (feed rate) to 40%-60%.
(3) Before vertical feed machining, decrease the feed rate to below 1/3 of the standard value in the above table.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(5) The tool overhang is as short as possible without affecting the use.

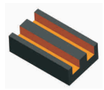
## Series B--Basic end mills

### Three-flute flat end mill (short flute structure)

**B3S···NG**


Side machining


Bottom machining


Slot milling

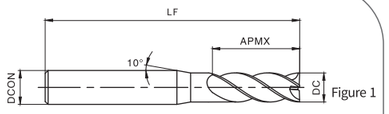


Figure 1

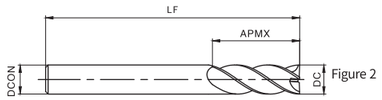
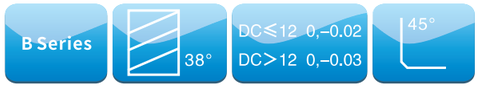


Figure 2




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B3S0300NG–4 | 3.0 | 4 | 8 | 50 | 3 | Figure 1 | ● |
| B3S0350NG–4 | 3.5 | 4 | 10 | 50 | 3 | Figure 1 | ○ |
| B3S0400NG–4 | 4.0 | 4 | 11 | 50 | 3 | Figure 2 | ● |
| B3S0300NG | 3.0 | 6 | 8 | 50 | 3 | Figure 1 | ○ |
| B3S0350NG | 3.5 | 6 | 10 | 50 | 3 | Figure 1 | ● |
| B3S0400NG | 4.0 | 6 | 11 | 50 | 3 | Figure 1 | ○ |
| B3S0450NG | 4.5 | 6 | 11 | 50 | 3 | Figure 1 | ● |
| B3S0500NG | 5.0 | 6 | 13 | 50 | 3 | Figure 1 | ○ |
| B3S0550NG | 5.5 | 6 | 16 | 50 | 3 | Figure 1 | ● |
| B3S0600NG | 6.0 | 6 | 16 | 50 | 3 | Figure 2 | ○ |
| B3S0700NG | 7.0 | 8 | 20 | 60 | 3 | Figure 1 | ● |
| B3S0800NG | 8.0 | 8 | 20 | 60 | 3 | Figure 2 | ● |
| B3S0900NG | 9.0 | 10 | 22 | 75 | 3 | Figure 1 | ● |
| B3S1000NG | 10.0 | 10 | 25 | 75 | 3 | Figure 2 | ● |
| B3S1200NG | 12.0 | 12 | 30 | 75 | 3 | Figure 2 | ● |
| B3S1400NG | 14.0 | 14 | 32 | 75 | 3 | Figure 2 | ● |
| B3S1600NG | 16.0 | 16 | 45 | 100 | 3 | Figure 2 | ● |
| B3S1800NG | 18.0 | 18 | 45 | 100 | 3 | Figure 2 | ● |
| B3S2000NG | 20.0 | 20 | 45 | 100 | 3 | Figure 2 | ● |

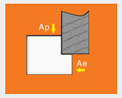
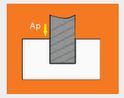
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B3S···NG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |   Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 3.5 | 3.5 | 1.1 | 0.025 | 2.6 | 3.5 | 0.025 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 4.5 | 4.5 | 1.4 | 0.035 | 3.4 | 4.5 | 0.030 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.030 |
| 5.5 | 5.5 | 1.7 | 0.040 | 4.1 | 5.5 | 0.030 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 14.0 | 14.0 | 4.2 | 0.100 | 10.5 | 14.0 | 0.085 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 18.0 | 18.0 | 5.4 | 0.130 | 13.5 | 18.0 | 0.105 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) Before vertical feed machining, decrease the feed rate to below 1/3 of the standard value in the above table.
(4) The down milling is recommended for side milling.
(5) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table is lowered in the same proportion.



## Series B--Basic end mills

### Three-flute flat end mill (long flute structure)

**B3L···NG**

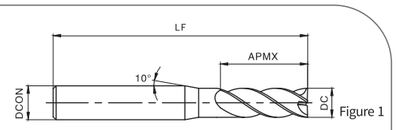


Figure 1

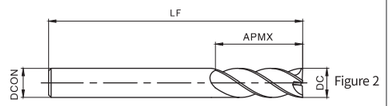
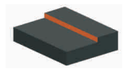
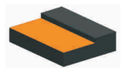
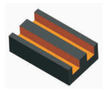
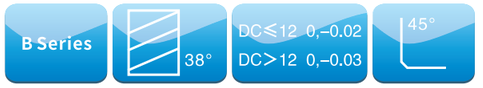


Figure 2


Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B3L0300NG–4 | 3.0 | 4 | 12 | 75 | 3 | Figure 1 | ● |
| B3L0400NG–4 | 4.0 | 4 | 15 | 75 | 3 | Figure 2 | ● |
| B3L0300NG | 3.0 | 6 | 12 | 75 | 3 | Figure 1 | ○ |
| B3L0400NG | 4.0 | 6 | 15 | 75 | 3 | Figure 1 | ● |
| B3L0500NG | 5.0 | 6 | 20 | 75 | 3 | Figure 1 | ● |
| B3L0600NG | 6.0 | 6 | 20 | 75 | 3 | Figure 2 | ● |
| B3L0800NG | 8.0 | 8 | 25 | 100 | 3 | Figure 2 | ● |
| B3L1000NG | 10.0 | 10 | 30 | 100 | 3 | Figure 2 | ○ |
| B3L1200NG | 12.0 | 12 | 35 | 100 | 3 | Figure 2 | ● |
| B3L1400NG | 14.0 | 14 | 40 | 100 | 3 | Figure 2 | ● |
| B3L1600NG | 16.0 | 16 | 50 | 150 | 3 | Figure 2 | ● |
| B3L2000NG | 20.0 | 20 | 55 | 150 | 3 | Figure 2 | ● |

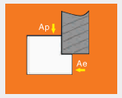
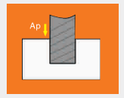
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B3L···NG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |   Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.030 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 14.0 | 14.0 | 4.2 | 0.100 | 10.5 | 14.0 | 0.085 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) Before vertical feed machining, decrease the feed rate to below 1/3 of the standard value in the above table.
(4) The down milling is recommended for side milling.
(5) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table is lowered in the same proportion.

## Series B--Basic end mills

### Four-flute flat end mill (short flute structure, small helical angle)

**B4S···LG**

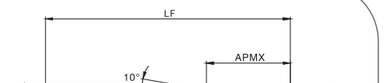


Figure 1

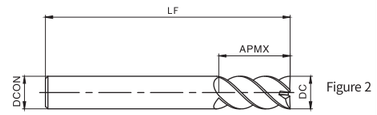
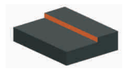
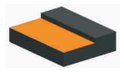
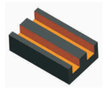
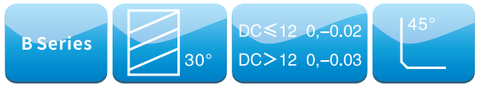


Figure 2


Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B4S0100LG–4 | 1.0 | 4 | 3 | 50 | 4 | Figure 1 | ● |
| B4S0150LG–4 | 1.5 | 4 | 4 | 50 | 4 | Figure 1 | ○ |
| B4S0200LG–4 | 2.0 | 4 | 6 | 50 | 4 | Figure 1 | ● |
| B4S0250LG–4 | 2.5 | 4 | 8 | 50 | 4 | Figure 1 | ● |
| B4S0300LG–4 | 3.0 | 4 | 8 | 50 | 4 | Figure 1 | ● |
| B4S0350LG–4 | 3.5 | 4 | 10 | 50 | 4 | Figure 1 | ● |
| B4S0400LG–4 | 4.0 | 4 | 11 | 50 | 4 | Figure 2 | ● |

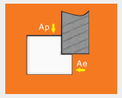
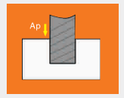
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B4S···LG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | |  Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 1.0 | 1.0 | 0.3 | 0.010 | 0.75 | 1.0 | 0.005 |
| 1.5 | 1.5 | 0.5 | 0.015 | 1.13 | 1.5 | 0.010 |
| 2.0 | 2.0 | 0.6 | 0.015 | 1.50 | 2.0 | 0.015 |
| 2.5 | 2.5 | 0.8 | 0.020 | 1.88 | 2.5 | 0.020 |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 3.5 | 3.5 | 1.1 | 0.025 | 2.6 | 3.5 | 0.025 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 4.5 | 4.5 | 1.4 | 0.035 | 3.4 | 4.5 | 0.030 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.030 |
| 5.5 | 5.5 | 1.7 | 0.040 | 4.1 | 5.5 | 0.035 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 11.0 | 11.0 | 3.3 | 0.080 | 8.0 | 11.0 | 0.065 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 14.0 | 14.0 | 4.2 | 0.100 | 10.5 | 14.0 | 0.085 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 18.0 | 18.0 | 5.4 | 0.130 | 13.5 | 18.0 | 0.105 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.



## Series B--Basic end mills

### Four-flute flat end mill (short flute structure, small helical angle)

**B4S···LG**

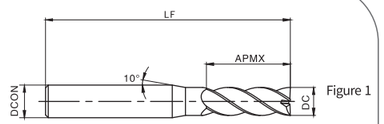


Figure 1

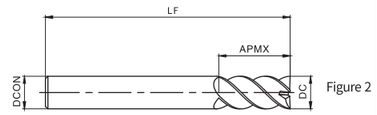
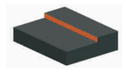
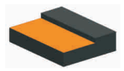
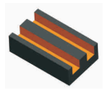
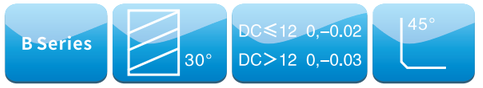


Figure 2


Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B4S0100LG | 1.0 | 6 | 3 | 50 | 4 | Figure 1 | ● |
| B4S0150LG | 1.5 | 6 | 4 | 50 | 4 | Figure 1 | ○ |
| B4S0200LG | 2.0 | 6 | 6 | 50 | 4 | Figure 1 | ● |
| B4S0250LG | 2.5 | 6 | 8 | 50 | 4 | Figure 1 | ○ |
| B4S0300LG | 3.0 | 6 | 8 | 50 | 4 | Figure 1 | ● |
| B4S0350LG | 3.5 | 6 | 10 | 50 | 4 | Figure 1 | ○ |
| B4S0400LG | 4.0 | 6 | 11 | 50 | 4 | Figure 1 | ● |
| B4S0450LG | 4.5 | 6 | 11 | 50 | 4 | Figure 1 | ○ |
| B4S0500LG | 5.0 | 6 | 13 | 50 | 4 | Figure 1 | ● |
| B4S0550LG | 5.5 | 6 | 16 | 50 | 4 | Figure 1 | ○ |
| B4S0600LG | 6.0 | 6 | 16 | 50 | 4 | Figure 2 | ● |
| B4S0700LG | 7.0 | 8 | 20 | 60 | 4 | Figure 2 | ○ |
| B4S0800LG | 8.0 | 8 | 20 | 60 | 4 | Figure 2 | ● |
| B4S0900LG | 9.0 | 10 | 22 | 75 | 4 | Figure 2 | ○ |
| B4S1000LG | 10.0 | 10 | 25 | 75 | 4 | Figure 2 | ● |
| B4S1100LG | 11.0 | 12 | 26 | 75 | 4 | Figure 2 | ● |
| B4S1200LG | 12.0 | 12 | 30 | 75 | 4 | Figure 2 | ● |
| B4S1400LG | 14.0 | 14 | 32 | 75 | 4 | Figure 2 | ● |
| B4S1600LG | 16.0 | 16 | 45 | 100 | 4 | Figure 2 | ● |
| B4S1800LG | 18.0 | 18 | 45 | 100 | 4 | Figure 2 | ● |
| B4S2000LG | 20.0 | 20 | 45 | 100 | 4 | Figure 2 | ● |

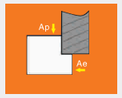
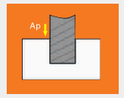
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B4S···LG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

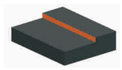
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |   Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 1.0 | 1.0 | 0.3 | 0.010 | 0.75 | 1.0 | 0.005 |
| 1.5 | 1.5 | 0.5 | 0.015 | 1.13 | 1.5 | 0.010 |
| 2.0 | 2.0 | 0.6 | 0.015 | 1.50 | 2.0 | 0.015 |
| 2.5 | 2.5 | 0.8 | 0.020 | 1.88 | 2.5 | 0.020 |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 3.5 | 3.5 | 1.1 | 0.025 | 2.6 | 3.5 | 0.025 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |

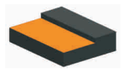
(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

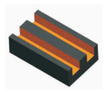
## Series B--Basic end mills

### Four-flute flat end mill (long flute structure, small helical angle)

**B4L···LG**


Side machining


Bottom machining


Slot milling

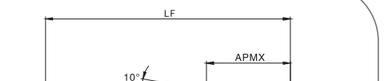


Figure 1

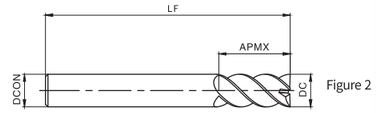
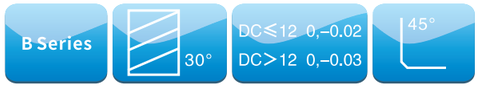


Figure 2




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B4L0300LG–4 | 3.0 | 4 | 12 | 75 | 4 | Figure 1 | ● |
| B4L0400LG–4 | 4.0 | 4 | 15 | 75 | 4 | Figure 2 | ○ |
| B4L0300LG | 3.0 | 6 | 12 | 75 | 4 | Figure 1 | ● |
| B4L0400LG | 4.0 | 6 | 15 | 75 | 4 | Figure 1 | ● |
| B4L0500LG | 5.0 | 6 | 20 | 75 | 4 | Figure 1 | ● |
| B4L0600LG | 6.0 | 6 | 20 | 75 | 4 | Figure 2 | ● |
| B4L0800LG | 8.0 | 8 | 25 | 100 | 4 | Figure 2 | ● |
| B4L1000LG | 10.0 | 10 | 30 | 100 | 4 | Figure 2 | ○ |
| B4L1200LG | 12.0 | 12 | 35 | 100 | 4 | Figure 2 | ● |
| B4L1400LG | 14.0 | 14 | 40 | 100 | 4 | Figure 2 | ● |
| B4L1600LG | 16.0 | 16 | 50 | 150 | 4 | Figure 2 | ● |
| B4L2000LG | 20.0 | 20 | 55 | 150 | 4 | Figure 2 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B4L···LG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

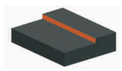
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method | Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.030 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 14.0 | 14.0 | 4.2 | 0.100 | 10.5 | 14.0 | 0.085 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

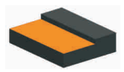
(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

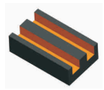
## Series B--Basic end mills

### Four-flute flat end mill (short flute structure, large helical angle)

**B4S···HG**


Side machining


Bottom machining


Slot milling

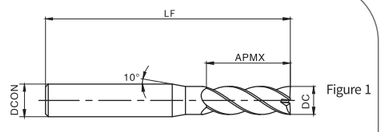


Figure 1

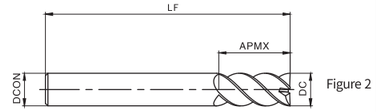
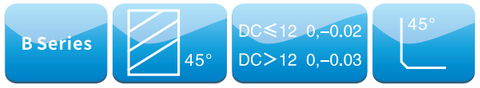


Figure 2




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B4S0100HG–4 | 1.0 | 4 | 3 | 50 | 4 | Figure 1 | ● |
| B4S0150HG–4 | 1.5 | 4 | 4 | 50 | 4 | Figure 1 | ● |
| B4S0200HG–4 | 2.0 | 4 | 6 | 50 | 4 | Figure 1 | ● |
| B4S0250HG–4 | 2.5 | 4 | 8 | 50 | 4 | Figure 1 | ● |
| B4S0300HG–4 | 3.0 | 4 | 8 | 50 | 4 | Figure 1 | ● |
| B4S0350HG–4 | 3.5 | 4 | 10 | 50 | 4 | Figure 1 | ● |
| B4S0400HG–4 | 4.0 | 4 | 11 | 50 | 4 | Figure 2 | ● |

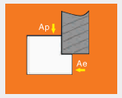
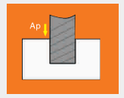
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B4S···HG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

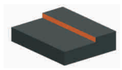
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |   Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 1.0 | 1.0 | 0.3 | 0.010 | 0.75 | 1.0 | 0.005 |
| 1.5 | 1.5 | 0.5 | 0.015 | 1.13 | 1.5 | 0.010 |
| 2.0 | 2.0 | 0.6 | 0.015 | 1.50 | 2.0 | 0.015 |
| 2.5 | 2.5 | 0.8 | 0.020 | 1.88 | 2.5 | 0.020 |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 3.5 | 3.5 | 1.1 | 0.025 | 2.6 | 3.5 | 0.025 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |

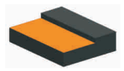
(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

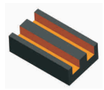
## Series B--Basic end mills

### Four-flute flat end mill (short flute structure, large helical angle)

**B4S···HG**


Side machining


Bottom machining


Slot milling

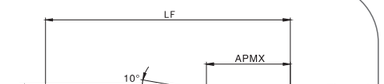


Figure 1

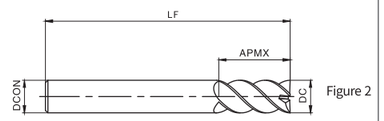


Figure 2

B Series | 45° | DC≤12 0,-0.02 DC>12 0,-0.03 | 45°

| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B4S0100HG | 1.0 | 6 | 3 | 50 | 4 | Figure 1 | ● |
| B4S0150HG | 1.5 | 6 | 4 | 50 | 4 | Figure 1 | ○ |
| B4S0200HG | 2.0 | 6 | 6 | 50 | 4 | Figure 1 | ● |
| B4S0250HG | 2.5 | 6 | 8 | 50 | 4 | Figure 1 | ○ |
| B4S0300HG | 3.0 | 6 | 8 | 50 | 4 | Figure 1 | ● |
| B4S0350HG | 3.5 | 6 | 10 | 50 | 4 | Figure 1 | ○ |
| B4S0400HG | 4.0 | 6 | 11 | 50 | 4 | Figure 1 | ● |
| B4S0450HG | 4.5 | 6 | 11 | 50 | 4 | Figure 1 | ○ |
| B4S0500HG | 5.0 | 6 | 13 | 50 | 4 | Figure 1 | ● |
| B4S0550HG | 5.5 | 6 | 16 | 50 | 4 | Figure 1 | ○ |
| B4S0600HG | 6.0 | 6 | 16 | 50 | 4 | Figure 2 | ● |
| B4S0700HG | 7.0 | 8 | 20 | 60 | 4 | Figure 1 | ● |
| B4S0800HG | 8.0 | 8 | 20 | 60 | 4 | Figure 2 | ● |
| B4S0900HG | 9.0 | 10 | 22 | 75 | 4 | Figure 1 | ● |
| B4S1000HG | 10.0 | 10 | 25 | 75 | 4 | Figure 2 | ● |
| B4S1100HG | 11.0 | 12 | 26 | 75 | 4 | Figure 1 | ● |
| B4S1200HG | 12.0 | 12 | 30 | 75 | 4 | Figure 2 | ● |
| B4S1400HG | 14.0 | 14 | 32 | 75 | 4 | Figure 2 | ● |
| B4S1600HG | 16.0 | 16 | 45 | 100 | 4 | Figure 2 | ● |
| B4S1800HG | 18.0 | 18 | 45 | 100 | 4 | Figure 2 | ● |
| B4S2000HG | 20.0 | 20 | 45 | 100 | 4 | Figure 2 | ● |

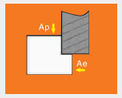
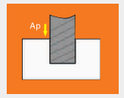
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B4S···HG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

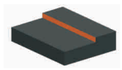
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | |  Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 1.0 | 1.0 | 0.3 | 0.010 | 0.75 | 1.0 | 0.005 |
| 1.5 | 1.5 | 0.5 | 0.015 | 1.13 | 1.5 | 0.010 |
| 2.0 | 2.0 | 0.6 | 0.015 | 1.50 | 2.0 | 0.015 |
| 2.5 | 2.5 | 0.8 | 0.020 | 1.88 | 2.5 | 0.020 |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 3.5 | 3.5 | 1.1 | 0.025 | 2.6 | 3.5 | 0.025 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 4.5 | 4.5 | 1.4 | 0.035 | 3.4 | 4.5 | 0.030 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.030 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 11.0 | 11.0 | 3.3 | 0.080 | 8.0 | 11.0 | 0.065 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 14.0 | 14.0 | 4.2 | 0.100 | 10.5 | 14.0 | 0.085 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 18.0 | 18.0 | 5.4 | 0.130 | 13.5 | 18.0 | 0.105 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

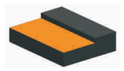
(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

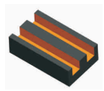
## Series B--Basic end mills

### Four-flute flat end mill (long flute structure, large helical angle)

**B4L···HG**


Side machining


Bottom machining


Slot milling

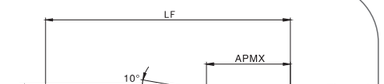


Figure 1

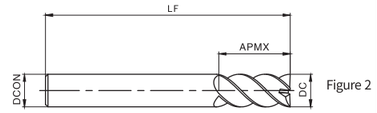
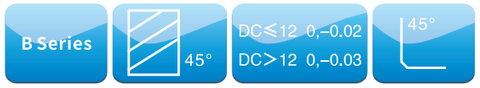


Figure 2




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B4L0300HG–4 | 3.0 | 4 | 12 | 75 | 4 | Figure 1 | ● |
| B4L0400HG–4 | 4.0 | 4 | 15 | 75 | 4 | Figure 2 | ● |
| B4L0300HG | 3.0 | 6 | 12 | 75 | 4 | Figure 1 | ● |
| B4L0400HG | 4.0 | 6 | 15 | 75 | 4 | Figure 1 | ● |
| B4L0500HG | 5.0 | 6 | 20 | 75 | 4 | Figure 1 | ● |
| B4L0600HG | 6.0 | 6 | 20 | 75 | 4 | Figure 2 | ● |
| B4L0800HG | 8.0 | 8 | 25 | 100 | 4 | Figure 2 | ● |
| B4L1000HG | 10.0 | 10 | 30 | 100 | 4 | Figure 2 | ● |
| B4L1200HG | 12.0 | 12 | 35 | 100 | 4 | Figure 2 | ● |
| B4L1400HG | 14.0 | 14 | 40 | 100 | 4 | Figure 2 | ● |
| B4L1600HG | 16.0 | 16 | 50 | 150 | 4 | Figure 2 | ● |
| B4L2000HG | 20.0 | 20 | 55 | 150 | 4 | Figure 2 | ● |

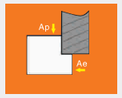
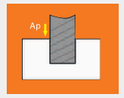
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B4L···HG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

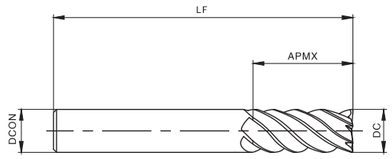
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |   Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.02 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.03 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.05 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.06 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.07 |
| 14.0 | 14.0 | 4.2 | 0.100 | 10.5 | 14.0 | 0.085 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.12 |

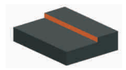
(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

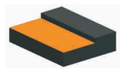
## Series B--Basic end mills

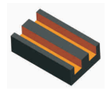
### Six-flute flat end mill (short flute structure)

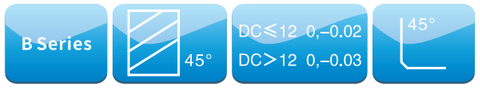
**B6S···HG**





Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | Inventory |
|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | |
| B6S0600HG | 6.0 | 6 | 18 | 60 | 6 | ● |
| B6S0800HG | 8.0 | 8 | 20 | 60 | 6 | ● |
| B6S1000HG | 10.0 | 10 | 30 | 75 | 6 | ● |
| B6S1200HG | 12.0 | 12 | 32 | 75 | 6 | ● |
| B6S1600HG | 16.0 | 16 | 40 | 100 | 6 | ● |
| B6S2000HG | 20.0 | 20 | 45 | 100 | 6 | ● |

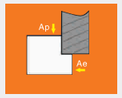
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B6S···HG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

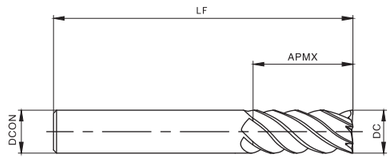
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.05xDc ) | fz ( mm/z ) | | | |
| 6.0 | 6.0 | 0.3 | 0.020 | | | |
| 8.0 | 8.0 | 0.4 | 0.027 | | | |
| 10.0 | 10.0 | 0.5 | 0.033 | | | |
| 12.0 | 12.0 | 0.6 | 0.040 | | | |
| 16.0 | 16.0 | 0.8 | 0.053 | | | |
| 20.0 | 20.0 | 1.0 | 0.067 | | | |

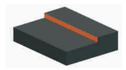
(1) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(2) The down milling is recommended for side milling.
(3) Use cutting fluid that is air-cooled or free of producing smoke.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of theabove table should be lowered in the same proportion.

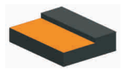
## Series B--Basic end mills

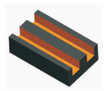
### Six-flute flat end mill (long flute structure)

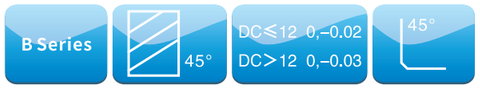
**B6L···HG**





Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | Inventory |
|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | |
| B6L0600HG | 6.0 | 6 | 24 | 75 | 6 | ● |
| B6L0800HG | 8.0 | 8 | 32 | 75 | 6 | ● |
| B6L1000HG | 10.0 | 10 | 40 | 100 | 6 | ● |
| B6L1200HG | 12.0 | 12 | 45 | 100 | 6 | ● |
| B6L1600HG | 16.0 | 16 | 64 | 150 | 6 | ● |
| B6L2000HG | 20.0 | 20 | 75 | 150 | 6 | ● |

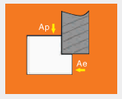
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B6L···HG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

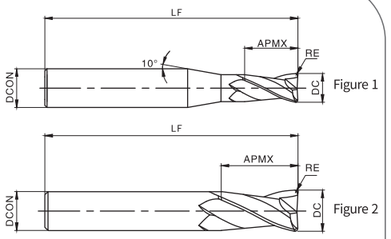
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.05xDc ) | fz ( mm/z ) | | | |
| 6.0 | 6.0 | 0.3 | 0.025 | | | |
| 8.0 | 8.0 | 0.4 | 0.033 | | | |
| 10.0 | 10.0 | 0.5 | 0.042 | | | |
| 12.0 | 12.0 | 0.6 | 0.050 | | | |
| 16.0 | 16.0 | 0.8 | 0.067 | | | |
| 20.0 | 20.0 | 1.0 | 0.083 | | | |

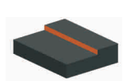
(1) Before slot milling, please reduce he cutting speed (rotating speed) to 50%-70% of the value indicated in the table above, and the Feed rate (feed rate) to 40%-60%.
(2) Before vertical feed machining, decrease the feed rate to below 1/3 of the standard value in the above table.
(3) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(4) The tool overhang is as short as possible without affecting the use.

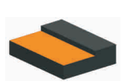
## Series B--Basic end mills

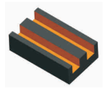
### Two-flute R end mill (short flute structure)

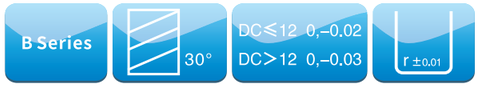
**B2S···R···LG**





Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | | |
| B2S0300R0020LG–4 | 3.0 | 4 | 8 | 50 | 0.2 | 2 | Figure 1 | ● |
| B2S0300R0030LG–4 | 3.0 | 4 | 8 | 50 | 0.3 | 2 | Figure 1 | ● |
| B2S0300R0050LG–4 | 3.0 | 4 | 8 | 50 | 0.5 | 2 | Figure 1 | ● |
| B2S0400R0020LG–4 | 4.0 | 4 | 11 | 50 | 0.2 | 2 | Figure 2 | ● |
| B2S0400R0030LG–4 | 4.0 | 4 | 11 | 50 | 0.3 | 2 | Figure 2 | ● |
| B2S0400R0050LG–4 | 4.0 | 4 | 11 | 50 | 0.5 | 2 | Figure 2 | ● |
| B2S0400R0100LG–4 | 4.0 | 4 | 11 | 50 | 1.0 | 2 | Figure 2 | ● |
| B2S0300R0020LG | 3.0 | 6 | 8 | 50 | 0.2 | 2 | Figure 1 | ● |
| B2S0300R0030LG | 3.0 | 6 | 8 | 50 | 0.3 | 2 | Figure 1 | ○ |
| B2S0300R0050LG | 3.0 | 6 | 8 | 50 | 0.5 | 2 | Figure 1 | ● |
| B2S0400R0020LG | 4.0 | 6 | 11 | 50 | 0.2 | 2 | Figure 1 | ● |
| B2S0400R0030LG | 4.0 | 6 | 11 | 50 | 0.3 | 2 | Figure 1 | ○ |
| B2S0400R0050LG | 4.0 | 6 | 11 | 50 | 0.5 | 2 | Figure 1 | ● |
| B2S0400R0100LG | 4.0 | 6 | 11 | 50 | 1.0 | 2 | Figure 1 | ● |
| B2S0500R0030LG | 5.0 | 6 | 13 | 50 | 0.3 | 2 | Figure 1 | ○ |
| B2S0500R0050LG | 5.0 | 6 | 13 | 50 | 0.5 | 2 | Figure 1 | ● |
| B2S0500R0100LG | 5.0 | 6 | 13 | 50 | 1.0 | 2 | Figure 1 | ● |
| B2S0600R0030LG | 6.0 | 6 | 16 | 50 | 0.3 | 2 | Figure 2 | ○ |
| B2S0600R0050LG | 6.0 | 6 | 16 | 50 | 0.5 | 2 | Figure 2 | ● |
| B2S0600R0100LG | 6.0 | 6 | 16 | 50 | 1.0 | 2 | Figure 2 | ● |
| B2S0800R0030LG | 8.0 | 8 | 20 | 60 | 0.3 | 2 | Figure 2 | ○ |
| B2S0800R0050LG | 8.0 | 8 | 20 | 60 | 0.5 | 2 | Figure 2 | ● |
| B2S0800R0100LG | 8.0 | 8 | 20 | 60 | 1.0 | 2 | Figure 2 | ● |
| B2S1000R0050LG | 10.0 | 10 | 25 | 75 | 0.5 | 2 | Figure 2 | ● |
| B2S1000R0100LG | 10.0 | 10 | 25 | 75 | 1.0 | 2 | Figure 2 | ● |
| B2S1000R0150LG | 10.0 | 10 | 25 | 75 | 1.5 | 2 | Figure 2 | ● |
| B2S1000R0200LG | 10.0 | 10 | 25 | 75 | 2.0 | 2 | Figure 2 | ● |
| B2S1200R0050LG | 12.0 | 12 | 30 | 75 | 0.5 | 2 | Figure 2 | ● |
| B2S1200R0100LG | 12.0 | 12 | 30 | 75 | 1.0 | 2 | Figure 2 | ● |
| B2S1200R0150LG | 12.0 | 12 | 30 | 75 | 1.5 | 2 | Figure 2 | ● |
| B2S1200R0200LG | 12.0 | 12 | 30 | 75 | 2.0 | 2 | Figure 2 | ● |

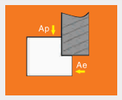
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B2S···R···LG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

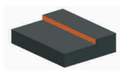
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 3.0 | 3.0 | 1.2 | 0.025 | 2.3 | 3.0 | 0.020 |
| 4.0 | 4.0 | 1.6 | 0.030 | 3.0 | 4.0 | 0.025 |
| 5.0 | 5.0 | 2.0 | 0.035 | 3.8 | 5.0 | 0.030 |
| 6.0 | 6.0 | 2.4 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 3.2 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 4.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 4.8 | 0.085 | 9.0 | 12.0 | 0.070 |

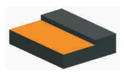
(1) Before slot milling, please reduce he cutting speed (rotating speed) to 50%-70% of the value indicated in the table above, and the Feed rate (feed rate) to 40%-60%.
(2) Before vertical feed machining, decrease the feed rate to below 1/3 of the standard value in the above table.
(3) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(4) The tool overhang is as short as possible without affecting the use.

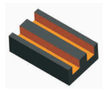
## Series B--Basic end mills

### Four-flute R end mill (short flute structure)

**B4S···R···LG**


Side machining


Bottom machining


Slot milling

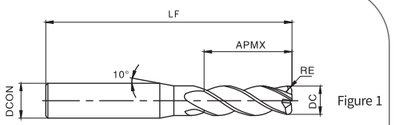


Figure 1

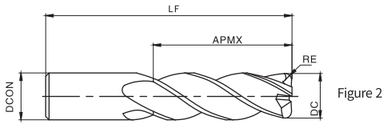


Figure 2

B Series | 30° | DC≤12 0,-0.02 DC>12 0,-0.03 | r ±0.01

| Type | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | | |
| B4S0300R0020LG–4 | 3.0 | 4 | 8 | 50 | 0.2 | 4 | Figure 1 | ● |
| B4S0400R0030LG–4 | 4.0 | 4 | 10 | 50 | 0.3 | 4 | Figure 2 | ○ |
| B4S0400R0050LG–4 | 4.0 | 4 | 10 | 50 | 0.5 | 4 | Figure 2 | ● |
| B4S0300R0020LG | 3.0 | 6 | 8 | 50 | 0.2 | 4 | Figure 1 | ● |
| B4S0400R0030LG | 4.0 | 6 | 10 | 50 | 0.3 | 4 | Figure 1 | ● |
| B4S0400R0050LG | 4.0 | 6 | 10 | 50 | 0.5 | 4 | Figure 1 | ● |
| B4S0500R0050LG | 5.0 | 6 | 13 | 50 | 0.5 | 4 | Figure 1 | ● |
| B4S0500R0100LG | 5.0 | 6 | 13 | 50 | 1.0 | 4 | Figure 1 | ● |
| B4S0600R0050LG | 6.0 | 6 | 16 | 50 | 0.5 | 4 | Figure 2 | ● |
| B4S0600R0100LG | 6.0 | 6 | 16 | 50 | 1.0 | 4 | Figure 2 | ● |
| B4S0800R0050LG | 8.0 | 8 | 20 | 60 | 0.5 | 4 | Figure 2 | ● |
| B4S0800R0100LG | 8.0 | 8 | 20 | 60 | 1.0 | 4 | Figure 2 | ● |
| B4S1000R0050LG | 10.0 | 10 | 25 | 75 | 0.5 | 4 | Figure 2 | ● |
| B4S1000R0100LG | 10.0 | 10 | 25 | 75 | 1.0 | 4 | Figure 2 | ● |
| B4S1000R0200LG | 10.0 | 10 | 25 | 75 | 2.0 | 4 | Figure 2 | ● |
| B4S1000R0300LG | 10.0 | 10 | 25 | 75 | 3.0 | 4 | Figure 2 | ● |
| B4S1200R0050LG | 12.0 | 12 | 30 | 75 | 0.5 | 4 | Figure 2 | ● |
| B4S1200R0100LG | 12.0 | 12 | 30 | 75 | 1.0 | 4 | Figure 2 | ● |
| B4S1200R0200LG | 12.0 | 12 | 30 | 75 | 2.0 | 4 | Figure 2 | ● |
| B4S1200R0300LG | 12.0 | 12 | 30 | 75 | 3.0 | 4 | Figure 2 | ● |

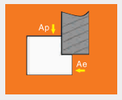
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B4S···R···LG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 3.0 | 3.0 | 1.2 | 0.025 | 2.3 | 3.0 | 0.020 |
| 4.0 | 4.0 | 1.6 | 0.030 | 3.0 | 4.0 | 0.025 |
| 5.0 | 5.0 | 2.0 | 0.035 | 3.8 | 5.0 | 0.030 |
| 6.0 | 6.0 | 2.4 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 3.2 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 4.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 4.8 | 0.085 | 9.0 | 12.0 | 0.070 |

(1) Before slot milling, please reduce he cutting speed (rotating speed) to 50%-70% of the value indicated in the table above, and the Feed rate (feed rate) to 40%-60%.
(2) Before vertical feed machining, decrease the feed rate to below 1/3 of the standard value in the above table.
(3) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(4) The tool overhang is as short as possible without affecting the use.

## Series B--Basic end mills

### Two-flute ball nose end mill (short flute structure)

**B2S···BLG**

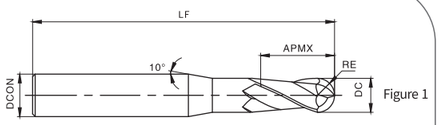


Figure 1

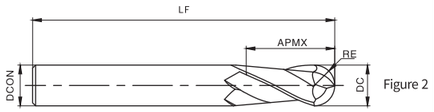
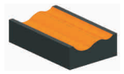
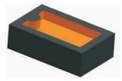
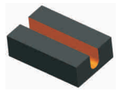
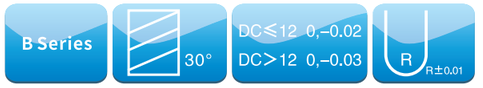


Figure 2


Profile milling


Cavity machining


slot machining




| Type | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | | |
| B2SR0050BLG–4 | 1.0 | 4 | 2 | 50 | 0.5 | 2 | Figure 1 | ● |
| B2SR0075BLG–4 | 1.5 | 4 | 3 | 50 | 0.75 | 2 | Figure 1 | ● |
| B2SR0100BLG–4 | 2.0 | 4 | 4 | 50 | 1.0 | 2 | Figure 1 | ● |
| B2SR0125BLG–4 | 2.5 | 4 | 5 | 50 | 1.25 | 2 | Figure 1 | ● |
| B2SR0150BLG–4 | 3.0 | 4 | 6 | 50 | 1.5 | 2 | Figure 1 | ● |
| B2SR0175BLG–4 | 3.5 | 4 | 8 | 50 | 1.75 | 2 | Figure 1 | ● |
| B2SR0200BLG–4 | 4.0 | 4 | 8 | 50 | 2.0 | 2 | Figure 2 | ● |
| B2SR0050BLG | 1.0 | 6 | 2 | 50 | 0.5 | 2 | Figure 1 | ● |
| B2SR0075BLG | 1.5 | 6 | 3 | 50 | 0.75 | 2 | Figure 1 | ● |
| B2SR0100BLG | 2.0 | 6 | 4 | 50 | 1.0 | 2 | Figure 1 | ● |
| B2SR0125BLG | 2.5 | 6 | 5 | 50 | 1.25 | 2 | Figure 1 | ● |
| B2SR0150BLG | 3.0 | 6 | 6 | 50 | 1.5 | 2 | Figure 1 | ● |
| B2SR0175BLG | 3.5 | 6 | 8 | 50 | 1.75 | 2 | Figure 1 | ● |
| B2SR0200BLG | 4.0 | 6 | 8 | 50 | 2.0 | 2 | Figure 1 | ● |
| B2SR0250BLG | 5.0 | 6 | 10 | 50 | 2.5 | 2 | Figure 1 | ● |
| B2SR0275BLG | 5.5 | 6 | 12 | 50 | 2.75 | 2 | Figure 1 | ● |
| B2SR0300BLG | 6.0 | 6 | 12 | 50 | 3.0 | 2 | Figure 2 | ● |
| B2SR0350BLG | 7.0 | 8 | 14 | 60 | 3.5 | 2 | Figure 1 | ● |
| B2SR0400BLG | 8.0 | 8 | 16 | 60 | 4.0 | 2 | Figure 2 | ● |
| B2SR0450BLG | 9.0 | 10 | 18 | 75 | 4.5 | 2 | Figure 1 | ● |
| B2SR0500BLG | 10.0 | 10 | 20 | 75 | 5.0 | 2 | Figure 2 | ● |
| B2SR0600BLG | 12.0 | 12 | 24 | 75 | 6.0 | 2 | Figure 2 | ● |
| B2SR0700BLG | 14.0 | 14 | 28 | 75 | 7.0 | 2 | Figure 2 | ● |
| B2SR0800BLG | 16.0 | 16 | 32 | 100 | 8.0 | 2 | Figure 2 | ● |
| B2SR1000BLG | 20.0 | 20 | 40 | 100 | 10.0 | 2 | Figure 2 | ● |

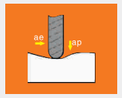
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | ☼ | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B2S···BLG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | 70 | 100 | 130 |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Profile milling | | | | | |
| Diameter （mm） | ap ( 0.1xDc ) | ae ( 0.1xDc ) | fz ( mm/z ) | | | |
| 1.0 | 0.1 | 0.1 | 0.020 | | | |
| 1.5 | 0.15 | 0.15 | 0.030 | | | |
| 2.0 | 0.2 | 0.2 | 0.040 | | | |
| 2.5 | 0.25 | 0.25 | 0.050 | | | |
| 3.0 | 0.3 | 0.3 | 0.060 | | | |
| 3.5 | 0.35 | 0.35 | 0.070 | | | |
| 4.0 | 0.4 | 0.4 | 0.080 | | | |
| 5.0 | 0.5 | 0.5 | 0.100 | | | |
| 5.5 | 0.55 | 0.55 | 0.110 | | | |
| 6.0 | 0.6 | 0.6 | 0.120 | | | |
| 7.0 | 0.7 | 0.7 | 0.140 | | | |
| 8.0 | 0.8 | 0.8 | 0.160 | | | |
| 9.0 | 0.9 | 0.9 | 0.180 | | | |
| 10.0 | 1.0 | 1.0 | 0.200 | | | |
| 12.0 | 1.2 | 1.2 | 0.240 | | | |
| 14.0 | 1.4 | 1.4 | 0.300 | | | |
| 16.0 | 1.6 | 1.6 | 0.360 | | | |
| 20.0 | 2.0 | 2.0 | 0.400 | | | |

(1) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(2) Air cooling or spray cooling is recommended.
(3) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(4) The tool overhang is as short as possible without affecting the use.



## Series B--Basic end mills

### Two-flute ball nose end mill (long flute structure)

**B2L···BLG**

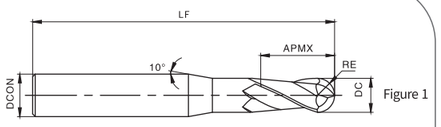


Figure 1

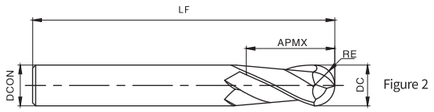
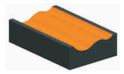
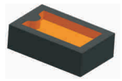
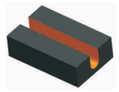
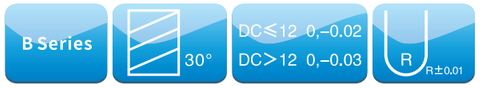


Figure 2


Profile milling


Cavity machining


slot machining




| Type | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | | |
| B2LR0100BLG–4 | 2.0 | 4 | 4 | 75 | 1.0 | 2 | Figure 1 | ● |
| B2LR0125BLG–4 | 2.5 | 4 | 5 | 75 | 1.25 | 2 | Figure 1 | ● |
| B2LR0150BLG–4 | 3.0 | 4 | 6 | 75 | 1.5 | 2 | Figure 1 | ● |
| B2LR0175BLG–4 | 3.5 | 4 | 8 | 75 | 1.75 | 2 | Figure 1 | ● |
| B2LR0200BLG–4 | 4.0 | 4 | 8 | 75 | 2.0 | 2 | Figure 2 | ● |
| B2LR0100BLG | 2.0 | 6 | 4 | 75 | 1.0 | 2 | Figure 1 | ● |
| B2LR0125BLG | 2.5 | 6 | 5 | 75 | 1.25 | 2 | Figure 1 | ● |
| B2LR0150BLG | 3.0 | 6 | 6 | 75 | 1.5 | 2 | Figure 1 | ● |
| B2LR0175BLG | 3.5 | 6 | 8 | 75 | 1.75 | 2 | Figure 1 | ● |
| B2LR0200BLG | 4.0 | 6 | 8 | 75 | 2.0 | 2 | Figure 1 | ● |
| B2LR0250BLG | 5.0 | 6 | 10 | 75 | 2.5 | 2 | Figure 1 | ● |
| B2LR0275BLG | 5.5 | 6 | 12 | 75 | 2.75 | 2 | Figure 1 | ● |
| B2LR0300BLG | 6.0 | 6 | 12 | 75 | 3.0 | 2 | Figure 2 | ● |
| B2LR0350BLG | 7.0 | 8 | 14 | 75 | 3.5 | 2 | Figure 1 | ● |
| B2LR0400BLG | 8.0 | 8 | 16 | 100 | 4.0 | 2 | Figure 2 | ● |
| B2LR0450BLG | 9.0 | 10 | 18 | 100 | 4.5 | 2 | Figure 1 | ● |
| B2LR0500BLG | 10.0 | 10 | 20 | 100 | 5.0 | 2 | Figure 2 | ● |
| B2LR0600BLG | 12.0 | 12 | 24 | 100 | 6.0 | 2 | Figure 2 | ● |
| B2LR0700BLG | 14.0 | 14 | 28 | 100 | 7.0 | 2 | Figure 2 | ● |
| B2LR0800BLG | 16.0 | 16 | 32 | 150 | 8.0 | 2 | Figure 2 | ● |
| B2LR1000BLG | 20.0 | 20 | 40 | 150 | 10.0 | 2 | Figure 2 | ● |

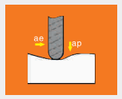
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | ☼ | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B2L···BLG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | 70 | 100 | 130 |
| | Hardened steel | – | > 60 HRC | – | – | – |

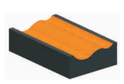
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Profile milling | | | | | |
| Diameter （mm） | ap ( 0.1xDc ) | ae ( 0.1xDc ) | fz ( mm/z ) | | | |
| 2.0 | 0.2 | 0.2 | 0.040 | | | |
| 2.5 | 0.25 | 0.25 | 0.050 | | | |
| 3.0 | 0.3 | 0.3 | 0.060 | | | |
| 3.5 | 0.35 | 0.35 | 0.070 | | | |
| 4.0 | 0.4 | 0.4 | 0.080 | | | |
| 5.0 | 0.5 | 0.5 | 0.100 | | | |
| 5.5 | 0.55 | 0.55 | 0.110 | | | |
| 6.0 | 0.6 | 0.6 | 0.120 | | | |
| 7.0 | 0.7 | 0.7 | 0.140 | | | |
| 8.0 | 0.8 | 0.8 | 0.160 | | | |
| 9.0 | 0.9 | 0.9 | 0.180 | | | |
| 10.0 | 1.0 | 1.0 | 0.200 | | | |
| 12.0 | 1.2 | 1.2 | 0.240 | | | |
| 14.0 | 1.4 | 1.4 | 0.300 | | | |
| 16.0 | 1.6 | 1.6 | 0.360 | | | |
| 20.0 | 2.0 | 2.0 | 0.400 | | | |

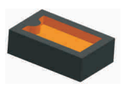
(1) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(2) Air cooling or spray cooling is recommended.
(3) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(4) The tool overhang is as short as possible without affecting the use.

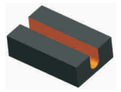
## Series B--Basic end mills

### Four-flute ball nose end mill (short flute structure)

**B4S···BLG**


Profile milling


Cavity machining


slot machining

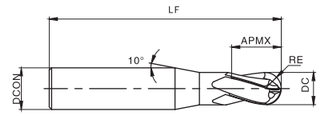


Figure 1

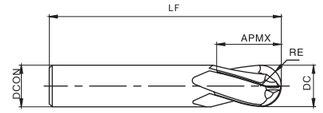
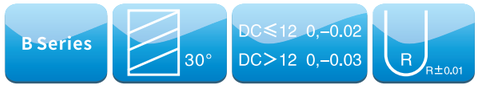


Figure 2




| Type | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | | |
| B4SR0150BLG–4 | 3.0 | 4 | 6 | 50 | 1.5 | 4 | Figure 1 | ● |
| B4SR0200BLG–4 | 4.0 | 4 | 8 | 50 | 2.0 | 4 | Figure 2 | ○ |
| B4SR0150BLG | 3.0 | 6 | 6 | 50 | 1.5 | 4 | Figure 1 | ○ |
| B4SR0200BLG | 4.0 | 6 | 8 | 50 | 2.0 | 4 | Figure 1 | ● |
| B4SR0250BLG | 5.0 | 6 | 10 | 50 | 2.5 | 4 | Figure 1 | ● |
| B4SR0300BLG | 6.0 | 6 | 12 | 50 | 3.0 | 4 | Figure 2 | ● |
| B4SR0400BLG | 8.0 | 8 | 16 | 60 | 4.0 | 4 | Figure 2 | ● |
| B4SR0500BLG | 10.0 | 10 | 20 | 75 | 5.0 | 4 | Figure 2 | ● |
| B4SR0600BLG | 12.0 | 12 | 24 | 75 | 6.0 | 4 | Figure 2 | ● |
| B4SR0800BLG | 16.0 | 16 | 32 | 100 | 8.0 | 4 | Figure 2 | ● |
| B4SR1000BLG | 20.0 | 20 | 40 | 100 | 10.0 | 4 | Figure 2 | ● |

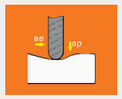
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ✹ | ✹ | ✹ | ✡ | ✹ | | | ✡ | ✡ | ✡ | | |

✹ Fit well ✡ Applicable

## Recommended cutting conditions——B4S···BLG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Profile milling | | | | | |
| Diameter （mm） | ap ( 0.1xDc ) | ae ( 0.1xDc ) | fz ( mm/z ) | | | |
| 3.0 | 0.3 | 0.3 | 0.060 | | | |
| 4.0 | 0.4 | 0.4 | 0.080 | | | |
| 5.0 | 0.5 | 0.5 | 0.100 | | | |
| 6.0 | 0.6 | 0.6 | 0.120 | | | |
| 8.0 | 0.8 | 0.8 | 0.160 | | | |
| 10.0 | 1.0 | 1.0 | 0.200 | | | |
| 12.0 | 1.2 | 1.2 | 0.240 | | | |
| 16.0 | 1.6 | 1.6 | 0.360 | | | |
| 20.0 | 2.0 | 2.0 | 0.400 | | | |

(1) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(2) Air cooling or spray cooling is recommended.
(3) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(4) The tool overhang is as short as possible without affecting the use.

## Series B--Basic end mills

### Four-flute ball nose end mill (long flute structure)

**B4L···BLG**

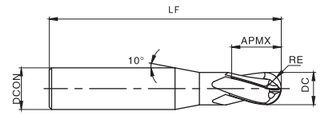


Figure 1

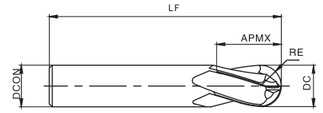
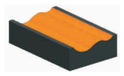
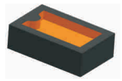
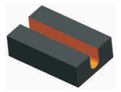
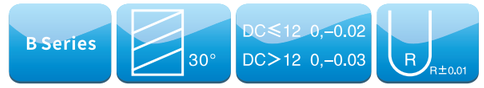


Figure 2


Profile milling


Cavity machining


slot machining




| Type | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | | |
| B4LR0150BLG–4 | 3.0 | 4 | 6 | 75 | 1.5 | 4 | Figure 1 | ● |
| B4LR0200BLG–4 | 4.0 | 4 | 8 | 75 | 2.0 | 4 | Figure 2 | ○ |
| B4LR0150BLG | 3.0 | 6 | 6 | 75 | 1.5 | 4 | Figure 1 | ○ |
| B4LR0200BLG | 4.0 | 6 | 8 | 75 | 2.0 | 4 | Figure 1 | ● |
| B4LR0250BLG | 5.0 | 6 | 10 | 75 | 2.5 | 4 | Figure 1 | ● |
| B4LR0300BLG | 6.0 | 6 | 12 | 75 | 3.0 | 4 | Figure 2 | ● |
| B4LR0400BLG | 8.0 | 8 | 16 | 100 | 4.0 | 4 | Figure 2 | ● |
| B4LR0500BLG | 10.0 | 10 | 20 | 100 | 5.0 | 4 | Figure 2 | ● |
| B4LR0600BLG | 12.0 | 12 | 24 | 100 | 6.0 | 4 | Figure 2 | ● |
| B4LR0800BLG | 16.0 | 16 | 32 | 150 | 8.0 | 4 | Figure 2 | ● |
| B4LR1000BLG | 20.0 | 20 | 40 | 150 | 10.0 | 4 | Figure 2 | ● |

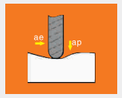
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B4L···BLG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

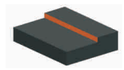
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Profile milling | | | | | |
| Diameter （mm） | ap ( 0.1xDc ) | ae ( 0.1xDc ) | fz ( mm/z ) | | | |
| 3.0 | 0.3 | 0.3 | 0.060 | | | |
| 4.0 | 0.4 | 0.4 | 0.080 | | | |
| 5.0 | 0.5 | 0.5 | 0.010 | | | |
| 6.0 | 0.6 | 0.6 | 0.120 | | | |
| 8.0 | 0.8 | 0.8 | 0.160 | | | |
| 10.0 | 1.0 | 1.0 | 0.200 | | | |
| 12.0 | 1.2 | 1.2 | 0.240 | | | |
| 16.0 | 1.6 | 1.6 | 0.320 | | | |
| 20.0 | 2.0 | 2.0 | 0.400 | | | |

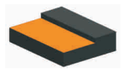
(1) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(2) Air cooling or spray cooling is recommended.
(3) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(4) The tool overhang is as short as possible without affecting the use.

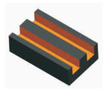
## Series B--Basic end mills

### Two-flute flat end mill (aluminum alloy machining)

**B2S···HN**


Side machining


Bottom machining


Slot milling

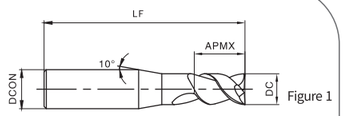


Figure 1

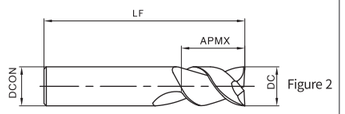
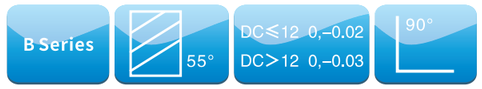


Figure 2




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B2S0100HN–4 | 1.0 | 4 | 3 | 50 | 2 | Figure 1 | ● |
| B2S0150HN–4 | 1.5 | 4 | 4 | 50 | 2 | Figure 1 | ● |
| B2S0200HN–4 | 2.0 | 4 | 6 | 50 | 2 | Figure 1 | ● |
| B2S0250HN–4 | 2.5 | 4 | 7 | 50 | 2 | Figure 1 | ● |
| B2S0300HN–4 | 3.0 | 4 | 9 | 50 | 2 | Figure 1 | ● |
| B2S0400HN–4 | 4.0 | 4 | 12 | 50 | 2 | Figure 2 | ● |
| B2S0300HN | 3.0 | 6 | 9 | 50 | 2 | Figure 1 | ● |
| B2S0400HN | 4.0 | 6 | 12 | 50 | 2 | Figure 1 | ○ |
| B2S0500HN | 5.0 | 6 | 15 | 50 | 2 | Figure 1 | ○ |
| B2S0600HN | 6.0 | 6 | 18 | 60 | 2 | Figure 2 | ● |
| B2S0800HN | 8.0 | 8 | 20 | 60 | 2 | Figure 2 | ● |
| B2S1000HN | 10.0 | 10 | 30 | 75 | 2 | Figure 2 | ● |
| B2S1200HN | 12.0 | 12 | 32 | 75 | 2 | Figure 2 | ● |
| B2S1600HN | 16.0 | 16 | 45 | 100 | 2 | Figure 2 | ● |
| B2S2000HN | 20.0 | 20 | 45 | 100 | 2 | Figure 2 | ● |

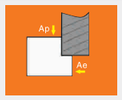
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| | | | | | ☼ | ✹ | | | | | |

✹ Fit well ☼ Applicable

## Recommended cutting conditions——B2S···HN

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | – | – | – |
| | Alloy steel | < 1200 | < 350 | – | – | – |
| | High-alloyed steel and tool steel | < 1400 | < 380 | – | – | – |
| M | Austenite and ferrite stainless steel | < 680 | <220 | – | – | – |
| | Martensite stainless steel | < 820 | < 240 | – | – | – |
| K | Gray cast iron | – | < 280 | – | – | – |
| | Nodular iron | – | < 320 | – | – | – |
| N | Non-ferrous alloy | < 250 | < 110 | 120 | 160 | 350 |
| | Aluminum alloy | < 530 | < 130 | 150 | 200 | 300 |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | – | – | – |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | Slot milling | | |
| Diameter （mm） | ap ( 1.5xDc ) | ae ( 0.1xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 1.0 | 1.5 | 0.1 | 0.010 | 0.75 | 1.0 | 0.003 |
| 1.5 | 2.25 | 0.15 | 0.015 | 1.2 | 1.5 | 0.004 |
| 2.0 | 3.0 | 0.3 | 0.020 | 1.5 | 2.0 | 0.006 |
| 2.5 | 3.75 | 0.25 | 0.025 | 1.9 | 2.5 | 0.008 |
| 3.0 | 4.5 | 0.3 | 0.030 | 2.3 | 3.0 | 0.010 |
| 4.0 | 6.0 | 0.4 | 0.040 | 3.0 | 4.0 | 0.013 |
| 5.0 | 7.5 | 0.5 | 0.050 | 3.8 | 5.0 | 0.017 |
| 6.0 | 9.0 | 0.6 | 0.060 | 4.5 | 6.0 | 0.020 |
| 8.0 | 12.0 | 0.8 | 0.080 | 6.0 | 8.0 | 0.027 |
| 10.0 | 15.0 | 1.0 | 0.100 | 7.5 | 10.0 | 0.033 |
| 12.0 | 18.0 | 1.2 | 0.120 | 9.0 | 12.0 | 0.040 |
| 16.0 | 24.0 | 1.6 | 0.160 | 12.0 | 16.0 | 0.053 |
| 20.0 | 30.0 | 2.0 | 0.200 | 15.0 | 20.0 | 0.067 |

(1) This series of tools is special for aluminum alloy machining;
(2) Before slot milling, please reduce the cutting speed (rotating speed) to 50%-70% of the value indicated in the table above, and the feed rate (feed rate) to 40%-60%.



## Series B--Basic end mills

### Two-flute flat end mill (aluminum alloy machining)

**B2L···HN**

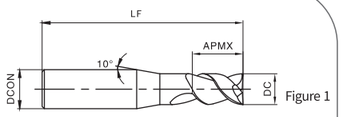


Figure 1

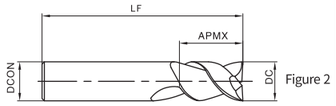
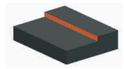
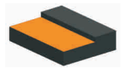
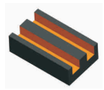
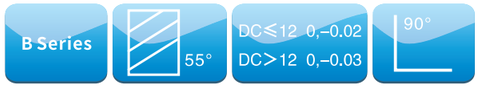


Figure 2


Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B2L0300HN–4 | 3.0 | 4 | 12 | 60 | 2 | Figure 1 | ● |
| B2L0400HN–4 | 4.0 | 4 | 16 | 60 | 2 | Figure 2 | ○ |
| B2L0300HN | 3.0 | 6 | 12 | 60 | 2 | Figure 1 | ○ |
| B2L0400HN | 4.0 | 6 | 16 | 60 | 2 | Figure 1 | ● |
| B2L0500HN | 5.0 | 6 | 20 | 60 | 2 | Figure 1 | ● |
| B2L0600HN | 6.0 | 6 | 25 | 75 | 2 | Figure 2 | ● |
| B2L0800HN | 8.0 | 8 | 32 | 75 | 2 | Figure 2 | ● |
| B2L1000HN | 10.0 | 10 | 45 | 100 | 2 | Figure 2 | ● |
| B2L1200HN | 12.0 | 12 | 45 | 100 | 2 | Figure 2 | ● |
| B2L1600HN | 16.0 | 16 | 65 | 150 | 2 | Figure 2 | ● |
| B2L2000HN | 20.0 | 20 | 75 | 150 | 2 | Figure 2 | ● |

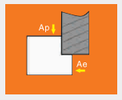
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| | | | | | ☼ | ✹ | | | | | |

✹ Fit well ☼ Applicable

## Recommended cutting conditions——B2L···HN

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | – | – | – |
| | Alloy steel | < 1200 | < 350 | – | – | – |
| | High-alloyed steel and tool steel | < 1400 | < 380 | – | – | – |
| M | Austenite and ferrite stainless steel | < 680 | <220 | – | – | – |
| | Martensite stainless steel | < 820 | < 240 | – | – | – |
| K | Gray cast iron | – | < 280 | – | – | – |
| | Nodular iron | – | < 320 | – | – | – |
| N | Non-ferrous alloy | < 250 | < 110 | 120 | 160 | 350 |
| | Aluminum alloy | < 530 | < 130 | 150 | 200 | 300 |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | – | – | – |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

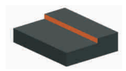
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | Slot milling | | |
| Diameter （mm） | ap ( 1.5xDc ) | ae ( 0.1xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 1.0 | 1.5 | 0.1 | 0.010 | 0.75 | 1.0 | 0.003 |
| 1.5 | 2.25 | 0.15 | 0.015 | 1.2 | 1.5 | 0.004 |
| 2.0 | 3.0 | 0.3 | 0.020 | 1.5 | 2.0 | 0.006 |
| 2.5 | 3.75 | 0.25 | 0.025 | 1.9 | 2.5 | 0.008 |
| 3.0 | 4.5 | 0.3 | 0.030 | 2.3 | 3.0 | 0.010 |
| 4.0 | 6.0 | 0.4 | 0.040 | 3.0 | 4.0 | 0.013 |
| 5.0 | 7.5 | 0.5 | 0.050 | 3.8 | 5.0 | 0.017 |
| 6.0 | 9.0 | 0.6 | 0.060 | 4.5 | 6.0 | 0.020 |
| 8.0 | 12.0 | 0.8 | 0.080 | 6.0 | 8.0 | 0.027 |
| 10.0 | 15.0 | 1.0 | 0.100 | 7.5 | 10.0 | 0.033 |
| 12.0 | 18.0 | 1.2 | 0.120 | 9.0 | 12.0 | 0.040 |
| 16.0 | 24.0 | 1.6 | 0.160 | 12.0 | 16.0 | 0.053 |
| 20.0 | 30.0 | 2.0 | 0.200 | 15.0 | 20.0 | 0.067 |

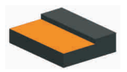
(1) This series of tools is special for aluminum alloy machining;
(2) Before slot milling, please reduce the cutting speed (rotating speed) to 50%-70% of the value indicated in the table above, and the feed rate (feed rate) to 40%-60%.

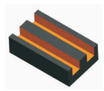
## Series B--Basic end mills

### Three-flute flat end mill (aluminum alloy machining)

**B3S···HN**


Side machining


Bottom machining


Slot milling

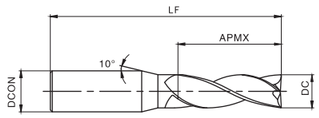


Figure 1

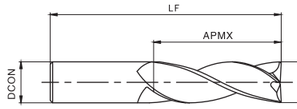


Figure 2

B Series | 45° | DC≤12 0,-0.02 DC>12 0,-0.03 | 90°

| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B3S0100HN–4 | 1.0 | 4 | 3 | 50 | 3 | Figure 1 | ● |
| B3S0150HN–4 | 1.5 | 4 | 4 | 50 | 3 | Figure 1 | ● |
| B3S0200HN–4 | 2.0 | 4 | 6 | 50 | 3 | Figure 1 | ● |
| B3S0250HN–4 | 2.5 | 4 | 7 | 50 | 3 | Figure 1 | ● |
| B3S0300HN–4 | 3.0 | 4 | 9 | 50 | 3 | Figure 1 | ● |
| B3S0400HN–4 | 4.0 | 4 | 12 | 50 | 3 | Figure 2 | ● |
| B3S0300HN | 3.0 | 6 | 9 | 50 | 3 | Figure 1 | ● |
| B3S0400HN | 4.0 | 6 | 12 | 50 | 3 | Figure 1 | ○ |
| B3S0500HN | 5.0 | 6 | 15 | 50 | 3 | Figure 1 | ○ |
| B3S0600HN | 6.0 | 6 | 18 | 60 | 3 | Figure 2 | ● |
| B3S0800HN | 8.0 | 8 | 20 | 60 | 3 | Figure 2 | ● |
| B3S1000HN | 10.0 | 10 | 30 | 75 | 3 | Figure 2 | ● |
| B3S1200HN | 12.0 | 12 | 32 | 75 | 3 | Figure 2 | ● |
| B3S1600HN | 16.0 | 16 | 45 | 100 | 3 | Figure 2 | ● |
| B3S2000HN | 20.0 | 20 | 45 | 100 | 3 | Figure 2 | ● |

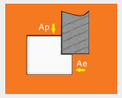
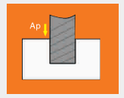
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| | | | | | ☼ | ✹ | | | | | |

✹ Fit well ☼ Applicable

## Recommended cutting conditions——B3S···HN

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | – | – | – |
| | Alloy steel | < 1200 | < 350 | – | – | – |
| | High-alloyed steel and tool steel | < 1400 | < 380 | – | – | – |
| M | Austenite and ferrite stainless steel | < 680 | <220 | – | – | – |
| | Martensite stainless steel | < 820 | < 240 | – | – | – |
| K | Gray cast iron | – | < 280 | – | – | – |
| | Nodular iron | – | < 320 | – | – | – |
| N | Non-ferrous alloy | < 250 | < 110 | 120 | 160 | 350 |
| | Aluminum alloy | < 530 | < 130 | 150 | 200 | 300 |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | – | – | – |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

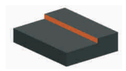
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |   Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1.5xDc ) | ae ( 0.1xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 3.0 | 4.5 | 0.3 | 0.030 | 2.3 | 3.0 | 0.010 |
| 4.0 | 6.0 | 0.4 | 0.040 | 3.0 | 4.0 | 0.013 |
| 5.0 | 7.5 | 0.5 | 0.050 | 3.8 | 5.0 | 0.017 |
| 6.0 | 9.0 | 0.6 | 0.060 | 4.5 | 6.0 | 0.020 |
| 8.0 | 12.0 | 0.8 | 0.080 | 6.0 | 8.0 | 0.027 |
| 10.0 | 15.0 | 1.0 | 0.100 | 7.5 | 10.0 | 0.033 |
| 12.0 | 18.0 | 1.2 | 0.120 | 9.0 | 12.0 | 0.040 |
| 16.0 | 24.0 | 1.6 | 0.160 | 12.0 | 16.0 | 0.053 |
| 20.0 | 30.0 | 2.0 | 0.200 | 15.0 | 20.0 | 0.067 |

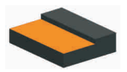
(1) This series of tools is special for aluminum alloy machining;
(2) Before slot milling, please reduce the cutting speed (rotating speed) to 50%-70% of the value indicated in the table above, and the feed rate (feed rate) to 40%-60%.

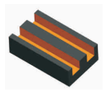
## Series B--Basic end mills

### Three-flute flat end mill (aluminum alloy machining)

**B3L···HN**


Side machining


Bottom machining


Slot milling

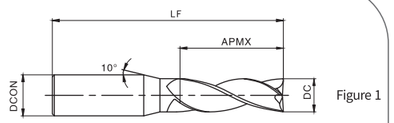


Figure 1

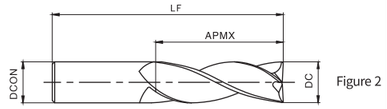


Figure 2

B Series | 45° | DC≤12 0,-0.02 DC>12 0,-0.03 | 90°

| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| B3L0300HN–4 | 3.0 | 4 | 12 | 60 | 3 | Figure 1 | ● |
| B3L0400HN–4 | 4.0 | 4 | 16 | 60 | 3 | Figure 2 | ○ |
| B3L0300HN | 3.0 | 6 | 12 | 60 | 3 | Figure 1 | ○ |
| B3L0400HN | 4.0 | 6 | 16 | 60 | 3 | Figure 1 | ● |
| B3L0500HN | 5.0 | 6 | 20 | 60 | 3 | Figure 1 | ● |
| B3L0600HN | 6.0 | 6 | 25 | 75 | 3 | Figure 2 | ● |
| B3L0800HN | 8.0 | 8 | 32 | 75 | 3 | Figure 2 | ● |
| B3L1000HN | 10.0 | 10 | 45 | 100 | 3 | Figure 2 | ● |
| B3L1200HN | 12.0 | 12 | 45 | 100 | 3 | Figure 2 | ● |
| B3L1600HN | 16.0 | 16 | 65 | 150 | 3 | Figure 2 | ● |
| B3L2000HN | 20.0 | 20 | 75 | 150 | 3 | Figure 2 | ● |

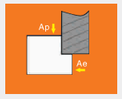
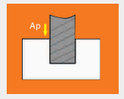
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| | | | | | ☼ | ☀ | | | | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B3L···HN

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | – | – | – |
| | Alloy steel | < 1200 | < 350 | – | – | – |
| | High-alloyed steel and tool steel | < 1400 | < 380 | – | – | – |
| M | Austenite and ferrite stainless steel | < 680 | <220 | – | – | – |
| | Martensite stainless steel | < 820 | < 240 | – | – | – |
| K | Gray cast iron | – | < 280 | – | – | – |
| | Nodular iron | – | < 320 | – | – | – |
| N | Non-ferrous alloy | < 250 | < 110 | 120 | 160 | 350 |
| | Aluminum alloy | < 530 | < 130 | 150 | 200 | 300 |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | – | – | – |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | |  Slot milling | | |
| Diameter （mm） | ap ( 1.5xDc ) | ae ( 0.1xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 3.0 | 4.5 | 0.3 | 0.030 | 2.3 | 3.0 | 0.010 |
| 4.0 | 6.0 | 0.4 | 0.040 | 3.0 | 4.0 | 0.013 |
| 5.0 | 7.5 | 0.5 | 0.050 | 3.8 | 5.0 | 0.017 |
| 6.0 | 9.0 | 0.6 | 0.060 | 4.5 | 6.0 | 0.020 |
| 8.0 | 12.0 | 0.8 | 0.080 | 6.0 | 8.0 | 0.027 |
| 10.0 | 15.0 | 1.0 | 0.100 | 7.5 | 10.0 | 0.033 |
| 12.0 | 18.0 | 1.2 | 0.120 | 9.0 | 12.0 | 0.040 |
| 16.0 | 24.0 | 1.6 | 0.160 | 12.0 | 16.0 | 0.053 |
| 20.0 | 30.0 | 2.0 | 0.200 | 15.0 | 20.0 | 0.067 |

(1) This series of tools is special for aluminum alloy machining;
(2) Before slot milling, please reduce the cutting speed (rotating speed) to 50%-70% of the value indicated in the table above, and the feed rate (feed rate) to 40%-60%.

## Series B--Basic end mills

### Two-flute ball nose end mill (aluminum alloy machining)

**B2S···BLN**

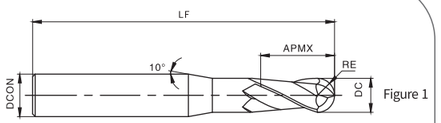


Figure 1

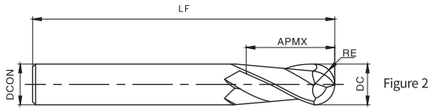
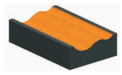
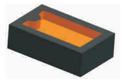
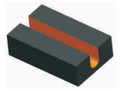
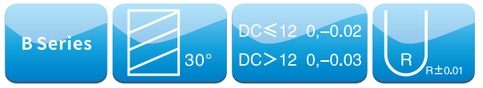


Figure 2


Profile milling


Cavity machining


slot machining




| Type | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | | |
| B2SR0100BLN | 2.0 | 6 | 4 | 60 | 1.0 | 2 | Figure 1 | ● |
| B2SR0150BLN | 3.0 | 6 | 6 | 60 | 1.5 | 2 | Figure 2 | ○ |
| B2SR0200BLN | 4.0 | 6 | 8 | 60 | 2.0 | 2 | Figure 1 | ○ |
| B2SR0250BLN | 5.0 | 6 | 10 | 60 | 2.5 | 2 | Figure 1 | ● |
| B2SR0300BLN | 6.0 | 6 | 12 | 60 | 3.0 | 2 | Figure 1 | ● |
| B2SR0400BLN | 8.0 | 8 | 16 | 75 | 4.0 | 2 | Figure 1 | ● |
| B2SR0500BLN | 10.0 | 10 | 20 | 75 | 5.0 | 2 | Figure 1 | ● |
| B2SR0600BLN | 12.0 | 12 | 24 | 75 | 6.0 | 2 | Figure 1 | ● |

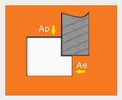
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| | | | | | ☼ | ☀ | | | | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——B2S···BLN

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | – | – | – |
| | Alloy steel | < 1200 | < 350 | – | – | – |
| | High-alloyed steel and tool steel | < 1400 | < 380 | – | – | – |
| M | Austenite and ferrite stainless steel | < 680 | <220 | – | – | – |
| | Martensite stainless steel | < 820 | < 240 | – | – | – |
| K | Gray cast iron | – | < 280 | – | – | – |
| | Nodular iron | – | < 320 | – | – | – |
| N | Non-ferrous alloy | < 250 | < 110 | 120 | 160 | 350 |
| | Aluminum alloy | < 530 | < 130 | 150 | 200 | 300 |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | – | – | – |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

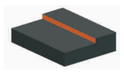
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | Slot milling | | |
| Diameter （mm） | ap ( 0.1xDc ) | ae ( 0.1xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 2.0 | 0.2 | 0.2 | 0.040 | 1.5 | 2.0 | 0.010 |
| 3.0 | 0.3 | 0.3 | 0.060 | 2.3 | 3.0 | 0.010 |
| 4.0 | 0.4 | 0.4 | 0.080 | 3.0 | 4.0 | 0.013 |
| 5.0 | 0.5 | 0.5 | 0.100 | 3.8 | 5.0 | 0.017 |
| 6.0 | 0.6 | 0.6 | 0.120 | 4.5 | 6.0 | 0.020 |
| 8.0 | 0.8 | 0.8 | 0.160 | 6.0 | 8.0 | 0.027 |
| 10.0 | 1.0 | 1.0 | 0.200 | 7.5 | 10.0 | 0.033 |
| 12.0 | 1.2 | 1.2 | 0.240 | 9.0 | 12.0 | 0.040 |

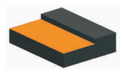
(1) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(2) Air cooling or spray cooling is recommended.
(3) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(4) The tool overhang is as short as possible without affecting the use.

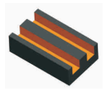
## Series P--High performance end mills

### Four-flute flat end mill (short flute structure)

**P4S···LG**


Side machining


Bottom machining


Slot milling

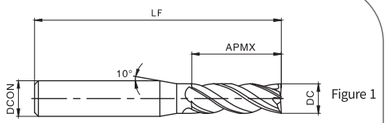


Figure 1

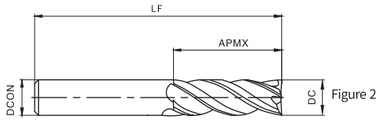
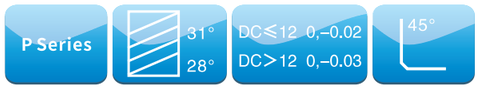


Figure 2




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| P4S0100LG–4 | 1.0 | 4 | 3 | 50 | 4 | Figure 1 | ● |
| P4S0150LG–4 | 1.5 | 4 | 4 | 50 | 4 | Figure 1 | ○ |
| P4S0200LG–4 | 2.0 | 4 | 6 | 50 | 4 | Figure 1 | ● |
| P4S0250LG–4 | 2.5 | 4 | 8 | 50 | 4 | Figure 1 | ○ |
| P4S0300LG–4 | 3.0 | 4 | 8 | 50 | 4 | Figure 1 | ● |
| P4S0350LG–4 | 3.5 | 4 | 10 | 50 | 4 | Figure 1 | ○ |
| P4S0400LG–4 | 4.0 | 4 | 11 | 50 | 4 | Figure 2 | ● |
| P4S0100LG | 1.0 | 6 | 3 | 50 | 4 | Figure 1 | ● |
| P4S0150LG | 1.5 | 6 | 4 | 50 | 4 | Figure 1 | ○ |
| P4S0200LG | 2.0 | 6 | 6 | 50 | 4 | Figure 1 | ● |
| P4S0250LG | 2.5 | 6 | 8 | 50 | 4 | Figure 1 | ○ |
| P4S0300LG | 3.0 | 6 | 8 | 50 | 4 | Figure 1 | ● |
| P4S0350LG | 3.5 | 6 | 10 | 50 | 4 | Figure 1 | ○ |
| P4S0400LG | 4.0 | 6 | 11 | 50 | 4 | Figure 1 | ● |
| P4S0450LG | 4.5 | 6 | 11 | 50 | 4 | Figure 1 | ○ |
| P4S0500LG | 5.0 | 6 | 13 | 50 | 4 | Figure 1 | ● |
| P4S0550LG | 5.5 | 6 | 16 | 50 | 4 | Figure 1 | ○ |
| P4S0600LG | 6.0 | 6 | 16 | 50 | 4 | Figure 2 | ● |
| P4S0700LG | 7.0 | 8 | 20 | 50 | 4 | Figure 1 | ● |
| P4S0800LG | 8.0 | 8 | 20 | 60 | 4 | Figure 2 | ● |
| P4S0900LG | 9.0 | 10 | 22 | 75 | 4 | Figure 1 | ● |
| P4S1000LG | 10.0 | 10 | 25 | 75 | 4 | Figure 2 | ● |
| P4S1100LG | 11.0 | 12 | 26 | 75 | 4 | Figure 1 | ● |
| P4S1200LG | 12.0 | 12 | 30 | 75 | 4 | Figure 2 | ● |
| P4S1400LG | 14.0 | 14 | 32 | 75 | 4 | Figure 2 | ● |
| P4S1600LG | 16.0 | 16 | 45 | 100 | 4 | Figure 2 | ● |
| P4S1800LG | 18.0 | 18 | 45 | 100 | 4 | Figure 2 | ● |
| P4S2000LG | 20.0 | 20 | 45 | 100 | 4 | Figure 2 | ● |

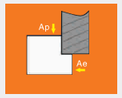
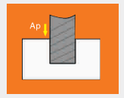
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ✹ | ✹ | ✹ | ✡ | ✹ | | | ✡ | ✡ | ✹ | | |

✹ Fit well ✡ Applicable

## Recommended cutting conditions——P4S···LG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |   Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 1.0 | 1.0 | 0.3 | 0.012 | 0.8 | 1.0 | 0.010 |
| 1.5 | 1.5 | 0.5 | 0.015 | 1.1 | 1.5 | 0.012 |
| 2.0 | 2.0 | 0.6 | 0.018 | 1.5 | 2.0 | 0.015 |
| 2.5 | 2.5 | 0.8 | 0.020 | 1.9 | 2.5 | 0.018 |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 3.5 | 3.5 | 1.1 | 0.025 | 2.6 | 3.5 | 0.025 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 4.5 | 4.5 | 1.4 | 0.035 | 3.4 | 4.5 | 0.030 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.030 |
| 5.5 | 5.5 | 1.7 | 0.035 | 4.1 | 5.5 | 0.030 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 7.0 | 7.0 | 2.1 | 0.050 | 5.3 | 7.0 | 0.040 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 9.0 | 9.0 | 2.7 | 0.065 | 6.8 | 9.0 | 0.055 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 11.0 | 11.0 | 3.3 | 0.075 | 8.3 | 11.0 | 0.065 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 14.0 | 14.0 | 4.2 | 0.100 | 10.5 | 14.0 | 0.085 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 18.0 | 18.0 | 5.4 | 0.130 | 13.5 | 18.0 | 0.105 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

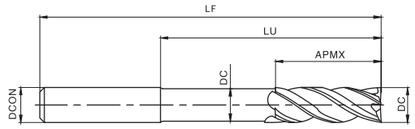
(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

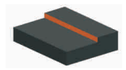


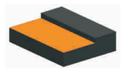
## Series P--High performance end mills

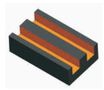
### Four-flute flat end mill (necking structure)

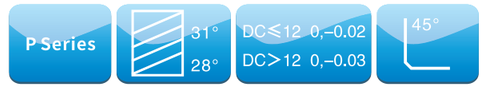
**P4P···LG**





Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | | | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LU | DN | LF | ZEFP | |
| P4P0600LG | 6.0 | 6 | 9 | 30 | 5.8 | 75 | 4 | ● |
| P4P0800LG | 8.0 | 8 | 12 | 40 | 7.8 | 100 | 4 | ● |
| P4P1000LG | 10.0 | 10 | 15 | 50 | 9.6 | 100 | 4 | ● |
| P4P1200LG | 12.0 | 12 | 18 | 50 | 11.5 | 100 | 4 | ● |
| P4P1600LG | 16.0 | 16 | 24 | 50 | 15.5 | 150 | 4 | ● |
| P4P2000LG | 20.0 | 20 | 30 | 60 | 19.5 | 150 | 4 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☀ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——P4P···LG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method | Side milling | | |  Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

## Series P--High performance end mills

### Four-flute flat end mill (short flute structure)

**P4S···NG**

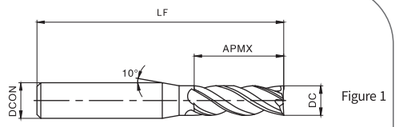


Figure 1

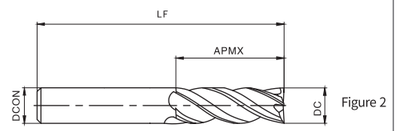
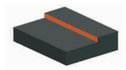
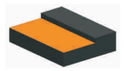
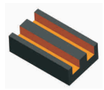
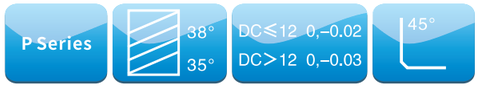


Figure 2


Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| P4S0100NG–4 | 1.0 | 4 | 3 | 50 | 4 | Figure 1 | ● |
| P4S0150NG–4 | 1.5 | 4 | 4 | 50 | 4 | Figure 1 | ○ |
| P4S0200NG–4 | 2.0 | 4 | 6 | 50 | 4 | Figure 1 | ● |
| P4S0250NG–4 | 2.5 | 4 | 8 | 50 | 4 | Figure 1 | ○ |
| P4S0300NG–4 | 3.0 | 4 | 8 | 50 | 4 | Figure 1 | ● |
| P4S0350NG–4 | 3.5 | 4 | 10 | 50 | 4 | Figure 1 | ○ |
| P4S0400NG–4 | 4.0 | 4 | 11 | 50 | 4 | Figure 2 | ● |
| P4S0100NG | 1.0 | 6 | 3 | 50 | 4 | Figure 1 | ● |
| P4S0150NG | 1.5 | 6 | 4 | 50 | 4 | Figure 1 | ○ |
| P4S0200NG | 2.0 | 6 | 6 | 50 | 4 | Figure 1 | ● |
| P4S0250NG | 2.5 | 6 | 8 | 50 | 4 | Figure 1 | ○ |
| P4S0300NG | 3.0 | 6 | 8 | 50 | 4 | Figure 1 | ● |
| P4S0350NG | 3.5 | 6 | 10 | 50 | 4 | Figure 1 | ○ |
| P4S0400NG | 4.0 | 6 | 11 | 50 | 4 | Figure 1 | ● |
| P4S0450NG | 4.5 | 6 | 11 | 50 | 4 | Figure 1 | ○ |
| P4S0500NG | 5.0 | 6 | 13 | 50 | 4 | Figure 1 | ● |
| P4S0550NG | 5.5 | 6 | 16 | 50 | 4 | Figure 1 | ○ |
| P4S0600NG | 6.0 | 6 | 16 | 50 | 4 | Figure 2 | ● |
| P4S0700NG | 7.0 | 8 | 20 | 60 | 4 | Figure 1 | ● |
| P4S0800NG | 8.0 | 8 | 20 | 60 | 4 | Figure 2 | ● |
| P4S0900NG | 9.0 | 10 | 22 | 75 | 4 | Figure 1 | ● |
| P4S1000NG | 10.0 | 10 | 25 | 75 | 4 | Figure 2 | ● |
| P4S1100NG | 11.0 | 12 | 26 | 75 | 4 | Figure 1 | ● |
| P4S1200NG | 12.0 | 12 | 30 | 75 | 4 | Figure 2 | ● |
| P4S1400NG | 14.0 | 14 | 32 | 75 | 4 | Figure 2 | ● |
| P4S1600NG | 16.0 | 16 | 45 | 100 | 4 | Figure 2 | ● |
| P4S1800NG | 18.0 | 18 | 45 | 100 | 4 | Figure 2 | ● |
| P4S2000NG | 20.0 | 20 | 45 | 100 | 4 | Figure 2 | ● |

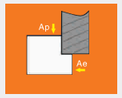
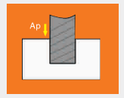
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☀ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——P4S···NG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | |  Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 1.0 | 1.0 | 0.3 | 0.012 | 0.8 | 1.0 | 0.010 |
| 1.5 | 1.5 | 0.5 | 0.015 | 1.1 | 1.5 | 0.012 |
| 2.0 | 2.0 | 0.6 | 0.018 | 1.5 | 2.0 | 0.015 |
| 2.5 | 2.5 | 0.8 | 0.020 | 1.9 | 2.5 | 0.018 |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 3.5 | 3.5 | 1.1 | 0.025 | 2.6 | 3.5 | 0.025 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 4.5 | 4.5 | 1.4 | 0.035 | 3.4 | 4.5 | 0.030 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.030 |
| 5.5 | 5.5 | 1.7 | 0.035 | 4.1 | 5.5 | 0.030 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 7.0 | 7.0 | 2.1 | 0.050 | 5.3 | 7.0 | 0.040 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 9.0 | 9.0 | 2.7 | 0.065 | 6.8 | 9.0 | 0.055 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 11.0 | 11.0 | 3.3 | 0.075 | 8.3 | 11.0 | 0.065 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 14.0 | 14.0 | 4.2 | 0.100 | 10.5 | 14.0 | 0.085 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 18.0 | 18.0 | 5.4 | 0.130 | 13.5 | 18.0 | 0.105 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

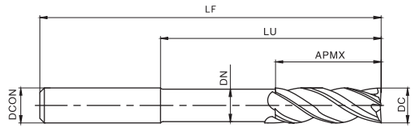
(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

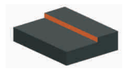


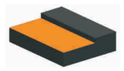
## Series P--High performance end mills

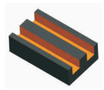
### Four-flute flat end mill (necking structure)

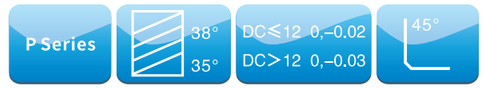
**P4P···NG**





Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | | | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LU | DN | LF | ZEFP | |
| P4P0600NG | 6.0 | 6 | 9 | 30 | 5.8 | 75 | 4 | ● |
| P4P0800NG | 8.0 | 8 | 12 | 40 | 7.8 | 100 | 4 | ● |
| P4P1000NG | 10.0 | 10 | 15 | 50 | 9.6 | 100 | 4 | ● |
| P4P1200NG | 12.0 | 12 | 18 | 50 | 11.5 | 100 | 4 | ● |
| P4P1600NG | 16.0 | 16 | 24 | 50 | 15.5 | 150 | 4 | ● |
| P4P2000NG | 20.0 | 20 | 30 | 60 | 19.5 | 150 | 4 | ● |

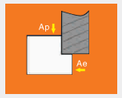
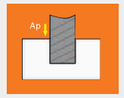
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☀ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——P4P···NG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | |  Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

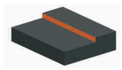
(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

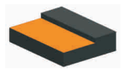


## Series P--High performance end mills

### Four-flute flat end mill (short flute structure)

**P4S···NS**


Side machining


Bottom machining

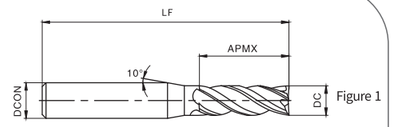


Figure 1

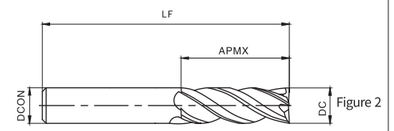
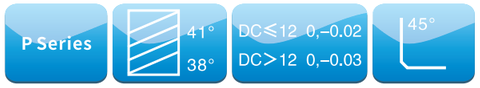


Figure 2




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| P4S0100NS–4 | 1.0 | 4 | 3 | 50 | 4 | Figure 1 | ● |
| P4S0150NS–4 | 1.5 | 4 | 4 | 50 | 4 | Figure 1 | ○ |
| P4S0200NS–4 | 2.0 | 4 | 6 | 50 | 4 | Figure 1 | ● |
| P4S0250NS–4 | 2.5 | 4 | 8 | 50 | 4 | Figure 1 | ○ |
| P4S0300NS–4 | 3.0 | 4 | 8 | 50 | 4 | Figure 1 | ● |
| P4S0350NS–4 | 3.5 | 4 | 10 | 50 | 4 | Figure 1 | ○ |
| P4S0400NS–4 | 4.0 | 4 | 11 | 50 | 4 | Figure 2 | ● |
| P4S0100NS | 1.0 | 6 | 3 | 50 | 4 | Figure 1 | ● |
| P4S0150NS | 1.5 | 6 | 4 | 50 | 4 | Figure 1 | ○ |
| P4S0200NS | 2.0 | 6 | 6 | 50 | 4 | Figure 1 | ● |
| P4S0250NS | 2.5 | 6 | 8 | 50 | 4 | Figure 1 | ○ |
| P4S0300NS | 3.0 | 6 | 8 | 50 | 4 | Figure 1 | ● |
| P4S0350NS | 3.5 | 6 | 10 | 50 | 4 | Figure 1 | ○ |
| P4S0400NS | 4.0 | 6 | 11 | 50 | 4 | Figure 1 | ● |
| P4S0450NS | 4.5 | 6 | 11 | 50 | 4 | Figure 1 | ○ |
| P4S0500NS | 5.0 | 6 | 13 | 50 | 4 | Figure 1 | ● |
| P4S0550NS | 5.5 | 6 | 16 | 50 | 4 | Figure 1 | ○ |
| P4S0600NS | 6.0 | 6 | 16 | 50 | 4 | Figure 2 | ● |
| P4S0700NS | 7.0 | 8 | 20 | 50 | 4 | Figure 1 | ● |
| P4S0800NS | 8.0 | 8 | 20 | 60 | 4 | Figure 2 | ● |
| P4S0900NS | 9.0 | 10 | 22 | 75 | 4 | Figure 1 | ● |
| P4S1000NS | 10.0 | 10 | 25 | 75 | 4 | Figure 2 | ● |
| P4S1100NS | 11.0 | 12 | 26 | 75 | 4 | Figure 1 | ● |
| P4S1200NS | 12.0 | 12 | 30 | 75 | 4 | Figure 2 | ● |
| P4S1400NS | 14.0 | 14 | 32 | 75 | 4 | Figure 2 | ● |
| P4S1600NS | 16.0 | 16 | 45 | 100 | 4 | Figure 2 | ● |
| P4S1800NS | 18.0 | 18 | 45 | 100 | 4 | Figure 2 | ● |
| P4S2000NS | 20.0 | 20 | 45 | 100 | 4 | Figure 2 | ● |

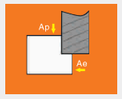
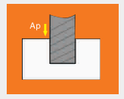
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ✹ | ✹ | ✹ | ✹ | ✹ | | | ✹ | ✹ | | | |

✹ Fit well ✲ Applicable

## Recommended cutting conditions——P4S···NS

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | – | – | – |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | |  Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 1.0 | 1.0 | 0.3 | 0.012 | 0.8 | 1.0 | 0.010 |
| 1.5 | 1.5 | 0.5 | 0.015 | 1.1 | 1.5 | 0.012 |
| 2.0 | 2.0 | 0.6 | 0.018 | 1.5 | 2.0 | 0.015 |
| 2.5 | 2.5 | 0.8 | 0.020 | 1.9 | 2.5 | 0.018 |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 3.5 | 3.5 | 1.1 | 0.025 | 2.6 | 3.5 | 0.025 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 4.5 | 4.5 | 1.4 | 0.035 | 3.4 | 4.5 | 0.030 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.030 |
| 5.5 | 5.5 | 1.7 | 0.035 | 4.1 | 5.5 | 0.030 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 7.0 | 7.0 | 2.1 | 0.050 | 5.3 | 7.0 | 0.040 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 9.0 | 9.0 | 2.7 | 0.065 | 6.8 | 9.0 | 0.055 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 11.0 | 11.0 | 3.3 | 0.075 | 8.3 | 11.0 | 0.065 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 14.0 | 14.0 | 4.2 | 0.100 | 10.5 | 14.0 | 0.085 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 18.0 | 18.0 | 5.4 | 0.130 | 13.5 | 18.0 | 0.105 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

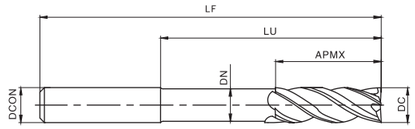
(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

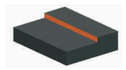


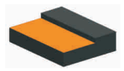
## Series P--High performance end mills

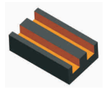
### Four-flute flat end mill (necking structure)

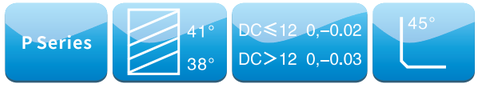
**P4P···NS**





Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | | | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LU | DN | LF | ZEFP | |
| P4P0600NS | 6.0 | 6 | 9 | 30 | 5.8 | 75 | 4 | ● |
| P4P0800NS | 8.0 | 8 | 12 | 40 | 7.8 | 100 | 4 | ● |
| P4P1000NS | 10.0 | 10 | 15 | 50 | 9.6 | 100 | 4 | ● |
| P4P1200NS | 12.0 | 12 | 18 | 50 | 11.5 | 100 | 4 | ● |
| P4P1600NS | 16.0 | 16 | 24 | 50 | 15.5 | 150 | 4 | ● |
| P4P2000NS | 20.0 | 20 | 30 | 60 | 19.5 | 150 | 4 | ● |

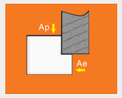
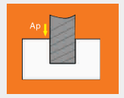
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☀ | | | ☀ | ☀ | | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——P4P···NS

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | – | – | – |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | |  Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

## Series P--High performance end mills

### Four-flute flat end mill (short flute structure)

**P4S···HH**

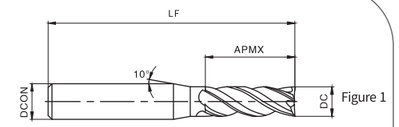


Figure 1

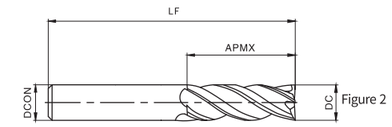
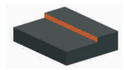
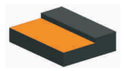


Figure 2


Side machining


Bottom machining

P Series | 45° 42° | DC≤12 0,-0.02 DC>12 0,-0.03 | 45°

| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| P4S0100HH–4 | 1.0 | 4 | 3 | 50 | 4 | Figure 1 | ● |
| P4S0150HH–4 | 1.5 | 4 | 4 | 50 | 4 | Figure 1 | ○ |
| P4S0200HH–4 | 2.0 | 4 | 6 | 50 | 4 | Figure 1 | ● |
| P4S0250HH–4 | 2.5 | 4 | 8 | 50 | 4 | Figure 1 | ○ |
| P4S0300HH–4 | 3.0 | 4 | 8 | 50 | 4 | Figure 1 | ● |
| P4S0350HH–4 | 3.5 | 4 | 10 | 50 | 4 | Figure 1 | ○ |
| P4S0400HH–4 | 4.0 | 4 | 11 | 50 | 4 | Figure 2 | ● |
| P4S0100HH | 1.0 | 6 | 3 | 50 | 4 | Figure 1 | ● |
| P4S0150HH | 1.5 | 6 | 4 | 50 | 4 | Figure 1 | ○ |
| P4S0200HH | 2.0 | 6 | 6 | 50 | 4 | Figure 1 | ● |
| P4S0250HH | 2.5 | 6 | 8 | 50 | 4 | Figure 1 | ○ |
| P4S0300HH | 3.0 | 6 | 8 | 50 | 4 | Figure 1 | ● |
| P4S0350HH | 3.5 | 6 | 10 | 50 | 4 | Figure 1 | ○ |
| P4S0400HH | 4.0 | 6 | 11 | 50 | 4 | Figure 1 | ● |
| P4S0450HH | 4.5 | 6 | 11 | 50 | 4 | Figure 1 | ○ |
| P4S0500HH | 5.0 | 6 | 13 | 50 | 4 | Figure 1 | ● |
| P4S0550HH | 5.5 | 6 | 16 | 50 | 4 | Figure 1 | ○ |
| P4S0600HH | 6.0 | 6 | 16 | 50 | 4 | Figure 2 | ● |
| P4S0700HH | 7.0 | 8 | 20 | 50 | 4 | Figure 1 | ● |
| P4S0800HH | 8.0 | 8 | 20 | 60 | 4 | Figure 2 | ● |
| P4S0900HH | 9.0 | 10 | 22 | 75 | 4 | Figure 1 | ● |
| P4S1000HH | 10.0 | 10 | 25 | 75 | 4 | Figure 2 | ● |
| P4S1100HH | 11.0 | 12 | 26 | 75 | 4 | Figure 1 | ● |
| P4S1200HH | 12.0 | 12 | 30 | 75 | 4 | Figure 2 | ● |
| P4S1400HH | 14.0 | 14 | 32 | 75 | 4 | Figure 2 | ● |
| P4S1600HH | 16.0 | 16 | 45 | 100 | 4 | Figure 2 | ● |
| P4S1800HH | 18.0 | 18 | 45 | 100 | 4 | Figure 2 | ● |
| P4S2000HH | 20.0 | 20 | 45 | 100 | 4 | Figure 2 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☼ | ☼ | ☼ | | ✹ | | | | | ✹ | ✹ | ✹ |

✹ Fit well ☼ Applicable

## Recommended cutting conditions——P4S···HH

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | – | – | – |
| | Martensite stainless steel | < 820 | < 240 | – | – | – |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | 70 | 100 | 130 |
| | Hardened steel | – | > 60 HRC | 60 | 70 | 80 |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method | Side milling | | |  Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 1.0 | 1.0 | 0.3 | 0.012 | 0.8 | 1.0 | 0.010 |
| 1.5 | 1.5 | 0.5 | 0.015 | 1.1 | 1.5 | 0.012 |
| 2.0 | 2.0 | 0.6 | 0.018 | 1.5 | 2.0 | 0.015 |
| 2.5 | 2.5 | 0.8 | 0.020 | 1.9 | 2.5 | 0.018 |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 3.5 | 3.5 | 1.1 | 0.025 | 2.6 | 3.5 | 0.025 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 4.5 | 4.5 | 1.4 | 0.035 | 3.4 | 4.5 | 0.030 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.030 |
| 5.5 | 5.5 | 1.7 | 0.035 | 4.1 | 5.5 | 0.030 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 7.0 | 7.0 | 2.1 | 0.050 | 5.3 | 7.0 | 0.040 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 9.0 | 9.0 | 2.7 | 0.065 | 6.8 | 9.0 | 0.055 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 11.0 | 11.0 | 3.3 | 0.075 | 8.3 | 11.0 | 0.065 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 14.0 | 14.0 | 4.2 | 0.100 | 10.5 | 14.0 | 0.085 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 18.0 | 18.0 | 5.4 | 0.130 | 13.5 | 18.0 | 0.105 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

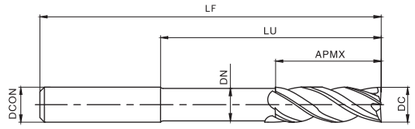
(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

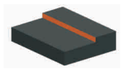


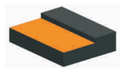
## Series P--High performance end mills

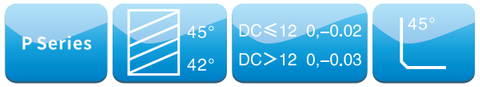
### Four-flute flat end mill (necking structure)

**P4P···HH**





Side machining


Bottom machining




| Type | Dimension (mm) | | | | | | | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LU | DN | LF | ZEFP | |
| P4P0600HH | 6.0 | 6 | 9 | 30 | 5.8 | 75 | 4 | ● |
| P4P0800HH | 8.0 | 8 | 12 | 40 | 7.8 | 100 | 4 | ● |
| P4P1000HH | 10.0 | 10 | 15 | 50 | 9.6 | 100 | 4 | ● |
| P4P1200HH | 12.0 | 12 | 18 | 50 | 11.5 | 100 | 4 | ● |
| P4P1600HH | 16.0 | 16 | 24 | 50 | 15.5 | 150 | 4 | ● |
| P4P2000HH | 20.0 | 20 | 30 | 60 | 19.5 | 150 | 4 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☼ | ☼ | ☼ | | ☀ | | | | | ☀ | ☀ | ☀ |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——P4P···HH

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | – | – | – |
| | Martensite stainless steel | < 820 | < 240 | – | – | – |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | 70 | 100 | 130 |
| | Hardened steel | – | > 60 HRC | 60 | 70 | 80 |

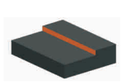
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method | Side milling | | |  Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

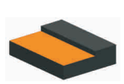
(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

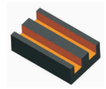
## Series P--High performance end mills

### Four-flute R end mill (short flute structure)

**P4S···R···LG**


Side machining


Bottom machining


Slot milling

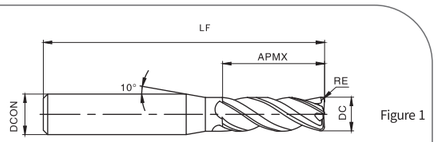


Figure 1

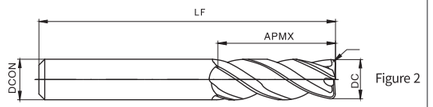
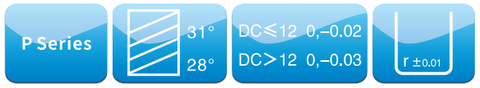


Figure 2




| Type | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | | |
| P4S0300R0020LG–4 | 3.0 | 4 | 8 | 50 | 0.2 | 4 | Figure 1 | ● |
| P4S0400R0030LG–4 | 4.0 | 4 | 10 | 50 | 0.3 | 4 | Figure 2 | ● |
| P4S0400R0050LG–4 | 4.0 | 4 | 10 | 50 | 0.5 | 4 | Figure 2 | ● |
| P4S0300R0020LG | 3.0 | 6 | 8 | 50 | 0.2 | 4 | Figure 1 | ● |
| P4S0400R0030LG | 4.0 | 6 | 10 | 50 | 0.3 | 4 | Figure 1 | ○ |
| P4S0400R0050LG | 4.0 | 6 | 10 | 50 | 0.5 | 4 | Figure 1 | ● |
| P4S0500R0050LG | 5.0 | 6 | 13 | 50 | 0.5 | 4 | Figure 1 | ○ |
| P4S0500R0100LG | 5.0 | 6 | 13 | 50 | 1.0 | 4 | Figure 1 | ○ |
| P4S0600R0050LG | 6.0 | 6 | 16 | 50 | 0.5 | 4 | Figure 2 | ● |
| P4S0600R0100LG | 6.0 | 6 | 16 | 50 | 1.0 | 4 | Figure 2 | ● |
| P4S0800R0050LG | 8.0 | 8 | 20 | 60 | 0.5 | 4 | Figure 2 | ● |
| P4S0800R0100LG | 8.0 | 8 | 20 | 60 | 1.0 | 4 | Figure 2 | ● |
| P4S1000R0050LG | 10.0 | 10 | 25 | 75 | 0.5 | 4 | Figure 2 | ● |
| P4S1000R0100LG | 10.0 | 10 | 25 | 75 | 1.0 | 4 | Figure 2 | ● |
| P4S1000R0200LG | 10.0 | 10 | 25 | 75 | 2.0 | 4 | Figure 2 | ● |
| P4S1000R0300LG | 10.0 | 10 | 25 | 75 | 3.0 | 4 | Figure 2 | ● |
| P4S1200R0050LG | 12.0 | 12 | 30 | 75 | 0.5 | 4 | Figure 2 | ● |
| P4S1200R0100LG | 12.0 | 12 | 30 | 75 | 1.0 | 4 | Figure 2 | ● |
| P4S1200R0200LG | 12.0 | 12 | 30 | 75 | 2.0 | 4 | Figure 2 | ● |
| P4S1200R0300LG | 12.0 | 12 | 30 | 75 | 3.0 | 4 | Figure 2 | ● |
| P4S1600R0100LG | 16.0 | 16 | 45 | 100 | 1.0 | 4 | Figure 2 | ● |
| P4S1600R0200LG | 16.0 | 16 | 45 | 100 | 2.0 | 4 | Figure 2 | ● |
| P4S1600R0300LG | 16.0 | 16 | 45 | 100 | 3.0 | 4 | Figure 2 | ● |
| P4S2000R0100LG | 20.0 | 20 | 45 | 100 | 1.0 | 4 | Figure 2 | ● |
| P4S2000R0200LG | 20.0 | 20 | 45 | 100 | 2.0 | 4 | Figure 2 | ● |
| P4S2000R0300LG | 20.0 | 20 | 45 | 100 | 3.0 | 4 | Figure 2 | ● |

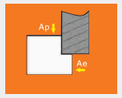
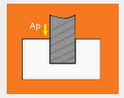
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☀ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——P4S···R···LG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

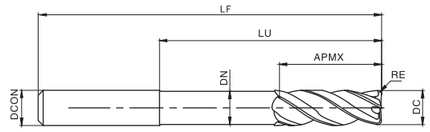
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |   Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.030 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

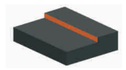
(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

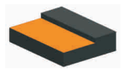
## Series P--High performance end mills

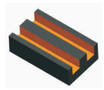
### Four-flute R end mill (necking structure)

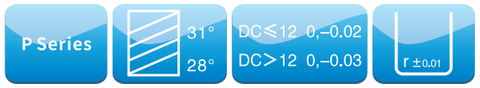
**P4P···R···LG**





Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | | | | Inventory |
|---|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LU | DN | LF | RE | ZEFP | |
| P4P0600R0050LG | 6.0 | 6 | 6 | 18 | 5.8 | 75 | 0.5 | 4 | ● |
| P4P0600R0100LG | 6.0 | 6 | 6 | 18 | 5.8 | 75 | 1.0 | 4 | ● |
| P4P0800R0050LG | 8.0 | 8 | 8 | 24 | 7.8 | 100 | 0.5 | 4 | ● |
| P4P0800R0100LG | 8.0 | 8 | 8 | 24 | 7.8 | 100 | 1.0 | 4 | ● |
| P4P1000R0050LG | 10.0 | 10 | 10 | 30 | 9.6 | 100 | 0.5 | 4 | ● |
| P4P1000R0100LG | 10.0 | 10 | 10 | 30 | 9.6 | 100 | 1.0 | 4 | ● |
| P4P1000R0200LG | 10.0 | 10 | 10 | 30 | 9.6 | 100 | 2.0 | 4 | ● |
| P4P1200R0050LG | 12.0 | 12 | 12 | 36 | 11.5 | 100 | 0.5 | 4 | ● |
| P4P1200R0100LG | 12.0 | 12 | 12 | 36 | 11.5 | 100 | 1.0 | 4 | ● |
| P4P1200R0200LG | 12.0 | 12 | 12 | 36 | 11.5 | 100 | 2.0 | 4 | ● |
| P4P1600R0100LG | 16.0 | 16 | 16 | 40 | 15.5 | 150 | 1.0 | 4 | ● |
| P4P1600R0200LG | 16.0 | 16 | 16 | 40 | 15.5 | 150 | 2.0 | 4 | ● |

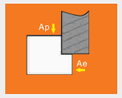
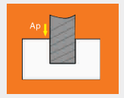
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☀ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——P4P···R···LG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

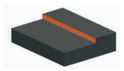
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | |  Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |

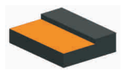
(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

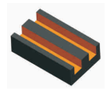
## Series P--High performance end mills

### Four-flute R end mill (short flute structure)

**P4S···R···NG**


Side machining


Bottom machining


Slot milling

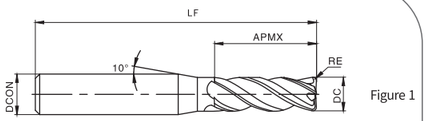


Figure 1

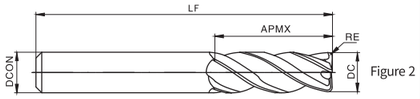
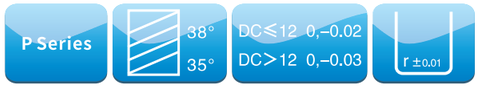


Figure 2




| Type | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | | |
| P4S0300R0020NG–4 | 3.0 | 4 | 8 | 50 | 0.2 | 4 | Figure 1 | ● |
| P4S0400R0030NG–4 | 4.0 | 4 | 10 | 50 | 0.3 | 4 | Figure 2 | ● |
| P4S0400R0050NG–4 | 4.0 | 4 | 10 | 50 | 0.5 | 4 | Figure 2 | ● |
| P4S0300R0020NG | 3.0 | 6 | 8 | 50 | 0.2 | 4 | Figure 1 | ● |
| P4S0400R0030NG | 4.0 | 6 | 10 | 50 | 0.3 | 4 | Figure 1 | ○ |
| P4S0400R0050NG | 4.0 | 6 | 10 | 50 | 0.5 | 4 | Figure 1 | ○ |
| P4S0500R0050NG | 5.0 | 6 | 13 | 50 | 0.5 | 4 | Figure 1 | ○ |
| P4S0500R0100NG | 5.0 | 6 | 13 | 50 | 1.0 | 4 | Figure 1 | ● |
| P4S0600R0050NG | 6.0 | 6 | 16 | 50 | 0.5 | 4 | Figure 2 | ● |
| P4S0600R0100NG | 6.0 | 6 | 16 | 50 | 1.0 | 4 | Figure 2 | ● |
| P4S0800R0050NG | 8.0 | 8 | 20 | 60 | 0.5 | 4 | Figure 2 | ● |
| P4S0800R0100NG | 8.0 | 8 | 20 | 60 | 1.0 | 4 | Figure 2 | ● |
| P4S1000R0050NG | 10.0 | 10 | 25 | 75 | 0.5 | 4 | Figure 2 | ● |
| P4S1000R0100NG | 10.0 | 10 | 25 | 75 | 1.0 | 4 | Figure 2 | ● |
| P4S1000R0200NG | 10.0 | 10 | 25 | 75 | 2.0 | 4 | Figure 2 | ● |
| P4S1000R0300NG | 10.0 | 10 | 25 | 75 | 3.0 | 4 | Figure 2 | ● |
| P4S1200R0050NG | 12.0 | 12 | 30 | 75 | 0.5 | 4 | Figure 2 | ● |
| P4S1200R0100NG | 12.0 | 12 | 30 | 75 | 1.0 | 4 | Figure 2 | ● |
| P4S1200R0200NG | 12.0 | 12 | 30 | 75 | 2.0 | 4 | Figure 2 | ● |
| P4S1200R0300NG | 12.0 | 12 | 30 | 75 | 3.0 | 4 | Figure 2 | ● |
| P4S1600R0100NG | 16.0 | 16 | 45 | 100 | 1.0 | 4 | Figure 2 | ● |
| P4S1600R0200NG | 16.0 | 16 | 45 | 100 | 2.0 | 4 | Figure 2 | ● |
| P4S1600R0300NG | 16.0 | 16 | 45 | 100 | 3.0 | 4 | Figure 2 | ● |
| P4S2000R0100NG | 20.0 | 20 | 45 | 100 | 1.0 | 4 | Figure 2 | ● |
| P4S2000R0200NG | 20.0 | 20 | 45 | 100 | 2.0 | 4 | Figure 2 | ● |
| P4S2000R0300NG | 20.0 | 20 | 45 | 100 | 3.0 | 4 | Figure 2 | ● |

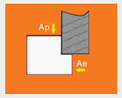
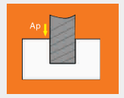
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☀ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——P4S···R···NG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

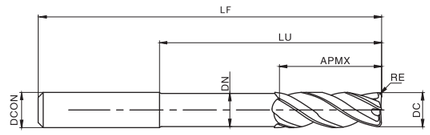
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |   Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.030 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

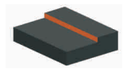
(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

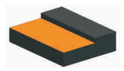
## Series P--High performance end mills

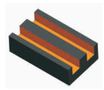
### Four-flute R end mill (necking structure)

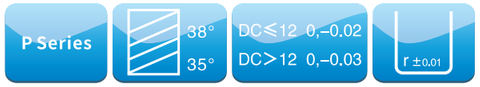
**P4P···R···NG**





Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | | | | Inventory |
|---|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LU | DN | LF | RE | ZEFP | |
| P4P0600R0050NG | 6.0 | 6 | 6 | 18 | 5.8 | 75 | 0.5 | 4 | ● |
| P4P0600R0100NG | 6.0 | 6 | 6 | 18 | 5.8 | 75 | 1.0 | 4 | ● |
| P4P0800R0050NG | 8.0 | 8 | 8 | 24 | 7.8 | 100 | 0.5 | 4 | ● |
| P4P0800R0100NG | 8.0 | 8 | 8 | 24 | 7.8 | 100 | 1.0 | 4 | ● |
| P4P1000R0050NG | 10.0 | 10 | 10 | 30 | 9.6 | 100 | 0.5 | 4 | ● |
| P4P1000R0100NG | 10.0 | 10 | 10 | 30 | 9.6 | 100 | 1.0 | 4 | ● |
| P4P1000R0200NG | 10.0 | 10 | 10 | 30 | 9.6 | 100 | 2.0 | 4 | ● |
| P4P1200R0050NG | 12.0 | 12 | 12 | 36 | 11.5 | 100 | 0.5 | 4 | ● |
| P4P1200R0100NG | 12.0 | 12 | 12 | 36 | 11.5 | 100 | 1.0 | 4 | ● |
| P4P1200R0200NG | 12.0 | 12 | 12 | 36 | 11.5 | 100 | 2.0 | 4 | ● |
| P4P1600R0100NG | 16.0 | 16 | 16 | 40 | 15.5 | 150 | 1.0 | 4 | ● |
| P4P1600R0200NG | 16.0 | 16 | 16 | 40 | 15.5 | 150 | 2.0 | 4 | ● |

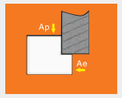
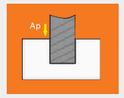
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | ☼ | ☼ | ☀ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——P4P···R···NG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | |  Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |

(1) Water-soluble cutting fluid is recommended during machining stainless steel.
(2) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(3) The down milling is recommended for side milling.
(4) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.

## Series P--High performance end mills

### Four-flute R end mill (short flute structure)

**P4S···R···NS**

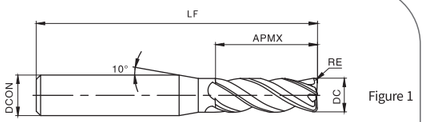


Figure 1

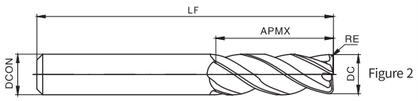
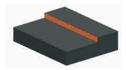
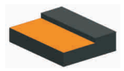
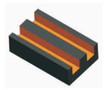
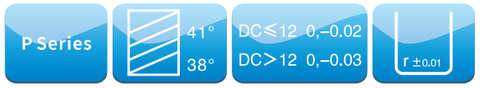


Figure 2


Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | | |
| P4S0300R0020NS–4 | 3.0 | 4 | 8 | 50 | 0.2 | 4 | Figure 1 | ● |
| P4S0400R0030NS–4 | 4.0 | 4 | 10 | 50 | 0.3 | 4 | Figure 2 | ● |
| P4S0400R0050NS–4 | 4.0 | 4 | 10 | 50 | 0.5 | 4 | Figure 2 | ● |
| P4S0300R0020NS | 3.0 | 6 | 8 | 50 | 0.2 | 4 | Figure 1 | ● |
| P4S0400R0030NS | 4.0 | 6 | 10 | 50 | 0.3 | 4 | Figure 1 | ● |
| P4S0400R0050NS | 4.0 | 6 | 10 | 50 | 0.5 | 4 | Figure 1 | ● |
| P4S0500R0050NS | 5.0 | 6 | 13 | 50 | 0.5 | 4 | Figure 1 | ● |
| P4S0500R0100NS | 5.0 | 6 | 13 | 50 | 1.0 | 4 | Figure 1 | ● |
| P4S0600R0050NS | 6.0 | 6 | 16 | 50 | 0.5 | 4 | Figure 2 | ● |
| P4S0600R0100NS | 6.0 | 6 | 16 | 50 | 1.0 | 4 | Figure 2 | ● |
| P4S0800R0050NS | 8.0 | 8 | 20 | 60 | 0.5 | 4 | Figure 2 | ● |
| P4S0800R0100NS | 8.0 | 8 | 20 | 60 | 1.0 | 4 | Figure 2 | ● |
| P4S1000R0050NS | 10.0 | 10 | 25 | 75 | 0.5 | 4 | Figure 2 | ● |
| P4S1000R0100NS | 10.0 | 10 | 25 | 75 | 1.0 | 4 | Figure 2 | ● |
| P4S1000R0200NS | 10.0 | 10 | 25 | 75 | 2.0 | 4 | Figure 2 | ● |
| P4S1000R0300NS | 10.0 | 10 | 25 | 75 | 3.0 | 4 | Figure 2 | ● |
| P4S1200R0050NS | 12.0 | 12 | 30 | 75 | 0.5 | 4 | Figure 2 | ● |
| P4S1200R0100NS | 12.0 | 12 | 30 | 75 | 1.0 | 4 | Figure 2 | ● |
| P4S1200R0200NS | 12.0 | 12 | 30 | 75 | 2.0 | 4 | Figure 2 | ● |
| P4S1200R0300NS | 12.0 | 12 | 30 | 75 | 3.0 | 4 | Figure 2 | ● |
| P4S1600R0100NS | 16.0 | 16 | 45 | 100 | 1.0 | 4 | Figure 2 | ● |
| P4S1600R0200NS | 16.0 | 16 | 45 | 100 | 2.0 | 4 | Figure 2 | ● |
| P4S1600R0300NS | 16.0 | 16 | 45 | 100 | 3.0 | 4 | Figure 2 | ● |
| P4S2000R0100NS | 20.0 | 20 | 45 | 100 | 1.0 | 4 | Figure 2 | ● |
| P4S2000R0200NS | 20.0 | 20 | 45 | 100 | 2.0 | 4 | Figure 2 | ● |
| P4S2000R0300NS | 20.0 | 20 | 45 | 100 | 3.0 | 4 | Figure 2 | ● |

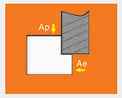
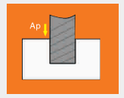
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ✹ | ✹ | ✹ | ✹ | ✹ | | | ✹ | ✹ | | | |

✹ Fit well ✡ Applicable

## Recommended cutting conditions——P4S···R···NS

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | – | – | – |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

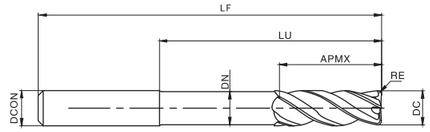
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |   Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 3.0 | 3.0 | 0.9 | 0.025 | 2.3 | 3.0 | 0.020 |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.030 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

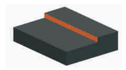
(1) Before slot milling, please reduce he cutting speed (rotating speed) to 80% of the value indicated in the table above, and the feed rate (feed rate) to 60%-80%.
(2) Please use high-precision machines and cutter shanks, and water-soluble cutting fluids are recommended.
(3) The down milling is recommended.

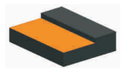
## Series P--High performance end mills

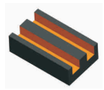
### Four-flute R end mill (necking structure)

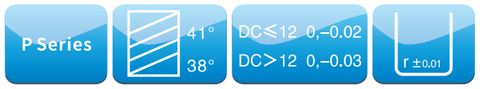
**P4P···R···NS**





Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | | | | Inventory |
|---|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LU | DN | LF | RE | ZEFP | |
| P4P0600R0050NS | 6.0 | 6 | 6 | 18 | 5.8 | 75 | 0.5 | 4 | ● |
| P4P0600R0100NS | 6.0 | 6 | 6 | 18 | 5.8 | 75 | 1.0 | 4 | ● |
| P4P0800R0050NS | 8.0 | 8 | 8 | 24 | 7.8 | 100 | 0.5 | 4 | ● |
| P4P0800R0100NS | 8.0 | 8 | 8 | 24 | 7.8 | 100 | 1.0 | 4 | ● |
| P4P1000R0050NS | 10.0 | 10 | 10 | 30 | 9.6 | 100 | 0.5 | 4 | ● |
| P4P1000R0100NS | 10.0 | 10 | 10 | 30 | 9.6 | 100 | 1.0 | 4 | ● |
| P4P1000R0200NS | 10.0 | 10 | 10 | 30 | 9.6 | 100 | 2.0 | 4 | ● |
| P4P1200R0050NS | 12.0 | 12 | 12 | 36 | 11.5 | 100 | 0.5 | 4 | ● |
| P4P1200R0100NS | 12.0 | 12 | 12 | 36 | 11.5 | 100 | 1.0 | 4 | ● |
| P4P1200R0200NS | 12.0 | 12 | 12 | 36 | 11.5 | 100 | 2.0 | 4 | ● |
| P4P1600R0100NS | 16.0 | 16 | 16 | 40 | 15.5 | 150 | 1.0 | 4 | ● |
| P4P1600R0200NS | 16.0 | 16 | 16 | 40 | 15.5 | 150 | 2.0 | 4 | ● |

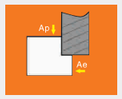
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☀ | | | ☀ | ☀ | | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——P4P···R···NS

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | – | – | – |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

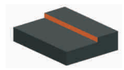
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |

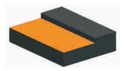
(1) Before slot milling, please reduce he cutting speed (rotating speed) to 80% of the value indicated in the table above, and the feed rate (feed rate) to 60%-80%.
(2) Please use high-precision machines and cutter shanks, and water-soluble cutting fluids are recommended.
(3) The down milling is recommended.

## Series P--High performance end mills

### Four-flute R end mill (short flute structure)

**P4S···R···HH**


Side machining


Bottom machining

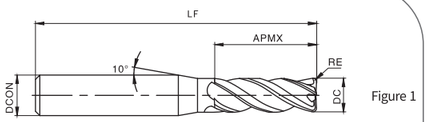


Figure 1

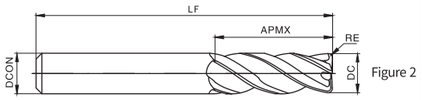
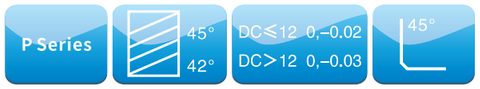


Figure 2




| Type | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | | |
| P4S0300R0020HH–4 | 3.0 | 4 | 8 | 50 | 0.2 | 4 | Figure 1 | ● |
| P4S0400R0030HH–4 | 4.0 | 4 | 10 | 50 | 0.3 | 4 | Figure 2 | ● |
| P4S0400R0050HH–4 | 4.0 | 4 | 10 | 50 | 0.5 | 4 | Figure 2 | ● |
| P4S0300R0020HH | 3.0 | 6 | 8 | 50 | 0.2 | 4 | Figure 1 | ● |
| P4S0400R0030HH | 4.0 | 6 | 10 | 50 | 0.3 | 4 | Figure 1 | ● |
| P4S0400R0050HH | 4.0 | 6 | 10 | 50 | 0.5 | 4 | Figure 1 | ● |
| P4S0500R0050HH | 5.0 | 6 | 13 | 50 | 0.5 | 4 | Figure 1 | ● |
| P4S0500R0100HH | 5.0 | 6 | 13 | 50 | 1.0 | 4 | Figure 1 | ● |
| P4S0600R0050HH | 6.0 | 6 | 16 | 50 | 0.5 | 4 | Figure 2 | ● |
| P4S0600R0100HH | 6.0 | 6 | 16 | 50 | 1.0 | 4 | Figure 2 | ● |
| P4S0800R0050HH | 8.0 | 8 | 20 | 60 | 0.5 | 4 | Figure 2 | ● |
| P4S0800R0100HH | 8.0 | 8 | 20 | 60 | 1.0 | 4 | Figure 2 | ● |
| P4S1000R0050HH | 10.0 | 10 | 25 | 75 | 0.5 | 4 | Figure 2 | ● |
| P4S1000R0100HH | 10.0 | 10 | 25 | 75 | 1.0 | 4 | Figure 2 | ● |
| P4S1000R0200HH | 10.0 | 10 | 25 | 75 | 2.0 | 4 | Figure 2 | ● |
| P4S1000R0300HH | 10.0 | 10 | 25 | 75 | 3.0 | 4 | Figure 2 | ● |
| P4S1200R0050HH | 12.0 | 12 | 30 | 75 | 0.5 | 4 | Figure 2 | ● |
| P4S1200R0100HH | 12.0 | 12 | 30 | 75 | 1.0 | 4 | Figure 2 | ● |
| P4S1200R0200HH | 12.0 | 12 | 30 | 75 | 2.0 | 4 | Figure 2 | ● |
| P4S1200R0300HH | 12.0 | 12 | 30 | 75 | 3.0 | 4 | Figure 2 | ● |
| P4S1600R0100HH | 16.0 | 16 | 45 | 100 | 1.0 | 4 | Figure 2 | ● |
| P4S1600R0200HH | 16.0 | 16 | 45 | 100 | 2.0 | 4 | Figure 2 | ● |
| P4S1600R0300HH | 16.0 | 16 | 45 | 100 | 3.0 | 4 | Figure 2 | ● |
| P4S2000R0100HH | 20.0 | 20 | 45 | 100 | 1.0 | 4 | Figure 2 | ● |
| P4S2000R0200HH | 20.0 | 20 | 45 | 100 | 2.0 | 4 | Figure 2 | ● |
| P4S2000R0300HH | 20.0 | 20 | 45 | 100 | 3.0 | 4 | Figure 2 | ● |

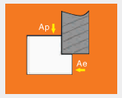
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☼ | ☼ | ☼ | | ☼ | | | | | ✹ | ✹ | ✹ |

✹ Fit well ☼ Applicable

## Recommended cutting conditions——P4S···R···HH

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | – | – | – |
| | Martensite stainless steel | < 820 | < 240 | – | – | – |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | 70 | 100 | 130 |
| | Hardened steel | – | > 60 HRC | 60 | 70 | 80 |

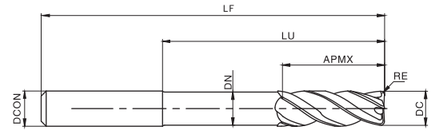
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | | | |
| 3.0 | 3.0 | 0.9 | 0.025 | | | |
| 4.0 | 4.0 | 1.2 | 0.030 | | | |
| 5.0 | 5.0 | 1.5 | 0.035 | | | |
| 6.0 | 6.0 | 1.8 | 0.045 | | | |
| 8.0 | 8.0 | 2.4 | 0.060 | | | |
| 10.0 | 10.0 | 3.0 | 0.070 | | | |
| 12.0 | 12.0 | 3.6 | 0.085 | | | |
| 16.0 | 16.0 | 4.8 | 0.115 | | | |
| 20.0 | 20.0 | 6.0 | 0.140 | | | |

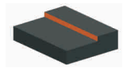
(1) Please use high precision machines and cutter shanks.
(2) Use cutting fluid that is air-cooled or free of producing smoke.
(3) If the rotating speed of machine is insufficient, decrease the feed rate in the same proportion.

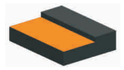
## Series P--High performance end mills

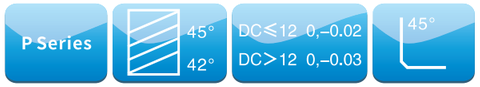
### Four-flute R end mill (necking structure)

**P4P···R···HH**





Side machining


Bottom machining




| Type | Dimension (mm) | | | | | | | | Inventory |
|---|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LU | DN | LF | RE | ZEFP | |
| P4P0600R0050HH | 6.0 | 6 | 6 | 18 | 5.8 | 75 | 0.5 | 4 | ● |
| P4P0600R0100HH | 6.0 | 6 | 6 | 18 | 5.8 | 75 | 1.0 | 4 | ● |
| P4P0800R0050HH | 8.0 | 8 | 8 | 24 | 7.8 | 100 | 0.5 | 4 | ● |
| P4P0800R0100HH | 8.0 | 8 | 8 | 24 | 7.8 | 100 | 1.0 | 4 | ● |
| P4P1000R0050HH | 10.0 | 10 | 10 | 30 | 9.6 | 100 | 0.52 | 4 | ● |
| P4P1000R0100HH | 10.0 | 10 | 10 | 30 | 9.6 | 100 | 1.0 | 4 | ● |
| P4P1000R0200HH | 10.0 | 10 | 10 | 30 | 9.6 | 100 | 2.0 | 4 | ● |
| P4P1200R0050HH | 12.0 | 12 | 12 | 36 | 11.5 | 100 | 0.5 | 4 | ● |
| P4P1200R0100HH | 12.0 | 12 | 12 | 36 | 11.5 | 100 | 1.0 | 4 | ● |
| P4P1200R0200HH | 12.0 | 12 | 12 | 36 | 11.5 | 100 | 2.0 | 4 | ● |
| P4P1600R0100HH | 16.0 | 16 | 16 | 40 | 15.5 | 150 | 1.0 | 4 | ● |
| P4P1600R0200HH | 16.0 | 16 | 16 | 40 | 15.5 | 150 | 2.0 | 4 | ● |

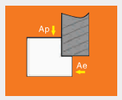
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☼ | ☼ | ☼ | | ☼ | | | | | ✹ | ✹ | ✹ |

✹ Fit well ☼ Applicable

## Recommended cutting conditions——P4P···R···HH

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | – | – | – |
| | Martensite stainless steel | < 820 | < 240 | – | – | – |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | 70 | 100 | 130 |
| | Hardened steel | – | > 60 HRC | 60 | 70 | 80 |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | | | |
| 6.0 | 6.0 | 1.8 | 0.045 | | | |
| 8.0 | 8.0 | 2.4 | 0.060 | | | |
| 10.0 | 10.0 | 3.0 | 0.070 | | | |
| 12.0 | 12.0 | 3.6 | 0.085 | | | |
| 16.0 | 16.0 | 4.8 | 0.115 | | | |

(1) Please use high precision machines and cutter shanks.
(2) Use cutting fluid that is air-cooled or free of producing smoke.
(3) If the rotating speed of machine is insufficient, decrease the feed rate in the same proportion.

## Series P--High performance end mills

### Two-flute ball nose end mill (short flute structure)

**P2S···BLG**

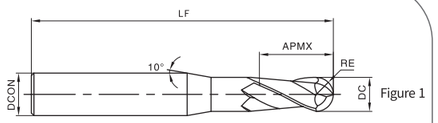


Figure 1

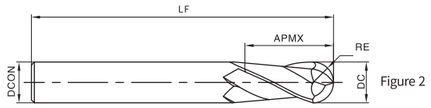
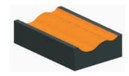
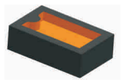
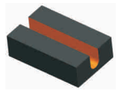
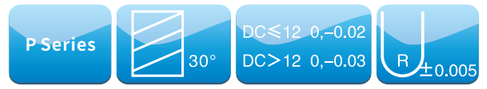


Figure 2


Profile machining


Cavity machining


Slot machining




| Type | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | | |
| P2SR0050BLG–4 | 1.0 | 4 | 2 | 50 | 0.5 | 2 | Figure 1 | ● |
| P2SR0075BLG–4 | 1.5 | 4 | 3 | 50 | 0.75 | 2 | Figure 1 | ● |
| P2SR0100BLG–4 | 2.0 | 4 | 4 | 50 | 1.0 | 2 | Figure 1 | ● |
| P2SR0125BLG–4 | 2.5 | 4 | 5 | 50 | 1.25 | 2 | Figure 1 | ● |
| P2SR0150BLG–4 | 3.0 | 4 | 6 | 50 | 1.5 | 2 | Figure 1 | ● |
| P2SR0175BLG–4 | 3.5 | 4 | 8 | 50 | 1.75 | 2 | Figure 1 | ● |
| P2SR0200BLG–4 | 4.0 | 4 | 8 | 50 | 2.0 | 2 | Figure 2 | ● |
| P2SR0050BLG | 1.0 | 6 | 2 | 50 | 0.5 | 2 | Figure 1 | ● |
| P2SR0075BLG | 1.5 | 6 | 3 | 50 | 0.75 | 2 | Figure 1 | ● |
| P2SR0100BLG | 2.0 | 6 | 4 | 50 | 1.0 | 2 | Figure 1 | ● |
| P2SR0125BLG | 2.5 | 6 | 5 | 50 | 1.25 | 2 | Figure 1 | ● |
| P2SR0150BLG | 3.0 | 6 | 6 | 50 | 1.5 | 2 | Figure 1 | ● |
| P2SR0175BLG | 3.5 | 6 | 8 | 50 | 1.75 | 2 | Figure 1 | ● |
| P2SR0200BLG | 4.0 | 6 | 8 | 50 | 2.0 | 2 | Figure 1 | ● |
| P2SR0250BLG | 5.0 | 6 | 10 | 50 | 2.5 | 2 | Figure 1 | ● |
| P2SR0275BLG | 5.5 | 6 | 12 | 50 | 2.75 | 2 | Figure 1 | ● |
| P2SR0300BLG | 6.0 | 6 | 12 | 50 | 3.0 | 2 | Figure 2 | ● |
| P2SR0350BLG | 7.0 | 8 | 14 | 60 | 3.5 | 2 | Figure 1 | ● |
| P2SR0400BLG | 8.0 | 8 | 16 | 60 | 4.0 | 2 | Figure 2 | ● |
| P2SR0450BLG | 9.0 | 10 | 18 | 75 | 4.5 | 2 | Figure 1 | ● |
| P2SR0500BLG | 10.0 | 10 | 20 | 75 | 5.0 | 2 | Figure 2 | ● |
| P2SR0600BLG | 12.0 | 12 | 24 | 75 | 6.0 | 2 | Figure 2 | ● |
| P2SR0700BLG | 14.0 | 14 | 28 | 75 | 7.0 | 2 | Figure 2 | ● |
| P2SR0800BLG | 16.0 | 16 | 32 | 100 | 8.0 | 2 | Figure 2 | ● |
| P2SR1000BLG | 20.0 | 20 | 40 | 100 | 10.0 | 2 | Figure 2 | ● |

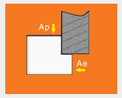
● Standing inventory ○ Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☀ | | | ☼ | ☼ | ☼ | ☼ | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——P2S···BLG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | 70 | 100 | 130 |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | | | |
| Diameter （mm） | ap ( 0.03xDc ) | ae ( 0.03xDc ) | fz ( mm/z ) | | | |
| 1.0 | 0.03 | 0.03 | 0.012 | | | |
| 1.5 | 0.045 | 0.045 | 0.015 | | | |
| 2.0 | 0.06 | 0.06 | 0.018 | | | |
| 2.5 | 0.075 | 0.075 | 0.020 | | | |
| 3.0 | 0.09 | 0.09 | 0.025 | | | |
| 3.5 | 0.105 | 0.105 | 0.025 | | | |
| 4.0 | 0.12 | 0.12 | 0.030 | | | |
| 5.0 | 0.15 | 0.15 | 0.035 | | | |
| 5.5 | 0.165 | 0.165 | 0.035 | | | |
| 6.0 | 0.18 | 0.18 | 0.045 | | | |
| 7.0 | 0.21 | 0.21 | 0.050 | | | |
| 8.0 | 0.24 | 0.24 | 0.060 | | | |
| 9.0 | 0.27 | 0.27 | 0.065 | | | |
| 10.0 | 0.30 | 0.30 | 0.070 | | | |
| 12.0 | 0.36 | 0.36 | 0.085 | | | |
| 14.0 | 0.42 | 0.42 | 0.100 | | | |
| 16.0 | 0.48 | 0.48 | 0.115 | | | |
| 20.0 | 0.60 | 0.60 | 0.140 | | | |

(1) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(2) Air cooling or spray cooling is recommended.
(3) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(4) The tool overhang is as short as possible without affecting the use.



## Series P--High performance end mills

### Two-flute ball nose end mill (short flute structure)

**P2S···BLH**

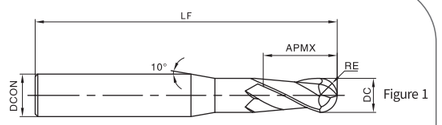


Figure 1

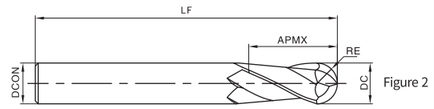
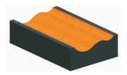
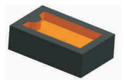
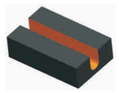
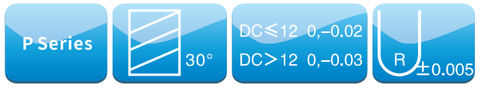


Figure 2


Profile machining


Cavity machining


Slot machining




| Type | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | | |
| P2SR0050BLH–4 | 1.0 | 4 | 2 | 50 | 0.5 | 2 | Figure 1 | ● |
| P2SR0075BLH–4 | 1.5 | 4 | 3 | 50 | 0.75 | 2 | Figure 1 | ● |
| P2SR0100BLH–4 | 2.0 | 4 | 4 | 50 | 1.0 | 2 | Figure 1 | ● |
| P2SR0125BLH–4 | 2.5 | 4 | 5 | 50 | 1.25 | 2 | Figure 1 | ● |
| P2SR0150BLH–4 | 3.0 | 4 | 6 | 50 | 1.5 | 2 | Figure 1 | ● |
| P2SR0175BLH–4 | 3.5 | 4 | 8 | 50 | 1.75 | 2 | Figure 1 | ● |
| P2SR0200BLH–4 | 4.0 | 4 | 8 | 50 | 2.0 | 2 | Figure 2 | ● |
| P2SR0050BLH | 1.0 | 6 | 2 | 50 | 0.5 | 2 | Figure 1 | ● |
| P2SR0075BLH | 1.5 | 6 | 3 | 50 | 0.75 | 2 | Figure 1 | ● |
| P2SR0100BLH | 2.0 | 6 | 4 | 50 | 1.0 | 2 | Figure 1 | ● |
| P2SR0125BLH | 2.5 | 6 | 5 | 50 | 1.25 | 2 | Figure 1 | ● |
| P2SR0150BLH | 3.0 | 6 | 6 | 50 | 1.5 | 2 | Figure 1 | ● |
| P2SR0175BLH | 3.5 | 6 | 8 | 50 | 2.0 | 2 | Figure 1 | ● |
| P2SR0200BLH | 4.0 | 6 | 8 | 50 | 2.0 | 2 | Figure 1 | ● |
| P2SR0250BLH | 5.0 | 6 | 10 | 50 | 2.5 | 2 | Figure 1 | ● |
| P2SR0275BLH | 5.5 | 6 | 12 | 50 | 2.75 | 2 | Figure 1 | ● |
| P2SR0300BLH | 6.0 | 6 | 12 | 50 | 3.0 | 2 | Figure 2 | ● |
| P2SR0350BLH | 7.0 | 8 | 14 | 60 | 3.5 | 2 | Figure 1 | ● |
| P2SR0400BLH | 8.0 | 8 | 16 | 60 | 4.0 | 2 | Figure 2 | ● |
| P2SR0450BLH | 9.0 | 10 | 18 | 75 | 4.5 | 2 | Figure 1 | ● |
| P2SR0500BLH | 10.0 | 10 | 20 | 75 | 5.0 | 2 | Figure 2 | ● |
| P2SR0600BLH | 12.0 | 12 | 24 | 75 | 6.0 | 2 | Figure 2 | ● |
| P2SR0700BLH | 14.0 | 14 | 28 | 75 | 7.0 | 2 | Figure 2 | ● |
| P2SR0800BLH | 16.0 | 16 | 32 | 100 | 8.0 | 2 | Figure 2 | ● |
| P2SR1000BLH | 20.0 | 20 | 40 | 100 | 10.0 | 2 | Figure 2 | ● |

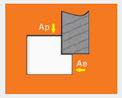
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☼ | ☼ | ☼ | ☼ | ☼ | | | ☼ | ☼ | ✹ | ✹ | ✹ |

✹ Fit well ☼ Applicable

## Recommended cutting conditions——P2S···BLH

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | 70 | 100 | 130 |
| | Hardened steel | – | > 60 HRC | 60 | 70 | 80 |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | | | |
| Diameter （mm） | ap ( 0.03xDc ) | ae ( 0.03xDc ) | fz ( mm/z ) | | | |
| 1.0 | 0.03 | 0.03 | 0.012 | | | |
| 1.5 | 0.045 | 0.045 | 0.015 | | | |
| 2.0 | 0.06 | 0.06 | 0.018 | | | |
| 2.5 | 0.075 | 0.075 | 0.020 | | | |
| 3.0 | 0.09 | 0.09 | 0.025 | | | |
| 3.5 | 0.105 | 0.105 | 0.025 | | | |
| 4.0 | 0.12 | 0.12 | 0.030 | | | |
| 5.0 | 0.15 | 0.15 | 0.035 | | | |
| 5.5 | 0.165 | 0.165 | 0.035 | | | |
| 6.0 | 0.18 | 0.18 | 0.045 | | | |
| 7.0 | 0.21 | 0.21 | 0.050 | | | |
| 8.0 | 0.24 | 0.24 | 0.060 | | | |
| 9.0 | 0.27 | 0.27 | 0.065 | | | |
| 10.0 | 0.30 | 0.30 | 0.070 | | | |
| 12.0 | 0.36 | 0.36 | 0.085 | | | |
| 14.0 | 0.42 | 0.42 | 0.100 | | | |
| 16.0 | 0.48 | 0.48 | 0.115 | | | |
| 20.0 | 0.60 | 0.60 | 0.140 | | | |

(1) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(2) Air cooling or spray cooling is recommended.
(3) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(4) The tool overhang is as short as possible without affecting the use.



## Series P--High performance end mills

### Two-flute ball nose end mill(necking structure)

**P2P···BLG**

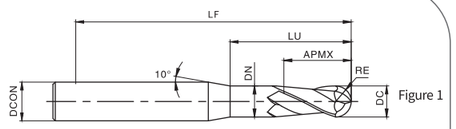


Figure 1

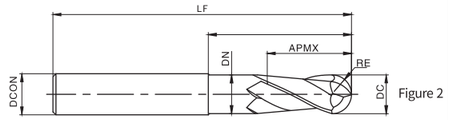
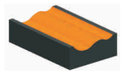
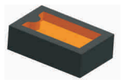
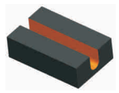
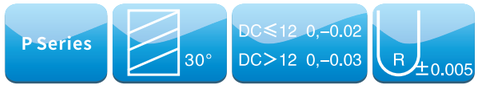


Figure 2


Profile machining


Cavity machining


Slot machining




| Type | Dimension (mm) | | | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LU | DN | LF | RE | ZEFP | | |
| P2PR0050BLG–4 | 1.0 | 4 | 1 | 2.5 | 0.95 | 75 | 0.5 | 2 | Figure 1 | ● |
| P2PR0075BLG–4 | 1.5 | 4 | 2 | 3 | 1.45 | 75 | 0.75 | 2 | Figure 1 | ● |
| P2PR0100BLG–4 | 2.0 | 4 | 2 | 4 | 1.95 | 75 | 1.0 | 2 | Figure 1 | ● |
| P2PR0150BLG–4 | 3.0 | 4 | 3 | 6 | 2.85 | 75 | 1.5 | 2 | Figure 1 | ● |
| P2PR0200BLG–4 | 4.0 | 4 | 4 | 8 | 3.85 | 75 | 2.0 | 2 | Figure 2 | ● |
| P2PR0050BLG | 1.0 | 6 | 1 | 2.5 | 0.95 | 75 | 0.5 | 2 | Figure 1 | ● |
| P2PR0075BLG | 1.5 | 6 | 2 | 3 | 1.45 | 75 | 0.75 | 2 | Figure 1 | ● |
| P2PR0100BLG | 2.0 | 6 | 2 | 4 | 1.95 | 75 | 1.0 | 2 | Figure 1 | ● |
| P2PR0150BLG | 3.0 | 6 | 3 | 6 | 2.85 | 75 | 1.5 | 2 | Figure 1 | ● |
| P2PR0200BLG | 4.0 | 6 | 4 | 8 | 3.85 | 75 | 2.0 | 2 | Figure 1 | ● |
| P2PR0250BLG | 5.0 | 6 | 5 | 10 | 4.85 | 75 | 2.5 | 2 | Figure 1 | ● |
| P2PR0300BLG | 6.0 | 6 | 6 | 12 | 5.8 | 75 | 3.0 | 2 | Figure 2 | ● |
| P2PR0400BLG | 8.0 | 8 | 8 | 16 | 7.8 | 100 | 4.0 | 2 | Figure 2 | ● |
| P2PR0500BLG | 10.0 | 10 | 10 | 20 | 9.6 | 100 | 5.0 | 2 | Figure 2 | ● |
| P2PR0600BLG | 12.0 | 12 | 12 | 24 | 11.5 | 100 | 6.0 | 2 | Figure 2 | ● |
| P2PR0800BLG | 16.0 | 16 | 16 | 32 | 15.5 | 150 | 8.0 | 2 | Figure 2 | ● |
| P2PR1000BLG | 20.0 | 20 | 20 | 40 | 19.5 | 150 | 10.0 | 2 | Figure 2 | ● |

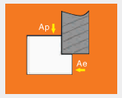
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☀ | | | ☼ | ☼ | ☼ | ☼ | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——P2P···BLG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | 70 | 100 | 130 |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | | | |
| Diameter （mm） | ap ( 0.03xDc ) | ae ( 0.03xDc ) | fz ( mm/z ) | | | |
| 1.0 | 0.03 | 0.03 | 0.012 | | | |
| 1.5 | 0.045 | 0.045 | 0.015 | | | |
| 2.0 | 0.06 | 0.06 | 0.018 | | | |
| 3.0 | 0.09 | 0.09 | 0.025 | | | |
| 4.0 | 0.12 | 0.12 | 0.030 | | | |
| 5.0 | 0.15 | 0.15 | 0.035 | | | |
| 6.0 | 0.18 | 0.18 | 0.045 | | | |
| 8.0 | 0.24 | 0.24 | 0.060 | | | |
| 10.0 | 0.3 | 0.3 | 0.070 | | | |
| 12.0 | 0.36 | 0.36 | 0.085 | | | |
| 16.0 | 0.48 | 0.48 | 0.115 | | | |
| 20.0 | 0.60 | 0.60 | 0.140 | | | |

(1) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(2) Air cooling or spray cooling is recommended.
(3) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(4) The tool overhang is as short as possible without affecting the use.

## Series P--High performance end mills

### Two-flute ball nose end mill(necking structure)

**P2P···BLH**

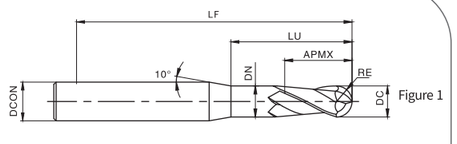



Figure 1

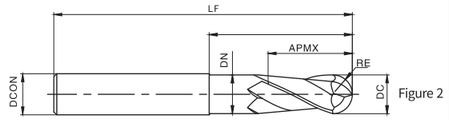
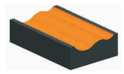
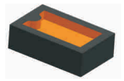


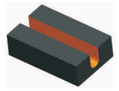

Figure 2



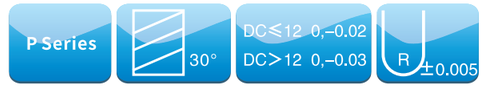
Profile machining



Cavity machining



Slot machining




| Type | Dimension (mm) | | | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LU | DN | LF | RE | ZEFP | | |
| P2PR0050BLH–4 | 1.0 | 4 | 1 | 2.5 | 0.95 | 75 | 0.5 | 2 | Figure 1 | ● |
| P2PR0075BLH–4 | 1.5 | 4 | 2 | 3 | 1.45 | 75 | 0.75 | 2 | Figure 1 | ● |
| P2PR0100BLH–4 | 2.0 | 4 | 2 | 4 | 1.95 | 75 | 1.0 | 2 | Figure 1 | ● |
| P2PR0150BLH–4 | 3.0 | 4 | 3 | 6 | 2.85 | 75 | 1.5 | 2 | Figure 1 | ● |
| P2PR0200BLH–4 | 4.0 | 4 | 4 | 8 | 3.85 | 75 | 2.0 | 2 | Figure 2 | ● |
| P2PR0050BLH | 1.0 | 6 | 1 | 2.5 | 0.95 | 75 | 0.5 | 2 | Figure 1 | ● |
| P2PR0075BLH | 1.5 | 6 | 2 | 3 | 1.45 | 75 | 0.75 | 2 | Figure 1 | ● |
| P2PR0100BLH | 2.0 | 6 | 2 | 4 | 1.95 | 75 | 1.0 | 2 | Figure 1 | ● |
| P2PR0150BLH | 3.0 | 6 | 3 | 6 | 2.85 | 75 | 1.5 | 2 | Figure 1 | ● |
| P2PR0200BLH | 4.0 | 6 | 4 | 8 | 3.85 | 75 | 2.0 | 2 | Figure 1 | ● |
| P2PR0250BLH | 5.0 | 6 | 5 | 10 | 4.85 | 75 | 2.5 | 2 | Figure 1 | ● |
| P2PR0300BLH | 6.0 | 6 | 6 | 12 | 5.8 | 75 | 3.0 | 2 | Figure 2 | ● |
| P2PR0400BLH | 8.0 | 8 | 8 | 16 | 7.8 | 100 | 4.0 | 2 | Figure 2 | ● |
| P2PR0500BLH | 10.0 | 10 | 10 | 20 | 9.6 | 100 | 5.0 | 2 | Figure 2 | ● |
| P2PR0600BLH | 12.0 | 12 | 12 | 24 | 11.5 | 100 | 6.0 | 2 | Figure 2 | ● |
| P2PR0800BLH | 16.0 | 16 | 16 | 32 | 15.5 | 150 | 8.0 | 2 | Figure 2 | ● |
| P2PR1000BLH | 20.0 | 20 | 20 | 40 | 19.5 | 150 | 10.0 | 2 | Figure 2 | ● |

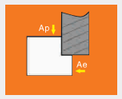
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☼ | ☼ | ☼ | | ☼ | | | | | ✹ | ✹ | ✹ |

✹ Fit well ☼ Applicable

## Recommended cutting conditions——P2P···BLH

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | 70 | 100 | 130 |
| | Hardened steel | – | > 60 HRC | 60 | 70 | 80 |

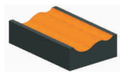
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | | | |
| Diameter （mm） | ap ( 0.03xDc ) | ae ( 0.03xDc ) | fz ( mm/z ) | | | |
| 1.0 | 0.03 | 0.03 | 0.012 | | | |
| 1.5 | 0.045 | 0.045 | 0.015 | | | |
| 2.0 | 0.06 | 0.06 | 0.018 | | | |
| 3.0 | 0.09 | 0.09 | 0.025 | | | |
| 4.0 | 0.12 | 0.12 | 0.030 | | | |
| 5.0 | 0.15 | 0.15 | 0.035 | | | |
| 6.0 | 0.18 | 0.18 | 0.045 | | | |
| 8.0 | 0.24 | 0.24 | 0.060 | | | |
| 10.0 | 0.3 | 0.3 | 0.070 | | | |
| 12.0 | 0.36 | 0.36 | 0.085 | | | |
| 16.0 | 0.48 | 0.48 | 0.115 | | | |
| 20.0 | 0.60 | 0.60 | 0.140 | | | |

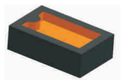
(1) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(2) Air cooling or spray cooling is recommended.
(3) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(4) The tool overhang is as short as possible without affecting the use.

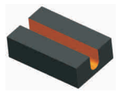
## Series P--High performance end mills

### Four-flute ball nose end mill (short flute structure)

**P4S···BNS**


Profile machining


Cavity machining


Slot machining

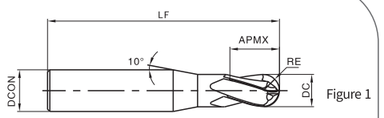


Figure 1

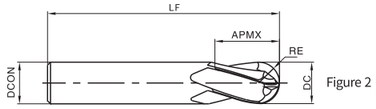
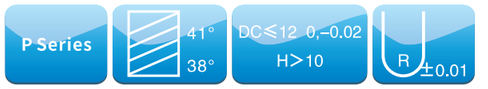


Figure 2




| Type | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | | |
| P4SR0150BNS–4 | 3.0 | 4 | 6 | 50 | 1.5 | 4 | Figure 1 | ● |
| P4SR0200BNS–4 | 4.0 | 4 | 8 | 50 | 2.0 | 4 | Figure 2 | ● |
| P4SR0150BNS | 3.0 | 6 | 6 | 50 | 1.5 | 4 | Figure 1 | ● |
| P4SR0200BNS | 4.0 | 6 | 8 | 50 | 2.0 | 4 | Figure 1 | ● |
| P4SR0250BNS | 5.0 | 6 | 10 | 50 | 2.5 | 4 | Figure 1 | ● |
| P4SR0300BNS | 6.0 | 6 | 12 | 50 | 3.0 | 4 | Figure 2 | ● |
| P4SR0400BNS | 8.0 | 8 | 16 | 60 | 4.0 | 4 | Figure 2 | ● |
| P4SR0500BNS | 10.0 | 10 | 20 | 75 | 5.0 | 4 | Figure 2 | ● |
| P4SR0600BNS | 12.0 | 12 | 24 | 75 | 6.0 | 4 | Figure 2 | ● |
| P4SR0700BNS | 14.0 | 14 | 28 | 75 | 7.0 | 4 | Figure 2 | ● |
| P4SR0800BNS | 16.0 | 16 | 32 | 100 | 8.0 | 4 | Figure 2 | ● |
| P4SR0900BNS | 18.0 | 18 | 36 | 100 | 9.0 | 4 | Figure 2 | ● |
| P4SR1000BNS | 20.0 | 20 | 40 | 100 | 10.0 | 4 | Figure 2 | ● |

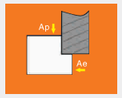
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ✹ | ✹ | ✹ | ✹ | ✹ | | | ✹ | ✹ | | | |

✹ Fit well ✵ Applicable

## Recommended cutting conditions——P4S···BNS

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | – | – | – |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

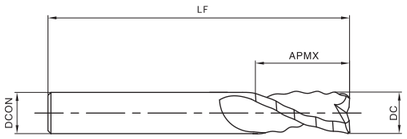
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | | | | |
| Diameter （mm） | ap ( 0.1xDc ) | ae ( 0.1xDc ) | fz ( mm/z ) | | | |
| 3.0 | 0.3 | 0.3 | 0.025 | | | |
| 4.0 | 0.4 | 0.4 | 0.030 | | | |
| 5.0 | 0.5 | 0.5 | 0.035 | | | |
| 6.0 | 0.6 | 0.6 | 0.045 | | | |
| 8.0 | 0.8 | 0.8 | 0.060 | | | |
| 10.0 | 1.0 | 1.0 | 0.070 | | | |
| 12.0 | 1.2 | 1.2 | 0.085 | | | |
| 14.0 | 1.4 | 1.4 | 0.100 | | | |
| 16.0 | 1.6 | 1.6 | 0.115 | | | |
| 18.0 | 1.8 | 1.8 | 0.130 | | | |
| 20.0 | 2.0 | 2.0 | 0.140 | | | |

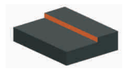
(1) If the cutting depth is reduced, the rotating speed and feed rate may be increased appropriately.
(2) Air cooling or spray cooling is recommended.
(3) With poor rigidity of the machine, if there is vibration or abnormal sound during machining, the cutting speed and feed rate of the above table should be lowered in the same proportion.
(4) The tool overhang is as short as possible without affecting the use.

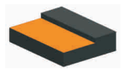
## Series X--Special end mills

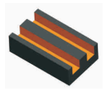
### Three-flute corrugated edge flat end mill

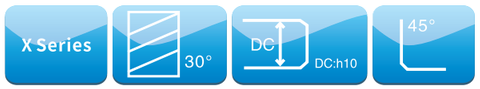
**X3S···WLN**





Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | Inventory |
|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | |
| X3S0600WLN | 6.0 | 6 | 16 | 50 | 3 | ● |
| X3S0800WLN | 8.0 | 8 | 20 | 60 | 3 | ● |
| X3S1000WLN | 10.0 | 10 | 25 | 75 | 3 | ● |
| X3S1200WLN | 12.0 | 12 | 30 | 75 | 3 | ● |
| X3S1600WLN | 16.0 | 16 | 45 | 100 | 3 | ● |
| X3S2000WLN | 20.0 | 20 | 45 | 100 | 3 | ● |

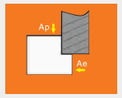
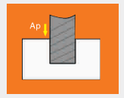
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| | | | | | | ☀ | | | | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——X3S···WLN

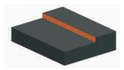
| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | – | – | – |
| | Alloy steel | < 1200 | < 350 | – | – | – |
| | High-alloyed steel and tool steel | < 1400 | < 380 | – | – | – |
| M | Austenite and ferrite stainless steel | < 680 | <220 | – | – | – |
| | Martensite stainless steel | < 820 | < 240 | – | – | – |
| K | Gray cast iron | – | < 280 | – | – | – |
| | Nodular iron | – | < 320 | – | – | – |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | 150 | 200 | 300 |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | – | – | – |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

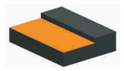
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |  Side milling | | |  Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

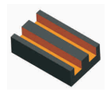
## Series X--Special end mills

### Four-flute corrugated edge flat end mill

**X4S···WNG**


Side machining


Bottom machining


Slot milling

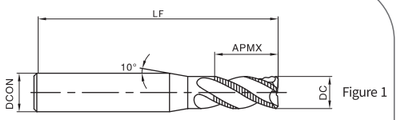


Figure 1

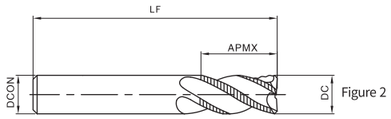
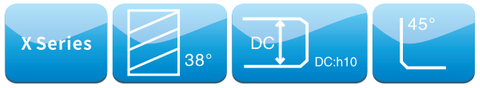


Figure 2




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| X4S0600WNG | 6.0 | 6 | 16 | 50 | 4 | Figure 2 | ● |
| X4S0700WNG | 7.0 | 8 | 20 | 60 | 4 | Figure 1 | ● |
| X4S0800WNG | 8.0 | 8 | 20 | 60 | 4 | Figure 2 | ● |
| X4S0900WNG | 9.0 | 10 | 22 | 75 | 4 | Figure 1 | ● |
| X4S1000WNG | 10.0 | 10 | 25 | 75 | 4 | Figure 2 | ● |
| X4S1100WNG | 11.0 | 12 | 26 | 75 | 4 | Figure 1 | ● |
| X4S1200WNG | 12.0 | 12 | 30 | 75 | 4 | Figure 2 | ● |
| X4S1600WNG | 16.0 | 16 | 45 | 100 | 4 | Figure 2 | ● |
| X4S2000WNG | 20.0 | 20 | 45 | 100 | 4 | Figure 2 | ● |

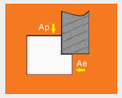
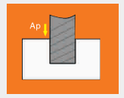
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☼ | ☀ | | | | | ☼ | | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——X4S···WNG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | – | – | – |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |   Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 7.0 | 7.0 | 2.1 | 0.055 | 5.3 | 7.0 | 0.045 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 9.0 | 9.0 | 2.7 | 0.065 | 6.8 | 9.0 | 0.055 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 11.0 | 11.0 | 3.3 | 0.080 | 8.3 | 11.0 | 0.065 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

## Series X--Special end mills

### Four-flute flat end mill

**X4S···HG**

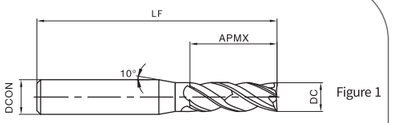


Figure 1

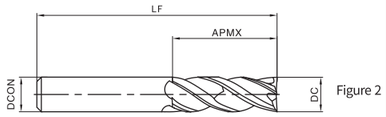
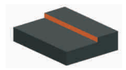
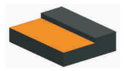
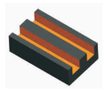
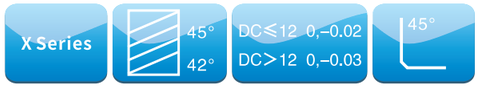


Figure 2


Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | ZEFP | | |
| X4S0400HG | 4.0 | 6 | 11 | 50 | 4 | Figure 1 | ● |
| X4S0500HG | 5.0 | 6 | 13 | 50 | 4 | Figure 1 | ● |
| X4S0600HG | 6.0 | 6 | 16 | 50 | 4 | Figure 2 | ● |
| X4S0800HG | 8.0 | 8 | 20 | 60 | 4 | Figure 2 | ● |
| X4S1000HG | 10.0 | 10 | 25 | 75 | 4 | Figure 2 | ● |
| X4S1200HG | 12.0 | 12 | 30 | 75 | 4 | Figure 2 | ● |
| X4S1600HG | 16.0 | 16 | 45 | 100 | 4 | Figure 2 | ● |
| X4S2000HG | 20.0 | 20 | 45 | 100 | 4 | Figure 2 | ● |

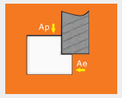
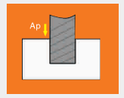
● Standing inventory ○ Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☀ | | | ☀ | ☀ | ☀ | ☀ | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——X4S···HG

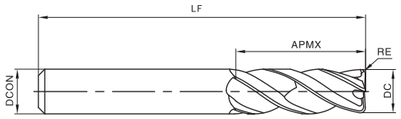
| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | 70 | 100 | 130 |
| | Hardened steel | – | > 60 HRC | – | – | – |

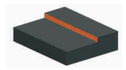
| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |   Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 4.0 | 4.0 | 1.2 | 0.030 | 3.0 | 4.0 | 0.025 |
| 5.0 | 5.0 | 1.5 | 0.035 | 3.8 | 5.0 | 0.030 |
| 6.0 | 6.0 | 1.8 | 0.045 | 4.5 | 6.0 | 0.035 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |

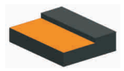
## Series X--Special end mills

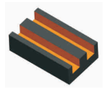
### Four-flute R end mill

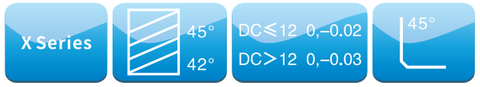
**X4S···R···HG**





Side machining


Bottom machining


Slot milling




| Type | Dimension (mm) | | | | | | Inventory |
|---|---|---|---|---|---|---|---|
| | DC | DCON | APMX | LF | RE | ZEFP | |
| X4S0600R0050HG | 6.0 | 6 | 16 | 50 | 0.5 | 4 | ● |
| X4S0600R0100HG | 6.0 | 6 | 16 | 50 | 1.0 | 4 | ● |
| X4S0800R0050HG | 8.0 | 8 | 20 | 60 | 0.5 | 4 | ● |
| X4S0800R0100HG | 8.0 | 8 | 20 | 60 | 1.0 | 4 | ● |
| X4S1000R0050HG | 10.0 | 10 | 25 | 75 | 0.5 | 4 | ● |
| X4S1000R0100HG | 10.0 | 10 | 25 | 75 | 1.0 | 4 | ● |
| X4S1000R0200HG | 10.0 | 10 | 25 | 75 | 2.0 | 4 | ● |
| X4S1200R0050HG | 12.0 | 12 | 30 | 75 | 0.5 | 4 | ● |
| X4S1200R0100HG | 12.0 | 12 | 30 | 75 | 1.0 | 4 | ● |
| X4S1200R0200HG | 12.0 | 12 | 30 | 75 | 2.0 | 4 | ● |
| X4S1600R0100HG | 16.0 | 16 | 45 | 100 | 1.0 | 4 | ● |
| X4S1600R0200HG | 16.0 | 16 | 45 | 100 | 2.0 | 4 | ● |
| X4S1600R0300HG | 16.0 | 16 | 45 | 100 | 3.0 | 4 | ● |
| X4S2000R0100HG | 20.0 | 20 | 45 | 100 | 1.0 | 4 | ● |
| X4S2000R0200HG | 20.0 | 20 | 45 | 100 | 2.0 | 4 | ● |
| X4S2000R0300HG | 20.0 | 20 | 45 | 100 | 3.0 | 4 | ● |

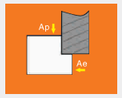
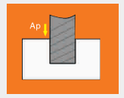
●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☀ | | | ☀ | ☀ | ☀ | ☀ | |

☀ Fit well ☼ Applicable

## Recommended cutting conditions——X4S···R···HG

| Recommended Cutting Speed | | | | | | |
|---|---|---|---|---|---|---|
| Workpiece material | | Strength (N/mm²) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
| | | | | Minimum | Recommendation | Maximum |
| P | Carbon steel | < 600 | < 230 | 180 | 210 | 240 |
| | Alloy steel | < 1200 | < 350 | 150 | 175 | 200 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 100 | 120 | 140 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 80 | 110 | 140 |
| | Martensite stainless steel | < 820 | < 240 | 60 | 90 | 120 |
| K | Gray cast iron | – | < 280 | 120 | 150 | 180 |
| | Nodular iron | – | < 320 | 90 | 110 | 130 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Heat resistant super alloys | < 3300 | < 350 | 40 | 50 | 60 |
| | Titanium alloy | <2100 | < 400 | 60 | 70 | 80 |
| H | Hardened steel | – | < 54HRC | 90 | 120 | 150 |
| | Hardened steel | – | 54–60HRC | 70 | 100 | 130 |
| | Hardened steel | – | > 60 HRC | – | – | – |

| Recommended Cutting Parameters | | | | | | |
|---|---|---|---|---|---|---|
| Machining method |   Side milling | | |   Slot milling | | |
| Diameter （mm） | ap ( 1xDc ) | ae ( 0.3xDc ) | fz ( mm/z ) | ap ( 0.75xDc ) | ae ( 1xDc ) | fz ( mm/z ) |
| 6.0 | 6.0 | 1.8 | 0.025 | 4.5 | 6.0 | 0.020 |
| 8.0 | 8.0 | 2.4 | 0.060 | 6.0 | 8.0 | 0.050 |
| 10.0 | 10.0 | 3.0 | 0.070 | 7.5 | 10.0 | 0.060 |
| 12.0 | 12.0 | 3.6 | 0.085 | 9.0 | 12.0 | 0.070 |
| 16.0 | 16.0 | 4.8 | 0.115 | 12.0 | 16.0 | 0.095 |
| 20.0 | 20.0 | 6.0 | 0.140 | 15.0 | 20.0 | 0.120 |



## Non-standard Customization of Solid Carbide End Mills

HUAREAL

**Customized tools: a good solution for process optimization and efficiency improvement**

| | |
|---|---|
| Client name:<br>Fax:<br>Tel.:<br>E-MAIL: | No.68 Chuangye 2nd RD., Lusong District, Zhuzhou, Hunan, P.R.China<br>Tel.: 0731-28216690<br>Fax: 0731-22286653<br>E-mail: zzhrhj@163.com<br>Postal code: 412000<br>Website: www.huareal.com.cn |

**Tool series**

☐ Series B Basic Type ☐ Series P High Performance Type ☐ Series X Special Type ☐ Others

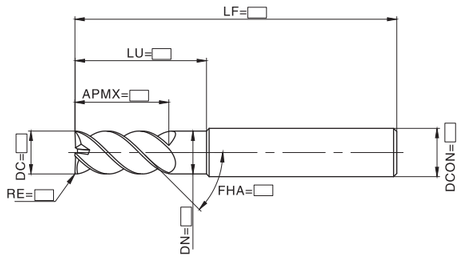
**Tool type**

☐ Flat end mill ☐ Chamfered flat end mill ☐ Radius mill ☐ Ball nose mill
☐ Flat end taper mill ☐ Ball nose taper mill ☐ Others

**Shank type**

☐ Straight shank ☐ Shank with flat DIN 6535HB
☐ Straight shank DIN 6535HA ☐ Others

**Tool information**




| | |
|---|---|
| Diameter range (Φ3~Φ20mm) | |
| Number of tool edges | |
| The end edge is through the center (Yes/No) | |
| Coated (Yes/No) | |
| Cutting direction | |
| Reference order number | |
| **Application** | |
| Type of machine | |
| Internal coolant (Yes/No) | |
| Cooling type | |
| Machining method | |
| Clamping form | |
| Cutting speed (Vc) | |
| Feed per revolution (Fz) | |
| Cutting depth (Ap) | |
| Cutting width (Ae) | |

Notes (Sketches or drawings of machined parts will be needed if the above workpiece types cannot be described in detail):

Order quantity: Pieces Expected delivery date: MM DD YYYY

Date: Signature:

# Drilling / Short hole drills

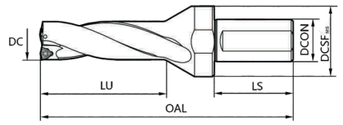
Tool shape

Tool type

## Indexable short hole drilling

### HD01 2D Series

Tool specification column
(including model, basic size, applicable inserts and accessories)



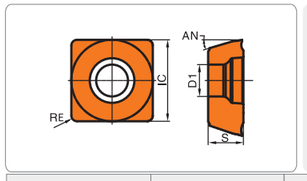

| Tool model | Inventory | Dimension (mm) | | | | | | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | $DCSF_{MS}$ | LS | LU | OAL | | | |
| HD01-2D-440-S40 | ○ | 44 | 40 | 60 | 70 | 91 | 193 | WCMX080412-DX | M40110 | HTT15IP |
| HD01-2D-450-S40 | ○ | 45 | 40 | 60 | 70 | 93 | 195 | | | |
| HD01-2D-460-S40 | ○ | 46 | 40 | 60 | 70 | 95 | 197 | | | |
| HD01-2D-470-S40 | ○ | 47 | 40 | 60 | 70 | 97 | 199 | | | |
| HD01-2D-480-S40 | ○ | 48 | 40 | 70 | 70 | 99 | 201 | | | |
| HD01-2D-490-S40 | ○ | 49 | 40 | 70 | 70 | 101 | 203 | | | |
| HD01-2D-500-S40 | ○ | 50 | 40 | 70 | 70 | 103 | 205 | | | |

● Running stock ○ Make-to-order

## Selection guidance of indexable short hole drilling inserts

### Indexable short hole drilling insert

Working condition: ● Stable ◕ Average ⌗ Tough




| Workpiece material | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | ●◕ | ● | ●◕ | ◕ | | |
| M | Stainless steel | | | | ● | ●◕ | ◕ | ●◕ | ●◕ |
| K | Cast iron | | | | ● | ●◕ | ◕ | | |
| N | Non-ferrous metal | | | | | | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | | CVD | | | PVD | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | IC | S | RE | D1 | AN | HR8115 | HR8125 | HR8225 | HR5110 | HR5120 | HR5130 | HR712 | HR7225 |
| | SPMG050204-DX | 5.00 | 2.38 | 0.4 | 2.25 | 14° | ☆ | | | | ☆ | ★ | | |
| | SPMG060204-DX | 6.00 | 2.38 | 0.4 | 2.61 | 14° | ☆ | | | | ☆ | ★ | | |
| | SPMG07T308-DX | 7.94 | 3.97 | 0.8 | 2.85 | 15.5° | ☆ | | | | ☆ | ★ | | |
| | SPMG090408-DX | 9.80 | 4.30 | 0.8 | 4.05 | 17.5° | ☆ | | | | ☆ | ★ | | |
| | SPMG110408-DX | 11.50 | 4.80 | 0.8 | 4.50 | 16.5° | ☆ | | | | ☆ | ★ | | |

★ Recommended grade ☆ Available grade

Insert shape

Insert type

Insert specification column
(including model, basic size and grade )

# C Drilling

## Indexable short hole drills


- Overview of drilling tools C-1
- Code key of indexable short hole drilling tools C-2
- Code key of indexable short hole drilling inserts C-3
- Indexable short hole drilling tools C-5
- Indexable short hole drilling inserts C-11
- Recommended cutting parameters for indexable short hole drilling tools C-12
- Technical information of indexable short hole drilling tools C-13


## Solid carbide drills


- Code key of solid carbide drills C-18
- Specification and parameters recommendation of solid carbide drills C-19
- Technical information of solid carbide drill C-71
- Non-standard customization of solid carbide drills C-73
- Non-standard customization of solid carbide reamers C-74

## Overview of drilling tools

| Tool type | Tool series | Size range (mm) | Tool shape | Cooling method | Applicable inserts | Workpiece material | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | P | M | K | N | S | H | Page |
| Indexable short hole drill | HD01 | Ø16–50 | | Internal cooling | WCMX□□ | ✷ | ✷ | ☼ | | ☼ | | C5 |
| | HD02 | Ø16–42 | | Internal cooling | SPMG□□ | ✷ | ✷ | ☼ | | ☼ | | C9 |
| BD Series Solid carbide drill | BD03 | Ø3–20 | | External cooling | / | ✷ | ✷ | ☼ | | ☼ | | C19 |
| | BD03C | Ø3–20 | | Internal cooling | / | ✷ | ✷ | ☼ | | ☼ | | C27 |
| | BD05 | Ø3–20 | | External cooling | / | ✷ | ✷ | ☼ | | ☼ | | C35 |
| | BD05C | Ø3–20 | | Internal cooling | / | ✷ | ✷ | ☼ | | ☼ | | C43 |
| | BD08C | Ø3–20 | | Internal cooling | / | ✷ | ✷ | ☼ | | ☼ | | C51 |

✷Fit well ☼Applicable

## Overview of drilling tools

| Tool type | Tool series | Size range (mm) | Tool shape | Cooling method | Applicable inserts | Workpiece material | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | P | M | K | N | S | H | Page |
| XD Series Solid carbide drills | XD12C | Ø3–20 | | Internal cooling | / | ✷ | ✷ | ☼ | | ☼ | | C57 |
| | XD20C | Ø3–14 | | Internal cooling | / | ✷ | ✷ | ☼ | | ☼ | | C65 |
| | XD30C | Ø3–10 | | Internal cooling | / | ✷ | ✷ | ☼ | | ☼ | | C67 |

✷Fit well ☼Applicable

## Code key of indexable short hole drilling tools

HD ① 01 ② - 2D ③ - 150 ④ - S ⑤ 20 ⑥

**① Short hole drilling series**

**② Series number**

| | |
|---|---|
| 01 | With WC insert |
| 02 | With SP insert |

**③ Length-diameter ratio**

| | |
|---|---|
| 2D | Length-diameter ratio: 2 |
| 3D | Length-diameter ratio: 3 |
| 5D | Length-diameter ratio: 5 |

**④ Tool diameter**

| | |
|---|---|
| 150 | 15mm |
| 200 | 20mm |
| 250 | 25mm |
| … | … |

**⑤ Shank type**

| | |
|---|---|
| S | Shank with flat |

**⑥ Sizes of tool installation parts**

| | |
|---|---|
| 20 | 20mm |
| 25 | 25mm |
| … | … |

# Code key of indexable short hole drilling inserts

| S | P | M | G | 07 | T3 | 08 | R | - | DX |
|---|---|---|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | | ⑨ |

### ① Shape code

| | |
|---|---|
| S | |
| W | |

### ③ Tolerance (mm)

| Class | Corner height (m) | Inscribed circle (ϕD) | Thickness (S) | Class | Corner height (m) | Inscribed circle (ϕD) | Thickness (S) |
|---|---|---|---|---|---|---|---|
| A | ±0.005 | ±0.025 | ±0.025 | J | ±0.005 | ±0.025 | ±0.025 |
| F | ±0.005 | ±0.013 | ±0.025 | K | ±0.005 | ±0.013 | ±0.025 |
| C | ±0.013 | ±0.025 | ±0.025 | L | ±0.013 | ±0.025 | ±0.025 |
| H | ±0.013 | ±0.013 | ±0.025 | M | ±0.013 | ±0.013 | ±0.025 |
| E | ±0.025 | ±0.025 | ±0.025 | N | ±0.025 | ±0.025 | ±0.025 |
| G | ±0.025 | ±0.025 | ±0.13 | U | ±0.025 | ±0.025 | ±0.13 |

### ⑤ Cutting edge length

| Code | Insert shape W | Insert shape S |
|---|---|---|
| 03 | 3.8 | |
| 04 | 4.3 | |
| 05 | 5.4 | 5.0 |
| 06 | 6.5 | 6.0 |
| 07 | | 7.94 |
| 08 | 8.7 | |
| 09 | | 9.8 |
| 11 | | 11.5 |

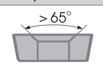
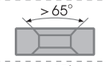
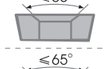
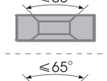
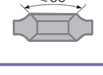
### ⑥ Insert thickness

| Code | Thickness (mm) | Code | Thickness (mm) |
|---|---|---|---|
| 00 | 0.79 | 05 | 5.96 |
| T0 | 0.99 | T5 | 5.95 |
| 01 | 1.59 | 06 | 6.35 |
| T1 | 1.98 | T6 | 6.75 |
| 02 | 2.38 | 07 | 7.94 |
| T2 | 2.58 | 09 | 9.52 |
| 03 | 3.18 | T9 | 11.11 |
| T3 | 3.97 | 11 | 12.70 |
| 04 | 4.76 | 12 | |
| T4 | 4.96 | | |

### ② Clearance angle major

| Code | Clearance angle | Code | Clearance angle |
|---|---|---|---|
| A | | B | |
| C | | D | |
| E | | F | |
| G | | N | |
| P | | O | Others |

### ④ Chip breaker and clamping form

| Code | Hole | Chip breaker | Chip breaker | Code | Hole | Chip breaker | Chip breaker |
|---|---|---|---|---|---|---|---|
| B | Y | N/A |  | N | N/A | N/A | |
| H | Y | Single-sided | | R | N/A | Single-sided | |
| C | Y | N/A |  | F | N/A | Double-sided | |
| J | Y | Double-sided | | A | Y | N/A | |
| W | Y | N/A |  | M | Y | Single-sided | |
| T | Y | Single-sided | | G | Y | Double-sided | |
| Q | Y | N/A |  | X | --- | --- | Exception |
| U | Y | Double-sided |  | | | | |

### ⑦ Corner radius

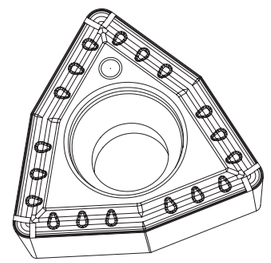
| Code | Description |
|---|---|
| 04 | 0.4mm |
| 08 | 0.8mm |
| 12 | 1.2mm |

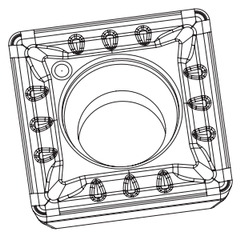
### ⑧ Cutting direction

| Code | Direction |
|---|---|
| R | Right |
| L | Left |
| N | Two-way |

### ⑨ Chip breaker code

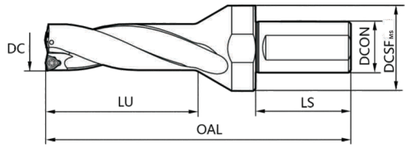
| Code | Geometry |
|---|---|
| DX | Dx Geometry |





# Indexable short hole drilling

## HD01 2D Series



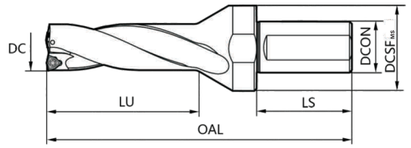

| Tool model | Inventory | Dimension (mm) | | | | | | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | $DCSF_{MS}$ | LS | LU | OAL | | | |
| HD01–2D–160–S25 | ● | 16 | 25 | 32 | 56 | 35 | 106 | WCMX030204–DX WCMX030208–DX | M25065 | HFT08IP |
| HD01–2D–170–S25 | ○ | 17 | 25 | 32 | 56 | 37 | 108 | | | |
| HD01–2D–180–S25 | ○ | 18 | 25 | 32 | 56 | 39 | 116 | | | |
| HD01–2D–190–S25 | ○ | 19 | 25 | 32 | 56 | 41 | 119 | | | |
| HD01–2D–200–S25 | ● | 20 | 25 | 32 | 56 | 43 | 121 | | | |
| HD01–2D–210–S25 | ○ | 21 | 25 | 45 | 56 | 45 | 125 | WCMX040204–DX WCMX040208–DX | M25065 | HFT08IP |
| HD01–2D–220–S25 | ○ | 22 | 25 | 45 | 56 | 47 | 126 | | | |
| HD01–2D–230–S25 | ○ | 23 | 25 | 45 | 56 | 49 | 128 | | | |
| HD01–2D–240–S25 | ○ | 24 | 25 | 45 | 56 | 51 | 130 | | | |
| HD01–2D–250–S25 | ● | 25 | 25 | 45 | 56 | 53 | 132 | WCMX050308–DX | M30070 | HFT09IP |
| HD01–2D–260–S32 | ○ | 26 | 32 | 55 | 60 | 55 | 133 | | | |
| HD01–2D–270–S32 | ○ | 27 | 32 | 55 | 60 | 57 | 135 | | | |
| HD01–2D–280–S32 | ○ | 28 | 32 | 55 | 60 | 59 | 139 | | | |
| HD01–2D–290–S32 | ○ | 29 | 32 | 55 | 60 | 61 | 141 | | | |
| HD01–2D–300–S32 | ● | 30 | 32 | 55 | 60 | 63 | 143 | | | |
| HD01–2D–310–S40 | ○ | 31 | 40 | 60 | 70 | 65 | 146 | WCMX06T308–DX | M35084 | HTT10IP |
| HD01–2D–320–S40 | ○ | 32 | 40 | 60 | 70 | 67 | 147 | | | |
| HD01–2D–330–S40 | ○ | 33 | 40 | 60 | 70 | 69 | 150 | | | |
| HD01–2D–340–S40 | ○ | 34 | 40 | 60 | 70 | 71 | 166 | | | |
| HD01–2D–350–S40 | ○ | 35 | 40 | 60 | 70 | 73 | 168 | | | |
| HD01–2D–360–S40 | ○ | 36 | 40 | 60 | 70 | 75 | 170 | | | |
| HD01–2D–370–S40 | ○ | 37 | 40 | 60 | 70 | 77 | 172 | | | |
| HD01–2D–380–S40 | ○ | 38 | 40 | 60 | 70 | 79 | 174 | | | |
| HD01–2D–390–S40 | ○ | 39 | 40 | 60 | 70 | 81 | 176 | | | |
| HD01–2D–400–S40 | ● | 40 | 40 | 60 | 70 | 83 | 178 | WCMX080412–DX | M40110 | HTT15IP |
| HD01–2D–410–S40 | ○ | 41 | 40 | 60 | 70 | 85 | 180 | | | |
| HD01–2D–420–S40 | ○ | 42 | 40 | 60 | 70 | 87 | 189 | | | |
| HD01–2D–430–S40 | ○ | 43 | 40 | 60 | 70 | 89 | 191 | | | |

●Standing inventory ○Make-to-order



# Indexable short hole drilling

## HD01 2D Series

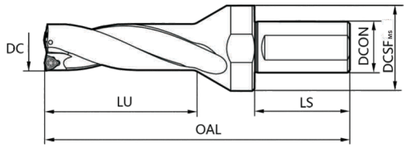



| Tool model | Inventory | Dimension (mm) | | | | | | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | $DCSF_{MS}$ | LS | LU | OAL | | | |
| HD01–2D–440–S40 | ○ | 44 | 40 | 60 | 70 | 91 | 193 | WCMX080412–DX | M40110 | HTT15IP |
| HD01–2D–450–S40 | ○ | 45 | 40 | 60 | 70 | 93 | 195 | | | |
| HD01–2D–460–S40 | ○ | 46 | 40 | 60 | 70 | 95 | 197 | | | |
| HD01–2D–470–S40 | ○ | 47 | 40 | 60 | 70 | 97 | 199 | | | |
| HD01–2D–480–S40 | ○ | 48 | 40 | 70 | 70 | 99 | 201 | | | |
| HD01–2D–490–S40 | ○ | 49 | 40 | 70 | 70 | 101 | 203 | | | |
| HD01–2D–500–S40 | ○ | 50 | 40 | 70 | 70 | 103 | 205 | | | |

●Standing inventory ○Make-to-order

# Indexable short hole drilling

## HD01 3DSeries



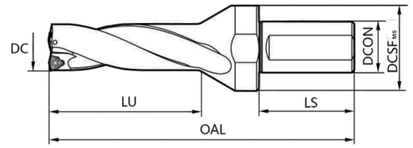

| Tool model | Inventory | Dimension (mm) | | | | | | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | $DCSF_{MS}$ | LS | LU | OAL | | | |
| HD01–3D–160–S25 | ● | 16 | 25 | 32 | 56 | 52 | 129 | WCMX030204–DX WCMX030208–DX | M25065 | HFT08IP |
| HD01–3D–170–S25 | ○ | 17 | 25 | 32 | 56 | 55 | 133 | | | |
| HD01–3D–180–S25 | ○ | 18 | 25 | 32 | 56 | 58 | 137 | | | |
| HD01–3D–190–S25 | ○ | 19 | 25 | 32 | 56 | 61 | 140 | | | |
| HD01–3D–200–S25 | ● | 20 | 25 | 32 | 56 | 64 | 143 | | | |
| HD01–3D–210–S25 | ○ | 21 | 25 | 45 | 56 | 67 | 153 | WCMX040204–DX WCMX040208–DX | M25065 | HFT08IP |
| HD01–3D–220–S25 | ○ | 22 | 25 | 45 | 56 | 70 | 156 | | | |
| HD01–3D–230–S25 | ○ | 23 | 25 | 45 | 56 | 73 | 159 | | | |
| HD01–3D–240–S25 | ○ | 24 | 25 | 45 | 56 | 76 | 162 | | | |
| HD01–3D–250–S25 | ● | 25 | 25 | 45 | 56 | 79 | 165 | WCMX050308–DX | M30070 | HFT09IP |
| HD01–3D–260–S32 | ○ | 26 | 32 | 55 | 60 | 83 | 176 | | | |
| HD01–3D–270–S32 | ○ | 27 | 32 | 55 | 60 | 86 | 180 | | | |
| HD01–3D–280–S32 | ○ | 28 | 32 | 55 | 60 | 89 | 184 | | | |
| HD01–3D–290–S32 | ○ | 29 | 32 | 55 | 60 | 92 | 188 | | | |
| HD01–3D–300–S32 | ● | 30 | 32 | 55 | 60 | 95 | 192 | | | |
| HD01–3D–310–S40 | ○ | 31 | 40 | 60 | 70 | 98 | 203 | WCMX06T308–DX | M35084 | HTT10IP |
| HD01–3D–320–S40 | ○ | 32 | 40 | 60 | 70 | 101 | 206 | | | |
| HD01–3D–330–S40 | ○ | 33 | 40 | 60 | 70 | 104 | 209 | | | |
| HD01–3D–340–S40 | ○ | 34 | 40 | 60 | 70 | 107 | 212 | | | |
| HD01–3D–350–S40 | ○ | 35 | 40 | 60 | 70 | 110 | 215 | | | |
| HD01–3D–360–S40 | ○ | 36 | 40 | 60 | 70 | 113 | 218 | | | |
| HD01–3D–370–S40 | ○ | 37 | 40 | 60 | 70 | 116 | 221 | | | |
| HD01–3D–380–S40 | ○ | 38 | 40 | 60 | 70 | 119 | 225 | | | |
| HD01–3D–390–S40 | ○ | 39 | 40 | 60 | 70 | 122 | 228 | | | |
| HD01–3D–400–S40 | ● | 40 | 40 | 60 | 70 | 125 | 231 | WCMX080412–DX | M40110 | HTT15IP |
| HD01–3D–410–S40 | ○ | 41 | 40 | 60 | 70 | 128 | 234 | | | |
| HD01–3D–420–S40 | ○ | 42 | 40 | 60 | 70 | 131 | 239 | | | |
| HD01–3D–430–S40 | ○ | 43 | 40 | 60 | 70 | 134 | 242 | | | |

●Standing inventory ○Make-to-order



# Indexable short hole drilling

## HD01 3DSeries

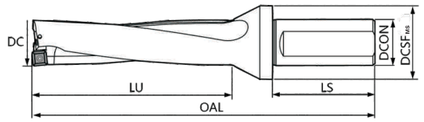



| Tool model | Inventory | Dimension (mm) | | | | | | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | $DCSF_{MS}$ | LS | LU | OAL | | | |
| HD01–3D–440–S40 | ○ | 44 | 40 | 60 | 70 | 137 | 245 | WCMX080412–DX | M40110 | HTT15IP |
| HD01–3D–450–S40 | ○ | 45 | 40 | 60 | 70 | 140 | 248 | | | |
| HD01–3D–460–S40 | ○ | 46 | 40 | 60 | 70 | 143 | 251 | | | |
| HD01–3D–470–S40 | ○ | 47 | 40 | 60 | 70 | 146 | 253 | | | |
| HD01–3D–480–S40 | ○ | 48 | 40 | 60 | 70 | 149 | 255 | | | |
| HD01–3D–490–S40 | ○ | 49 | 40 | 60 | 70 | 152 | 257 | | | |
| HD01–3D–500–S40 | ○ | 50 | 40 | 60 | 70 | 155 | 259 | | | |

●Standing inventory ○Make-to-order

# Indexable short hole drilling

## HD02 2D Series



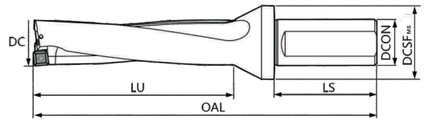

| Tool model | Inventory | Dimension (mm) | | | | | | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | DCSF MS | LS | LU | OAL | | | |
| HD02–2D–160–S20 | ● | 16 | 20 | 25 | 50 | 35 | 102 | SPMG050204–DX | M20043 | HFT06IP |
| HD02–2D–170–S20 | ○ | 17 | 20 | 25 | 50 | 37 | 104 | SPMG060204–DX | M22055 | HFT07IP |
| HD02–2D–180–S25 | ○ | 18 | 25 | 32 | 56 | 39 | 113 | | | |
| HD02–2D–190–S25 | ○ | 19 | 25 | 32 | 56 | 41 | 115 | | | |
| HD02–2D–200–S25 | ● | 20 | 25 | 32 | 56 | 43 | 117 | | | |
| HD02–2D–210–S25 | ○ | 21 | 25 | 32 | 56 | 45 | 119 | | | |
| HD02–2D–220–S25 | ○ | 22 | 25 | 32 | 56 | 47 | 121 | SPMG07T308–DX | M25074 | HFT07IP |
| HD02–2D–230–S25 | ○ | 23 | 25 | 32 | 56 | 49 | 123 | | | |
| HD02–2D–240–S25 | ○ | 24 | 25 | 32 | 56 | 51 | 125 | | | |
| HD02–2D–250–S25 | ● | 25 | 25 | 32 | 56 | 53 | 127 | | | |
| HD02–2D–260–S32 | ○ | 26 | 32 | 32 | 56 | 55 | 129 | | | |
| HD02–2D–270–S32 | ○ | 27 | 32 | 32 | 56 | 57 | 131 | | | |
| HD02–2D–280–S32 | ○ | 28 | 32 | 37 | 60 | 59 | 139 | SPMG090408–DX | M35084 | HTT10IP |
| HD02–2D–290–S32 | ○ | 29 | 32 | 37 | 60 | 61 | 141 | | | |
| HD02–2D–300–S32 | ● | 30 | 32 | 37 | 60 | 63 | 143 | | | |
| HD02–2D–310–S40 | ○ | 40 | 32 | 37 | 60 | 65 | 145 | | | |
| HD02–2D–320–S40 | ○ | 40 | 32 | 37 | 60 | 67 | 147 | | | |
| HD02–2D–330–S40 | ○ | 40 | 32 | 37 | 60 | 69 | 149 | | | |
| HD02–2D–340–S40 | ○ | 34 | 40 | 47 | 70 | 71 | 166 | SPMG110408–DX | M40110 | HTT15IP |
| HD02–2D–350–S40 | ○ | 35 | 40 | 47 | 70 | 73 | 168 | | | |
| HD02–2D–360–S40 | ○ | 36 | 40 | 47 | 70 | 75 | 170 | | | |
| HD02–2D–370–S40 | ○ | 37 | 40 | 47 | 70 | 77 | 172 | | | |
| HD02–2D–380–S40 | ○ | 38 | 40 | 47 | 70 | 79 | 174 | | | |
| HD02–2D–390–S40 | ○ | 39 | 40 | 47 | 70 | 81 | 176 | | | |
| HD02–2D–400–S40 | ● | 40 | 40 | 47 | 70 | 83 | 178 | | | |
| HD02–2D–410–S40 | ○ | 41 | 40 | 47 | 70 | 85 | 180 | | | |

●Standing inventory ○Make-to-order



# Indexable short hole drilling

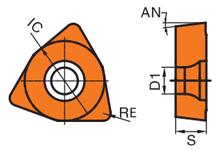
## HD02 3D Series




| Tool model | Inventory | Dimension (mm) | | | | | | Applicable inserts | Screw | Wrench |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | DCSF MS | LS | LU | OAL | | | |
| HD02–3D–160–S20 | ● | 16 | 20 | 25 | 50 | 51 | 117 | SPMG050204DG–DX | M20043 | HFT06IP |
| HD02–3D–170–S20 | ○ | 17 | 20 | 25 | 50 | 54 | 120 | SPMG060204DG–DX | M22055 | HFT07IP |
| HD02–3D–180–S25 | ○ | 18 | 25 | 32 | 56 | 57 | 131 | | | |
| HD02–3D–190–S25 | ○ | 19 | 25 | 32 | 56 | 60 | 134 | | | |
| HD02–3D–200–S25 | ● | 20 | 25 | 32 | 56 | 63 | 137 | | | |
| HD02–3D–210–S25 | ○ | 21 | 25 | 32 | 56 | 66 | 140 | | | |
| HD02–3D–220–S25 | ○ | 22 | 25 | 32 | 56 | 69 | 143 | SPMG07T308DG–DX | M25074 | HFT07IP |
| HD02–3D–230–S25 | ○ | 23 | 25 | 32 | 56 | 72 | 147 | | | |
| HD02–3D–240–S25 | ○ | 24 | 25 | 32 | 56 | 75 | 150 | | | |
| HD02–3D–250–S25 | ● | 25 | 25 | 32 | 56 | 78 | 153 | | | |
| HD02–3D–260–S32 | ○ | 26 | 32 | 32 | 56 | 81 | 156 | | | |
| HD02–3D–270–S32 | ○ | 27 | 32 | 32 | 56 | 84 | 160 | | | |
| HD02–3D–280–S32 | ○ | 28 | 32 | 37 | 60 | 87 | 169 | SPMG090408DG–DX | M35084 | HTT10IP |
| HD02–3D–290–S32 | ○ | 29 | 32 | 37 | 60 | 90 | 172 | | | |
| HD02–3D–300–S32 | ● | 30 | 32 | 37 | 60 | 93 | 175 | | | |
| HD02–3D–310–S40 | ○ | 31 | 40 | 37 | 60 | 96 | 178 | | | |
| HD02–3D–320–S40 | ○ | 32 | 40 | 37 | 60 | 99 | 181 | | | |
| HD02–3D–330–S40 | ○ | 33 | 40 | 37 | 60 | 102 | 184 | | | |
| HD02–3D–340–S40 | ○ | 34 | 40 | 47 | 70 | 105 | 200 | SPMG110408DG–DX | M40110 | HTT15IP |
| HD02–3D–350–S40 | ○ | 35 | 40 | 47 | 70 | 108 | 203 | | | |
| HD02–3D–360–S40 | ○ | 36 | 40 | 47 | 70 | 111 | 206 | | | |
| HD02–3D–370–S40 | ○ | 37 | 40 | 47 | 70 | 114 | 209 | | | |
| HD02–3D–380–S40 | ○ | 38 | 40 | 47 | 70 | 117 | 212 | | | |
| HD02–3D–390–S40 | ○ | 39 | 40 | 47 | 70 | 120 | 215 | | | |
| HD02–3D–400–S40 | ● | 40 | 40 | 47 | 70 | 123 | 218 | | | |
| HD02–3D–410–S40 | ○ | 41 | 40 | 47 | 70 | 126 | 221 | | | |

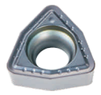
●Standing inventory ○Make-to-order

# Indexable short hole drilling insert




Working condition: ● Stable ◕ Average ⌗ Tough

| Workpiece material | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | ●◕ | ● | ●◕ | ◕ | | |
| M | Stainless steel | | | | ● | ●◕ | ◕ | ●◕ | ●◕ |
| K | Cast iron | | | | ● | ●◕ | ◕ | | |
| N | Non-ferrous metal | | | | | | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | | CVD | | | PVD | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | IC | S | RE | D1 | AN | HR8115 | HR8125 | HR8225 | HR5110 | HR5120 | HR5130 | HR7125 | HR7225 |
|  | WCMX030204–DX | 5.56 | 2.38 | 0.4 | 2.55 | 7° | ☆ | | | | ☆ | ★ | | |
| | WCMX030208–DX | 5.56 | 2.38 | 0.8 | 2.55 | 7° | ☆ | | | | ☆ | ★ | | |
| | WCMX040204–DX | 6.35 | 2.38 | 0.4 | 2.80 | 7° | ☆ | | | | ☆ | ★ | | |
| | WCMX040208–DX | 6.35 | 2.38 | 0.8 | 2.80 | 7° | ☆ | | | | ☆ | ★ | | |
| | WCMX050308–DX | 7.94 | 3.18 | 0.8 | 3.20 | 7° | ☆ | | | | ☆ | ★ | | |
| | WCMX06T308–DX | 9.525 | 3.97 | 0.8 | 3.70 | 7° | ☆ | | | | ☆ | ★ | | |
| | WCMX080412–DX | 12.70 | 4.76 | 1.2 | 4.30 | 7° | ☆ | | | | ☆ | ★ | | |

★ Recommended grade ☆ Available grade

Working condition: ● Stable ◕ Average ⌗ Tough

| Workpiece material | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Steel | ● | ◕ | ●◕ | ● | ●◕ | ◕ | | |
| M | Stainless steel | | | | ● | ●◕ | ◕ | ●◕ | ●◕ |
| K | Cast iron | | | | ● | ●◕ | ◕ | | |
| N | Non-ferrous metal | | | | | | | | |
| S | Heat resistant super alloys Titanium alloy | | | | | | | | |

| Insert shape | Type | Dimension (mm) | | | | | CVD | | | PVD | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | IC | S | RE | D1 | AN | HR8115 | HR8125 | HR8225 | HR5110 | HR5120 | HR5130 | HR7125 | HR7225 |
| | SPMG050204–DX | 5.00 | 2.38 | 0.4 | 2.25 | 14° | ☆ | | | | ☆ | ★ | | |
| | SPMG060204–DX | 6.00 | 2.38 | 0.4 | 2.61 | 14° | ☆ | | | | ☆ | ★ | | |
| | SPMG07T308–DX | 7.94 | 3.97 | 0.8 | 2.85 | 15.5° | ☆ | | | | ☆ | ★ | | |
| | SPMG090408–DX | 9.80 | 4.30 | 0.8 | 4.05 | 17.5° | ☆ | | | | ☆ | ★ | | |
| | SPMG110408–DX | 11.50 | 4.80 | 0.8 | 4.50 | 16.5° | ☆ | | | | ☆ | ★ | | |

★ Recommended grade ☆ Available grade

## Recommended cutting parameters for indexable short hole drilling

| ISO | Workpiece material | | | Brinell hardness | Feed rate fn (mm/r) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Cutting speed vc m/min | Diameter of drill bit (mm) | | | | |
| | | | | | | 16-20 | 20-25 | 25-30 | 30-35 | 35-50 |
| P | Unalloyed steel | C≤0.10% | | 125 | 70–200 | 0.04–0.09 | 0.07–0.11 | 0.10–0.21 | 0.18–0.27 | 0.25–0.35 |
| | | 0.10<C≤0.25% | | 125 | 70–180 | 0.04–0.09 | 0.07–0.11 | 0.10–0.21 | 0.18–0.27 | 0.25–0.35 |
| | | 0.25<C≤0.55% | | 150 | 70–150 | 0.04–0.09 | 0.07–0.11 | 0.10–0.21 | 0.18–0.27 | 0.25–0.35 |
| | | 0.55<C≤0.80% | | 170 | 70–130 | 0.04–0.09 | 0.07–0.11 | 0.10–0.21 | 0.18–0.27 | 0.25–0.35 |
| | High carbon Steel | Carbon tool steel | | 210 | 70–130 | 0.04–0.09 | 0.07–0.11 | 0.10–0.21 | 0.18–0.27 | 0.25–0.35 |
| | Low-alloyed steel | Unalloyed | | 180 | 80–180 | 0.04–0.08 | 0.05–0.10 | 0.08–0.22 | 0.15–0.28 | 0.23–0.38 |
| | | Quenching and tempering | | 275 | 70–150 | 0.04–0.08 | 0.05–0.10 | 0.08–0.22 | 0.15–0.28 | 0.23–0.38 |
| | | Quenching and tempering | | 350 | 70–150 | 0.04–0.08 | 0.05–0.10 | 0.08–0.22 | 0.15–0.28 | 0.23–0.38 |
| | High-alloyed steel | Annealing | | 200 | 55–110 | 0.04–0.08 | 0.05–0.10 | 0.08–0.22 | 0.15–0.28 | 0.23–0.38 |
| | | Quenching and tempering | | 325 | 55–110 | 0.04–0.08 | 0.05–0.10 | 0.08–0.22 | 0.15–0.28 | 0.23–0.38 |
| | Cast steel | Non-alloyed | | 180 | 55–110 | 0.04–0.08 | 0.05–0.09 | 0.07–0.20 | 0.16–0.27 | 0.22–0.36 |
| | | Low alloy (alloy composition < 5%) | | 200 | 55–110 | 0.04–0.08 | 0.05–0.09 | 0.07–0.20 | 0.16–0.27 | 0.22–0.36 |
| M | Stainless steel | Unquenched/ferrite/martensite | | 200 | 80–180 | 0.04–0.09 | 0.06–0.11 | 0.10–0.20 | 0.17–0.29 | 0.25–0.38 |
| | | Austenite, quenching | | 200 | 80–180 | 0.04–0.09 | 0.06–0.10 | 0.10–0.20 | 0.17–0.29 | 0.25–0.38 |
| | | Austenite, precipitation hardening stainless steel (PH stainless steel) | | 300 | 80–180 | 0.04–0.09 | 0.06–0.10 | 0.10–0.20 | 0.17–0.25 | 0.21–0.33 |
| | | Austenite- ferrite, duplex stainless steel | | 230 | 80–180 | 0.04–0.09 | 0.06–0.10 | 0.10–0.20 | 0.17–0.25 | 0.21–0.33 |
| K | Malleable cast iron | Ferrite | | 200 | 100–200 | 0.04–0.10 | 0.10–0.15 | 0.11–0.22 | 0.17–0.29 | 0.25–0.38 |
| | | Pearlite | | 260 | 100–200 | 0.04–0.10 | 0.10–0.15 | 0.11–0.22 | 0.17–0.29 | 0.25–0.38 |
| | Grey cast iron | Low tensile strength | | 180 | 120–220 | 0.04–0.10 | 0.10–0.15 | 0.11–0.22 | 0.17–0.29 | 0.25–0.38 |
| | | High tensile strength/austenite | | 245 | 120–220 | 0.04–0.10 | 0.10–0.15 | 0.11–0.22 | 0.17–0.29 | 0.25–0.38 |
| | Nodular cast iron | Ferrite | | 155 | 100–200 | 0.04–0.10 | 0.10–0.15 | 0.11–0.22 | 0.17–0.29 | 0.25–0.38 |
| | | Pearlite | | 265 | 100–200 | 0.04–0.10 | 0.10–0.15 | 0.11–0.22 | 0.17–0.29 | 0.25–0.38 |
| | Compacted graphite iron | GGV (CGI) | | 230 | | | | | | |
| N | Wrought aluminum alloy | Non-aging | | 30 | 150–300 | 0.05–0.12 | 0.09–0.16 | 0.15–0.23 | 0.19–0.27 | 0.21–0.33 |
| | | Ageable and aged | | 100 | 150–300 | 0.05–0.12 | 0.09–0.16 | 0.15–0.23 | 0.19–0.27 | 0.21–0.33 |
| | Foundry aluminum alloy | ≤12% silicon, non-aging | | 75 | 150–300 | 0.05–0.12 | 0.09–0.16 | 0.15–0.23 | 0.19–0.27 | 0.21–0.33 |
| | | ≤ 12% silicon, ageable and aged | | 90 | 150–300 | 0.05–0.12 | 0.09–0.16 | 0.15–0.23 | 0.19–0.27 | 0.21–0.33 |
| | | > 12% silicon, non-aging | | 130 | 150–300 | 0.05–0.12 | 0.09–0.16 | 0.15–0.23 | 0.19–0.27 | 0.21–0.33 |
| | Magnesium alloy | | | 70 | | | | | | |
| | Copper and copper alloy (Bronze/ brass) | Non-alloyed, electrolytic copper | | 100 | 150–300 | 0.05–0.12 | 0.09–0.16 | 0.15–0.23 | 0.19–0.27 | 0.21–0.33 |
| | | Brass, bronze, red brass | | 90 | 150–300 | 0.05–0.12 | 0.09–0.16 | 0.15–0.23 | 0.19–0.27 | 0.21–0.33 |
| | | Copper alloy, short chip | | 110 | 150–300 | 0.05–0.12 | 0.09–0.16 | 0.15–0.23 | 0.19–0.27 | 0.21–0.33 |
| | | Ampco alloy of high strength | | 300 | 150–300 | 0.05–0.12 | 0.09–0.16 | 0.15–0.23 | 0.19–0.27 | 0.21–0.33 |
| S | Iron-based alloy | Iron-based | Annealing | 200 | 10–55 | 0.07–0.10 | 0.09–0.14 | 0.13–0.20 | 0.19–0.25 | 0.23–0.30 |
| | | | Aged | 280 | 10–55 | 0.07–0.10 | 0.09–0.14 | 0.13–0.20 | 0.19–0.25 | 0.23–0.30 |
| | | Nickel-based or cobalt-based | Annealing | 250 | 10–55 | 0.07–0.10 | 0.09–0.14 | 0.13–0.20 | 0.19–0.25 | 0.23–0.30 |
| | | | Aged | 350 | 10–55 | 0.07–0.10 | 0.09–0.14 | 0.13–0.20 | 0.19–0.25 | 0.23–0.30 |
| | | | Casting | 320 | 10–55 | 0.07–0.10 | 0.09–0.14 | 0.13–0.20 | 0.19–0.25 | 0.23–0.30 |
| | Titanium alloy | Pure titanium | | 200 | 30–60 | 0.07–0.10 | 0.09–0.14 | 0.13–0.20 | 0.19–0.25 | 0.23–0.30 |
| | | α phase alloy | | 375 | 30–60 | 0.07–0.10 | 0.09–0.14 | 0.13–0.20 | 0.19–0.25 | 0.23–0.30 |
| | | α and β phase alloys, aged | | 375 | 30–60 | 0.07–0.10 | 0.09–0.14 | 0.13–0.20 | 0.19–0.25 | 0.23–0.30 |
| | | β phase alloy | | 410 | 30–60 | 0.07–0.10 | 0.09–0.14 | 0.13–0.20 | 0.19–0.25 | 0.23–0.30 |

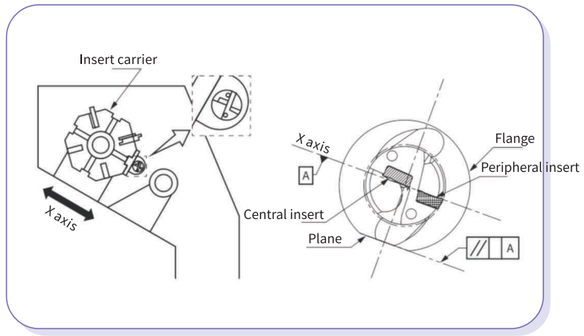
# Technical information of indexable short hole drilling tools

## Precautions for indexable short hole drilling

### 1 Precautions for short hole drilling in lathe

I. The peripheral insert is mounted parallel to the X axis of the equipment.

II. The peripheral insert should be mounted towards the operator. With upper and lower turrets on the lathe, if the drill bit needs to be mounted on the lower one, The peripheral insert should face towards the operator.




### 2 Adjustment method of center height:

The center height of the central insert is about 0.05 mm lower than the center (design state). If the turntable is staggered from the spindle center, the center may be too high or the core may be too low. It is very important to check the center height of the inner insert in order to stabilize the machining.

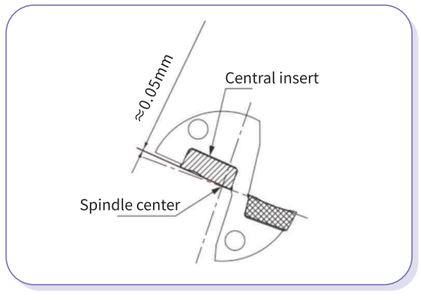



Figure 2
Illustration of center height of the drill bit inner insert

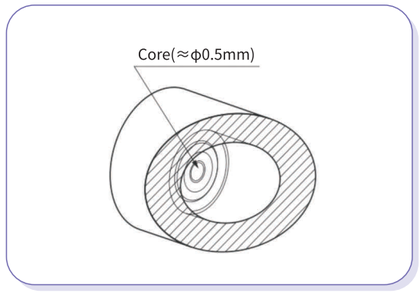



Figure 3
Illustration of core residues in blind hole drilling

Check whether the center height setting of the central insert is proper by the cores remaining in the center of the inner end face of the blind hole. If the diameter of residual cores is about 0.5mm, the center height is correct. If there is no core residue at all or the diameter is over 1mm, the center height needs to be adjusted.

◎The blind holes used for checking is machined by a feed rate below 0.1 mm/rev and a depth of about 10mm.

◎If there is no core residue at all (or it is very small), it is necessary to adjust the center height because the parts around the drill bit center of the inner cutter insert are prone to collapse.

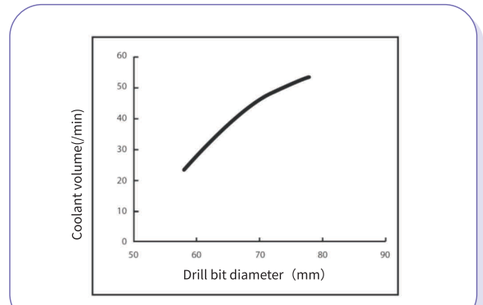
## Short hole drilling and recommended countermeasures

### 1 Countermeasures to drill hole diameter changes

If the hole diameter gradually shrinks or increases toward the bottom, it is often caused by cutting blockage. It is suggested to adjust the cutting parameters, such as increasing cutting speed and reducing feed rate. If the overall hole diameter is too small, it may be caused by plastic deformation of materials. It is recommended to replace a short hole drilling tool with a long one.

### 2 Can external cooling be used for short hole drilling?

Given the large amount of chips in short hole drilling, external cooling is not recommended considering the machining efficiency. Meanwhile, the cutting pressure of internal cooling should be ensured for longer tool life and better machining performance.




Recommended relationship between drill bit diameter and coolant volume

### 3 Chip entanglement is highly possible in the cutting process.

When the material to be cut is sticky and the chip is long, the combination of low speed + large feed or high speed + small feed may be used to solve the problem. If chip entanglement is highly possible from the entrance to 10mm while the cutting is stable after 10mm, the entry machining parameters may be adjusted or segmented cutting can be adopted.

At a low speed + large feed, thicker chips are produced, which are easy to break and control.

At a high speed + small feed, thinner chips are produced, and the chip flow direction could be controlled by centrifugal force.

1-10mm can be processed by segment cutting, which can be followed by continuous machining.

### 4 There is tool vibration in the cutting process.

Tool vibration may be caused by insufficient feed per revolution during the cutting process. The cutting parameters are adjusted as follows:

Increase the feed rate if it is too small.

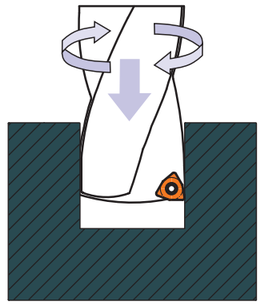
If the feed rate is below f=0.06mm/rev, please increase it to f=0.08-0.12mm/rev.

If the over fast cutting speed causes cutter vibration, decrease to about Vc=100-150m/rev.

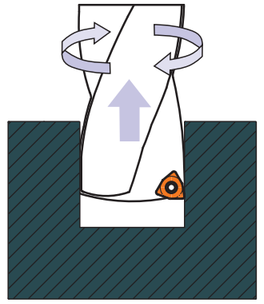
If there are obvious burrs at the drill or the workpiece clamping rigidity is poor, decrease the feed rate to f=0.07-0.08 mm/rev.

### 5 There are obvious scratches on the surface of the machined hole

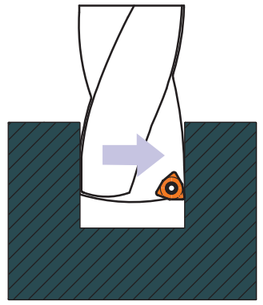
Please change the cutting parameters or optimize the way of returning the insert.



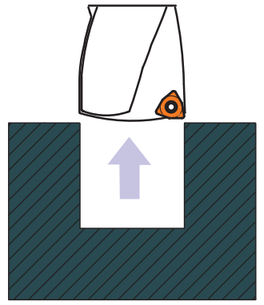
① Rotate to return the insert



② After machining, retract 0.5mm and then return the insert



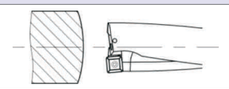
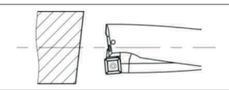
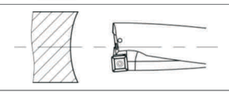
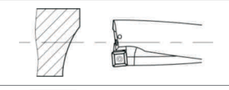
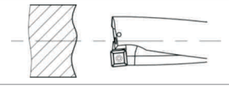
③ Return the insert eccentrically



④ Return the insert directly

## Drilling means and measures of drill bits

Drilling bit is a key factor for successful drilling. One way to ensure good quality of the hole is to ensure that the drilling surface of the workpiece is perpendicular to the central axis of the drill bit. In addition, the indexable short hole drilling may also be used to process convex, concave, inclined and irregular drilling surfaces by adjusting the feed rate.

| Workpiece surface | Solutions |
|---|---|
|  | The normal feed rate can be adopted for convex surface, because its machining conditions are relatively good, and the drilling core can contact the workpiece first as expected. |
|  | The surface of the drilling part is inclined, so the cutting edge is subjected to uneven load, which will cause premature wear of the cutting edge. If the angle of the inclined surface exceeds 2°, decrease the feed rate to 1/3 of the recommended value. |
|  | Usually, the drill bit axis deviates from the center when drilling into a concave surface, for which the feed rate is reduced to 1/3 of the recommended value. |
|  | When drilling an asymmetric curved surface, the drill bit may deviate from the center. So its feed rate should be smaller than that of drilling a concave surface. |
|  | A danger of insert collapse may occur when drilling into irregular surfaces, so the feed rate must be reduced at the beginning of drilling. This may also occur when the drill bit drills through the material, so the feed must also be reduced. |

## Selection guidance of solid carbide drills

Tool outline drawing

Tool type

**BD03 Series**

Product specification drawing

Helical angle, coating, insert diameter tolerance, etc.

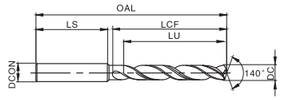



Figure 1

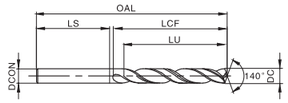



Figure 2

BD Series | 3×D | m7 | 140° | h6

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03A1650 | 16.50 | 18.00 | 123 | 73 | 48 | 45.2 | Figure 1 | ● |
| BD03A1690 | 16.90 | 18.00 | 123 | 73 | 48 | 44.6 | Figure 1 | ○ |
| BD03A1700 | 17.00 | 18.00 | 123 | 73 | 48 | 44.4 | Figure 1 | ● |
| BD03A1750 | 17.50 | 18.00 | 123 | 73 | 48 | 43.6 | Figure 1 | ● |
| BD03A1755 | 17.55 | 18.00 | 123 | 73 | 48 | 43.5 | Figure 1 | ○ |
| BD03A1790 | 17.90 | 18.00 | 123 | 73 | 48 | 42.9 | Figure 1 | ○ |
| BD03A1800 | 18.00 | 18.00 | 123 | 73 | 48 | 42.7 | Figure 2 | ● |
| BD03A1830 | 18.30 | 20.00 | 131 | 79 | 50 | 48.2 | Figure 1 | ○ |
| BD03A1850 | 18.50 | 20.00 | 131 | 79 | 50 | 47.9 | Figure 1 | ● |
| BD03A1890 | 18.90 | 20.00 | 131 | 79 | 50 | 47.2 | Figure 1 | ○ |
| BD03A1900 | 19.00 | 20.00 | 131 | 79 | 50 | 47.0 | Figure 1 | ● |
| BD03A1930 | 19.30 | 20.00 | 131 | 79 | 50 | 46.5 | Figure 1 | ○ |
| BD03A1950 | 19.50 | 20.00 | 131 | 79 | 50 | 46.2 | Figure 1 | ● |
| BD03A1955 | 19.55 | 20.00 | 131 | 79 | 50 | 46.1 | Figure 1 | ○ |
| BD03A1990 | 19.90 | 20.00 | 131 | 79 | 50 | 45.5 | Figure 1 | ○ |
| BD03A2000 | 20.00 | 20.00 | 131 | 79 | 50 | 45.4 | Figure 2 | ● |

●Standing inventory ○Make-to-order

Product order number

Basic dimension

Pattern

Inventory

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54–60HRC | ⩾60HRC |
| | | | | | | | | | | | |

☀ Fit well ☼ Applicable

Range of workpiece materials

## Code key of solid carbide drilling tools

| BD | 03 | C | A | 1000 |
|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ |

| ① Product series | |
|---|---|
| BD | Economical |
| XD | Deep hole type |

| ② Length series (length-diameter ratio) | |
|---|---|
| 03 | 3×D Series |
| 05 | 5×D Series |
| 08 | 8×D Series |
| 12 | 12×D Series |
| 20 | 20×D Series |
| 30 | 30×D Series |

| ③ Cooling method | |
|---|---|
| C | Internal cooling |
| Default | External cooling |

| ④ Shank form | |
|---|---|
| A | Straight shank (DIN 6535HA) |
| B | Whistle notch shank (DIN 6535HE) |

| ⑤ Diameter | |
|---|---|
| 0300 | 3mm |
| 0600 | 6mm |
| 1000 | 10mm |
| 1200 | 12mm |
| 1600 | 16mm |
| 2000 | 20mm |

# Solid carbide drill

## BD03 Series

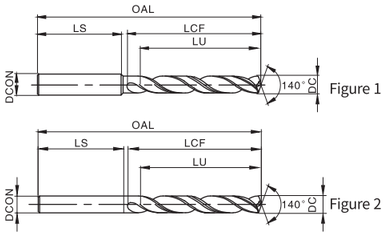



Figure 1




Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03A0300 | 3.00 | 6.00 | 62 | 20 | 36 | 15.0 | Figure 1 | ● |
| BD03A0310 | 3.10 | 6.00 | 62 | 20 | 36 | 14.8 | Figure 1 | ● |
| BD03A0317 | 3.17 | 6.00 | 62 | 20 | 36 | 14.7 | Figure 1 | ○ |
| BD03A0320 | 3.20 | 6.00 | 62 | 20 | 36 | 14.6 | Figure 1 | ● |
| BD03A0325 | 3.25 | 6.00 | 62 | 20 | 36 | 14.5 | Figure 1 | ○ |
| BD03A0330 | 3.30 | 6.00 | 62 | 20 | 36 | 14.4 | Figure 1 | ● |
| BD03A0340 | 3.40 | 6.00 | 62 | 20 | 36 | 14.3 | Figure 1 | ● |
| BD03A0350 | 3.50 | 6.00 | 62 | 20 | 36 | 14.1 | Figure 1 | ● |
| BD03A0357 | 3.57 | 6.00 | 62 | 20 | 36 | 14.0 | Figure 1 | ○ |
| BD03A0360 | 3.60 | 6.00 | 62 | 20 | 36 | 13.9 | Figure 1 | ● |
| BD03A0370 | 3.70 | 6.00 | 62 | 20 | 36 | 13.8 | Figure 1 | ● |
| BD03A0380 | 3.80 | 6.00 | 66 | 24 | 36 | 17.6 | Figure 1 | ● |
| BD03A0390 | 3.90 | 6.00 | 66 | 24 | 36 | 17.4 | Figure 1 | ● |
| BD03A0397 | 3.97 | 6.00 | 66 | 24 | 36 | 17.3 | Figure 1 | ○ |
| BD03A0400 | 4.00 | 6.00 | 66 | 24 | 36 | 17.3 | Figure 1 | ● |
| BD03A0410 | 4.10 | 6.00 | 66 | 24 | 36 | 17.1 | Figure 1 | ● |
| BD03A0420 | 4.20 | 6.00 | 66 | 24 | 36 | 16.9 | Figure 1 | ● |
| BD03A0430 | 4.30 | 6.00 | 66 | 24 | 36 | 16.8 | Figure 1 | ● |
| BD03A0437 | 4.37 | 6.00 | 66 | 24 | 36 | 16.6 | Figure 1 | ○ |
| BD03A0440 | 4.40 | 6.00 | 66 | 24 | 36 | 16.6 | Figure 1 | ● |
| BD03A0445 | 4.45 | 6.00 | 66 | 24 | 36 | 16.5 | Figure 1 | ○ |
| BD03A0450 | 4.50 | 6.00 | 66 | 24 | 36 | 16.4 | Figure 1 | ● |
| BD03A0460 | 4.60 | 6.00 | 66 | 24 | 36 | 16.3 | Figure 1 | ● |
| BD03A0465 | 4.65 | 6.00 | 66 | 24 | 36 | 16.2 | Figure 1 | ○ |
| BD03A0470 | 4.70 | 6.00 | 66 | 24 | 36 | 16.1 | Figure 1 | ● |
| BD03A0476 | 4.76 | 6.00 | 66 | 28 | 36 | 20.0 | Figure 1 | ○ |
| BD03A0480 | 4.80 | 6.00 | 66 | 28 | 36 | 19.9 | Figure 1 | ● |
| BD03A0490 | 4.90 | 6.00 | 66 | 28 | 36 | 19.8 | Figure 1 | ● |

●Standing inventory ○Make-to-order

## BD03 Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03A0500 | 5.00 | 6.00 | 66 | 28 | 36 | 19.6 | Figure 1 | ● |
| BD03A0510 | 5.10 | 6.00 | 66 | 28 | 36 | 19.4 | Figure 1 | ● |
| BD03A0516 | 5.16 | 6.00 | 66 | 28 | 36 | 19.3 | Figure 1 | ○ |
| BD03A0520 | 5.20 | 6.00 | 66 | 28 | 36 | 19.3 | Figure 1 | ● |
| BD03A0530 | 5.30 | 6.00 | 66 | 28 | 36 | 19.1 | Figure 1 | ● |
| BD03A0540 | 5.40 | 6.00 | 66 | 28 | 36 | 18.9 | Figure 1 | ● |
| BD03A0550 | 5.50 | 6.00 | 66 | 28 | 36 | 18.7 | Figure 1 | ● |
| BD03A0555 | 5.55 | 6.00 | 66 | 28 | 36 | 18.7 | Figure 1 | ○ |
| BD03A0556 | 5.56 | 6.00 | 66 | 28 | 36 | 18.6 | Figure 1 | ● |
| BD03A0560 | 5.60 | 6.00 | 66 | 28 | 36 | 18.6 | Figure 1 | ● |
| BD03A0565 | 5.65 | 6.00 | 66 | 28 | 36 | 18.5 | Figure 1 | ● |
| BD03A0570 | 5.70 | 6.00 | 66 | 28 | 36 | 18.4 | Figure 1 | ● |
| BD03A0575 | 5.75 | 6.00 | 66 | 28 | 36 | 18.3 | Figure 1 | ○ |
| BD03A0580 | 5.80 | 6.00 | 66 | 28 | 36 | 18.2 | Figure 1 | ● |
| BD03A0590 | 5.90 | 6.00 | 66 | 28 | 36 | 18.1 | Figure 1 | ● |
| BD03A0595 | 5.95 | 6.00 | 66 | 28 | 36 | 18.0 | Figure 1 | ○ |
| BD03A0600 | 6.00 | 6.00 | 66 | 28 | 36 | 17.9 | Figure 2 | ● |
| BD03A0610 | 6.10 | 8.00 | 79 | 34 | 36 | 23.7 | Figure 1 | ● |
| BD03A0620 | 6.20 | 8.00 | 79 | 34 | 36 | 23.6 | Figure 1 | ● |
| BD03A0630 | 6.30 | 8.00 | 79 | 34 | 36 | 23.4 | Figure 1 | ● |
| BD03A0635 | 6.35 | 8.00 | 79 | 34 | 36 | 23.3 | Figure 1 | ○ |
| BD03A0640 | 6.40 | 8.00 | 79 | 34 | 36 | 23.2 | Figure 1 | ● |
| BD03A0650 | 6.50 | 8.00 | 79 | 34 | 36 | 23.1 | Figure 1 | ● |
| BD03A0660 | 6.60 | 8.00 | 79 | 34 | 36 | 22.9 | Figure 1 | ● |
| BD03A0670 | 6.70 | 8.00 | 79 | 34 | 36 | 22.7 | Figure 1 | ● |
| BD03A0675 | 6.75 | 8.00 | 79 | 34 | 36 | 22.6 | Figure 1 | ○ |
| BD03A0680 | 6.80 | 8.00 | 79 | 34 | 36 | 22.6 | Figure 1 | ● |
| BD03A0690 | 6.90 | 8.00 | 79 | 34 | 36 | 22.4 | Figure 1 | ● |
| BD03A0700 | 7.00 | 8.00 | 79 | 34 | 36 | 22.2 | Figure 1 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## BD03 Series

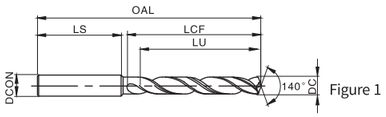



Figure 1

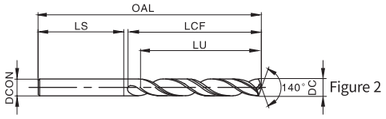



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03A0710 | 7.10 | 8.00 | 79 | 41 | 36 | 29.1 | Figure 1 | ● |
| BD03A0714 | 7.14 | 8.00 | 79 | 41 | 36 | 29.0 | Figure 1 | ○ |
| BD03A0720 | 7.20 | 8.00 | 79 | 41 | 36 | 28.9 | Figure 1 | ● |
| BD03A0730 | 7.30 | 8.00 | 79 | 41 | 36 | 28.7 | Figure 1 | ● |
| BD03A0740 | 7.40 | 8.00 | 79 | 41 | 36 | 28.6 | Figure 1 | ● |
| BD03A0745 | 7.45 | 8.00 | 79 | 41 | 36 | 28.5 | Figure 1 | ○ |
| BD03A0750 | 7.50 | 8.00 | 79 | 41 | 36 | 28.4 | Figure 1 | ● |
| BD03A0754 | 7.54 | 8.00 | 79 | 41 | 36 | 28.3 | Figure 1 | ○ |
| BD03A0760 | 7.60 | 8.00 | 79 | 41 | 36 | 28.2 | Figure 1 | ● |
| BD03A0765 | 7.65 | 8.00 | 79 | 41 | 36 | 28.1 | Figure 1 | ○ |
| BD03A0770 | 7.70 | 8.00 | 79 | 41 | 36 | 28.0 | Figure 1 | ● |
| BD03A0780 | 7.80 | 8.00 | 79 | 41 | 36 | 27.9 | Figure 1 | ● |
| BD03A0790 | 7.90 | 8.00 | 79 | 41 | 36 | 27.7 | Figure 1 | ● |
| BD03A0794 | 7.94 | 8.00 | 79 | 41 | 36 | 27.6 | Figure 1 | ○ |
| BD03A0800 | 8.00 | 8.00 | 79 | 41 | 36 | 27.5 | Figure 2 | ● |
| BD03A0810 | 8.10 | 10.00 | 89 | 47 | 40 | 33.4 | Figure 1 | ● |
| BD03A0820 | 8.20 | 10.00 | 89 | 47 | 40 | 33.2 | Figure 1 | ● |
| BD03A0830 | 8.30 | 10.00 | 89 | 47 | 40 | 33.0 | Figure 1 | ● |
| BD03A0833 | 8.33 | 10.00 | 89 | 47 | 40 | 33.0 | Figure 1 | ○ |
| BD03A0840 | 8.40 | 10.00 | 89 | 47 | 40 | 32.9 | Figure 1 | ● |
| BD03A0850 | 8.50 | 10.00 | 89 | 47 | 40 | 32.7 | Figure 1 | ● |
| BD03A0855 | 8.55 | 10.00 | 89 | 47 | 40 | 32.6 | Figure 1 | ○ |
| BD03A0860 | 8.60 | 10.00 | 89 | 47 | 40 | 32.5 | Figure 1 | ● |
| BD03A0870 | 8.70 | 10.00 | 89 | 47 | 40 | 32.4 | Figure 1 | ● |
| BD03A0873 | 8.73 | 10.00 | 89 | 47 | 40 | 32.3 | Figure 1 | ○ |
| BD03A0880 | 8.80 | 10.00 | 89 | 47 | 40 | 32.2 | Figure 1 | ● |
| BD03A0890 | 8.90 | 10.00 | 89 | 47 | 40 | 32.0 | Figure 1 | ● |
| BD03A0900 | 9.00 | 10.00 | 89 | 47 | 40 | 31.9 | Figure 1 | ● |

● Standing inventory ○ Make-to-order

## BD03 Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03A0905 | 9.05 | 10.00 | 89 | 47 | 40 | 31.8 | Figure 1 | ○ |
| BD03A0910 | 9.10 | 10.00 | 89 | 47 | 40 | 31.7 | Figure 1 | ● |
| BD03A0913 | 9.13 | 10.00 | 89 | 47 | 40 | 31.6 | Figure 1 | ○ |
| BD03A0920 | 9.20 | 10.00 | 89 | 47 | 40 | 31.5 | Figure 1 | ● |
| BD03A0925 | 9.25 | 10.00 | 89 | 47 | 40 | 31.4 | Figure 1 | ○ |
| BD03A0930 | 9.30 | 10.00 | 89 | 47 | 40 | 31.4 | Figure 1 | ● |
| BD03A0940 | 9.40 | 10.00 | 89 | 47 | 40 | 31.2 | Figure 1 | ● |
| BD03A0950 | 9.50 | 10.00 | 89 | 47 | 40 | 31.0 | Figure 1 | ● |
| BD03A0952 | 9.52 | 10.00 | 89 | 47 | 40 | 31.0 | Figure 1 | ○ |
| BD03A0955 | 9.55 | 10.00 | 89 | 47 | 40 | 30.9 | Figure 1 | ○ |
| BD03A0960 | 9.60 | 10.00 | 89 | 47 | 40 | 30.9 | Figure 1 | ● |
| BD03A0970 | 9.70 | 10.00 | 89 | 47 | 40 | 30.7 | Figure 1 | ● |
| BD03A0980 | 9.80 | 10.00 | 89 | 47 | 40 | 30.5 | Figure 1 | ● |
| BD03A0990 | 9.90 | 10.00 | 89 | 47 | 40 | 30.3 | Figure 1 | ● |
| BD03A0992 | 9.92 | 10.00 | 89 | 47 | 40 | 30.3 | Figure 1 | ○ |
| BD03A1000 | 10.00 | 10.00 | 89 | 47 | 40 | 30.2 | Figure 2 | ● |
| BD03A1010 | 10.10 | 12.00 | 102 | 55 | 45 | 38.0 | Figure 1 | ● |
| BD03A1020 | 10.20 | 12.00 | 102 | 55 | 45 | 37.8 | Figure 1 | ● |
| BD03A1030 | 10.30 | 12.00 | 102 | 55 | 45 | 37.7 | Figure 1 | ● |
| BD03A1032 | 10.32 | 12.00 | 102 | 55 | 45 | 37.6 | Figure 1 | ○ |
| BD03A1040 | 10.40 | 12.00 | 102 | 55 | 45 | 37.5 | Figure 1 | ● |
| BD03A1050 | 10.50 | 12.00 | 102 | 55 | 45 | 37.3 | Figure 1 | ● |
| BD03A1060 | 10.60 | 12.00 | 102 | 55 | 45 | 37.2 | Figure 1 | ● |
| BD03A1070 | 10.70 | 12.00 | 102 | 55 | 45 | 37.0 | Figure 1 | ● |
| BD03A1072 | 10.72 | 12.00 | 102 | 55 | 45 | 37.0 | Figure 1 | ○ |
| BD03A1080 | 10.80 | 12.00 | 102 | 55 | 45 | 36.8 | Figure 1 | ● |
| BD03A1090 | 10.90 | 12.00 | 102 | 55 | 45 | 36.7 | Figure 1 | ● |
| BD03A1100 | 11.00 | 12.00 | 102 | 55 | 45 | 36.5 | Figure 1 | ● |
| BD03A1110 | 11.10 | 12.00 | 102 | 55 | 45 | 36.3 | Figure 1 | ● |

● Standing inventory ○ Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## BD03 Series

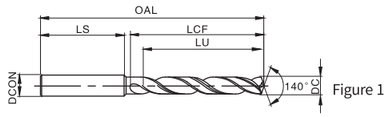



Figure 1

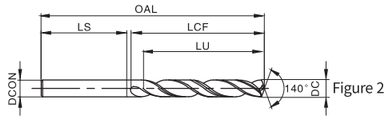



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03A1111 | 11.11 | 12.00 | 102 | 55 | 45 | 36.3 | Figure 1 | ● |
| BD03A1120 | 11.20 | 12.00 | 102 | 55 | 45 | 36.2 | Figure 1 | ● |
| BD03A1130 | 11.30 | 12.00 | 102 | 55 | 45 | 36.0 | Figure 1 | ● |
| BD03A1140 | 11.40 | 12.00 | 102 | 55 | 45 | 35.8 | Figure 1 | ● |
| BD03A1150 | 11.50 | 12.00 | 102 | 55 | 45 | 35.7 | Figure 1 | ● |
| BD03A1151 | 11.51 | 12.00 | 102 | 55 | 45 | 35.6 | Figure 1 | ○ |
| BD03A1155 | 11.55 | 12.00 | 102 | 55 | 45 | 35.6 | Figure 1 | ○ |
| BD03A1160 | 11.60 | 12.00 | 102 | 55 | 45 | 35.5 | Figure 1 | ● |
| BD03A1170 | 11.70 | 12.00 | 102 | 55 | 45 | 35.3 | Figure 1 | ● |
| BD03A1180 | 11.80 | 12.00 | 102 | 55 | 45 | 35.2 | Figure 1 | ● |
| BD03A1190 | 11.90 | 12.00 | 102 | 55 | 45 | 35.0 | Figure 1 | ● |
| BD03A1191 | 11.91 | 12.00 | 102 | 55 | 45 | 35.0 | Figure 1 | ○ |
| BD03A1200 | 12.00 | 12.00 | 102 | 55 | 45 | 34.8 | Figure 2 | ● |
| BD03A1210 | 12.10 | 14.00 | 107 | 60 | 45 | 39.6 | Figure 1 | ○ |
| BD03A1220 | 12.20 | 14.00 | 107 | 60 | 45 | 39.5 | Figure 1 | ○ |
| BD03A1230 | 12.30 | 14.00 | 107 | 60 | 45 | 39.3 | Figure 1 | ○ |
| BD03A1240 | 12.40 | 14.00 | 107 | 60 | 45 | 39.1 | Figure 1 | ○ |
| BD03A1250 | 12.50 | 14.00 | 107 | 60 | 45 | 39.0 | Figure 1 | ● |
| BD03A1260 | 12.60 | 14.00 | 107 | 60 | 45 | 38.8 | Figure 1 | ○ |
| BD03A1270 | 12.70 | 14.00 | 107 | 60 | 45 | 38.6 | Figure 1 | ○ |
| BD03A1280 | 12.80 | 14.00 | 107 | 60 | 45 | 38.5 | Figure 1 | ○ |
| BD03A1290 | 12.90 | 14.00 | 107 | 60 | 45 | 38.3 | Figure 1 | ○ |
| BD03A1300 | 13.00 | 14.00 | 107 | 60 | 45 | 38.1 | Figure 1 | ● |
| BD03A1310 | 13.10 | 14.00 | 107 | 60 | 45 | 38.0 | Figure 1 | ○ |
| BD03A1320 | 13.20 | 14.00 | 107 | 60 | 45 | 37.8 | Figure 1 | ○ |
| BD03A1330 | 13.30 | 14.00 | 107 | 60 | 45 | 37.6 | Figure 1 | ○ |
| BD03A1340 | 13.40 | 14.00 | 107 | 60 | 45 | 37.5 | Figure 1 | ○ |
| BD03A1350 | 13.50 | 14.00 | 107 | 60 | 45 | 37.3 | Figure 1 | ● |

●Standing inventory ○Make-to-order

## BD03 Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03A1355 | 13.55 | 14.00 | 107 | 60 | 45 | 37.2 | Figure 1 | ○ |
| BD03A1360 | 13.60 | 14.00 | 107 | 60 | 45 | 37.1 | Figure 1 | ○ |
| BD03A1370 | 13.70 | 14.00 | 107 | 60 | 45 | 37.0 | Figure 1 | ○ |
| BD03A1380 | 13.80 | 14.00 | 107 | 60 | 45 | 36.8 | Figure 1 | ○ |
| BD03A1390 | 13.90 | 14.00 | 107 | 60 | 45 | 36.6 | Figure 1 | ○ |
| BD03A1400 | 14.00 | 14.00 | 107 | 60 | 45 | 36.5 | Figure 2 | ● |
| BD03A1410 | 14.10 | 16.00 | 115 | 65 | 48 | 41.3 | Figure 1 | ○ |
| BD03A1420 | 14.20 | 16.00 | 115 | 65 | 48 | 41.1 | Figure 1 | ○ |
| BD03A1429 | 14.29 | 16.00 | 115 | 65 | 48 | 41.0 | Figure 1 | ○ |
| BD03A1430 | 14.30 | 16.00 | 115 | 65 | 48 | 40.9 | Figure 1 | ○ |
| BD03A1440 | 14.40 | 16.00 | 115 | 65 | 48 | 40.8 | Figure 1 | ○ |
| BD03A1450 | 14.50 | 16.00 | 115 | 65 | 48 | 40.6 | Figure 1 | ● |
| BD03A1460 | 14.60 | 16.00 | 115 | 65 | 48 | 40.4 | Figure 1 | ○ |
| BD03A1470 | 14.70 | 16.00 | 115 | 65 | 48 | 40.3 | Figure 1 | ○ |
| BD03A1480 | 14.80 | 16.00 | 115 | 65 | 48 | 40.1 | Figure 1 | ○ |
| BD03A1490 | 14.90 | 16.00 | 115 | 65 | 48 | 39.9 | Figure 1 | ○ |
| BD03A1500 | 15.00 | 16.00 | 115 | 65 | 48 | 39.8 | Figure 1 | ● |
| BD03A1510 | 15.10 | 16.00 | 115 | 65 | 48 | 39.6 | Figure 1 | ○ |
| BD03A1520 | 15.20 | 16.00 | 115 | 65 | 48 | 39.4 | Figure 1 | ○ |
| BD03A1530 | 15.30 | 16.00 | 115 | 65 | 48 | 39.3 | Figure 1 | ○ |
| BD03A1540 | 15.40 | 16.00 | 115 | 65 | 48 | 39.1 | Figure 1 | ○ |
| BD03A1550 | 15.50 | 16.00 | 115 | 65 | 48 | 38.9 | Figure 1 | ● |
| BD03A1555 | 15.55 | 16.00 | 115 | 65 | 48 | 38.8 | Figure 1 | ○ |
| BD03A1560 | 15.60 | 16.00 | 115 | 65 | 48 | 38.8 | Figure 1 | ○ |
| BD03A1570 | 15.70 | 16.00 | 115 | 65 | 48 | 38.6 | Figure 1 | ○ |
| BD03A1580 | 15.80 | 16.00 | 115 | 65 | 48 | 38.4 | Figure 1 | ○ |
| BD03A1587 | 15.87 | 16.00 | 115 | 65 | 48 | 38.3 | Figure 1 | ○ |
| BD03A1590 | 15.90 | 16.00 | 115 | 65 | 48 | 38.3 | Figure 1 | ○ |
| BD03A1600 | 16.00 | 16.00 | 115 | 65 | 48 | 38.1 | Figure 2 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## BD03 Series

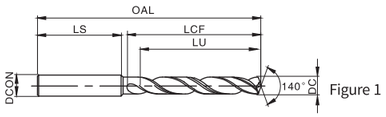



Figure 1

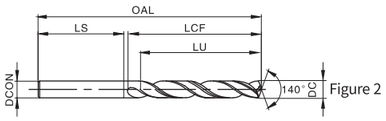



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03A1650 | 16.50 | 18.00 | 123 | 73 | 48 | 45.2 | Figure 1 | ● |
| BD03A1690 | 16.90 | 18.00 | 123 | 73 | 48 | 44.6 | Figure 1 | ○ |
| BD03A1700 | 17.00 | 18.00 | 123 | 73 | 48 | 44.4 | Figure 1 | ● |
| BD03A1750 | 17.50 | 18.00 | 123 | 73 | 48 | 43.6 | Figure 1 | ● |
| BD03A1755 | 17.55 | 18.00 | 123 | 73 | 48 | 43.5 | Figure 1 | ○ |
| BD03A1790 | 17.90 | 18.00 | 123 | 73 | 48 | 42.9 | Figure 1 | ○ |
| BD03A1800 | 18.00 | 18.00 | 123 | 73 | 48 | 42.7 | Figure 2 | ● |
| BD03A1830 | 18.30 | 20.00 | 131 | 79 | 50 | 48.2 | Figure 1 | ○ |
| BD03A1850 | 18.50 | 20.00 | 131 | 79 | 50 | 47.9 | Figure 1 | ● |
| BD03A1890 | 18.90 | 20.00 | 131 | 79 | 50 | 47.2 | Figure 1 | ○ |
| BD03A1900 | 19.00 | 20.00 | 131 | 79 | 50 | 47.0 | Figure 1 | ● |
| BD03A1930 | 19.30 | 20.00 | 131 | 79 | 50 | 46.5 | Figure 1 | ○ |
| BD03A1950 | 19.50 | 20.00 | 131 | 79 | 50 | 46.2 | Figure 1 | ● |
| BD03A1955 | 19.55 | 20.00 | 131 | 79 | 50 | 46.1 | Figure 1 | ○ |
| BD03A1990 | 19.90 | 20.00 | 131 | 79 | 50 | 45.5 | Figure 1 | ○ |
| BD03A2000 | 20.00 | 20.00 | 131 | 79 | 50 | 45.4 | Figure 2 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## Cutting speed recommendations - BD03 Series

| Workpiece material | | Strength ($N/mm^2$) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
|---|---|---|---|---|---|---|
| | | | | Minimum /min | Optimal /opt | Maximum /max |
| P | Carbon steel | < 600 | < 230 | 80 | 90 | 100 |
| | Alloy steel | < 1200 | < 350 | 60 | 70 | 80 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 50 | 60 | 70 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 30 | 40 | 50 |
| | Martensite stainless steel | < 820 | < 240 | 30 | 40 | 50 |
| K | Gray cast iron | – | < 280 | 160 | 180 | 200 |
| | Nodular cast iron | – | < 320 | 120 | 140 | 160 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | < 3300 | < 350 | 15 | 25 | 35 |
| | Titanium alloy | <2100 | < 400 | 20 | 30 | 40 |
| H | High hardness steel | – | < 54HRC | – | – | – |
| | High hardness steel | – | 52–60HRC | – | – | – |
| | High hardness steel | – | > 60 HRC | – | – | – |

## Recommended feed rate - BD03 Series

| Workpiece material | | Feed per revolution mm/r | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Φ2~ Φ2.5 | Φ2.5 ~Φ3 | Φ3 ~Φ4 | Φ4 ~Φ5 | Φ5 ~Φ6 | Φ6 ~Φ8 | Φ8 ~Φ10 | Φ10 ~Φ12 | Φ12 ~Φ16 | Φ16 ~Φ20 |
| P | Carbon steel | 0.100 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 | 0.315 | 0.315 | 0.400 | 0.500 |
| | Alloy steel | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 | 0.250 | 0.250 | 0.315 | 0.400 |
| | High-alloyed steel and tool steel | 0.063 | 0.080 | 0.100 | 0.100 | 0.125 | 0.160 | 0.200 | 0.200 | 0.250 | 0.315 |
| M | Austenite and ferrite stainless steel | 0.050 | 0.063 | 0.080 | 0.080 | 0.100 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 |
| | Martensite stainless steel | 0.040 | 0.050 | 0.063 | 0.063 | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 |
| K | Gray cast iron | 0.160 | 0.160 | 0.200 | 0.250 | 0.315 | 0.315 | 0.400 | 0.500 | 0.630 | 0.630 |
| | Nodular cast iron | 0.125 | 0.160 | 0.200 | 0.200 | 0.250 | 0.315 | 0.400 | 0.400 | 0.500 | 0.630 |
| N | Non-ferrous alloy | – | – | – | – | – | – | – | – | – | – |
| | Aluminum alloy | – | – | – | – | – | – | – | – | – | – |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | 0.050 | 0.063 | 0.080 | 0.080 | 0.080 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 |
| | Titanium alloy | 0.040 | 0.050 | 0.063 | 0.063 | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 |
| H | High hardness steel | – | – | – | – | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – | – | – | – | – |

# Solid carbide drill

## BD03C Series

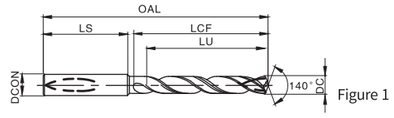



Figure 1

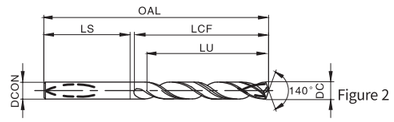



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03CA0300 | 3.00 | 6.00 | 62 | 20 | 36 | 15.0 | Figure 1 | ● |
| BD03CA0310 | 3.10 | 6.00 | 62 | 20 | 36 | 14.8 | Figure 1 | ● |
| BD03CA0317 | 3.17 | 6.00 | 62 | 20 | 36 | 14.7 | Figure 1 | ○ |
| BD03CA0320 | 3.20 | 6.00 | 62 | 20 | 36 | 14.6 | Figure 1 | ● |
| BD03CA0325 | 3.25 | 6.00 | 62 | 20 | 36 | 14.5 | Figure 1 | ○ |
| BD03CA0330 | 3.30 | 6.00 | 62 | 20 | 36 | 14.4 | Figure 1 | ● |
| BD03CA0340 | 3.40 | 6.00 | 62 | 20 | 36 | 14.3 | Figure 1 | ● |
| BD03CA0350 | 3.50 | 6.00 | 62 | 20 | 36 | 14.1 | Figure 1 | ● |
| BD03CA0357 | 3.57 | 6.00 | 62 | 20 | 36 | 14.0 | Figure 1 | ○ |
| BD03CA0360 | 3.60 | 6.00 | 62 | 20 | 36 | 13.9 | Figure 1 | ● |
| BD03CA0370 | 3.70 | 6.00 | 62 | 20 | 36 | 13.8 | Figure 1 | ● |
| BD03CA0380 | 3.80 | 6.00 | 66 | 24 | 36 | 17.6 | Figure 1 | ● |
| BD03CA0390 | 3.90 | 6.00 | 66 | 24 | 36 | 17.4 | Figure 1 | ● |
| BD03CA0397 | 3.97 | 6.00 | 66 | 24 | 36 | 17.3 | Figure 1 | ○ |
| BD03CA0400 | 4.00 | 6.00 | 66 | 24 | 36 | 17.3 | Figure 1 | ● |
| BD03CA0410 | 4.10 | 6.00 | 66 | 24 | 36 | 17.1 | Figure 1 | ● |
| BD03CA0420 | 4.20 | 6.00 | 66 | 24 | 36 | 16.9 | Figure 1 | ● |
| BD03CA0430 | 4.30 | 6.00 | 66 | 24 | 36 | 16.8 | Figure 1 | ● |
| BD03CA0437 | 4.37 | 6.00 | 66 | 24 | 36 | 16.6 | Figure 1 | ○ |
| BD03CA0440 | 4.40 | 6.00 | 66 | 24 | 36 | 16.6 | Figure 1 | ● |
| BD03CA0445 | 4.45 | 6.00 | 66 | 24 | 36 | 16.5 | Figure 1 | ○ |
| BD03CA0450 | 4.50 | 6.00 | 66 | 24 | 36 | 16.4 | Figure 1 | ● |
| BD03CA0460 | 4.60 | 6.00 | 66 | 24 | 36 | 16.3 | Figure 1 | ● |
| BD03CA0465 | 4.65 | 6.00 | 66 | 24 | 36 | 16.2 | Figure 1 | ○ |
| BD03CA0470 | 4.70 | 6.00 | 66 | 24 | 36 | 16.1 | Figure 1 | ● |
| BD03CA0476 | 4.76 | 6.00 | 66 | 28 | 36 | 20.0 | Figure 1 | ○ |
| BD03CA0480 | 4.80 | 6.00 | 66 | 28 | 36 | 19.9 | Figure 1 | ● |
| BD03CA0490 | 4.90 | 6.00 | 66 | 28 | 36 | 19.8 | Figure 1 | ● |

●Standing inventory ○Make-to-order

## BD03C Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03CA0500 | 5.00 | 6.00 | 66 | 28 | 36 | 19.6 | Figure 1 | ● |
| BD03CA0510 | 5.10 | 6.00 | 66 | 28 | 36 | 19.4 | Figure 1 | ● |
| BD03CA0516 | 5.16 | 6.00 | 66 | 28 | 36 | 19.3 | Figure 1 | ○ |
| BD03CA0520 | 5.20 | 6.00 | 66 | 28 | 36 | 19.3 | Figure 1 | ● |
| BD03CA0530 | 5.30 | 6.00 | 66 | 28 | 36 | 19.1 | Figure 1 | ● |
| BD03CA0540 | 5.40 | 6.00 | 66 | 28 | 36 | 18.9 | Figure 1 | ● |
| BD03CA0550 | 5.50 | 6.00 | 66 | 28 | 36 | 18.7 | Figure 1 | ● |
| BD03CA0555 | 5.55 | 6.00 | 66 | 28 | 36 | 18.7 | Figure 1 | ○ |
| BD03CA0556 | 5.56 | 6.00 | 66 | 28 | 36 | 18.6 | Figure 1 | ● |
| BD03CA0560 | 5.60 | 6.00 | 66 | 28 | 36 | 18.6 | Figure 1 | ● |
| BD03CA0565 | 5.65 | 6.00 | 66 | 28 | 36 | 18.5 | Figure 1 | ● |
| BD03CA0570 | 5.70 | 6.00 | 66 | 28 | 36 | 18.4 | Figure 1 | ● |
| BD03CA0575 | 5.75 | 6.00 | 66 | 28 | 36 | 18.3 | Figure 1 | ○ |
| BD03CA0580 | 5.80 | 6.00 | 66 | 28 | 36 | 18.2 | Figure 1 | ● |
| BD03CA0590 | 5.90 | 6.00 | 66 | 28 | 36 | 18.1 | Figure 1 | ● |
| BD03CA0595 | 5.95 | 6.00 | 66 | 28 | 36 | 18.0 | Figure 1 | ○ |
| BD03CA0600 | 6.00 | 6.00 | 66 | 28 | 36 | 17.9 | Figure 2 | ● |
| BD03CA0610 | 6.10 | 8.00 | 79 | 34 | 36 | 23.7 | Figure 1 | ● |
| BD03CA0620 | 6.20 | 8.00 | 79 | 34 | 36 | 23.6 | Figure 1 | ● |
| BD03CA0630 | 6.30 | 8.00 | 79 | 34 | 36 | 23.4 | Figure 1 | ● |
| BD03CA0635 | 6.35 | 8.00 | 79 | 34 | 36 | 23.3 | Figure 1 | ○ |
| BD03CA0640 | 6.40 | 8.00 | 79 | 34 | 36 | 23.2 | Figure 1 | ● |
| BD03CA0650 | 6.50 | 8.00 | 79 | 34 | 36 | 23.1 | Figure 1 | ● |
| BD03CA0660 | 6.60 | 8.00 | 79 | 34 | 36 | 22.9 | Figure 1 | ● |
| BD03CA0670 | 6.70 | 8.00 | 79 | 34 | 36 | 22.7 | Figure 1 | ● |
| BD03CA0675 | 6.75 | 8.00 | 79 | 34 | 36 | 22.6 | Figure 1 | ○ |
| BD03CA0680 | 6.80 | 8.00 | 79 | 34 | 36 | 22.6 | Figure 1 | ● |
| BD03CA0690 | 6.90 | 8.00 | 79 | 34 | 36 | 22.4 | Figure 1 | ● |
| BD03CA0700 | 7.00 | 8.00 | 79 | 34 | 36 | 22.2 | Figure 1 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## BD03C Series

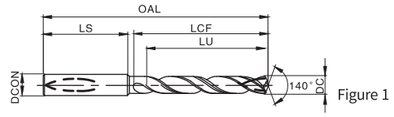



Figure 1

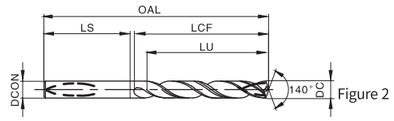



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03CA0710 | 7.10 | 8.00 | 79 | 41 | 36 | 29.1 | Figure 1 | ● |
| BD03CA0714 | 7.14 | 8.00 | 79 | 41 | 36 | 29.0 | Figure 1 | ○ |
| BD03CA0720 | 7.20 | 8.00 | 79 | 41 | 36 | 28.9 | Figure 1 | ● |
| BD03CA0730 | 7.30 | 8.00 | 79 | 41 | 36 | 28.7 | Figure 1 | ● |
| BD03CA0740 | 7.40 | 8.00 | 79 | 41 | 36 | 28.6 | Figure 1 | ● |
| BD03CA0745 | 7.45 | 8.00 | 79 | 41 | 36 | 28.5 | Figure 1 | ○ |
| BD03CA0750 | 7.50 | 8.00 | 79 | 41 | 36 | 28.4 | Figure 1 | ● |
| BD03CA0754 | 7.54 | 8.00 | 79 | 41 | 36 | 28.3 | Figure 1 | ○ |
| BD03CA0760 | 7.60 | 8.00 | 79 | 41 | 36 | 28.2 | Figure 1 | ● |
| BD03CA0765 | 7.65 | 8.00 | 79 | 41 | 36 | 28.1 | Figure 1 | ○ |
| BD03CA0770 | 7.70 | 8.00 | 79 | 41 | 36 | 28.0 | Figure 1 | ● |
| BD03CA0780 | 7.80 | 8.00 | 79 | 41 | 36 | 27.9 | Figure 1 | ● |
| BD03CA0790 | 7.90 | 8.00 | 79 | 41 | 36 | 27.7 | Figure 1 | ● |
| BD03CA0794 | 7.94 | 8.00 | 79 | 41 | 36 | 27.6 | Figure 1 | ○ |
| BD03CA0800 | 8.00 | 8.00 | 79 | 41 | 36 | 27.5 | Figure 2 | ● |
| BD03CA0810 | 8.10 | 10.00 | 89 | 47 | 40 | 33.4 | Figure 1 | ● |
| BD03CA0820 | 8.20 | 10.00 | 89 | 47 | 40 | 33.2 | Figure 1 | ● |
| BD03CA0830 | 8.30 | 10.00 | 89 | 47 | 40 | 33.0 | Figure 1 | ● |
| BD03CA0833 | 8.33 | 10.00 | 89 | 47 | 40 | 33.0 | Figure 1 | ○ |
| BD03CA0840 | 8.40 | 10.00 | 89 | 47 | 40 | 32.9 | Figure 1 | ● |
| BD03CA0850 | 8.50 | 10.00 | 89 | 47 | 40 | 32.7 | Figure 1 | ● |
| BD03CA0855 | 8.55 | 10.00 | 89 | 47 | 40 | 32.6 | Figure 1 | ○ |
| BD03CA0860 | 8.60 | 10.00 | 89 | 47 | 40 | 32.5 | Figure 1 | ● |
| BD03CA0870 | 8.70 | 10.00 | 89 | 47 | 40 | 32.4 | Figure 1 | ● |
| BD03CA0873 | 8.73 | 10.00 | 89 | 47 | 40 | 32.3 | Figure 1 | ○ |
| BD03CA0880 | 8.80 | 10.00 | 89 | 47 | 40 | 32.2 | Figure 1 | ● |
| BD03CA0890 | 8.90 | 10.00 | 89 | 47 | 40 | 32.0 | Figure 1 | ● |
| BD03CA0900 | 9.00 | 10.00 | 89 | 47 | 40 | 31.9 | Figure 1 | ● |

●Standing inventory ○Make-to-order

## BD03C Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03CA0905 | 9.05 | 10.00 | 89 | 47 | 40 | 31.8 | Figure 1 | ○ |
| BD03CA0910 | 9.10 | 10.00 | 89 | 47 | 40 | 31.7 | Figure 1 | ● |
| BD03CA0913 | 9.13 | 10.00 | 89 | 47 | 40 | 31.6 | Figure 1 | ○ |
| BD03CA0920 | 9.20 | 10.00 | 89 | 47 | 40 | 31.5 | Figure 1 | ● |
| BD03CA0925 | 9.25 | 10.00 | 89 | 47 | 40 | 31.4 | Figure 1 | ○ |
| BD03CA0930 | 9.30 | 10.00 | 89 | 47 | 40 | 31.4 | Figure 1 | ● |
| BD03CA0940 | 9.40 | 10.00 | 89 | 47 | 40 | 31.2 | Figure 1 | ● |
| BD03CA0950 | 9.50 | 10.00 | 89 | 47 | 40 | 31.0 | Figure 1 | ● |
| BD03CA0952 | 9.52 | 10.00 | 89 | 47 | 40 | 31.0 | Figure 1 | ○ |
| BD03CA0955 | 9.55 | 10.00 | 89 | 47 | 40 | 30.9 | Figure 1 | ○ |
| BD03CA0960 | 9.60 | 10.00 | 89 | 47 | 40 | 30.9 | Figure 1 | ● |
| BD03CA0970 | 9.70 | 10.00 | 89 | 47 | 40 | 30.7 | Figure 1 | ● |
| BD03CA0980 | 9.80 | 10.00 | 89 | 47 | 40 | 30.5 | Figure 1 | ● |
| BD03CA0990 | 9.90 | 10.00 | 89 | 47 | 40 | 30.3 | Figure 1 | ● |
| BD03CA0992 | 9.92 | 10.00 | 89 | 47 | 40 | 30.3 | Figure 1 | ○ |
| BD03CA1000 | 10.00 | 10.00 | 89 | 47 | 40 | 30.2 | Figure 2 | ● |
| BD03CA1010 | 10.10 | 12.00 | 102 | 55 | 45 | 38.0 | Figure 1 | ● |
| BD03CA1020 | 10.20 | 12.00 | 102 | 55 | 45 | 37.8 | Figure 1 | ● |
| BD03CA1030 | 10.30 | 12.00 | 102 | 55 | 45 | 37.7 | Figure 1 | ● |
| BD03CA1032 | 10.32 | 12.00 | 102 | 55 | 45 | 37.6 | Figure 1 | ○ |
| BD03CA1040 | 10.40 | 12.00 | 102 | 55 | 45 | 37.5 | Figure 1 | ● |
| BD03CA1050 | 10.50 | 12.00 | 102 | 55 | 45 | 37.3 | Figure 1 | ● |
| BD03CA1060 | 10.60 | 12.00 | 102 | 55 | 45 | 37.2 | Figure 1 | ● |
| BD03CA1070 | 10.70 | 12.00 | 102 | 55 | 45 | 37.0 | Figure 1 | ● |
| BD03CA1072 | 10.72 | 12.00 | 102 | 55 | 45 | 37.0 | Figure 1 | ○ |
| BD03CA1080 | 10.80 | 12.00 | 102 | 55 | 45 | 36.8 | Figure 1 | ● |
| BD03CA1090 | 10.90 | 12.00 | 102 | 55 | 45 | 36.7 | Figure 1 | ● |
| BD03CA1100 | 11.00 | 12.00 | 102 | 55 | 45 | 36.5 | Figure 1 | ● |
| BD03CA1110 | 11.10 | 12.00 | 102 | 55 | 45 | 36.3 | Figure 1 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## BD03C Series

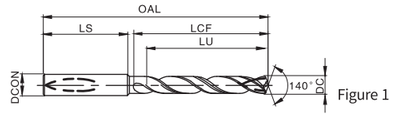



Figure 1

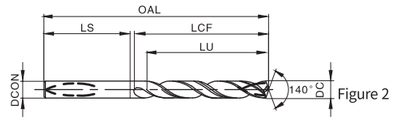



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03CA1111 | 11.11 | 12.00 | 102 | 55 | 45 | 36.3 | Figure 1 | ● |
| BD03CA1120 | 11.20 | 12.00 | 102 | 55 | 45 | 36.2 | Figure 1 | ● |
| BD03CA1130 | 11.30 | 12.00 | 102 | 55 | 45 | 36.0 | Figure 1 | ● |
| BD03CA1140 | 11.40 | 12.00 | 102 | 55 | 45 | 35.8 | Figure 1 | ● |
| BD03CA1150 | 11.50 | 12.00 | 102 | 55 | 45 | 35.7 | Figure 1 | ● |
| BD03CA1151 | 11.51 | 12.00 | 102 | 55 | 45 | 35.6 | Figure 1 | ○ |
| BD03CA1155 | 11.55 | 12.00 | 102 | 55 | 45 | 35.6 | Figure 1 | ○ |
| BD03CA1160 | 11.60 | 12.00 | 102 | 55 | 45 | 35.5 | Figure 1 | ● |
| BD03CA1170 | 11.70 | 12.00 | 102 | 55 | 45 | 35.3 | Figure 1 | ● |
| BD03CA1180 | 11.80 | 12.00 | 102 | 55 | 45 | 35.2 | Figure 1 | ● |
| BD03CA1190 | 11.90 | 12.00 | 102 | 55 | 45 | 35.0 | Figure 1 | ● |
| BD03CA1191 | 11.91 | 12.00 | 102 | 55 | 45 | 35.0 | Figure 1 | ○ |
| BD03CA1200 | 12.00 | 12.00 | 102 | 55 | 45 | 34.8 | Figure 2 | ● |
| BD03CA1210 | 12.10 | 14.00 | 107 | 60 | 45 | 39.6 | Figure 1 | ○ |
| BD03CA1220 | 12.20 | 14.00 | 107 | 60 | 45 | 39.5 | Figure 1 | ○ |
| BD03CA1230 | 12.30 | 14.00 | 107 | 60 | 45 | 39.3 | Figure 1 | ○ |
| BD03CA1240 | 12.40 | 14.00 | 107 | 60 | 45 | 39.1 | Figure 1 | ○ |
| BD03CA1250 | 12.50 | 14.00 | 107 | 60 | 45 | 39.0 | Figure 1 | ● |
| BD03CA1260 | 12.60 | 14.00 | 107 | 60 | 45 | 38.8 | Figure 1 | ○ |
| BD03CA1270 | 12.70 | 14.00 | 107 | 60 | 45 | 38.6 | Figure 1 | ○ |
| BD03CA1280 | 12.80 | 14.00 | 107 | 60 | 45 | 38.5 | Figure 1 | ○ |
| BD03CA1290 | 12.90 | 14.00 | 107 | 60 | 45 | 38.3 | Figure 1 | ○ |
| BD03CA1300 | 13.00 | 14.00 | 107 | 60 | 45 | 38.1 | Figure 1 | ● |
| BD03CA1310 | 13.10 | 14.00 | 107 | 60 | 45 | 38.0 | Figure 1 | ○ |
| BD03CA1320 | 13.20 | 14.00 | 107 | 60 | 45 | 37.8 | Figure 1 | ○ |
| BD03CA1330 | 13.30 | 14.00 | 107 | 60 | 45 | 37.6 | Figure 1 | ○ |
| BD03CA1340 | 13.40 | 14.00 | 107 | 60 | 45 | 37.5 | Figure 1 | ○ |
| BD03CA1350 | 13.50 | 14.00 | 107 | 60 | 45 | 37.3 | Figure 1 | ● |

●Standing inventory ○Make-to-order



## BD03C Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03CA1355 | 13.55 | 14.00 | 107 | 60 | 45 | 37.2 | Figure 1 | ○ |
| BD03CA1360 | 13.60 | 14.00 | 107 | 60 | 45 | 37.1 | Figure 1 | ○ |
| BD03CA1370 | 13.70 | 14.00 | 107 | 60 | 45 | 37.0 | Figure 1 | ○ |
| BD03CA1380 | 13.80 | 14.00 | 107 | 60 | 45 | 36.8 | Figure 1 | ○ |
| BD03CA1390 | 13.90 | 14.00 | 107 | 60 | 45 | 36.6 | Figure 1 | ○ |
| BD03CA1400 | 14.00 | 14.00 | 107 | 60 | 45 | 36.5 | Figure 2 | ● |
| BD03CA1410 | 14.10 | 16.00 | 115 | 65 | 48 | 41.3 | Figure 1 | ○ |
| BD03CA1420 | 14.20 | 16.00 | 115 | 65 | 48 | 41.1 | Figure 1 | ○ |
| BD03CA1429 | 14.29 | 16.00 | 115 | 65 | 48 | 41.0 | Figure 1 | ○ |
| BD03CA1430 | 14.30 | 16.00 | 115 | 65 | 48 | 40.9 | Figure 1 | ○ |
| BD03CA1440 | 14.40 | 16.00 | 115 | 65 | 48 | 40.8 | Figure 1 | ○ |
| BD03CA1450 | 14.50 | 16.00 | 115 | 65 | 48 | 40.6 | Figure 1 | ● |
| BD03CA1460 | 14.60 | 16.00 | 115 | 65 | 48 | 40.4 | Figure 1 | ○ |
| BD03CA1470 | 14.70 | 16.00 | 115 | 65 | 48 | 40.3 | Figure 1 | ○ |
| BD03CA1480 | 14.80 | 16.00 | 115 | 65 | 48 | 40.1 | Figure 1 | ○ |
| BD03CA1490 | 14.90 | 16.00 | 115 | 65 | 48 | 39.9 | Figure 1 | ○ |
| BD03CA1500 | 15.00 | 16.00 | 115 | 65 | 48 | 39.8 | Figure 1 | ● |
| BD03CA1510 | 15.10 | 16.00 | 115 | 65 | 48 | 39.6 | Figure 1 | ○ |
| BD03CA1520 | 15.20 | 16.00 | 115 | 65 | 48 | 39.4 | Figure 1 | ○ |
| BD03CA1530 | 15.30 | 16.00 | 115 | 65 | 48 | 39.3 | Figure 1 | ○ |
| BD03CA1540 | 15.40 | 16.00 | 115 | 65 | 48 | 39.1 | Figure 1 | ○ |
| BD03CA1550 | 15.50 | 16.00 | 115 | 65 | 48 | 38.9 | Figure 1 | ● |
| BD03CA1555 | 15.55 | 16.00 | 115 | 65 | 48 | 38.8 | Figure 1 | ○ |
| BD03CA1560 | 15.60 | 16.00 | 115 | 65 | 48 | 38.8 | Figure 1 | ○ |
| BD03CA1570 | 15.70 | 16.00 | 115 | 65 | 48 | 38.6 | Figure 1 | ○ |
| BD03CA1580 | 15.80 | 16.00 | 115 | 65 | 48 | 38.4 | Figure 1 | ○ |
| BD03CA1587 | 15.87 | 16.00 | 115 | 65 | 48 | 38.3 | Figure 1 | ○ |
| BD03CA1590 | 15.90 | 16.00 | 115 | 65 | 48 | 38.3 | Figure 1 | ○ |
| BD03CA1600 | 16.00 | 16.00 | 115 | 65 | 48 | 38.1 | Figure 2 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## BD03C Series

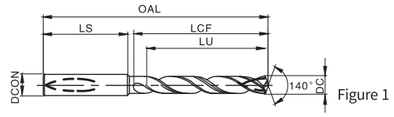



Figure 1

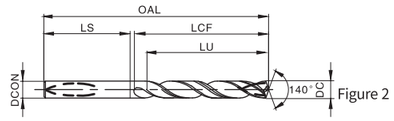



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD03CA1650 | 16.50 | 18.00 | 123 | 73 | 48 | 45.2 | Figure 1 | ● |
| BD03CA1690 | 16.90 | 18.00 | 123 | 73 | 48 | 44.6 | Figure 1 | ○ |
| BD03CA1700 | 17.00 | 18.00 | 123 | 73 | 48 | 44.4 | Figure 1 | ● |
| BD03CA1750 | 17.50 | 18.00 | 123 | 73 | 48 | 43.6 | Figure 1 | ● |
| BD03CA1755 | 17.55 | 18.00 | 123 | 73 | 48 | 43.5 | Figure 1 | ○ |
| BD03CA1790 | 17.90 | 18.00 | 123 | 73 | 48 | 42.9 | Figure 1 | ○ |
| BD03CA1800 | 18.00 | 18.00 | 123 | 73 | 48 | 42.7 | Figure 2 | ● |
| BD03CA1830 | 18.30 | 20.00 | 131 | 79 | 50 | 48.2 | Figure 1 | ○ |
| BD03CA1850 | 18.50 | 20.00 | 131 | 79 | 50 | 47.9 | Figure 1 | ● |
| BD03CA1890 | 18.90 | 20.00 | 131 | 79 | 50 | 47.2 | Figure 1 | ○ |
| BD03CA1900 | 19.00 | 20.00 | 131 | 79 | 50 | 47.0 | Figure 1 | ● |
| BD03CA1930 | 19.30 | 20.00 | 131 | 79 | 50 | 46.5 | Figure 1 | ○ |
| BD03CA1950 | 19.50 | 20.00 | 131 | 79 | 50 | 46.2 | Figure 1 | ● |
| BD03CA1955 | 19.55 | 20.00 | 131 | 79 | 50 | 46.1 | Figure 1 | ○ |
| BD03CA1990 | 19.90 | 20.00 | 131 | 79 | 50 | 45.5 | Figure 1 | ○ |
| BD03CA2000 | 20.00 | 20.00 | 131 | 79 | 50 | 45.4 | Figure 2 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## Cutting speed recommendations - BD03C Series

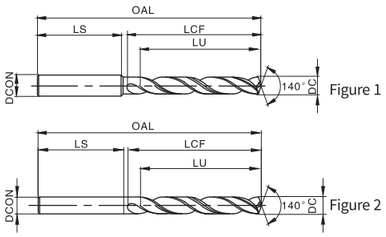
| Workpiece material | | Strength ($N/mm^2$) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
|---|---|---|---|---|---|---|
| | | | | Minimum /min | Optimal /opt | Maximum /max |
| P | Carbon steel | < 600 | < 230 | 100 | 110 | 120 |
| | Alloy steel | < 1200 | < 350 | 80 | 90 | 100 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 60 | 70 | 80 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 40 | 50 | 60 |
| | Martensite stainless steel | < 820 | < 240 | 40 | 50 | 60 |
| K | Gray cast iron | – | < 280 | 180 | 200 | 220 |
| | Nodular cast iron | – | < 320 | 140 | 160 | 180 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | < 3300 | < 350 | 20 | 30 | 40 |
| | Titanium alloy | <2100 | < 400 | 30 | 40 | 50 |
| H | High hardness steel | – | < 54HRC | – | – | – |
| | High hardness steel | – | 52–60HRC | – | – | – |
| | High hardness steel | – | > 60 HRC | – | – | – |

## Recommended feed rate - BD03C Series

| Feed per revolution mm/r | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Workpiece material | | Φ2~Φ2.5 | Φ2.5~Φ3 | Φ3~Φ4 | Φ4~Φ5 | Φ5~Φ6 | Φ6~Φ8 | Φ8~Φ10 | Φ10~Φ12 | Φ12~Φ16 | Φ16~Φ20 |
| P | Carbon steel | 0.100 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 | 0.315 | 0.315 | 0.400 | 0.500 |
| | Alloy steel | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 | 0.250 | 0.250 | 0.315 | 0.400 |
| | High-alloyed steel and tool steel | 0.063 | 0.080 | 0.100 | 0.100 | 0.125 | 0.160 | 0.200 | 0.200 | 0.250 | 0.315 |
| M | Austenite and ferrite stainless steel | 0.050 | 0.063 | 0.080 | 0.080 | 0.100 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 |
| | Martensite stainless steel | 0.040 | 0.050 | 0.063 | 0.063 | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 |
| K | Gray cast iron | 0.160 | 0.160 | 0.200 | 0.250 | 0.315 | 0.315 | 0.400 | 0.500 | 0.630 | 0.630 |
| | Nodular cast iron | 0.125 | 0.160 | 0.200 | 0.200 | 0.250 | 0.315 | 0.400 | 0.400 | 0.500 | 0.630 |
| N | Non-ferrous alloy | – | – | – | – | – | – | – | – | – | – |
| | Aluminum alloy | – | – | – | – | – | – | – | – | – | – |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | 0.050 | 0.063 | 0.080 | 0.080 | 0.080 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 |
| | Titanium alloy | 0.040 | 0.050 | 0.063 | 0.063 | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 |
| H | High hardness steel | – | – | – | – | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – | – | – | – | – |

# Solid carbide drill

## BD05 Series



| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD05A0300 | 3.00 | 6.00 | 66 | 28 | 36 | 23.0 | Figure 1 | ● |
| BD05A0310 | 3.10 | 6.00 | 66 | 28 | 36 | 22.8 | Figure 1 | ● |
| BD05A0317 | 3.17 | 6.00 | 66 | 28 | 36 | 22.7 | Figure 1 | ○ |
| BD05A0320 | 3.20 | 6.00 | 66 | 28 | 36 | 22.6 | Figure 1 | ● |
| BD05A0325 | 3.25 | 6.00 | 66 | 28 | 36 | 22.5 | Figure 1 | ○ |
| BD05A0330 | 3.30 | 6.00 | 66 | 28 | 36 | 22.4 | Figure 1 | ● |
| BD05A0340 | 3.40 | 6.00 | 66 | 28 | 36 | 22.3 | Figure 1 | ● |
| BD05A0350 | 3.50 | 6.00 | 66 | 28 | 36 | 22.1 | Figure 1 | ● |
| BD05A0357 | 3.57 | 6.00 | 66 | 28 | 36 | 22.0 | Figure 1 | ○ |
| BD05A0360 | 3.60 | 6.00 | 66 | 28 | 36 | 21.9 | Figure 1 | ● |
| BD05A0370 | 3.70 | 6.00 | 66 | 28 | 36 | 21.8 | Figure 1 | ● |
| BD05A0380 | 3.80 | 6.00 | 74 | 36 | 36 | 29.6 | Figure 1 | ● |
| BD05A0390 | 3.90 | 6.00 | 74 | 36 | 36 | 29.4 | Figure 1 | ● |
| BD05A0397 | 3.97 | 6.00 | 74 | 36 | 36 | 29.3 | Figure 1 | ○ |
| BD05A0400 | 4.00 | 6.00 | 74 | 36 | 36 | 29.3 | Figure 1 | ● |
| BD05A0410 | 4.10 | 6.00 | 74 | 36 | 36 | 29.1 | Figure 1 | ● |
| BD05A0420 | 4.20 | 6.00 | 74 | 36 | 36 | 28.9 | Figure 1 | ● |
| BD05A0430 | 4.30 | 6.00 | 74 | 36 | 36 | 28.8 | Figure 1 | ● |
| BD05A0437 | 4.37 | 6.00 | 74 | 36 | 36 | 28.6 | Figure 1 | ○ |
| BD05A0440 | 4.40 | 6.00 | 74 | 36 | 36 | 28.6 | Figure 1 | ● |
| BD05A0450 | 4.50 | 6.00 | 74 | 36 | 36 | 28.4 | Figure 1 | ○ |
| BD05A0460 | 4.60 | 6.00 | 74 | 36 | 36 | 28.3 | Figure 1 | ● |
| BD05A0465 | 4.65 | 6.00 | 74 | 36 | 36 | 28.2 | Figure 1 | ● |
| BD05A0470 | 4.70 | 6.00 | 74 | 36 | 36 | 28.1 | Figure 1 | ○ |
| BD05A0476 | 4.76 | 6.00 | 82 | 44 | 36 | 36.0 | Figure 1 | ● |
| BD05A0480 | 4.80 | 6.00 | 82 | 44 | 36 | 35.9 | Figure 1 | ○ |
| BD05A0490 | 4.90 | 6.00 | 82 | 44 | 36 | 35.8 | Figure 1 | ● |
| BD05A0500 | 5.00 | 6.00 | 82 | 44 | 36 | 35.6 | Figure 1 | ● |

●Standing inventory ○Make-to-order

## BD05 Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD05A0510 | 5.10 | 6.00 | 82 | 44 | 36 | 35.4 | Figure 1 | ● |
| BD05A0516 | 5.16 | 6.00 | 82 | 44 | 36 | 35.3 | Figure 1 | ● |
| BD05A0520 | 5.20 | 6.00 | 82 | 44 | 36 | 35.3 | Figure 1 | ○ |
| BD05A0530 | 5.30 | 6.00 | 82 | 44 | 36 | 35.1 | Figure 1 | ● |
| BD05A0540 | 5.40 | 6.00 | 82 | 44 | 36 | 34.9 | Figure 1 | ● |
| BD05A0550 | 5.50 | 6.00 | 82 | 44 | 36 | 34.7 | Figure 1 | ● |
| BD05A0555 | 5.55 | 6.00 | 82 | 44 | 36 | 34.7 | Figure 1 | ● |
| BD05A0560 | 5.60 | 6.00 | 82 | 44 | 36 | 34.6 | Figure 1 | ○ |
| BD05A0570 | 5.70 | 6.00 | 82 | 44 | 36 | 34.4 | Figure 1 | ● |
| BD05A0580 | 5.80 | 6.00 | 82 | 44 | 36 | 34.2 | Figure 1 | ● |
| BD05A0590 | 5.90 | 6.00 | 82 | 44 | 36 | 34.1 | Figure 1 | ● |
| BD05A0595 | 5.95 | 6.00 | 82 | 44 | 36 | 34.0 | Figure 1 | ● |
| BD05A0600 | 6.00 | 6.00 | 82 | 44 | 36 | 33.9 | Figure 2 | ○ |
| BD05A0610 | 6.10 | 8.00 | 91 | 53 | 36 | 42.7 | Figure 1 | ● |
| BD05A0620 | 6.20 | 8.00 | 91 | 53 | 36 | 42.6 | Figure 1 | ● |
| BD05A0630 | 6.30 | 8.00 | 91 | 53 | 36 | 42.4 | Figure 1 | ○ |
| BD05A0635 | 6.35 | 8.00 | 91 | 53 | 36 | 42.3 | Figure 1 | ● |
| BD05A0640 | 6.40 | 8.00 | 91 | 53 | 36 | 42.2 | Figure 1 | ● |
| BD05A0650 | 6.50 | 8.00 | 91 | 53 | 36 | 42.1 | Figure 1 | ● |
| BD05A0653 | 6.53 | 8.00 | 91 | 53 | 36 | 42.0 | Figure 1 | ● |
| BD05A0660 | 6.60 | 8.00 | 91 | 53 | 36 | 41.9 | Figure 1 | ○ |
| BD05A0670 | 6.70 | 8.00 | 91 | 53 | 36 | 41.7 | Figure 1 | ● |
| BD05A0675 | 6.75 | 8.00 | 91 | 53 | 36 | 41.6 | Figure 1 | ● |
| BD05A0680 | 6.80 | 8.00 | 91 | 53 | 36 | 41.6 | Figure 1 | ● |
| BD05A0690 | 6.90 | 8.00 | 91 | 53 | 36 | 41.4 | Figure 1 | ● |
| BD05A0700 | 7.00 | 8.00 | 91 | 53 | 36 | 41.2 | Figure 1 | ○ |
| BD05A0710 | 7.10 | 8.00 | 91 | 53 | 36 | 41.1 | Figure 1 | ● |
| BD05A0714 | 7.14 | 8.00 | 91 | 53 | 36 | 41.0 | Figure 1 | ● |
| BD05A0720 | 7.20 | 8.00 | 91 | 53 | 36 | 40.9 | Figure 1 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## BD05 Series

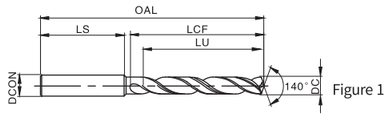



Figure 1

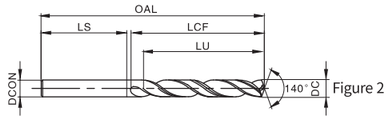



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD05A0730 | 7.30 | 8.00 | 91 | 53 | 36 | 40.7 | Figure 1 | ● |
| BD05A0740 | 7.40 | 8.00 | 91 | 53 | 36 | 40.6 | Figure 1 | ○ |
| BD05A0750 | 7.50 | 8.00 | 91 | 53 | 36 | 40.4 | Figure 1 | ● |
| BD05A0754 | 7.54 | 8.00 | 91 | 53 | 36 | 40.3 | Figure 1 | ● |
| BD05A0760 | 7.60 | 8.00 | 91 | 53 | 36 | 40.2 | Figure 1 | ● |
| BD05A0770 | 7.70 | 8.00 | 91 | 53 | 36 | 40.0 | Figure 1 | ○ |
| BD05A0780 | 7.80 | 8.00 | 91 | 53 | 36 | 39.9 | Figure 1 | ● |
| BD05A0790 | 7.90 | 8.00 | 91 | 53 | 36 | 39.7 | Figure 1 | ○ |
| BD05A0794 | 7.94 | 8.00 | 91 | 53 | 36 | 39.6 | Figure 1 | ● |
| BD05A0800 | 8.00 | 8.00 | 91 | 53 | 36 | 39.5 | Figure 2 | ○ |
| BD05A0810 | 8.10 | 10.00 | 103 | 61 | 40 | 47.4 | Figure 1 | ● |
| BD05A0820 | 8.20 | 10.00 | 103 | 61 | 40 | 47.2 | Figure 1 | ● |
| BD05A0830 | 8.30 | 10.00 | 103 | 61 | 40 | 47.0 | Figure 1 | ● |
| BD05A0833 | 8.33 | 10.00 | 103 | 61 | 40 | 47.0 | Figure 1 | ○ |
| BD05A0840 | 8.40 | 10.00 | 103 | 61 | 40 | 46.9 | Figure 1 | ● |
| BD05A0850 | 8.50 | 10.00 | 103 | 61 | 40 | 46.7 | Figure 1 | ● |
| BD05A0860 | 8.60 | 10.00 | 103 | 61 | 40 | 46.5 | Figure 1 | ● |
| BD05A0870 | 8.70 | 10.00 | 103 | 61 | 40 | 46.4 | Figure 1 | ● |
| BD05A0873 | 8.73 | 10.00 | 103 | 61 | 40 | 46.3 | Figure 1 | ○ |
| BD05A0880 | 8.80 | 10.00 | 103 | 61 | 40 | 46.2 | Figure 1 | ● |
| BD05A0890 | 8.90 | 10.00 | 103 | 61 | 40 | 46.0 | Figure 1 | ● |
| BD05A0900 | 9.00 | 10.00 | 103 | 61 | 40 | 45.9 | Figure 1 | ○ |
| BD05A0910 | 9.10 | 10.00 | 103 | 61 | 40 | 45.7 | Figure 1 | ● |
| BD05A0913 | 9.13 | 10.00 | 103 | 61 | 40 | 45.6 | Figure 1 | ● |
| BD05A0920 | 9.20 | 10.00 | 103 | 61 | 40 | 45.5 | Figure 1 | ○ |
| BD05A0925 | 9.25 | 10.00 | 103 | 61 | 40 | 45.4 | Figure 1 | ● |
| BD05A0930 | 9.30 | 10.00 | 103 | 61 | 40 | 45.4 | Figure 1 | ● |
| BD05A0940 | 9.40 | 10.00 | 103 | 61 | 40 | 45.2 | Figure 1 | ● |

●Standing inventory ○Make-to-order

## BD05 Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD05A0950 | 9.50 | 10.00 | 103 | 61 | 40 | 45.0 | Figure 1 | ○ |
| BD05A0952 | 9.52 | 10.00 | 103 | 61 | 40 | 45.0 | Figure 1 | ● |
| BD05A0960 | 9.60 | 10.00 | 103 | 61 | 40 | 44.9 | Figure 1 | ○ |
| BD05A0970 | 9.70 | 10.00 | 103 | 61 | 40 | 44.7 | Figure 1 | ● |
| BD05A0980 | 9.80 | 10.00 | 103 | 61 | 40 | 44.5 | Figure 1 | ○ |
| BD05A0990 | 9.90 | 10.00 | 103 | 61 | 40 | 44.3 | Figure 1 | ● |
| BD05A0992 | 9.92 | 10.00 | 103 | 61 | 40 | 44.3 | Figure 1 | ● |
| BD05A1000 | 10.00 | 10.00 | 103 | 61 | 40 | 44.2 | Figure 2 | ● |
| BD05A1010 | 10.10 | 12.00 | 118 | 71 | 45 | 54.0 | Figure 1 | ○ |
| BD05A1020 | 10.20 | 12.00 | 118 | 71 | 45 | 53.8 | Figure 1 | ○ |
| BD05A1030 | 10.30 | 12.00 | 118 | 71 | 45 | 53.7 | Figure 1 | ● |
| BD05A1032 | 10.32 | 12.00 | 118 | 71 | 45 | 53.6 | Figure 1 | ● |
| BD05A1040 | 10.40 | 12.00 | 118 | 71 | 45 | 53.5 | Figure 1 | ● |
| BD05A1050 | 10.50 | 12.00 | 118 | 71 | 45 | 53.3 | Figure 1 | ● |
| BD05A1060 | 10.60 | 12.00 | 118 | 71 | 45 | 53.2 | Figure 1 | ○ |
| BD05A1070 | 10.70 | 12.00 | 118 | 71 | 45 | 53.0 | Figure 1 | ● |
| BD05A1072 | 10.72 | 12.00 | 118 | 71 | 45 | 53.0 | Figure 1 | ● |
| BD05A1080 | 10.80 | 12.00 | 118 | 71 | 45 | 52.8 | Figure 1 | ● |
| BD05A1090 | 10.90 | 12.00 | 118 | 71 | 45 | 52.7 | Figure 1 | ● |
| BD05A1100 | 11.00 | 12.00 | 118 | 71 | 45 | 52.5 | Figure 1 | ○ |
| BD05A1110 | 11.10 | 12.00 | 118 | 71 | 45 | 52.3 | Figure 1 | ● |
| BD05A1111 | 11.11 | 12.00 | 118 | 71 | 45 | 52.3 | Figure 1 | ● |
| BD05A1120 | 11.20 | 12.00 | 118 | 71 | 45 | 52.2 | Figure 1 | ● |
| BD05A1130 | 11.30 | 12.00 | 118 | 71 | 45 | 52.0 | Figure 1 | ● |
| BD05A1140 | 11.40 | 12.00 | 118 | 71 | 45 | 51.8 | Figure 1 | ○ |
| BD05A1150 | 11.50 | 12.00 | 118 | 71 | 45 | 51.7 | Figure 1 | ● |
| BD05A1160 | 11.60 | 12.00 | 118 | 71 | 45 | 51.5 | Figure 1 | ● |
| BD05A1170 | 11.70 | 12.00 | 118 | 71 | 45 | 51.3 | Figure 1 | ● |
| BD05A1180 | 11.80 | 12.00 | 118 | 71 | 45 | 51.2 | Figure 1 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## BD05 Series

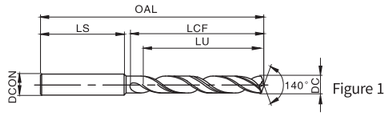



Figure 1

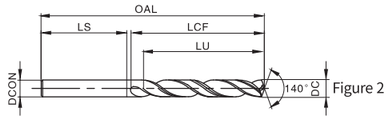



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD05A1190 | 11.90 | 12.00 | 118 | 71 | 45 | 51.0 | Figure 1 | ● |
| BD05A1191 | 11.91 | 12.00 | 118 | 71 | 45 | 51.0 | Figure 1 | ● |
| BD05A1200 | 12.00 | 12.00 | 118 | 71 | 45 | 50.8 | Figure 2 | ● |
| BD05A1210 | 12.10 | 14.00 | 124 | 77 | 45 | 56.6 | Figure 1 | ● |
| BD05A1220 | 12.20 | 14.00 | 124 | 77 | 45 | 56.5 | Figure 1 | ● |
| BD05A1230 | 12.30 | 14.00 | 124 | 77 | 45 | 56.3 | Figure 1 | ○ |
| BD05A1240 | 12.40 | 14.00 | 124 | 77 | 45 | 56.1 | Figure 1 | ○ |
| BD05A1250 | 12.50 | 14.00 | 124 | 77 | 45 | 56.0 | Figure 1 | ● |
| BD05A1260 | 12.60 | 14.00 | 124 | 77 | 45 | 55.8 | Figure 1 | ● |
| BD05A1270 | 12.70 | 14.00 | 124 | 77 | 45 | 55.6 | Figure 1 | ● |
| BD05A1280 | 12.80 | 14.00 | 124 | 77 | 45 | 55.5 | Figure 1 | ● |
| BD05A1290 | 12.90 | 14.00 | 124 | 77 | 45 | 55.3 | Figure 1 | ○ |
| BD05A1300 | 13.00 | 14.00 | 124 | 77 | 45 | 55.1 | Figure 1 | ● |
| BD05A1310 | 13.10 | 14.00 | 124 | 77 | 45 | 55.0 | Figure 1 | ○ |
| BD05A1320 | 13.20 | 14.00 | 124 | 77 | 45 | 54.8 | Figure 1 | ○ |
| BD05A1330 | 13.30 | 14.00 | 124 | 77 | 45 | 54.6 | Figure 1 | ○ |
| BD05A1340 | 13.40 | 14.00 | 124 | 77 | 45 | 54.5 | Figure 1 | ○ |
| BD05A1350 | 13.50 | 14.00 | 124 | 77 | 45 | 54.3 | Figure 1 | ● |
| BD05A1370 | 13.70 | 14.00 | 124 | 77 | 45 | 54.0 | Figure 1 | ○ |
| BD05A1380 | 13.80 | 14.00 | 124 | 77 | 45 | 53.8 | Figure 1 | ○ |
| BD05A1390 | 13.90 | 14.00 | 124 | 77 | 45 | 53.6 | Figure 1 | ○ |
| BD05A1400 | 14.00 | 14.00 | 124 | 77 | 45 | 53.5 | Figure 2 | ○ |
| BD05A1410 | 14.10 | 16.00 | 133 | 83 | 48 | 59.3 | Figure 1 | ● |
| BD05A1420 | 14.20 | 16.00 | 133 | 83 | 48 | 59.1 | Figure 1 | ○ |
| BD05A1429 | 14.29 | 16.00 | 133 | 83 | 48 | 59.0 | Figure 1 | ○ |
| BD05A1430 | 14.30 | 16.00 | 133 | 83 | 48 | 58.9 | Figure 1 | ○ |
| BD05A1440 | 14.40 | 16.00 | 133 | 83 | 48 | 58.8 | Figure 1 | ○ |
| BD05A1450 | 14.50 | 16.00 | 133 | 83 | 48 | 58.6 | Figure 1 | ● |

●Standing inventory ○Make-to-order

## BD05 Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD05A1460 | 14.60 | 16.00 | 133 | 83 | 48 | 58.4 | Figure 1 | ○ |
| BD05A1470 | 14.70 | 16.00 | 133 | 83 | 48 | 58.3 | Figure 1 | ○ |
| BD05A1480 | 14.80 | 16.00 | 133 | 83 | 48 | 58.1 | Figure 1 | ○ |
| BD05A1490 | 14.90 | 16.00 | 133 | 83 | 48 | 57.9 | Figure 1 | ○ |
| BD05A1500 | 15.00 | 16.00 | 133 | 83 | 48 | 57.8 | Figure 1 | ○ |
| BD05A1510 | 15.10 | 16.00 | 133 | 83 | 48 | 57.6 | Figure 1 | ● |
| BD05A1520 | 15.20 | 16.00 | 133 | 83 | 48 | 57.4 | Figure 1 | ○ |
| BD05A1530 | 15.30 | 16.00 | 133 | 83 | 48 | 57.3 | Figure 1 | ○ |
| BD05A1540 | 15.40 | 16.00 | 133 | 83 | 48 | 57.1 | Figure 1 | ○ |
| BD05A1550 | 15.50 | 16.00 | 133 | 83 | 48 | 56.9 | Figure 1 | ○ |
| BD05A1560 | 15.60 | 16.00 | 133 | 83 | 48 | 56.8 | Figure 1 | ○ |
| BD05A1570 | 15.70 | 16.00 | 133 | 83 | 48 | 56.6 | Figure 1 | ● |
| BD05A1580 | 15.80 | 16.00 | 133 | 83 | 48 | 56.4 | Figure 1 | ○ |
| BD05A1587 | 15.87 | 16.00 | 133 | 83 | 48 | 56.3 | Figure 1 | ○ |
| BD05A1590 | 15.90 | 16.00 | 133 | 83 | 48 | 56.3 | Figure 1 | ○ |
| BD05A1600 | 16.00 | 16.00 | 133 | 83 | 48 | 56.1 | Figure 2 | ○ |
| BD05A1608 | 16.08 | 18.00 | 143 | 93 | 48 | 66.0 | Figure 1 | ● |
| BD05A1650 | 16.50 | 18.00 | 143 | 93 | 48 | 65.2 | Figure 1 | ○ |
| BD05A1667 | 16.67 | 18.00 | 143 | 93 | 48 | 65.0 | Figure 1 | ○ |
| BD05A1670 | 16.70 | 18.00 | 143 | 93 | 48 | 64.9 | Figure 1 | ○ |
| BD05A1690 | 16.90 | 18.00 | 143 | 93 | 48 | 64.6 | Figure 1 | ○ |
| BD05A1700 | 17.00 | 18.00 | 143 | 93 | 48 | 64.4 | Figure 1 | ● |
| BD05A1750 | 17.50 | 18.00 | 143 | 93 | 48 | 63.6 | Figure 1 | ○ |
| BD05A1770 | 17.70 | 18.00 | 143 | 93 | 48 | 63.2 | Figure 1 | ○ |
| BD05A1786 | 17.86 | 18.00 | 143 | 93 | 48 | 63.0 | Figure 1 | ○ |
| BD05A1800 | 18.00 | 18.00 | 143 | 93 | 48 | 62.7 | Figure 2 | ○ |
| BD05A1850 | 18.50 | 20.00 | 153 | 101 | 50 | 69.9 | Figure 1 | ○ |
| BD05A1870 | 18.70 | 20.00 | 153 | 101 | 50 | 69.5 | Figure 1 | ○ |
| BD05A1890 | 18.90 | 20.00 | 153 | 101 | 50 | 69.2 | Figure 1 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## BD05 Series

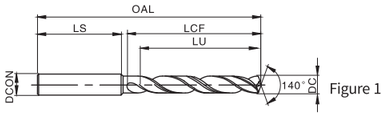



Figure 1

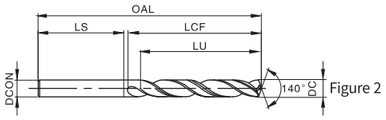



Figure 2

BD Series | 5×D | m7 | 140° | h6

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD05A1900 | 19.00 | 20.00 | 153 | 101 | 50 | 69.0 | Figure 1 | ● |
| BD05A1905 | 19.05 | 20.00 | 153 | 101 | 50 | 69.0 | Figure 1 | ○ |
| BD05A1916 | 19.16 | 20.00 | 153 | 101 | 50 | 68.8 | Figure 1 | ○ |
| BD05A1925 | 19.25 | 20.00 | 153 | 101 | 50 | 68.6 | Figure 1 | ○ |
| BD05A1930 | 19.30 | 20.00 | 153 | 101 | 50 | 68.5 | Figure 1 | ○ |
| BD05A1945 | 19.45 | 20.00 | 153 | 101 | 50 | 68.3 | Figure 1 | ○ |
| BD05A1950 | 19.50 | 20.00 | 153 | 101 | 50 | 68.2 | Figure 1 | ● |
| BD05A1970 | 19.70 | 20.00 | 153 | 101 | 50 | 67.9 | Figure 1 | ○ |
| BD05A1984 | 19.84 | 20.00 | 153 | 101 | 50 | 67.6 | Figure 1 | ○ |
| BD05A2000 | 20.00 | 20.00 | 153 | 101 | 50 | 67.4 | Figure 2 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## Cutting speed recommendations - BD05C Series

| Workpiece material | | Strength ($N/mm^2$) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
|---|---|---|---|---|---|---|
| | | | | Minimum /min | Optimal /opt | Maximum /max |
| P | Carbon steel | < 600 | < 230 | 80 | 90 | 100 |
| | Alloy steel | < 1200 | < 350 | 60 | 70 | 80 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 50 | 60 | 70 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 30 | 40 | 50 |
| | Martensite stainless steel | < 820 | < 240 | 30 | 40 | 50 |
| K | Gray cast iron | – | < 280 | 160 | 180 | 200 |
| | Nodular cast iron | – | < 320 | 120 | 140 | 160 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | < 3300 | < 350 | 15 | 25 | 35 |
| | Titanium alloy | <2100 | < 400 | 20 | 30 | 40 |
| H | High hardness steel | – | < 54HRC | – | – | – |
| | High hardness steel | – | 52–60HRC | – | – | – |
| | High hardness steel | – | > 60 HRC | – | – | – |

## Recommended feed rate - BD05C Series

| Feed per revolution mm/r | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Workpiece material | | Φ2~Φ2.5 | Φ2.5~Φ3 | Φ3~Φ4 | Φ4~Φ5 | Φ5~Φ6 | Φ6~Φ8 | Φ8~Φ10 | Φ10~Φ12 | Φ12~Φ16 | Φ16~Φ20 |
| P | Carbon steel | 0.100 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 | 0.315 | 0.315 | 0.400 | 0.500 |
| | Alloy steel | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 | 0.250 | 0.250 | 0.315 | 0.400 |
| | High-alloyed steel and tool steel | 0.063 | 0.080 | 0.100 | 0.100 | 0.125 | 0.160 | 0.200 | 0.200 | 0.250 | 0.315 |
| M | Austenite and ferrite stainless steel | 0.050 | 0.063 | 0.080 | 0.080 | 0.100 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 |
| | Martensite stainless steel | 0.040 | 0.050 | 0.063 | 0.063 | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 |
| K | Gray cast iron | 0.160 | 0.160 | 0.200 | 0.250 | 0.315 | 0.315 | 0.400 | 0.500 | 0.630 | 0.630 |
| | Nodular cast iron | 0.125 | 0.160 | 0.200 | 0.200 | 0.250 | 0.315 | 0.400 | 0.400 | 0.500 | 0.630 |
| N | Non-ferrous alloy | – | – | – | – | – | – | – | – | – | – |
| | Aluminum alloy | – | – | – | – | – | – | – | – | – | – |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | 0.050 | 0.063 | 0.080 | 0.080 | 0.080 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 |
| | Titanium alloy | 0.040 | 0.050 | 0.063 | 0.063 | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 |
| H | High hardness steel | – | – | – | – | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – | – | – | – | – |

# Solid carbide drill

## BD05C Series

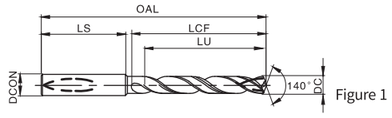



Figure 1

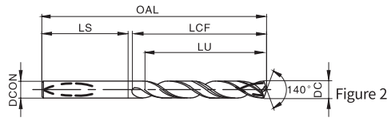



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD05CA0300 | 3.00 | 6.00 | 66 | 28 | 36 | 23.0 | Figure 1 | ● |
| BD05CA0310 | 3.10 | 6.00 | 66 | 28 | 36 | 22.8 | Figure 1 | ● |
| BD05CA0317 | 3.17 | 6.00 | 66 | 28 | 36 | 22.7 | Figure 1 | ○ |
| BD05CA0320 | 3.20 | 6.00 | 66 | 28 | 36 | 22.6 | Figure 1 | ● |
| BD05CA0325 | 3.25 | 6.00 | 66 | 28 | 36 | 22.5 | Figure 1 | ○ |
| BD05CA0330 | 3.30 | 6.00 | 66 | 28 | 36 | 22.4 | Figure 1 | ● |
| BD05CA0340 | 3.40 | 6.00 | 66 | 28 | 36 | 22.3 | Figure 1 | ● |
| BD05CA0350 | 3.50 | 6.00 | 66 | 28 | 36 | 22.1 | Figure 1 | ● |
| BD05CA0357 | 3.57 | 6.00 | 66 | 28 | 36 | 22.0 | Figure 1 | ○ |
| BD05CA0360 | 3.60 | 6.00 | 66 | 28 | 36 | 21.9 | Figure 1 | ● |
| BD05CA0370 | 3.70 | 6.00 | 66 | 28 | 36 | 21.8 | Figure 1 | ● |
| BD05CA0380 | 3.80 | 6.00 | 74 | 36 | 36 | 29.6 | Figure 1 | ● |
| BD05CA0390 | 3.90 | 6.00 | 74 | 36 | 36 | 29.4 | Figure 1 | ● |
| BD05CA0397 | 3.97 | 6.00 | 74 | 36 | 36 | 29.3 | Figure 1 | ○ |
| BD05CA0400 | 4.00 | 6.00 | 74 | 36 | 36 | 29.3 | Figure 1 | ● |
| BD05CA0410 | 4.10 | 6.00 | 74 | 36 | 36 | 29.1 | Figure 1 | ● |
| BD05CA0420 | 4.20 | 6.00 | 74 | 36 | 36 | 28.9 | Figure 1 | ● |
| BD05CA0430 | 4.30 | 6.00 | 74 | 36 | 36 | 28.8 | Figure 1 | ● |
| BD05CA0437 | 4.37 | 6.00 | 74 | 36 | 36 | 28.6 | Figure 1 | ○ |
| BD05CA0440 | 4.40 | 6.00 | 74 | 36 | 36 | 28.6 | Figure 1 | ● |
| BD05CA0450 | 4.50 | 6.00 | 74 | 36 | 36 | 28.4 | Figure 1 | ○ |
| BD05CA0460 | 4.60 | 6.00 | 74 | 36 | 36 | 28.3 | Figure 1 | ● |
| BD05CA0465 | 4.65 | 6.00 | 74 | 36 | 36 | 28.2 | Figure 1 | ● |
| BD05CA0470 | 4.70 | 6.00 | 74 | 36 | 36 | 28.1 | Figure 1 | ○ |
| BD05CA0476 | 4.76 | 6.00 | 82 | 44 | 36 | 36.0 | Figure 1 | ● |
| BD05CA0480 | 4.80 | 6.00 | 82 | 44 | 36 | 35.9 | Figure 1 | ○ |
| BD05CA0490 | 4.90 | 6.00 | 82 | 44 | 36 | 35.8 | Figure 1 | ● |
| BD05CA0500 | 5.00 | 6.00 | 82 | 44 | 36 | 35.6 | Figure 1 | ● |

●Standing inventory ○Make-to-order

## BD05C Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD05CA0510 | 5.10 | 6.00 | 82 | 44 | 36 | 35.4 | Figure 1 | ● |
| BD05CA0516 | 5.16 | 6.00 | 82 | 44 | 36 | 35.3 | Figure 1 | ● |
| BD05CA0520 | 5.20 | 6.00 | 82 | 44 | 36 | 35.3 | Figure 1 | ○ |
| BD05CA0530 | 5.30 | 6.00 | 82 | 44 | 36 | 35.1 | Figure 1 | ● |
| BD05CA0540 | 5.40 | 6.00 | 82 | 44 | 36 | 34.9 | Figure 1 | ● |
| BD05CA0550 | 5.50 | 6.00 | 82 | 44 | 36 | 34.7 | Figure 1 | ● |
| BD05CA0555 | 5.55 | 6.00 | 82 | 44 | 36 | 34.7 | Figure 1 | ● |
| BD05CA0560 | 5.60 | 6.00 | 82 | 44 | 36 | 34.6 | Figure 1 | ○ |
| BD05CA0570 | 5.70 | 6.00 | 82 | 44 | 36 | 34.4 | Figure 1 | ● |
| BD05CA0580 | 5.80 | 6.00 | 82 | 44 | 36 | 34.2 | Figure 1 | ● |
| BD05CA0590 | 5.90 | 6.00 | 82 | 44 | 36 | 34.1 | Figure 1 | ● |
| BD05CA0595 | 5.95 | 6.00 | 82 | 44 | 36 | 34.0 | Figure 1 | ● |
| BD05CA0600 | 6.00 | 6.00 | 82 | 44 | 36 | 33.9 | Figure 2 | ○ |
| BD05CA0610 | 6.10 | 8.00 | 91 | 53 | 36 | 42.7 | Figure 1 | ● |
| BD05CA0620 | 6.20 | 8.00 | 91 | 53 | 36 | 42.6 | Figure 1 | ● |
| BD05CA0630 | 6.30 | 8.00 | 91 | 53 | 36 | 42.4 | Figure 1 | ○ |
| BD05CA0635 | 6.35 | 8.00 | 91 | 53 | 36 | 42.3 | Figure 1 | ● |
| BD05CA0640 | 6.40 | 8.00 | 91 | 53 | 36 | 42.2 | Figure 1 | ● |
| BD05CA0650 | 6.50 | 8.00 | 91 | 53 | 36 | 42.1 | Figure 1 | ● |
| BD05CA0653 | 6.53 | 8.00 | 91 | 53 | 36 | 42.0 | Figure 1 | ● |
| BD05CA0660 | 6.60 | 8.00 | 91 | 53 | 36 | 41.9 | Figure 1 | ○ |
| BD05CA0670 | 6.70 | 8.00 | 91 | 53 | 36 | 41.7 | Figure 1 | ● |
| BD05CA0675 | 6.75 | 8.00 | 91 | 53 | 36 | 41.6 | Figure 1 | ● |
| BD05CA0680 | 6.80 | 8.00 | 91 | 53 | 36 | 41.6 | Figure 1 | ● |
| BD05CA0690 | 6.90 | 8.00 | 91 | 53 | 36 | 41.4 | Figure 1 | ● |
| BD05CA0700 | 7.00 | 8.00 | 91 | 53 | 36 | 41.2 | Figure 1 | ○ |
| BD05CA0710 | 7.10 | 8.00 | 91 | 53 | 36 | 41.1 | Figure 1 | ● |
| BD05CA0714 | 7.14 | 8.00 | 91 | 53 | 36 | 41.0 | Figure 1 | ● |
| BD05CA0720 | 7.20 | 8.00 | 91 | 53 | 36 | 40.9 | Figure 1 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## BD05C Series

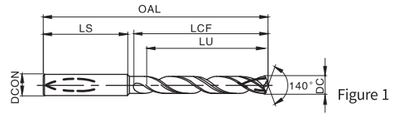



Figure 1

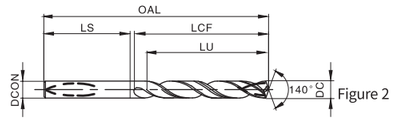



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD05CA0730 | 7.30 | 8.00 | 91 | 53 | 36 | 40.7 | Figure 1 | ● |
| BD05CA0740 | 7.40 | 8.00 | 91 | 53 | 36 | 40.6 | Figure 1 | ○ |
| BD05CA0750 | 7.50 | 8.00 | 91 | 53 | 36 | 40.4 | Figure 1 | ● |
| BD05CA0754 | 7.54 | 8.00 | 91 | 53 | 36 | 40.3 | Figure 1 | ● |
| BD05CA0760 | 7.60 | 8.00 | 91 | 53 | 36 | 40.2 | Figure 1 | ● |
| BD05CA0770 | 7.70 | 8.00 | 91 | 53 | 36 | 40.0 | Figure 1 | ○ |
| BD05CA0780 | 7.80 | 8.00 | 91 | 53 | 36 | 39.9 | Figure 1 | ● |
| BD05CA0790 | 7.90 | 8.00 | 91 | 53 | 36 | 39.7 | Figure 1 | ○ |
| BD05CA0794 | 7.94 | 8.00 | 91 | 53 | 36 | 39.6 | Figure 1 | ● |
| BD05CA0800 | 8.00 | 8.00 | 91 | 53 | 36 | 39.5 | Figure 2 | ○ |
| BD05CA0810 | 8.10 | 10.00 | 103 | 61 | 40 | 47.4 | Figure 1 | ● |
| BD05CA0820 | 8.20 | 10.00 | 103 | 61 | 40 | 47.2 | Figure 1 | ● |
| BD05CA0830 | 8.30 | 10.00 | 103 | 61 | 40 | 47.0 | Figure 1 | ● |
| BD05CA0833 | 8.33 | 10.00 | 103 | 61 | 40 | 47.0 | Figure 1 | ○ |
| BD05CA0840 | 8.40 | 10.00 | 103 | 61 | 40 | 46.9 | Figure 1 | ● |
| BD05CA0850 | 8.50 | 10.00 | 103 | 61 | 40 | 46.7 | Figure 1 | ● |
| BD05CA0860 | 8.60 | 10.00 | 103 | 61 | 40 | 46.5 | Figure 1 | ● |
| BD05CA0870 | 8.70 | 10.00 | 103 | 61 | 40 | 46.4 | Figure 1 | ● |
| BD05CA0873 | 8.73 | 10.00 | 103 | 61 | 40 | 46.3 | Figure 1 | ○ |
| BD05CA0880 | 8.80 | 10.00 | 103 | 61 | 40 | 46.2 | Figure 1 | ● |
| BD05CA0890 | 8.90 | 10.00 | 103 | 61 | 40 | 46.0 | Figure 1 | ● |
| BD05CA0900 | 9.00 | 10.00 | 103 | 61 | 40 | 45.9 | Figure 1 | ○ |
| BD05CA0910 | 9.10 | 10.00 | 103 | 61 | 40 | 45.7 | Figure 1 | ● |
| BD05CA0913 | 9.13 | 10.00 | 103 | 61 | 40 | 45.6 | Figure 1 | ● |
| BD05CA0920 | 9.20 | 10.00 | 103 | 61 | 40 | 45.5 | Figure 1 | ○ |
| BD05CA0925 | 9.25 | 10.00 | 103 | 61 | 40 | 45.4 | Figure 1 | ● |
| BD05CA0930 | 9.30 | 10.00 | 103 | 61 | 40 | 45.4 | Figure 1 | ● |
| BD05CA0940 | 9.40 | 10.00 | 103 | 61 | 40 | 45.2 | Figure 1 | ● |

●Standing inventory ○Make-to-order



## BD05C Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD05CA0950 | 9.50 | 10.00 | 103 | 61 | 40 | 45.0 | Figure 1 | ○ |
| BD05CA0952 | 9.52 | 10.00 | 103 | 61 | 40 | 45.0 | Figure 1 | ● |
| BD05CA0960 | 9.60 | 10.00 | 103 | 61 | 40 | 44.9 | Figure 1 | ○ |
| BD05CA0970 | 9.70 | 10.00 | 103 | 61 | 40 | 44.7 | Figure 1 | ● |
| BD05CA0980 | 9.80 | 10.00 | 103 | 61 | 40 | 44.5 | Figure 1 | ○ |
| BD05CA0990 | 9.90 | 10.00 | 103 | 61 | 40 | 44.3 | Figure 1 | ● |
| BD05CA0992 | 9.92 | 10.00 | 103 | 61 | 40 | 44.3 | Figure 1 | ● |
| BD05CA1000 | 10.00 | 10.00 | 103 | 61 | 40 | 44.2 | Figure 2 | ● |
| BD05CA1010 | 10.10 | 12.00 | 118 | 71 | 45 | 54.0 | Figure 1 | ○ |
| BD05CA1020 | 10.20 | 12.00 | 118 | 71 | 45 | 53.8 | Figure 1 | ○ |
| BD05CA1030 | 10.30 | 12.00 | 118 | 71 | 45 | 53.7 | Figure 1 | ● |
| BD05CA1032 | 10.32 | 12.00 | 118 | 71 | 45 | 53.6 | Figure 1 | ● |
| BD05CA1040 | 10.40 | 12.00 | 118 | 71 | 45 | 53.5 | Figure 1 | ● |
| BD05CA1050 | 10.50 | 12.00 | 118 | 71 | 45 | 53.3 | Figure 1 | ● |
| BD05CA1060 | 10.60 | 12.00 | 118 | 71 | 45 | 53.2 | Figure 1 | ○ |
| BD05CA1070 | 10.70 | 12.00 | 118 | 71 | 45 | 53.0 | Figure 1 | ● |
| BD05CA1072 | 10.72 | 12.00 | 118 | 71 | 45 | 53.0 | Figure 1 | ● |
| BD05CA1080 | 10.80 | 12.00 | 118 | 71 | 45 | 52.8 | Figure 1 | ● |
| BD05CA1090 | 10.90 | 12.00 | 118 | 71 | 45 | 52.7 | Figure 1 | ● |
| BD05CA1100 | 11.00 | 12.00 | 118 | 71 | 45 | 52.5 | Figure 1 | ○ |
| BD05CA1110 | 11.10 | 12.00 | 118 | 71 | 45 | 52.3 | Figure 1 | ● |
| BD05CA1111 | 11.11 | 12.00 | 118 | 71 | 45 | 52.3 | Figure 1 | ● |
| BD05CA1120 | 11.20 | 12.00 | 118 | 71 | 45 | 52.2 | Figure 1 | ● |
| BD05CA1130 | 11.30 | 12.00 | 118 | 71 | 45 | 52.0 | Figure 1 | ● |
| BD05CA1140 | 11.40 | 12.00 | 118 | 71 | 45 | 51.8 | Figure 1 | ○ |
| BD05CA1150 | 11.50 | 12.00 | 118 | 71 | 45 | 51.7 | Figure 1 | ● |
| BD05CA1160 | 11.60 | 12.00 | 118 | 71 | 45 | 51.5 | Figure 1 | ● |
| BD05CA1170 | 11.70 | 12.00 | 118 | 71 | 45 | 51.3 | Figure 1 | ● |
| BD05CA1180 | 11.80 | 12.00 | 118 | 71 | 45 | 51.2 | Figure 1 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## BD05C Series

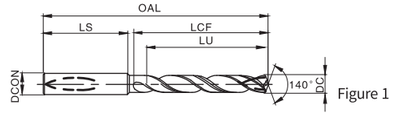



Figure 1

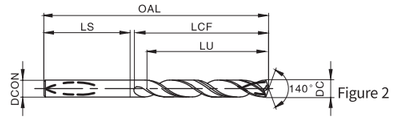



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD05CA1190 | 11.90 | 12.00 | 118 | 71 | 45 | 51.0 | Figure 1 | ● |
| BD05CA1191 | 11.91 | 12.00 | 118 | 71 | 45 | 51.0 | Figure 1 | ● |
| BD05CA1200 | 12.00 | 12.00 | 118 | 71 | 45 | 50.8 | Figure 2 | ● |
| BD05CA1210 | 12.10 | 14.00 | 124 | 77 | 45 | 56.6 | Figure 1 | ● |
| BD05CA1220 | 12.20 | 14.00 | 124 | 77 | 45 | 56.5 | Figure 1 | ● |
| BD05CA1230 | 12.30 | 14.00 | 124 | 77 | 45 | 56.3 | Figure 1 | ○ |
| BD05CA1240 | 12.40 | 14.00 | 124 | 77 | 45 | 56.1 | Figure 1 | ○ |
| BD05CA1250 | 12.50 | 14.00 | 124 | 77 | 45 | 56.0 | Figure 1 | ● |
| BD05CA1260 | 12.60 | 14.00 | 124 | 77 | 45 | 55.8 | Figure 1 | ● |
| BD05CA1270 | 12.70 | 14.00 | 124 | 77 | 45 | 55.6 | Figure 1 | ● |
| BD05CA1280 | 12.80 | 14.00 | 124 | 77 | 45 | 55.5 | Figure 1 | ● |
| BD05CA1290 | 12.90 | 14.00 | 124 | 77 | 45 | 55.3 | Figure 1 | ○ |
| BD05CA1300 | 13.00 | 14.00 | 124 | 77 | 45 | 55.1 | Figure 1 | ● |
| BD05CA1310 | 13.10 | 14.00 | 124 | 77 | 45 | 55.0 | Figure 1 | ○ |
| BD05CA1320 | 13.20 | 14.00 | 124 | 77 | 45 | 54.8 | Figure 1 | ○ |
| BD05CA1330 | 13.30 | 14.00 | 124 | 77 | 45 | 54.6 | Figure 1 | ○ |
| BD05CA1340 | 13.40 | 14.00 | 124 | 77 | 45 | 54.5 | Figure 1 | ○ |
| BD05CA1350 | 13.50 | 14.00 | 124 | 77 | 45 | 54.3 | Figure 1 | ● |
| BD05CA1370 | 13.70 | 14.00 | 124 | 77 | 45 | 54.0 | Figure 1 | ○ |
| BD05CA1380 | 13.80 | 14.00 | 124 | 77 | 45 | 53.8 | Figure 1 | ○ |
| BD05CA1390 | 13.90 | 14.00 | 124 | 77 | 45 | 53.6 | Figure 1 | ○ |
| BD05CA1400 | 14.00 | 14.00 | 124 | 77 | 45 | 53.5 | Figure 2 | ○ |
| BD05CA1410 | 14.10 | 16.00 | 133 | 83 | 48 | 59.3 | Figure 1 | ● |
| BD05CA1420 | 14.20 | 16.00 | 133 | 83 | 48 | 59.1 | Figure 1 | ○ |
| BD05CA1429 | 14.29 | 16.00 | 133 | 83 | 48 | 59.0 | Figure 1 | ○ |
| BD05CA1430 | 14.30 | 16.00 | 133 | 83 | 48 | 58.9 | Figure 1 | ○ |
| BD05CA1440 | 14.40 | 16.00 | 133 | 83 | 48 | 58.8 | Figure 1 | ○ |
| BD05CA1450 | 14.50 | 16.00 | 133 | 83 | 48 | 58.6 | Figure 1 | ● |

●Standing inventory ○Make-to-order

## BD05C Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD05CA1460 | 14.60 | 16.00 | 133 | 83 | 48 | 58.4 | Figure 1 | ○ |
| BD05CA1470 | 14.70 | 16.00 | 133 | 83 | 48 | 58.3 | Figure 1 | ○ |
| BD05CA1480 | 14.80 | 16.00 | 133 | 83 | 48 | 58.1 | Figure 1 | ○ |
| BD05CA1490 | 14.90 | 16.00 | 133 | 83 | 48 | 57.9 | Figure 1 | ○ |
| BD05CA1500 | 15.00 | 16.00 | 133 | 83 | 48 | 57.8 | Figure 1 | ○ |
| BD05CA1510 | 15.10 | 16.00 | 133 | 83 | 48 | 57.6 | Figure 1 | ● |
| BD05CA1520 | 15.20 | 16.00 | 133 | 83 | 48 | 57.4 | Figure 1 | ○ |
| BD05CA1530 | 15.30 | 16.00 | 133 | 83 | 48 | 57.3 | Figure 1 | ○ |
| BD05CA1540 | 15.40 | 16.00 | 133 | 83 | 48 | 57.1 | Figure 1 | ○ |
| BD05CA1550 | 15.50 | 16.00 | 133 | 83 | 48 | 56.9 | Figure 1 | ○ |
| BD05CA1560 | 15.60 | 16.00 | 133 | 83 | 48 | 56.8 | Figure 1 | ○ |
| BD05CA1570 | 15.70 | 16.00 | 133 | 83 | 48 | 56.6 | Figure 1 | ● |
| BD05CA1580 | 15.80 | 16.00 | 133 | 83 | 48 | 56.4 | Figure 1 | ○ |
| BD05CA1587 | 15.87 | 16.00 | 133 | 83 | 48 | 56.3 | Figure 1 | ○ |
| BD05CA1590 | 15.90 | 16.00 | 133 | 83 | 48 | 56.3 | Figure 1 | ○ |
| BD05CA1600 | 16.00 | 16.00 | 133 | 83 | 48 | 56.1 | Figure 2 | ○ |
| BD05CA1608 | 16.08 | 18.00 | 143 | 93 | 48 | 66.0 | Figure 1 | ● |
| BD05CA1650 | 16.50 | 18.00 | 143 | 93 | 48 | 65.2 | Figure 1 | ○ |
| BD05CA1667 | 16.67 | 18.00 | 143 | 93 | 48 | 65.0 | Figure 1 | ○ |
| BD05CA1670 | 16.70 | 18.00 | 143 | 93 | 48 | 64.9 | Figure 1 | ○ |
| BD05CA1690 | 16.90 | 18.00 | 143 | 93 | 48 | 64.6 | Figure 1 | ○ |
| BD05CA1700 | 17.00 | 18.00 | 143 | 93 | 48 | 64.4 | Figure 1 | ● |
| BD05CA1750 | 17.50 | 18.00 | 143 | 93 | 48 | 63.6 | Figure 1 | ○ |
| BD05CA1770 | 17.70 | 18.00 | 143 | 93 | 48 | 63.2 | Figure 1 | ○ |
| BD05CA1786 | 17.86 | 18.00 | 143 | 93 | 48 | 63.0 | Figure 1 | ○ |
| BD05CA1800 | 18.00 | 18.00 | 143 | 93 | 48 | 62.7 | Figure 2 | ○ |
| BD05CA1850 | 18.50 | 20.00 | 153 | 101 | 50 | 69.9 | Figure 1 | ○ |
| BD05CA1870 | 18.70 | 20.00 | 153 | 101 | 50 | 69.5 | Figure 1 | ○ |
| BD05CA1890 | 18.90 | 20.00 | 153 | 101 | 50 | 69.2 | Figure 1 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## BD05C Series

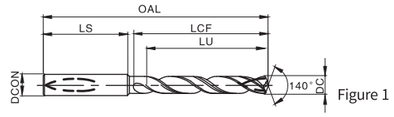



Figure 1

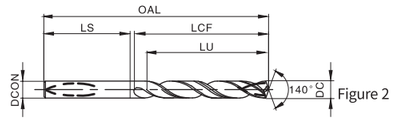



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD05CA1900 | 19.00 | 20.00 | 153 | 101 | 50 | 69.0 | Figure 1 | ● |
| BD05CA1905 | 19.05 | 20.00 | 153 | 101 | 50 | 69.0 | Figure 1 | ○ |
| BD05CA1916 | 19.16 | 20.00 | 153 | 101 | 50 | 68.8 | Figure 1 | ○ |
| BD05CA1925 | 19.25 | 20.00 | 153 | 101 | 50 | 68.6 | Figure 1 | ○ |
| BD05CA1930 | 19.30 | 20.00 | 153 | 101 | 50 | 68.5 | Figure 1 | ○ |
| BD05CA1945 | 19.45 | 20.00 | 153 | 101 | 50 | 68.3 | Figure 1 | ○ |
| BD05CA1950 | 19.50 | 20.00 | 153 | 101 | 50 | 68.2 | Figure 1 | ● |
| BD05CA1970 | 19.70 | 20.00 | 153 | 101 | 50 | 67.9 | Figure 1 | ○ |
| BD05CA1984 | 19.84 | 20.00 | 153 | 101 | 50 | 67.6 | Figure 1 | ○ |
| BD05CA2000 | 20.00 | 20.00 | 153 | 101 | 50 | 67.4 | Figure 2 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## Cutting speed recommendations - BD05C Series

| Workpiece material | | Strength ($N/mm^2$) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
|---|---|---|---|---|---|---|
| | | | | Minimum /min | Optimal /opt | Maximum /max |
| P | Carbon steel | < 600 | < 230 | 100 | 110 | 120 |
| | Alloy steel | < 1200 | < 350 | 80 | 90 | 100 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 60 | 70 | 80 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 40 | 50 | 60 |
| | Martensite stainless steel | < 820 | < 240 | 40 | 50 | 60 |
| K | Gray cast iron | – | < 280 | 180 | 200 | 220 |
| | Nodular cast iron | – | < 320 | 140 | 160 | 180 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | < 3300 | < 350 | 20 | 30 | 40 |
| | Titanium alloy | <2100 | < 400 | 30 | 40 | 50 |
| H | High hardness steel | – | < 54HRC | – | – | – |
| | High hardness steel | – | 52–60HRC | – | – | – |
| | High hardness steel | – | > 60 HRC | – | – | – |

## Recommended feed rate - BD05C Series

| Workpiece material | | Feed per revolution mm/r | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Φ2~Φ2.5 | Φ2.5~Φ3 | Φ3~Φ4 | Φ4~Φ5 | Φ5~Φ6 | Φ6~Φ8 | Φ8~Φ10 | Φ10~Φ12 | Φ12~Φ16 | Φ16~Φ20 |
| P | Carbon steel | 0.100 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 | 0.315 | 0.315 | 0.400 | 0.500 |
| | Alloy steel | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 | 0.250 | 0.250 | 0.315 | 0.400 |
| | High-alloyed steel and tool steel | 0.063 | 0.080 | 0.100 | 0.100 | 0.125 | 0.160 | 0.200 | 0.200 | 0.250 | 0.315 |
| M | Austenite and ferrite stainless steel | 0.050 | 0.063 | 0.080 | 0.080 | 0.100 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 |
| | Martensite stainless steel | 0.040 | 0.050 | 0.063 | 0.063 | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 |
| K | Gray cast iron | 0.160 | 0.160 | 0.200 | 0.250 | 0.315 | 0.315 | 0.400 | 0.500 | 0.630 | 0.630 |
| | Nodular cast iron | 0.125 | 0.160 | 0.200 | 0.200 | 0.250 | 0.315 | 0.400 | 0.400 | 0.500 | 0.630 |
| N | Non-ferrous alloy | – | – | – | – | – | – | – | – | – | – |
| | Aluminum alloy | – | – | – | – | – | – | – | – | – | – |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | 0.050 | 0.063 | 0.080 | 0.080 | 0.080 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 |
| | Titanium alloy | 0.040 | 0.050 | 0.063 | 0.063 | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 |
| H | High hardness steel | – | – | – | – | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – | – | – | – | – |

# Solid carbide drill

## BD08C Series

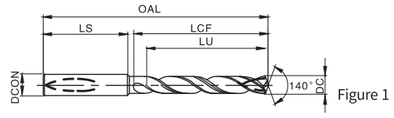



Figure 1

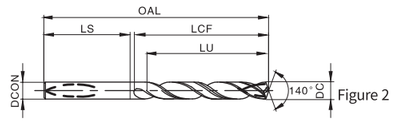



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD08CA0300 | 3.00 | 6.00 | 70 | 30 | 36 | 25.0 | Figure 1 | ● |
| BD08CA0310 | 3.10 | 6.00 | 70 | 30 | 36 | 24.8 | Figure 1 | ● |
| BD08CA0317 | 3.17 | 6.00 | 70 | 30 | 36 | 24.7 | Figure 1 | ○ |
| BD08CA0320 | 3.20 | 6.00 | 70 | 30 | 36 | 24.6 | Figure 1 | ● |
| BD08CA0325 | 3.25 | 6.00 | 70 | 30 | 36 | 24.5 | Figure 1 | ○ |
| BD08CA0330 | 3.30 | 6.00 | 70 | 30 | 36 | 24.4 | Figure 1 | ● |
| BD08CA0340 | 3.40 | 6.00 | 75 | 35.5 | 36 | 29.8 | Figure 1 | ● |
| BD08CA0350 | 3.50 | 6.00 | 75 | 35.5 | 36 | 29.6 | Figure 1 | ● |
| BD08CA0357 | 3.57 | 6.00 | 75 | 35.5 | 36 | 29.5 | Figure 1 | ○ |
| BD08CA0360 | 3.60 | 6.00 | 75 | 35.5 | 36 | 29.4 | Figure 1 | ● |
| BD08CA0370 | 3.70 | 6.00 | 75 | 35.5 | 36 | 29.3 | Figure 1 | ● |
| BD08CA0380 | 3.80 | 6.00 | 75 | 37.5 | 36 | 31.1 | Figure 1 | ● |
| BD08CA0390 | 3.90 | 6.00 | 75 | 37.5 | 36 | 30.9 | Figure 1 | ● |
| BD08CA0397 | 3.97 | 6.00 | 75 | 37.5 | 36 | 30.8 | Figure 1 | ○ |
| BD08CA0400 | 4.00 | 6.00 | 75 | 37.5 | 36 | 30.8 | Figure 1 | ● |
| BD08CA0410 | 4.10 | 6.00 | 75 | 37.5 | 36 | 30.6 | Figure 1 | ● |
| BD08CA0420 | 4.20 | 6.00 | 75 | 37.5 | 36 | 30.4 | Figure 1 | ● |
| BD08CA0430 | 4.30 | 6.00 | 85 | 45 | 36 | 37.8 | Figure 1 | ● |
| BD08CA0437 | 4.37 | 6.00 | 85 | 45 | 36 | 37.6 | Figure 1 | ○ |
| BD08CA0440 | 4.40 | 6.00 | 85 | 45 | 36 | 37.6 | Figure 1 | ● |
| BD08CA0450 | 4.50 | 6.00 | 85 | 45 | 36 | 37.4 | Figure 1 | ○ |
| BD08CA0460 | 4.60 | 6.00 | 85 | 45 | 36 | 37.3 | Figure 1 | ● |
| BD08CA0465 | 4.65 | 6.00 | 85 | 45 | 36 | 37.2 | Figure 1 | ● |
| BD08CA0470 | 4.70 | 6.00 | 85 | 45 | 36 | 37.1 | Figure 1 | ○ |
| BD08CA0476 | 4.76 | 6.00 | 90 | 50 | 36 | 42.0 | Figure 1 | ● |
| BD08CA0480 | 4.80 | 6.00 | 90 | 50 | 36 | 41.9 | Figure 1 | ○ |
| BD08CA0490 | 4.90 | 6.00 | 90 | 50 | 36 | 41.8 | Figure 1 | ● |
| BD08CA0500 | 5.00 | 6.00 | 90 | 50 | 36 | 41.6 | Figure 1 | ● |

●Standing inventory ○Make-to-order

## BD08C Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD08CA0510 | 5.10 | 6.00 | 90 | 50 | 36 | 41.4 | Figure 1 | ● |
| BD08CA0516 | 5.16 | 6.00 | 90 | 50 | 36 | 41.3 | Figure 1 | ● |
| BD08CA0520 | 5.20 | 6.00 | 90 | 50 | 36 | 41.3 | Figure 1 | ○ |
| BD08CA0530 | 5.30 | 6.00 | 90 | 50 | 36 | 41.1 | Figure 1 | ● |
| BD08CA0540 | 5.40 | 6.00 | 97 | 57 | 36 | 47.9 | Figure 1 | ● |
| BD08CA0550 | 5.50 | 6.00 | 97 | 57 | 36 | 47.7 | Figure 1 | ● |
| BD08CA0556 | 5.56 | 6.00 | 97 | 57 | 36 | 47.6 | Figure 1 | ● |
| BD08CA0570 | 5.70 | 6.00 | 97 | 57 | 36 | 47.4 | Figure 1 | ○ |
| BD08CA0580 | 5.80 | 6.00 | 97 | 57 | 36 | 47.2 | Figure 1 | ● |
| BD08CA0590 | 5.90 | 6.00 | 97 | 57 | 36 | 47.1 | Figure 1 | ● |
| BD08CA0595 | 5.95 | 6.00 | 97 | 57 | 36 | 47.0 | Figure 1 | ● |
| BD08CA0600 | 6.00 | 6.00 | 97 | 57 | 36 | 46.9 | Figure 2 | ● |
| BD08CA0620 | 6.20 | 8.00 | 106 | 66 | 36 | 55.6 | Figure 1 | ○ |
| BD08CA0630 | 6.30 | 8.00 | 106 | 66 | 36 | 55.4 | Figure 1 | ● |
| BD08CA0635 | 6.35 | 8.00 | 106 | 66 | 36 | 55.3 | Figure 1 | ● |
| BD08CA0650 | 6.50 | 8.00 | 106 | 66 | 36 | 55.1 | Figure 1 | ○ |
| BD08CA0653 | 6.53 | 8.00 | 106 | 66 | 36 | 55.0 | Figure 1 | ● |
| BD08CA0660 | 6.60 | 8.00 | 106 | 66 | 36 | 54.9 | Figure 1 | ● |
| BD08CA0670 | 6.70 | 8.00 | 106 | 66 | 36 | 54.7 | Figure 1 | ● |
| BD08CA0675 | 6.75 | 8.00 | 106 | 66 | 36 | 54.6 | Figure 1 | ● |
| BD08CA0680 | 6.80 | 8.00 | 106 | 66 | 36 | 54.6 | Figure 1 | ○ |
| BD08CA0690 | 6.90 | 8.00 | 116 | 76 | 36 | 64.4 | Figure 1 | ● |
| BD08CA0700 | 7.00 | 8.00 | 116 | 76 | 36 | 64.2 | Figure 1 | ● |
| BD08CA0710 | 7.10 | 8.00 | 116 | 76 | 36 | 64.1 | Figure 1 | ● |
| BD08CA0714 | 7.14 | 8.00 | 116 | 76 | 36 | 64.0 | Figure 1 | ● |
| BD08CA0720 | 7.20 | 8.00 | 116 | 76 | 36 | 63.9 | Figure 1 | ○ |
| BD08CA0730 | 7.30 | 8.00 | 116 | 76 | 36 | 63.7 | Figure 1 | ● |
| BD08CA0740 | 7.40 | 8.00 | 116 | 76 | 36 | 63.6 | Figure 1 | ● |
| BD08CA0750 | 7.50 | 8.00 | 116 | 76 | 36 | 63.4 | Figure 1 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## BD08C Series

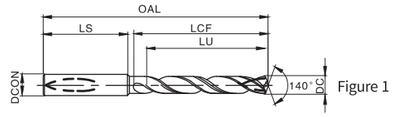



Figure 1

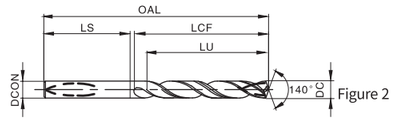



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD08CA0754 | 7.54 | 8.00 | 116 | 76 | 36 | 63.3 | Figure 1 | ● |
| BD08CA0760 | 7.60 | 8.00 | 116 | 76 | 36 | 63.2 | Figure 1 | ○ |
| BD08CA0770 | 7.70 | 8.00 | 116 | 76 | 36 | 63.0 | Figure 1 | ● |
| BD08CA0780 | 7.80 | 8.00 | 116 | 76 | 36 | 62.9 | Figure 1 | ● |
| BD08CA0794 | 7.94 | 8.00 | 116 | 76 | 36 | 62.6 | Figure 1 | ● |
| BD08CA0800 | 8.00 | 8.00 | 116 | 76 | 36 | 62.5 | Figure 2 | ○ |
| BD08CA0810 | 8.10 | 10.00 | 131 | 87 | 40 | 73.4 | Figure 1 | ● |
| BD08CA0820 | 8.20 | 10.00 | 131 | 87 | 40 | 73.2 | Figure 1 | ○ |
| BD08CA0833 | 8.33 | 10.00 | 131 | 87 | 40 | 73.0 | Figure 1 | ● |
| BD08CA0840 | 8.40 | 10.00 | 131 | 87 | 40 | 72.9 | Figure 1 | ○ |
| BD08CA0850 | 8.50 | 10.00 | 131 | 87 | 40 | 72.7 | Figure 1 | ● |
| BD08CA0860 | 8.60 | 10.00 | 131 | 87 | 40 | 72.5 | Figure 1 | ● |
| BD08CA0870 | 8.70 | 10.00 | 131 | 87 | 40 | 72.4 | Figure 1 | ● |
| BD08CA0873 | 8.73 | 10.00 | 131 | 87 | 40 | 72.3 | Figure 1 | ○ |
| BD08CA0880 | 8.80 | 10.00 | 131 | 87 | 40 | 72.2 | Figure 1 | ● |
| BD08CA0900 | 9.00 | 10.00 | 131 | 87 | 40 | 71.9 | Figure 1 | ● |
| BD08CA0910 | 9.10 | 10.00 | 139 | 95 | 40 | 79.7 | Figure 1 | ● |
| BD08CA0913 | 9.13 | 10.00 | 139 | 95 | 40 | 79.6 | Figure 1 | ● |
| BD08CA0920 | 9.20 | 10.00 | 139 | 95 | 40 | 79.5 | Figure 1 | ○ |
| BD08CA0930 | 9.30 | 10.00 | 139 | 95 | 40 | 79.4 | Figure 1 | ● |
| BD08CA0940 | 9.40 | 10.00 | 139 | 95 | 40 | 79.2 | Figure 1 | ● |
| BD08CA0950 | 9.50 | 10.00 | 139 | 95 | 40 | 79.0 | Figure 1 | ○ |
| BD08CA0952 | 9.52 | 10.00 | 139 | 95 | 40 | 79.0 | Figure 1 | ● |
| BD08CA0970 | 9.70 | 10.00 | 139 | 95 | 40 | 78.7 | Figure 1 | ● |
| BD08CA0980 | 9.80 | 10.00 | 139 | 95 | 40 | 78.5 | Figure 1 | ○ |
| BD08CA0990 | 9.90 | 10.00 | 139 | 95 | 40 | 78.3 | Figure 1 | ● |
| BD08CA0992 | 9.92 | 10.00 | 139 | 95 | 40 | 78.3 | Figure 1 | ● |
| BD08CA1000 | 10.00 | 10.00 | 139 | 95 | 40 | 78.2 | Figure 2 | ● |

●Standing inventory ○Make-to-order



## BD08C Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD08CA1020 | 10.20 | 12.00 | 155 | 106 | 45 | 88.8 | Figure 1 | ○ |
| BD08CA1030 | 10.30 | 12.00 | 155 | 106 | 45 | 88.7 | Figure 1 | ● |
| BD08CA1032 | 10.32 | 12.00 | 155 | 106 | 45 | 88.6 | Figure 1 | ○ |
| BD08CA1050 | 10.50 | 12.00 | 155 | 106 | 45 | 88.3 | Figure 1 | ● |
| BD08CA1072 | 10.72 | 12.00 | 155 | 106 | 45 | 88.0 | Figure 1 | ○ |
| BD08CA1080 | 10.80 | 12.00 | 155 | 106 | 45 | 87.8 | Figure 1 | ● |
| BD08CA1100 | 11.00 | 12.00 | 155 | 106 | 45 | 87.5 | Figure 1 | ● |
| BD08CA1111 | 11.11 | 12.00 | 155 | 106 | 45 | 87.3 | Figure 1 | ● |
| BD08CA1120 | 11.20 | 12.00 | 163 | 114 | 45 | 95.2 | Figure 1 | ○ |
| BD08CA1150 | 11.50 | 12.00 | 163 | 114 | 45 | 94.7 | Figure 1 | ○ |
| BD08CA1180 | 11.80 | 12.00 | 163 | 114 | 45 | 94.2 | Figure 1 | ● |
| BD08CA1191 | 11.91 | 12.00 | 163 | 114 | 45 | 94.0 | Figure 1 | ● |
| BD08CA1200 | 12.00 | 12.00 | 163 | 114 | 45 | 93.8 | Figure 2 | ● |
| BD08CA1210 | 12.10 | 14.00 | 182 | 133 | 45 | 112.6 | Figure 1 | ● |
| BD08CA1220 | 12.20 | 14.00 | 182 | 133 | 45 | 112.5 | Figure 1 | ○ |
| BD08CA1230 | 12.30 | 14.00 | 182 | 133 | 45 | 112.3 | Figure 1 | ● |
| BD08CA1250 | 12.50 | 14.00 | 182 | 133 | 45 | 112.0 | Figure 1 | ● |
| BD08CA1270 | 12.70 | 14.00 | 182 | 133 | 45 | 111.6 | Figure 1 | ● |
| BD08CA1300 | 13.00 | 14.00 | 182 | 133 | 45 | 111.1 | Figure 1 | ● |
| BD08CA1350 | 13.50 | 14.00 | 182 | 133 | 45 | 110.3 | Figure 1 | ○ |
| BD08CA1400 | 14.00 | 14.00 | 182 | 133 | 45 | 109.5 | Figure 2 | ● |
| BD08CA1410 | 14.10 | 16.00 | 204 | 152 | 48 | 128.3 | Figure 1 | ● |
| BD08CA1420 | 14.20 | 16.00 | 204 | 152 | 48 | 128.1 | Figure 1 | ● |
| BD08CA1429 | 14.29 | 16.00 | 204 | 152 | 48 | 128.0 | Figure 1 | ● |
| BD08CA1450 | 14.50 | 16.00 | 204 | 152 | 48 | 127.6 | Figure 1 | ○ |
| BD08CA1500 | 15.00 | 16.00 | 204 | 152 | 48 | 126.8 | Figure 1 | ● |
| BD08CA1550 | 15.50 | 16.00 | 204 | 152 | 48 | 125.9 | Figure 1 | ● |
| BD08CA1587 | 15.87 | 16.00 | 204 | 152 | 48 | 125.3 | Figure 1 | ● |
| BD08CA1600 | 16.00 | 16.00 | 204 | 152 | 48 | 125.1 | Figure 2 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## BD08C Series

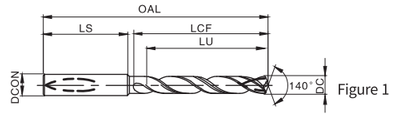



Figure 1

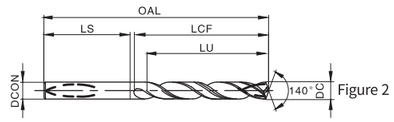



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| BD08CA1650 | 16.50 | 18.00 | 223 | 171 | 48 | 143.2 | Figure 1 | ● |
| BD08CA1667 | 16.67 | 18.00 | 223 | 171 | 48 | 143.0 | Figure 1 | ○ |
| BD08CA1700 | 17.00 | 18.00 | 223 | 171 | 48 | 142.4 | Figure 1 | ○ |
| BD08CA1750 | 17.50 | 18.00 | 223 | 171 | 48 | 141.6 | Figure 1 | ○ |
| BD08CA1800 | 18.00 | 18.00 | 223 | 171 | 48 | 140.7 | Figure 2 | ○ |
| BD08CA1850 | 18.50 | 20.00 | 244 | 190 | 50 | 158.9 | Figure 1 | ○ |
| BD08CA1900 | 19.00 | 20.00 | 244 | 190 | 50 | 158.0 | Figure 1 | ● |
| BD08CA1905 | 19.05 | 20.00 | 244 | 190 | 50 | 158.0 | Figure 1 | ○ |
| BD08CA1950 | 19.50 | 20.00 | 244 | 190 | 50 | 157.2 | Figure 1 | ○ |
| BD08CA2000 | 20.00 | 20.00 | 244 | 190 | 50 | 156.4 | Figure 2 | ● |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## Cutting speed recommendations - BD08C Series

| Workpiece material | | Strength ($N/mm^2$) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
|---|---|---|---|---|---|---|
| | | | | Minimum /min | Optimal /opt | Maximum /max |
| P | Carbon steel | < 600 | < 230 | 100 | 110 | 120 |
| | Alloy steel | < 1200 | < 350 | 80 | 90 | 100 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 60 | 70 | 80 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 40 | 50 | 60 |
| | Martensite stainless steel | < 820 | < 240 | 40 | 50 | 60 |
| K | Gray cast iron | – | < 280 | 180 | 200 | 220 |
| | Nodular cast iron | – | < 320 | 140 | 160 | 180 |
| N | Non-ferrous alloy | < 250 | < 110 | – | – | – |
| | Aluminum alloy | < 530 | < 130 | – | – | – |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | < 3300 | < 350 | 20 | 30 | 40 |
| | Titanium alloy | <2100 | < 400 | 30 | 40 | 50 |
| H | High hardness steel | – | < 54HRC | – | – | – |
| | High hardness steel | – | 52–60HRC | – | – | – |
| | High hardness steel | – | > 60 HRC | – | – | – |

## Recommended feed rate - BD08C Series

| Workpiece material | | Feed per revolution mm/r | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Φ2~Φ2.5 | Φ2.5~Φ3 | Φ3~Φ4 | Φ4~Φ5 | Φ5~Φ6 | Φ6~Φ8 | Φ8~Φ10 | Φ10~Φ12 | Φ12~Φ16 | Φ16~Φ20 |
| P | Carbon steel | 0.100 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 | 0.315 | 0.315 | 0.400 | 0.500 |
| | Alloy steel | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 | 0.250 | 0.250 | 0.315 | 0.400 |
| | High-alloyed steel and tool steel | 0.063 | 0.080 | 0.100 | 0.100 | 0.125 | 0.160 | 0.200 | 0.200 | 0.250 | 0.315 |
| M | Austenite and ferrite stainless steel | 0.050 | 0.063 | 0.080 | 0.080 | 0.100 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 |
| | Martensite stainless steel | 0.040 | 0.050 | 0.063 | 0.063 | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 |
| K | Gray cast iron | 0.160 | 0.160 | 0.200 | 0.250 | 0.315 | 0.315 | 0.400 | 0.500 | 0.630 | 0.630 |
| | Nodular cast iron | 0.125 | 0.160 | 0.200 | 0.200 | 0.250 | 0.315 | 0.400 | 0.400 | 0.500 | 0.630 |
| N | Non-ferrous alloy | – | – | – | – | – | – | – | – | – | – |
| | Aluminum alloy | – | – | – | – | – | – | – | – | – | – |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | 0.050 | 0.063 | 0.080 | 0.080 | 0.080 | 0.125 | 0.160 | 0.160 | 0.200 | 0.250 |
| | Titanium alloy | 0.040 | 0.050 | 0.063 | 0.063 | 0.080 | 0.100 | 0.125 | 0.125 | 0.160 | 0.200 |
| H | High hardness steel | – | – | – | – | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – | – | – | – | – |

# Solid carbide drill

## XD12C Series

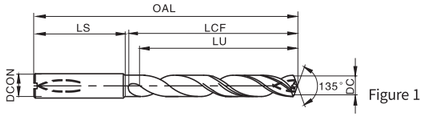


Figure 1

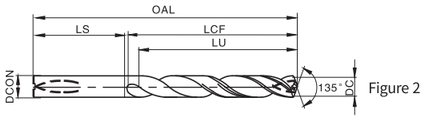


Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| XD12CA0300 | 3.00 | 6 | 90 | 50 | 36 | 40 | Figure 1 | ● |
| XD12CA0310 | 3.10 | 6 | 90 | 50 | 36 | 40 | Figure 1 | ○ |
| XD12CA0320 | 3.20 | 6 | 90 | 50 | 36 | 40 | Figure 1 | ○ |
| XD12CA0330 | 3.30 | 6 | 90 | 50 | 36 | 40 | Figure 1 | ○ |
| XD12CA0340 | 3.40 | 6 | 90 | 50 | 36 | 40 | Figure 1 | ○ |
| XD12CA0350 | 3.50 | 6 | 90 | 50 | 36 | 40 | Figure 2 | ○ |
| XD12CA0360 | 3.60 | 6 | 90 | 50 | 36 | 40 | Figure 1 | ○ |
| XD12CA0370 | 3.70 | 6 | 90 | 50 | 36 | 46 | Figure 1 | ○ |
| XD12CA0380 | 3.80 | 6 | 90 | 50 | 36 | 46 | Figure 1 | ○ |
| XD12CA0390 | 3.90 | 6 | 90 | 50 | 36 | 46 | Figure 1 | ○ |
| XD12CA0400 | 4.00 | 6 | 102 | 64 | 36 | 56 | Figure 1 | ● |
| XD12CA0410 | 4.10 | 6 | 102 | 64 | 36 | 56 | Figure 1 | ○ |
| XD12CA0420 | 4.20 | 6 | 102 | 64 | 36 | 56 | Figure 1 | ○ |
| XD12CA0430 | 4.30 | 6 | 102 | 64 | 36 | 56 | Figure 1 | ○ |
| XD12CA0440 | 4.40 | 6 | 102 | 64 | 36 | 56 | Figure 1 | ○ |
| XD12CA0450 | 4.50 | 6 | 102 | 64 | 36 | 56 | Figure 1 | ● |
| XD12CA0460 | 4.60 | 6 | 102 | 64 | 36 | 56 | Figure 1 | ○ |
| XD12CA0470 | 4.70 | 6 | 102 | 64 | 36 | 56 | Figure 1 | ○ |
| XD12CA0480 | 4.80 | 6 | 102 | 64 | 36 | 56 | Figure 1 | ○ |
| XD12CA0490 | 4.90 | 6 | 102 | 64 | 36 | 56 | Figure 1 | ○ |
| XD12CA0500 | 5.00 | 6 | 116 | 78 | 36 | 72 | Figure 1 | ● |
| XD12CA0510 | 5.10 | 6 | 116 | 78 | 36 | 72 | Figure 1 | ○ |
| XD12CA0520 | 5.20 | 6 | 116 | 78 | 36 | 72 | Figure 1 | ○ |
| XD12CA0530 | 5.30 | 6 | 116 | 78 | 36 | 72 | Figure 1 | ○ |
| XD12CA0540 | 5.40 | 6 | 116 | 78 | 36 | 72 | Figure 1 | ○ |
| XD12CA0550 | 5.50 | 6 | 116 | 78 | 36 | 72 | Figure 1 | ● |
| XD12CA0560 | 5.60 | 6 | 116 | 78 | 36 | 72 | Figure 1 | ○ |
| XD12CA0570 | 5.70 | 6 | 116 | 78 | 36 | 72 | Figure 2 | ○ |

● Standing inventory ○ Make-to-order

## XD12C Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| XD12CA0580 | 5.80 | 6 | 116 | 78 | 36 | 72 | Figure 1 | ○ |
| XD12CA0590 | 5.90 | 6 | 116 | 78 | 36 | 72 | Figure 1 | ○ |
| XD12CA0600 | 6.00 | 6 | 116 | 78 | 36 | 72 | Figure 1 | ● |
| XD12CA0610 | 6.10 | 8 | 131 | 93 | 36 | 84 | Figure 1 | ○ |
| XD12CA0620 | 6.20 | 8 | 131 | 93 | 36 | 84 | Figure 1 | ○ |
| XD12CA0630 | 6.30 | 8 | 131 | 93 | 36 | 84 | Figure 1 | ○ |
| XD12CA0640 | 6.40 | 8 | 131 | 93 | 36 | 84 | Figure 1 | ○ |
| XD12CA0650 | 6.50 | 8 | 131 | 93 | 36 | 84 | Figure 1 | ● |
| XD12CA0660 | 6.60 | 8 | 131 | 93 | 36 | 84 | Figure 1 | ○ |
| XD12CA0670 | 6.70 | 8 | 131 | 93 | 36 | 84 | Figure 1 | ○ |
| XD12CA0680 | 6.80 | 8 | 131 | 93 | 36 | 84 | Figure 1 | ○ |
| XD12CA0690 | 6.90 | 8 | 131 | 93 | 36 | 84 | Figure 1 | ○ |
| XD12CA0700 | 7.00 | 8 | 131 | 93 | 36 | 84 | Figure 2 | ● |
| XD12CA0710 | 7.10 | 8 | 146 | 108 | 36 | 96 | Figure 1 | ○ |
| XD12CA0720 | 7.20 | 8 | 146 | 108 | 36 | 96 | Figure 1 | ○ |
| XD12CA0730 | 7.30 | 8 | 146 | 108 | 36 | 96 | Figure 1 | ○ |
| XD12CA0740 | 7.40 | 8 | 146 | 108 | 36 | 96 | Figure 1 | ○ |
| XD12CA0750 | 7.50 | 8 | 146 | 108 | 36 | 96 | Figure 1 | ● |
| XD12CA0760 | 7.60 | 8 | 146 | 108 | 36 | 96 | Figure 1 | ○ |
| XD12CA0770 | 7.70 | 8 | 146 | 108 | 36 | 96 | Figure 1 | ○ |
| XD12CA0780 | 7.80 | 8 | 146 | 108 | 36 | 96 | Figure 2 | ○ |
| XD12CA0790 | 7.90 | 8 | 146 | 108 | 36 | 96 | Figure 1 | ○ |
| XD12CA0800 | 8.00 | 8 | 146 | 108 | 36 | 96 | Figure 1 | ● |
| XD12CA0810 | 8.10 | 10 | 162 | 120 | 40 | 108 | Figure 1 | ○ |
| XD12CA0820 | 8.20 | 10 | 162 | 120 | 40 | 108 | Figure 1 | ○ |
| XD12CA0830 | 8.30 | 10 | 162 | 120 | 40 | 108 | Figure 1 | ○ |
| XD12CA0840 | 8.40 | 10 | 162 | 120 | 40 | 108 | Figure 1 | ○ |
| XD12CA0850 | 8.50 | 10 | 162 | 120 | 40 | 108 | Figure 1 | ● |
| XD12CA0860 | 8.60 | 10 | 162 | 120 | 40 | 108 | Figure 2 | ○ |

● Standing inventory ○ Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## XD12C Series

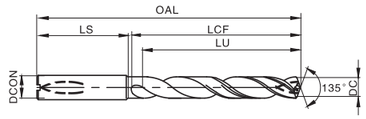



Figure 1

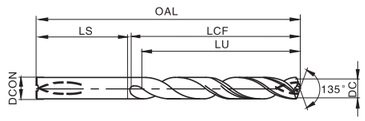



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| XD12CA0870 | 8.70 | 10 | 162 | 120 | 40 | 108 | Figure 1 | ○ |
| XD12CA0880 | 8.80 | 10 | 162 | 120 | 40 | 108 | Figure 1 | ○ |
| XD12CA0890 | 8.90 | 10 | 162 | 120 | 40 | 108 | Figure 1 | ○ |
| XD12CA0900 | 9.00 | 10 | 162 | 120 | 40 | 108 | Figure 1 | ● |
| XD12CA0910 | 9.10 | 10 | 174 | 132 | 40 | 120 | Figure 1 | ○ |
| XD12CA0920 | 9.20 | 10 | 174 | 132 | 40 | 120 | Figure 2 | ○ |
| XD12CA0930 | 9.30 | 10 | 174 | 132 | 40 | 120 | Figure 1 | ○ |
| XD12CA0940 | 9.40 | 10 | 174 | 132 | 40 | 120 | Figure 1 | ○ |
| XD12CA0950 | 9.50 | 10 | 174 | 132 | 40 | 120 | Figure 1 | ● |
| XD12CA0960 | 9.60 | 10 | 174 | 132 | 40 | 120 | Figure 1 | ○ |
| XD12CA0970 | 9.70 | 10 | 174 | 132 | 40 | 120 | Figure 1 | ○ |
| XD12CA0980 | 9.80 | 10 | 174 | 132 | 40 | 120 | Figure 1 | ○ |
| XD12CA0990 | 9.90 | 10 | 174 | 132 | 40 | 120 | Figure 1 | ○ |
| XD12CA1000 | 10.00 | 10 | 174 | 132 | 40 | 120 | Figure 1 | ● |
| XD12CA1010 | 10.10 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1020 | 10.20 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1030 | 10.30 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1040 | 10.40 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1050 | 10.50 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ● |
| XD12CA1060 | 10.60 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1070 | 10.70 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1080 | 10.80 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1090 | 10.90 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1100 | 11.00 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ● |
| XD12CA1110 | 11.10 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1120 | 11.20 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1130 | 11.30 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1140 | 11.40 | 12 | 204 | 156 | 45 | 144 | Figure 2 | ○ |

●Standing inventory ○Make-to-order



## XD12C Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| XD12CA1150 | 11.50 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ● |
| XD12CA1160 | 11.60 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1170 | 11.70 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1180 | 11.80 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1190 | 11.90 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ○ |
| XD12CA1200 | 12.00 | 12 | 204 | 156 | 45 | 144 | Figure 1 | ● |
| XD12CA1250 | 12.50 | 14 | 230 | 182 | 45 | 168 | Figure 1 | ● |
| XD12CA1270 | 12.70 | 14 | 230 | 182 | 45 | 168 | Figure 1 | ○ |
| XD12CA1280 | 12.80 | 14 | 230 | 182 | 45 | 168 | Figure 1 | ○ |
| XD12CA1300 | 13.00 | 14 | 230 | 182 | 45 | 168 | Figure 1 | ○ |
| XD12CA1350 | 13.50 | 14 | 230 | 182 | 45 | 168 | Figure 1 | ● |
| XD12CA1400 | 14.00 | 14 | 230 | 182 | 45 | 168 | Figure 1 | ● |
| XD12CA1450 | 14.50 | 16 | 260 | 208 | 48 | 194 | Figure 2 | ○ |
| XD12CA1500 | 15.00 | 16 | 260 | 208 | 48 | 194 | Figure 1 | ○ |
| XD12CA1550 | 15.50 | 16 | 260 | 208 | 48 | 194 | Figure 1 | ○ |
| XD12CA1600 | 16.00 | 16 | 260 | 208 | 48 | 194 | Figure 1 | ○ |
| XD12CA1650 | 16.50 | 18 | 286 | 234 | 48 | 218 | Figure 1 | ○ |
| XD12CA1700 | 17.00 | 18 | 286 | 234 | 48 | 218 | Figure 1 | ○ |
| XD12CA1750 | 17.50 | 18 | 286 | 234 | 48 | 218 | Figure 1 | ○ |
| XD12CA1800 | 18.00 | 18 | 286 | 234 | 48 | 218 | Figure 1 | ○ |
| XD12CA1850 | 18.50 | 20 | 310 | 258 | 48 | 240 | Figure 2 | ○ |
| XD12CA1900 | 19.00 | 20 | 310 | 258 | 48 | 240 | Figure 1 | ○ |
| XD12CA1950 | 19.50 | 20 | 310 | 258 | 48 | 240 | Figure 1 | ○ |
| XD12CA2000 | 20.00 | 20 | 310 | 258 | 48 | 240 | Figure 1 | ○ |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## Cutting speed recommendations - XD12C Series

| Workpiece material | | Strength ($N/mm^2$) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
|---|---|---|---|---|---|---|
| | | | | Minimum /min | Optimal /opt | Maximum /max |
| P | Carbon steel | < 600 | < 230 | 60 | 90 | 120 |
| | Alloy steel | < 1200 | < 350 | 60 | 80 | 120 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 50 | 70 | 80 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 40 | 60 | 80 |
| | Martensite stainless steel | < 820 | < 240 | 40 | 50 | 80 |
| K | Gray cast iron | – | < 280 | 80 | 120 | 150 |
| | Nodular cast iron | – | < 320 | 60 | 90 | 120 |
| N | Non-ferrous alloy | < 250 | < 110 | 100 | 140 | 180 |
| | Aluminum alloy | < 530 | < 130 | 100 | 140 | 180 |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | High hardness steel | – | < 54HRC | – | – | – |
| | High hardness steel | – | 52–60HRC | – | – | – |
| | High hardness steel | – | > 60 HRC | – | – | – |

## Recommended feed rate - XD12C Series

| Workpiece material | | Feed per revolution mm/r | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Φ3 | Φ4 | Φ5 | Φ6 | Φ8 | Φ10 | Φ12 | Φ14 | Φ16 | Φ18 | Φ20 |
| P | Carbon steel | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 | 0.16–0.24 | 0.18–0.28 | 0.20–0.3 | 0.22–0.32 | 0.25–0.35 |
| | Alloy steel | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 | 0.16–0.24 | 0.18–0.28 | 0.20–0.3 | 0.22–0.32 | 0.25–0.35 |
| | High-alloyed steel and tool steel | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 | 0.16–0.24 | 0.18–0.28 | 0.20–0.3 | 0.22–0.32 | 0.25–0.35 |
| M | Austenite and ferrite stainless steel | 0.03–0.07 | 0.04–0.08 | 0.05–0.1 | 0.06–0.12 | 0.08–0.16 | 0.1–0.18 | 0.12–0.2 | 0.13–0.22 | 0.14–0.25 | 0.15–0.28 | 0.16–0.3 |
| | Martensite stainless steel | 0.03–0.07 | 0.04–0.08 | 0.05–0.1 | 0.06–0.12 | 0.08–0.16 | 0.1–0.18 | 0.12–0.2 | 0.13–0.22 | 0.14–0.25 | 0.15–0.28 | 0.16–0.3 |
| K | Gray cast iron | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 | 0.16–0.24 | 0.18–0.28 | 0.20–0.30 | 0.22–0.32 | 0.25–0.35 |
| | Nodular cast iron | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 | 0.16–0.24 | 0.18–0.28 | 0.20–0.30 | 0.22–0.32 | 0.25–0.35 |
| N | Non-ferrous alloy | 0.09–0.12 | 0.1–0.15 | 0.1–0.15 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 | 0.16–0.25 | 0.18–0.28 | 0.25–0.36 | 0.28–0.38 | 0.30–0.40 |
| | Aluminum alloy | 0.09–0.12 | 0.1–0.15 | 0.1–0.15 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 | 0.16–0.25 | 0.18–0.28 | 0.25–0.36 | 0.28–0.38 | 0.30–0.40 |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | – | – | – | – | – | – | – | – | – | – | – |
| | Titanium alloy | – | – | – | – | – | – | – | – | – | – | – |
| H | High hardness steel | – | – | – | – | – | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – | – | – | – | – | – |

# Solid carbide drill

## XD20C Series

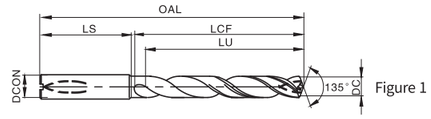



Figure 1

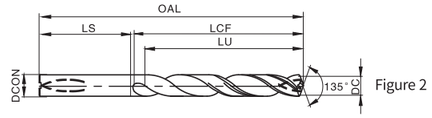



Figure 2

XD系列 | 20×D | h7 | 135° | h5

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| XD20CA0300 | 3.0 | 6 | 110 | 70 | 36 | 62 | Figure 1 | ○ |
| XD20CA0310 | 3.1 | 6 | 123 | 83 | 36 | 72 | Figure 1 | ○ |
| XD20CA0320 | 3.2 | 6 | 123 | 83 | 36 | 72 | Figure 1 | ○ |
| XD20CA0330 | 3.3 | 6 | 123 | 83 | 36 | 72 | Figure 1 | ○ |
| XD20CA0340 | 3.4 | 6 | 123 | 83 | 36 | 72 | Figure 1 | ○ |
| XD20CA0350 | 3.5 | 6 | 123 | 83 | 36 | 72 | Figure 2 | ○ |
| XD20CA0360 | 3.6 | 6 | 136 | 96 | 36 | 84 | Figure 1 | ○ |
| XD20CA0370 | 3.7 | 6 | 136 | 96 | 36 | 84 | Figure 1 | ○ |
| XD20CA0380 | 3.8 | 6 | 136 | 96 | 36 | 84 | Figure 1 | ○ |
| XD20CA0390 | 3.9 | 6 | 136 | 96 | 36 | 84 | Figure 1 | ○ |
| XD20CA0400 | 4.0 | 6 | 136 | 96 | 36 | 84 | Figure 1 | ○ |
| XD20CA0410 | 4.1 | 6 | 148 | 108 | 36 | 96 | Figure 1 | ○ |
| XD20CA0420 | 4.2 | 6 | 148 | 108 | 36 | 96 | Figure 1 | ○ |
| XD20CA0430 | 4.3 | 6 | 148 | 108 | 36 | 96 | Figure 1 | ○ |
| XD20CA0440 | 4.4 | 6 | 148 | 108 | 36 | 96 | Figure 1 | ○ |
| XD20CA0450 | 4.5 | 6 | 148 | 108 | 36 | 96 | Figure 1 | ○ |
| XD20CA0460 | 4.6 | 6 | 158 | 118 | 36 | 106 | Figure 1 | ○ |
| XD20CA0470 | 4.7 | 6 | 158 | 118 | 36 | 106 | Figure 1 | ○ |
| XD20CA0480 | 4.8 | 6 | 158 | 118 | 36 | 106 | Figure 1 | ○ |
| XD20CA0490 | 4.9 | 6 | 158 | 118 | 36 | 106 | Figure 1 | ○ |
| XD20CA0500 | 5.0 | 6 | 158 | 118 | 36 | 106 | Figure 1 | ○ |
| XD20CA0510 | 5.1 | 6 | 168 | 128 | 36 | 116 | Figure 1 | ○ |
| XD20CA0520 | 5.2 | 6 | 168 | 128 | 36 | 116 | Figure 1 | ○ |
| XD20CA0530 | 5.3 | 6 | 168 | 128 | 36 | 116 | Figure 1 | ○ |
| XD20CA0540 | 5.4 | 6 | 168 | 128 | 36 | 116 | Figure 1 | ○ |
| XD20CA0550 | 5.5 | 6 | 168 | 128 | 36 | 116 | Figure 1 | ○ |
| XD20CA0560 | 5.6 | 6 | 180 | 140 | 36 | 126 | Figure 1 | ○ |
| XD20CA0570 | 5.7 | 6 | 180 | 140 | 36 | 126 | Figure 2 | ○ |

●Standing inventory ○Make-to-order

## XD20C Series

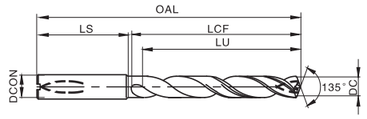



Figure 1

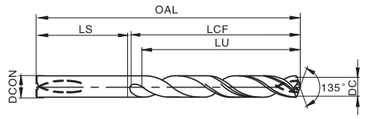



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| XD20CA0580 | 5.8 | 6 | 180 | 140 | 36 | 126 | Figure 1 | ○ |
| XD20CA0590 | 5.9 | 6 | 180 | 140 | 36 | 126 | Figure 1 | ○ |
| XD20CA0600 | 6.0 | 6 | 180 | 140 | 36 | 126 | Figure 1 | ○ |
| XD20CA0610 | 6.1 | 8 | 192 | 150 | 36 | 132 | Figure 1 | ○ |
| XD20CA0620 | 6.2 | 8 | 192 | 150 | 36 | 132 | Figure 1 | ○ |
| XD20CA0630 | 6.3 | 8 | 192 | 150 | 36 | 132 | Figure 2 | ○ |
| XD20CA0640 | 6.4 | 8 | 192 | 150 | 36 | 132 | Figure 1 | ○ |
| XD20CA0650 | 6.5 | 8 | 192 | 150 | 36 | 132 | Figure 1 | ○ |
| XD20CA0660 | 6.6 | 8 | 202 | 162 | 36 | 144 | Figure 1 | ○ |
| XD20CA0670 | 6.7 | 8 | 202 | 162 | 36 | 144 | Figure 1 | ○ |
| XD20CA0680 | 6.8 | 8 | 202 | 162 | 36 | 144 | Figure 1 | ○ |
| XD20CA0690 | 6.9 | 8 | 202 | 162 | 36 | 144 | Figure 1 | ○ |
| XD20CA0700 | 7.0 | 8 | 202 | 162 | 36 | 144 | Figure 1 | ○ |
| XD20CA0710 | 7.1 | 8 | 213 | 173 | 36 | 155 | Figure 1 | ○ |
| XD20CA0720 | 7.2 | 8 | 213 | 173 | 36 | 155 | Figure 1 | ○ |
| XD20CA0730 | 7.3 | 8 | 213 | 173 | 36 | 155 | Figure 1 | ○ |
| XD20CA0740 | 7.4 | 8 | 213 | 173 | 36 | 155 | Figure 1 | ○ |
| XD20CA0750 | 7.5 | 8 | 213 | 173 | 36 | 155 | Figure 1 | ○ |
| XD20CA0760 | 7.6 | 8 | 223 | 183 | 36 | 165 | Figure 1 | ○ |
| XD20CA0770 | 7.7 | 8 | 223 | 183 | 36 | 165 | Figure 1 | ○ |
| XD20CA0780 | 7.8 | 8 | 223 | 183 | 36 | 165 | Figure 1 | ○ |
| XD20CA0790 | 7.9 | 8 | 223 | 183 | 36 | 165 | Figure 1 | ○ |
| XD20CA0800 | 8.0 | 8 | 223 | 183 | 36 | 165 | Figure 1 | ○ |
| XD20CA0810 | 8.1 | 10 | 239 | 195 | 40 | 176 | Figure 1 | ○ |
| XD20CA0820 | 8.2 | 10 | 239 | 195 | 40 | 176 | Figure 1 | ○ |
| XD20CA0830 | 8.3 | 10 | 239 | 195 | 40 | 176 | Figure 1 | ○ |
| XD20CA0840 | 8.4 | 10 | 239 | 195 | 40 | 176 | Figure 1 | ○ |
| XD20CA0850 | 8.5 | 10 | 239 | 195 | 40 | 176 | Figure 2 | ○ |

● Standing inventory ○ Make-to-order

## XD20C Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| XD20CA0860 | 8.6 | 10 | 249 | 205 | 40 | 186 | Figure 2 | ○ |
| XD20CA0870 | 8.7 | 10 | 249 | 205 | 40 | 186 | Figure 1 | ○ |
| XD20CA0880 | 8.8 | 10 | 249 | 205 | 40 | 186 | Figure 1 | ○ |
| XD20CA0890 | 8.9 | 10 | 249 | 205 | 40 | 186 | Figure 1 | ○ |
| XD20CA0900 | 9.0 | 10 | 249 | 205 | 40 | 186 | Figure 1 | ○ |
| XD20CA0910 | 9.1 | 10 | 262 | 218 | 40 | 196 | Figure 1 | ○ |
| XD20CA0920 | 9.2 | 10 | 262 | 218 | 40 | 196 | Figure 2 | ○ |
| XD20CA0930 | 9.3 | 10 | 262 | 218 | 40 | 196 | Figure 1 | ○ |
| XD20CA0940 | 9.4 | 10 | 262 | 218 | 40 | 196 | Figure 1 | ○ |
| XD20CA0950 | 9.5 | 10 | 262 | 218 | 40 | 196 | Figure 1 | ○ |
| XD20CA0960 | 9.6 | 10 | 272 | 228 | 40 | 206 | Figure 1 | ○ |
| XD20CA0970 | 9.7 | 10 | 272 | 228 | 40 | 206 | Figure 1 | ○ |
| XD20CA0980 | 9.8 | 10 | 272 | 228 | 40 | 206 | Figure 1 | ○ |
| XD20CA0990 | 9.9 | 10 | 272 | 228 | 40 | 206 | Figure 1 | ○ |
| XD20CA1000 | 10.0 | 10 | 272 | 228 | 40 | 206 | Figure 1 | ○ |
| XD20CA1010 | 10.1 | 12 | 292 | 242 | 45 | 220 | Figure 1 | ○ |
| XD20CA1020 | 10.2 | 12 | 292 | 242 | 45 | 220 | Figure 1 | ○ |
| XD20CA1030 | 10.3 | 12 | 292 | 242 | 45 | 220 | Figure 1 | ○ |
| XD20CA1040 | 10.4 | 12 | 292 | 242 | 45 | 220 | Figure 1 | ○ |
| XD20CA1050 | 10.5 | 12 | 292 | 242 | 45 | 220 | Figure 1 | ○ |
| XD20CA1060 | 10.6 | 12 | 300 | 250 | 45 | 228 | Figure 1 | ○ |
| XD20CA1070 | 10.7 | 12 | 300 | 250 | 45 | 228 | Figure 1 | ○ |
| XD20CA1080 | 10.8 | 12 | 300 | 250 | 45 | 228 | Figure 1 | ○ |
| XD20CA1090 | 10.9 | 12 | 300 | 250 | 45 | 228 | Figure 1 | ○ |
| XD20CA1100 | 11.0 | 12 | 300 | 250 | 45 | 228 | Figure 1 | ○ |
| XD20CA1110 | 11.1 | 12 | 315 | 265 | 45 | 240 | Figure 1 | ○ |
| XD20CA1120 | 11.2 | 12 | 315 | 265 | 45 | 240 | Figure 1 | ○ |
| XD20CA1130 | 11.3 | 12 | 315 | 265 | 45 | 240 | Figure 1 | ○ |
| XD20CA1140 | 11.4 | 12 | 315 | 265 | 45 | 240 | Figure 2 | ○ |

● Standing inventory ○ Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## XD20C Series

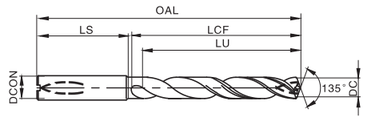



Figure 1

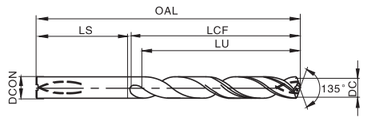



Figure 2

XD系列 | 20×D | h7 | 135° | h5

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| XD20CA1150 | 11.5 | 12 | 315 | 265 | 45 | 240 | Figure 1 | ○ |
| XD20CA1160 | 11.6 | 12 | 325 | 275 | 45 | 250 | Figure 1 | ○ |
| XD20CA1170 | 11.7 | 12 | 325 | 275 | 45 | 250 | Figure 1 | ○ |
| XD20CA1180 | 11.8 | 12 | 325 | 275 | 45 | 250 | Figure 1 | ○ |
| XD20CA1190 | 11.9 | 12 | 325 | 275 | 45 | 250 | Figure 1 | ○ |
| XD20CA1200 | 12.0 | 12 | 325 | 275 | 45 | 250 | Figure 1 | ○ |
| XD20CA1250 | 12.5 | 14 | 323 | 275 | 45 | 250 | Figure 1 | ○ |
| XD20CA1300 | 13.0 | 14 | 338 | 290 | 45 | 265 | Figure 1 | ○ |
| XD20CA1350 | 13.5 | 14 | 338 | 290 | 45 | 265 | Figure 1 | ○ |
| XD20CA1400 | 14.0 | 14 | 367 | 318 | 45 | 290 | Figure 1 | ○ |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## Cutting speed recommendations - XD20C Series

| Workpiece material | | Strength ($N/mm^2$) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
|---|---|---|---|---|---|---|
| | | | | Minimum /min | Optimal /opt | Maximum /max |
| P | Carbon steel | < 600 | < 230 | 50 | 70 | 80 |
| | Alloy steel | < 1200 | < 350 | 50 | 60 | 80 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 40 | 50 | 60 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 40 | 50 | 60 |
| | Martensite stainless steel | < 820 | < 240 | 40 | 50 | 60 |
| K | Gray cast iron | – | < 280 | 50 | 60 | 80 |
| | Nodular cast iron | – | < 320 | 60 | 70 | 80 |
| N | Non-ferrous alloy | < 250 | < 110 | 100 | 140 | 180 |
| | Aluminum alloy | < 530 | < 130 | 100 | 150 | 180 |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | High hardness steel | – | < 54HRC | – | – | – |
| | High hardness steel | – | 52–60HRC | – | – | – |
| | High hardness steel | – | > 60 HRC | – | – | – |

## Recommended feed rate - XD20C Series

| Workpiece material | | Feed per revolution mm/r | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Φ3 | Φ4 | Φ5 | Φ6 | Φ8 | Φ10 | Φ12 | Φ14 |
| P | Carbon steel | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 | 0.16–0.24 | 0.18–0.28 |
| | Alloy steel | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 | 0.16–0.24 | 0.18–0.28 |
| | High-alloyed steel and tool steel | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 | 0.16–0.24 | 0.18–0.28 |
| M | Austenite and ferrite stainless steel | 0.03–0.07 | 0.04–0.08 | 0.05–0.1 | 0.06–0.12 | 0.08–0.16 | 0.1–0.18 | 0.12–0.2 | 0.13–0.22 |
| | Martensite stainless steel | 0.03–0.07 | 0.04–0.08 | 0.05–0.1 | 0.06–0.12 | 0.08–0.16 | 0.1–0.18 | 0.12–0.2 | 0.13–0.22 |
| K | Gray cast iron | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 | 0.16–0.24 | 0.18–0.28 |
| | Nodular cast iron | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 | 0.16–0.24 | 0.18–0.28 |
| N | Non-ferrous alloy | 0.09–0.12 | 0.1–0.15 | 0.1–0.15 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 | 0.16–0.25 | 0.18–0.28 |
| | Aluminum alloy | 0.09–0.12 | 0.1–0.15 | 0.1–0.15 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 | 0.16–0.25 | 0.18–0.28 |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | – | – | – | – | – | – | – | – |
| | Titanium alloy | – | – | – | – | – | – | – | – |
| H | High hardness steel | – | – | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – | – | – |

# Solid carbide drill

## XD30C Series

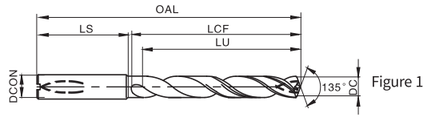



Figure 1

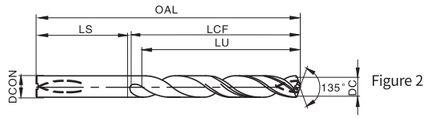



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| XD30CA0300 | 3.0 | 6 | 140 | 100 | 36 | 92 | Figure 1 | ○ |
| XD30CA0310 | 3.1 | 6 | 160 | 120 | 36 | 108 | Figure 1 | ○ |
| XD30CA0320 | 3.2 | 6 | 160 | 120 | 36 | 108 | Figure 1 | ○ |
| XD30CA0330 | 3.3 | 6 | 160 | 120 | 36 | 108 | Figure 1 | ○ |
| XD30CA0340 | 3.4 | 6 | 160 | 120 | 36 | 108 | Figure 1 | ○ |
| XD30CA0350 | 3.5 | 6 | 160 | 120 | 36 | 108 | Figure 2 | ○ |
| XD30CA0360 | 3.6 | 6 | 176 | 136 | 36 | 124 | Figure 1 | ○ |
| XD30CA0370 | 3.7 | 6 | 176 | 136 | 36 | 124 | Figure 1 | ○ |
| XD30CA0380 | 3.8 | 6 | 176 | 136 | 36 | 124 | Figure 1 | ○ |
| XD30CA0390 | 3.9 | 6 | 176 | 136 | 36 | 124 | Figure 1 | ○ |
| XD30CA0400 | 4.0 | 6 | 176 | 136 | 36 | 124 | Figure 1 | ○ |
| XD30CA0410 | 4.1 | 6 | 192 | 152 | 36 | 140 | Figure 1 | ○ |
| XD30CA0420 | 4.2 | 6 | 192 | 152 | 36 | 140 | Figure 1 | ○ |
| XD30CA0430 | 4.3 | 6 | 192 | 152 | 36 | 140 | Figure 1 | ○ |
| XD30CA0440 | 4.4 | 6 | 192 | 152 | 36 | 140 | Figure 1 | ○ |
| XD30CA0450 | 4.5 | 6 | 192 | 152 | 36 | 140 | Figure 1 | ○ |
| XD30CA0460 | 4.6 | 6 | 208 | 168 | 36 | 156 | Figure 1 | ○ |
| XD30CA0470 | 4.7 | 6 | 208 | 168 | 36 | 156 | Figure 1 | ○ |
| XD30CA0480 | 4.8 | 6 | 208 | 168 | 36 | 156 | Figure 1 | ○ |
| XD30CA0490 | 4.9 | 6 | 208 | 168 | 36 | 156 | Figure 1 | ○ |
| XD30CA0500 | 5.0 | 6 | 208 | 168 | 36 | 156 | Figure 1 | ○ |
| XD30CA0510 | 5.1 | 6 | 228 | 188 | 36 | 170 | Figure 1 | ○ |
| XD30CA0520 | 5.2 | 6 | 228 | 188 | 36 | 170 | Figure 1 | ○ |
| XD30CA0530 | 5.3 | 6 | 228 | 188 | 36 | 170 | Figure 1 | ○ |
| XD30CA0540 | 5.4 | 6 | 228 | 188 | 36 | 170 | Figure 1 | ○ |
| XD30CA0550 | 5.5 | 6 | 228 | 188 | 36 | 170 | Figure 1 | ○ |
| XD30CA0560 | 5.6 | 6 | 240 | 200 | 36 | 182 | Figure 1 | ○ |
| XD30CA0570 | 5.7 | 6 | 240 | 200 | 36 | 182 | Figure 2 | ○ |

●Standing inventory ○Make-to-order

## XD30C Series

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| XD30CA0580 | 5.8 | 6 | 240 | 200 | 36 | 182 | Figure 1 | ○ |
| XD30CA0590 | 5.9 | 6 | 240 | 200 | 36 | 182 | Figure 1 | ○ |
| XD30CA0600 | 6.0 | 6 | 240 | 200 | 36 | 182 | Figure 1 | ○ |
| XD30CA0610 | 6.1 | 8 | 260 | 220 | 36 | 202 | Figure 1 | ○ |
| XD30CA0620 | 6.2 | 8 | 260 | 220 | 36 | 202 | Figure 1 | ○ |
| XD30CA0630 | 6.3 | 8 | 260 | 220 | 36 | 202 | Figure 1 | ○ |
| XD30CA0640 | 6.4 | 8 | 260 | 220 | 36 | 202 | Figure 1 | ○ |
| XD30CA0650 | 6.5 | 8 | 260 | 220 | 36 | 202 | Figure 1 | ○ |
| XD30CA0660 | 6.6 | 8 | 272 | 232 | 36 | 214 | Figure 1 | ○ |
| XD30CA0670 | 6.7 | 8 | 272 | 232 | 36 | 214 | Figure 1 | ○ |
| XD30CA0680 | 6.8 | 8 | 272 | 232 | 36 | 214 | Figure 1 | ○ |
| XD30CA0690 | 6.9 | 8 | 272 | 232 | 36 | 214 | Figure 1 | ○ |
| XD30CA0700 | 7.0 | 8 | 272 | 232 | 36 | 214 | Figure 2 | ○ |
| XD30CA0710 | 7.1 | 8 | 290 | 250 | 36 | 232 | Figure 1 | ○ |
| XD30CA0720 | 7.2 | 8 | 290 | 250 | 36 | 232 | Figure 1 | ○ |
| XD30CA0730 | 7.3 | 8 | 290 | 250 | 36 | 232 | Figure 1 | ○ |
| XD30CA0740 | 7.4 | 8 | 290 | 250 | 36 | 232 | Figure 1 | ○ |
| XD30CA0750 | 7.5 | 8 | 290 | 250 | 36 | 232 | Figure 1 | ○ |
| XD30CA0760 | 7.6 | 8 | 305 | 265 | 36 | 246 | Figure 1 | ○ |
| XD30CA0770 | 7.7 | 8 | 305 | 265 | 36 | 246 | Figure 1 | ○ |
| XD30CA0780 | 7.8 | 8 | 305 | 265 | 36 | 246 | Figure 2 | ○ |
| XD30CA0790 | 7.9 | 8 | 305 | 265 | 36 | 246 | Figure 1 | ○ |
| XD30CA0800 | 8.0 | 8 | 305 | 265 | 36 | 246 | Figure 1 | ○ |
| XD30CA0810 | 8.1 | 10 | 330 | 285 | 40 | 265 | Figure 1 | ○ |
| XD30CA0820 | 8.2 | 10 | 330 | 285 | 40 | 265 | Figure 1 | ○ |
| XD30CA0830 | 8.3 | 10 | 330 | 285 | 40 | 265 | Figure 1 | ○ |
| XD30CA0840 | 8.4 | 10 | 330 | 285 | 40 | 265 | Figure 1 | ○ |
| XD30CA0850 | 8.5 | 10 | 330 | 285 | 40 | 265 | Figure 1 | ○ |
| XD30CA0860 | 8.6 | 10 | 340 | 295 | 40 | 275 | Figure 2 | ○ |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## XD30C Series



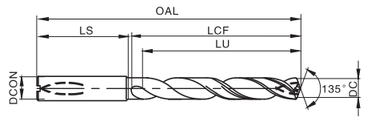



Figure 1

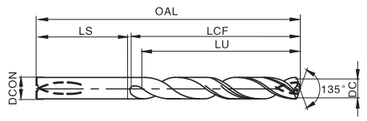



Figure 2

| Order number | Dimension (mm) | | | | | | Pattern | Inventory |
|---|---|---|---|---|---|---|---|---|
| | DC | DCON | OAL | LCF | LS | LU | | |
| XD30CA0870 | 8.7 | 10 | 340 | 295 | 40 | 275 | Figure 1 | ○ |
| XD30CA0880 | 8.8 | 10 | 340 | 295 | 40 | 275 | Figure 1 | ○ |
| XD30CA0890 | 8.9 | 10 | 340 | 295 | 40 | 275 | Figure 1 | ○ |
| XD30CA0900 | 9.0 | 10 | 340 | 295 | 40 | 275 | Figure 1 | ○ |
| XD30CA0910 | 9.1 | 10 | 360 | 315 | 40 | 292 | Figure 1 | ○ |
| XD30CA0920 | 9.2 | 10 | 360 | 315 | 40 | 292 | Figure 2 | ○ |
| XD30CA0930 | 9.3 | 10 | 360 | 315 | 40 | 292 | Figure 1 | ○ |
| XD30CA0940 | 9.4 | 10 | 360 | 315 | 40 | 292 | Figure 1 | ○ |
| XD30CA0950 | 9.5 | 10 | 360 | 315 | 40 | 292 | Figure 1 | ○ |
| XD30CA0960 | 9.6 | 10 | 372 | 328 | 40 | 305 | Figure 1 | ○ |
| XD30CA0970 | 9.7 | 10 | 372 | 328 | 40 | 305 | Figure 1 | ○ |
| XD30CA0980 | 9.8 | 10 | 372 | 328 | 40 | 305 | Figure 1 | ○ |
| XD30CA0990 | 9.9 | 10 | 372 | 328 | 40 | 305 | Figure 1 | ○ |
| XD30CA1000 | 10.0 | 10 | 372 | 328 | 40 | 305 | Figure 1 | ○ |

●Standing inventory ○Make-to-order

| P | | | M | K | N | | S | | H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon steel | Alloy steel | High-alloyed steel | Stainless steel | Cast iron | Non-ferrous alloy | Aluminum alloy | High-temp alloy | Titanium alloy | <54HRC | 54--60HRC | ⩾60HRC |
| ☀ | ☀ | ☀ | ☀ | ☼ | | | ☼ | ☼ | | | |

☀ Fit well ☼ Applicable

## Cutting speed recommendations - XD30C Series

| Workpiece material | | Strength ($N/mm^2$) | Hardness (HB/HRC) | Cutting speed (m/min) | | |
|---|---|---|---|---|---|---|
| | | | | Minimum /min | Optimal /opt | Maximum /max |
| P | Carbon steel | < 600 | < 230 | 50 | 70 | 80 |
| | Alloy steel | < 1200 | < 350 | 50 | 60 | 80 |
| | High-alloyed steel and tool steel | < 1400 | < 380 | 40 | 50 | 60 |
| M | Austenite and ferrite stainless steel | < 680 | <220 | 40 | 50 | 60 |
| | Martensite stainless steel | < 820 | < 240 | 40 | 50 | 60 |
| K | Gray cast iron | – | < 280 | 50 | 60 | 80 |
| | Nodular cast iron | – | < 320 | 60 | 70 | 80 |
| N | Non-ferrous alloy | < 250 | < 110 | 100 | 140 | 180 |
| | Aluminum alloy | < 530 | < 130 | 100 | 150 | 180 |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | < 3300 | < 350 | – | – | – |
| | Titanium alloy | <2100 | < 400 | – | – | – |
| H | High hardness steel | – | < 54HRC | – | – | – |
| | High hardness steel | – | 52–60HRC | – | – | – |
| | High hardness steel | – | > 60 HRC | – | – | – |

## Recommended feed rate - XD30C Series

| Workpiece material | | Feed per revolution mm/r | | | | | |
|---|---|---|---|---|---|---|---|
| | | Φ3 | Φ4 | Φ5 | Φ6 | Φ8 | Φ10 |
| P | Carbon steel | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 |
| | Alloy steel | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 |
| | High-alloyed steel and tool steel | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 |
| M | Austenite and ferrite stainless steel | 0.03–0.07 | 0.04–0.08 | 0.05–0.1 | 0.06–0.12 | 0.08–0.16 | 0.1–0.18 |
| | Martensite stainless steel | 0.03–0.07 | 0.04–0.08 | 0.05–0.1 | 0.06–0.12 | 0.08–0.16 | 0.1–0.18 |
| K | Gray cast iron | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 |
| | Nodular cast iron | 0.06–0.1 | 0.08–0.12 | 0.1–0.14 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 |
| N | Non-ferrous alloy | 0.09–0.12 | 0.1–0.15 | 0.1–0.15 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 |
| | Aluminum alloy | 0.09–0.12 | 0.1–0.15 | 0.1–0.15 | 0.11–0.16 | 0.13–0.19 | 0.14–0.22 |
| S | Iron-based, nickel-based and cobalt-based high-temp alloy | – | – | – | – | – | – |
| | Titanium alloy | – | – | – | – | – | – |
| H | High hardness steel | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – |
| | High hardness steel | – | – | – | – | – | – |

# Technical information of solid carbide drills

## FAQs of hole drilling

| | Phenomenon | Causes | Solutions |
|---|---|---|---|
| Hole | Oversize holes | Poor clamping<br>Large run-out around spindle | Select the holder and chuck with high precision<br>Check and adjust after clamping drill |
| | | Asymmetric point angle<br>Large run-out of the drill bit<br>Chisel edge is off center | Regrind the tool<br>Check the accuracy after regrinding |
| | Low position accuracy | Asymmetric point angle<br>Large run-out of the drill bit<br>Chisel edge is off center<br>Excessive margin abrasion | Select the holder and chuck with high precision<br>Check and adjust after clamping drill |
| | | Poor clamping<br>Large run-out around the spindle<br>Poor workpiece clamping | Select the holder and chuck with high precision<br>Check and adjust after clamping drill |
| | | Excessive feed rate | Reduce the feed rate |
| | | Insufficient supply of cutting fluid | Change the cutting fluid supply method to increase the flow rate |
| | Irregular hole size | Low re-positioning accuracy of spindle<br>Poor clamping<br>Large run-out around the spindle | Increase the re-positioning accuracy of the machine tool<br>Select the holder and chuck with high precision<br>Check and adjust after clamping drill |
| | | The machined surface is not perpendicular to the feed direction | Adjust the machined surface to be perpendicular to the feed direction |
| | | The center does not align with the axis (lathe) | Carefully adjust it before machining |
| | Poor linearity<br>Poor perpendicularity | Excessive wear of the tool | Regrind the tool |
| | | Poor accuracy of the center hole | Improve the position accuracy of the center hole |
| | | Asymmetric point angle<br>Large run-out of the drill bit<br>Chisel edge is off-center | Regrind the tool<br>Check the accuracy after regrinding |
| | | Poor rigidity of the drill bit | Improve the drill bit rigidity |
| | | Uneven workpiece surface<br>The center does not align with the axis (lathe) | Adjust the panel to be horizontal or premachine the horizontal plane with center hole |

| | Phenomenon | Causes | Solutions |
|---|---|---|---|
| Hole | Poor roundness | Asymmetric point angle<br>Large run-out of the drill bit<br>Chisel edge is off-center | Regrind the tool<br>Check the accuracy after grinding |
| | | Poor clamping<br>Large run-out around the spindle<br>Poor workpiece clamping | Select the holder and chuck with high precision<br>Check and adjust after clamping drill |
| | | Too large clearance angle | Regrind the cutting edge |
| | | Poor rigidity of the drill bit | Improve the drill bit rigidity |
| | Poor surface quality of the machined workpiece | Improper regrinding | Regrind and correct |
| | | Insufficient cutting fluid supply or mismatched model | Change the cutting fluid supply method to increase the flow rate<br>Use the cutting oil with good lubricity |
| | | Poor clamping<br>Large run-out around the spindle | Select the holder and chuck with high precision<br>Calibrating spindle |
| | | Feed rate is too high | Reduce the feed rate |
| | | Excessive wear of the cutting edge<br>Excessive build-up on margin | Regrind the cutting edge<br>Use coated drill bit |
| | | Chip jamming | Reselect a drill bit (chip-hold groove type, helical angle, etc.)<br>Reselect the machining method<br>(Adjust the feed rate, e.g. using step-by-step method) |
| | Poor cylindricity | Asymmetric point angle<br>Large run-out of the drill bit<br>Chisel edge off-center<br>Excessive abrasion on cutting edge | Regrind the tool<br>Check the accuracy after grinding |
| | | Feed rate is too low | Increase the feed rate |

# Non-standard customization of solid carbide drills

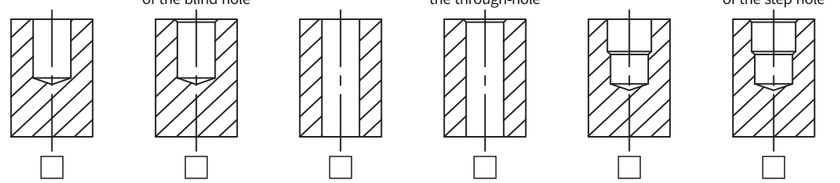
HUAREAL

**Customized tools: a good solution for process optimization and efficiency improvement**

| | |
|---|---|
| Client name:<br>Fax:<br>Tel.:<br>E-MAIL: | No.68 Chuangye 2nd RD., Lusong District, Zhuzhou, Hunan, P.R.China<br>Tel.: 0731-28216690<br>Fax: 0731-22286653<br>E-mail: zzhrhj@163.com<br>Postal code: 412000<br>Website: www.huareal.com.cn |

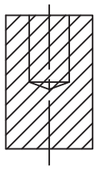
**Information of the machined hole**

Blind hole | Orifice chamfering of the blind hole | Through-hole | Orifice chamfering of the through-hole | Step hole | Orifice chamfering of the step hole



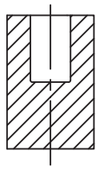
**Process condition**

☐ Solid drilling



☐ Prepared hole

Size of prepared hole:



**Workpiece information**

Workpiece material: Hardness (HRC/HB):
Hole diameter: Hole tolerance:
Hole depth: Roughness:

Sketches or drawings of machined parts will be needed if the above workpiece types cannot be described in detail.

**Tool type**

☐ Twist drill ☐ Straight fluted drill ☐ Step twist drill ☐ Step straight fluted drill ☐ Three-flute drill ☐ Others

**Shank Type**

☐ Straight shank ☐ Straight shank (DIN 6535HA) ☐ Shank with flat (DIN 6535HB) ☐ Others

**Machine Tool Information** Name: Model:

☐ Horizontal machining center ☐ Vertical machining center ☐ Drilling machine ☐ Special machine ☐ Others

Chuck type: ☐ Hydraulic pressure ☐ Thermal expansion ☐ Spring ☐ Side-pressure type ☐ Others

Cooling method: ☐ Internal cooling ☐ External cooling

| | |
|---|---|
| Sketch of Components or Machining Parts: | Current tool manufacturer:<br>Tool model:<br>Tool machining rotating speed:<br>Tool machining feed: |

Order quantity: Piece Expected delivery date: MM/ DD/ YYYY

Date: Signature:



# Non-standard customization of solid carbide reamers

HUAREAL

**Customized tools: a good solution for process optimization and efficiency improvement**

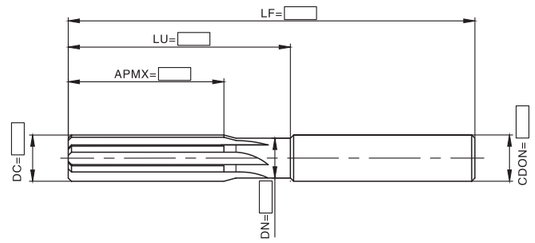
| | |
|---|---|
| Client name:<br>Fax:<br>Tel.:<br>E-MAIL: | No.68 Chuangye 2nd RD., Lusong District, Zhuzhou, Hunan, P.R.China<br>Tel.: 0731-28216690<br>Fax: 0731-22286653<br>E-mail: zzhrhj@163.com<br>Postal code: 412000<br>Website: www.huareal.com.cn |

| Information of the machined hole | Workpiece information |
|---|---|
| Shape of machined hole:<br>☐Through-hole ☐Blind hole<br>Size of machined hole (mm):<br>Tolerance of machined hole:<br>Depth of machined hole (mm) | ☐ Grey cast iron<br>☐ Ductile iron<br>☐ Aluminum alloy<br>☐ Silicoaluminum Si<10%<br>☐ Silicoaluminum Si⩾10%<br>Grade of machined material:<br>Tensile strength= N/mm²<br>Hardness (HRC/HB)= |

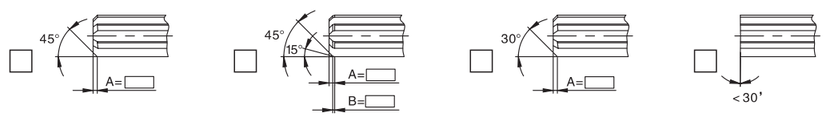
**Tool information**

| Tool rotation direction | Cooling requirements |
|---|---|
| ☐ Dextral rotation | ☐ Internal cooling |
| ☐ Straight Fluted | ☐ External cooling |
| ☐ Sinistral rotation | |

Coating: ☐ Yes ☐ No




**Cutting edge angle type**




Note:

Order quantity: Piece Expected delivery date: MM/ DD/ YYYY

Date: Signature:

# Safety standard for carbide

## 1. Safety responsibility

Before using products of Zhuzhou Huarui Precision Cutting Tools Co.,Ltd., the operators should accept necessary safety training, and carefully read the safety precautions on the product packaging. The company does not hold any legal liability for any adverse consequences caused by the failure to use and operate in accordance with the relevant requirements.

## 2. Basic features of carbide tools

Carbide tool is a mixture wet grinded by W, Co, Ti, Ta, Nb, Si, AI, C, N, O and their compounds, which will be finally formed by pressing, sintering, and a series of subsequent mechanical machining and fabrication. carbide is an ideal tool for most metal and high-strength non-metal materials machining with its high chemical stability, strength and wear resistance.

## 3. Precautions for Using Carbide Tools

1) Carbide materials are relatively brittle due to their high hardness. brittle crack and damage caused by excessive force or stress on some specific parts may cause damage to the sharp edge of carbide tools.

2) Operators should wear labor protection appliance such as protective suits and glasses to protect themselves from chips and slices inevitably produced by the sharp edge of carbide tools during cutting and machining.

3) With tungsten carbide and cobalt, etc. as main components, carbide is of high density and should be handled with care.

4) Carbide tools are stored in a dry and non-corrosive environment.

5) As the thermal expansion coefficient of carbide is different from that of steel, it is welded at an appropriate temperature to avoid welding cracks caused by stress concentration.

6) The wet cutting coolants is selected correctly for the service life of machine and cutting tools.

7) Please stop using the tools with cracks during machining.

8) Non-professionals please do not repair and grind the carbide tools with passivated edge and reduced strength caused by long-term use.

9) Please recycle and store the worn and replaced carbide tools to prevent misuse.

# Possible safety problems and protective measures in using cutting tools

| Possible Safety Problems | Protective Measures |
|---|---|
| Casualty can be caused by clothes, gloves, long hair, etc. twisting into high-speed equipment during rotary cutting. | Please do not wear gloves during rotary cutting. |
| | Please hide your long hair in the working cap. |
| | Caution to prevent clothes and other items from contacting any rotating parts. |
| Injury can be caused by attachments flying out due to the cutting tool damage caused by improper use. | Read this catalogue and the Safety Standards before using. |
| | Please wear protective glasses and protective suits. |
| Human injury can be caused by direct contact with the sharp edge of the tools. | Please wear labor protection appliances such as gloves when handling cutting tools. |
| Scratches and scalds can be caused by chips produced during cutting. | Remove chips in time by cleaning tools. |
| | Please wear protective glasses, suits and gloves. |
| Scratches are likely to be caused by defects, such as burrs, on the machined workpieces. | Do not touch defects such as burrs on any machined workpieces. |
| | Please wear protective appliances such as protective suits and gloves |
| Tool damage and machined workpiece spatter can be caused by cutting without tight clamping. | The workpieces must be clamped tightly. |
| | Please wear protective glasses, suits and gloves. |
| Injury can be caused by tools falling off and flying out due to cutting without clamping the insert or its attachments tightly. | Make sure that the inserts and other attachments have been fastened properly with appropriate tools before machining. |
| Injury can be caused by high-speed chips when cutting at high speed. | Use safety hood, protective screen, outer cover, etc. |
| | Please wear protective glasses, suits and gloves. |
| Injury can be caused by the insert or its attachments falling off and flying out due to inertial centrifugal force at high speed. | Please use the tools according to the recommended purposes. |
| | Please wear protective glasses and protective suits. |
| Scratches to hand can be caused by direct touching on the sharp edge of milling tools. | Please wear labor protection appliances such as gloves when contacting cutting tools. |
| Injury to operators can be caused by tool damage and spatter due to any dramatical increase of cutting resistance caused by excessive wear and severe impact. | Replace any worn tools in time. |
| | Please wear protective glasses and protective suits. |
| Fire and explosion can be caused by sparks and high-temperature chips produced during cutting. | Remove inflammables and explosives from the processing workshop. |
| | Prepare fire extinguishers. |
| Tool damage can be caused by intense vibration of high-speed machine tools due to the poor balance of clamps and other attachments. | Check the equipment for looseness or abnormal sound before cutting. |
| | Please wear protective glasses and protective suits. |
| Damage and spatter of inserts or tools can be caused by excessive fastening using auxiliary tools such as screw pin or pressure plate. | Do not tighten excessively by auxiliary tools such as casing. |
| Damage and scattering can be caused by shaking or vibration of the tools with eccentric rotating or poor balance when rotary machining. | Please use the tools within the restricted rotating speed range. |
| | Check the balance performance of the machine regularly. |
| Drilling with very small tools can easily cause the tool to break, splash and fail to be taken out. | Reduce the tool vibration and process at a suitable running speed. |
| | Please wear protective glasses, suits and gloves. |
| Increased wear of machine and cutting tools as well as other harms can be caused beyond the specified purposes. | Please follow the instructions and regulations. |
| Note: Incidents caused by any modification or diversion of cutting tools without the permission of our company will be at your own risk. | |



# Comparison table of cutting materials

| Country Region | Europe | Germany | UK | | Sweden | The United States | France | Italy | Spain | Japan |
|---|---|---|---|---|---|---|---|---|---|---|
| Standard | DIN EN | W.-nr | BS | EN | SS | AISI | AFNOR | UNI | UNE | JIS |
| | Non-alloyed steel | | | | | | | | | |
| P | S235JR G2 | 1.0038 | 4360 40 C | – | 1311 | A570.36 | E 24–2 Ne | – | – | STKM 12A;C |
| | S235J2 G3 | 1.0116 | 4360 40 B | – | 1312 | A573–81 65 | E 24–U | Fe37–3 | – | – |
| | C15 | 1.0401 | 080M15 | – | 1350 | 1015 | CC12 | C15C16 | F.111 | – |
| | C22 | 1.0402 | 050A20 | 2C/2D | 1450 | 1020 | CC20 | C20C21 | F.112 | – |
| | C15E | 1.1141 | 080M15 | 32C | 1370 | 1015 | XC12 | C16 | C15K | S15C |
| | C25E | 1.1158 | – | – | – | 1025 | – | – | – | S25C |
| | S380N | 1.89 | 4360 55 E | – | 2145 | A572–60 | – | FeE390KG | – | – |
| | 17MnV7 | 1.087 | 4360 55 E | – | 2142 | A572–60 | NFA 35–501 E 36 | – | – | – |
| | 55Si7 | 1.0904 | 250A53 | 45 | 2085 | 9255 | 55S7 | 55Si8 | 56Si7 | – |
| | – | – | – | – | 2090 | 9255 | 55S7 | – | – | – |
| | C35 | 1.0501 | 060A35 | – | 1550 | 1035 | CC35 | C35 | F.113 | – |
| | C45 | 1.0503 | 080M46 | – | 1650 | 1045 | CC45 | C45 | F.114 | – |
| | 40Mn4 | 1.1157 | 150M36 | 15 | – | 1039 | 35M5 | – | – | – |
| | 36MN5 | 1.1167 | – | – | 2120 | 1335 | 40M5 | – | 36Mn5 | SMn438(H) |
| | 28Mn6 | 1.117 | 150M28 | 14A | – | 1330 | 20M5 | C28Mn | – | SCMn1 |
| | C35G | 1.1183 | 060A35 | – | 1572 | 1035 | XC38TS | C36 | – | S35C |
| | C45E | 1.1191 | 080M46 | – | 1672 | 1045 | XC42 | C45 | C45K | S45C |
| | C53G | 1.1213 | 060A52 | – | 1674 | 1050 | XC48TS | C53 | – | S50C |
| | C55 | 1.0535 | 070M55 | – | 1655 | 1055 | – | C55 | – | – |
| | C55E | 1.1203 | 070M55 | – | – | 1055 | XC55 | C50 | C55K | S55C |
| | S275J2G3 | 1.0144 | 4360 43C | – | 1412 | A573–81 | E 28–3 | – | – | SM 400A;B;C |
| | S355J2G3+C2 | 1.057 | 4360 50B | – | 2132 | – | E36–3 | Fe52BFN/Fe52CFN | – | SM490A;B;C;YA;YB |
| | S355J2G3 | 1.0841 | 150 M 19 | – | 2172 | 5120 | 20 MC 5 | Fe52 | F–431 | – |
| | C60E | 1.0601 | 080A62 | 43D | – | 1060 | CC55 | C60 | – | – |
| | C60E | 1.1221 | 080A62 | 43D | 1678 | 1060 | XC60 | C60 | – | S58C |
| | C101E | 1.1274 | 060 A 96 | – | 1870 | 1095 | XC 100 | – | F–5117 | – |
| | C101u | 1.1545 | BW 1A | – | 1880 | W 1 | Y105 | C36KU | F–5118 | SK 3 |
| | C105W1 | – | BW2 | – | 2900 | W210 | Y120 | C120KU | F.515 | SUP4 |
| | S340 MGC | 1.0961 | – | – | – | 9262 | 60SC7 | 60SiCr8 | 60SiCr8 | – |
| | 11SMn30 | 1.0715 | 230M07 | – | 1912 | 1213 | S250 | CF9SMn28 | 11SMn28 | SUM22 |
| | 11SMnPb30 | 1.0718 | – | – | 1914 | 12L13 | S250Pb | CF9SMnPb28 | 11SMnPb28 | SUM22L |
| | 10SPb20 | 1.0722 | – | – | – | – | 10PbF2 | CF10SPb20 | 10SPb20 | – |
| | 11SMn37 | 1.0736 | 240M07 | 1B | – | 1215 | S 300 | CF9SMn36 | 12SMn35 | – |
| | 11SMnPb37 | 1.0737 | – | – | 1926 | 12L14 | S300Pb | CF9SMnPb36 | 12SMnP35 | – |
| | 35S20 | 1.0726 | 212M36 | 8M | 1957 | 1140 | 35MF4 | – | F210G | – |
| | GC16E | 1.1142 | 030A04 | 1A | 1325 | 1115 | – | – | – | – |
| | Low-alloyed steel | | | | | | | | | |
| | 16Mo3 | 1.5415 | 1501–240 | – | 2912 | A204Gr.A | 15D3 | 16Mo3KW | 16Mo3 | – |
| | 14Ni6 | 1.5622 | – | – | – | A350LF5 | 16N6 | 14Ni6 | 15Ni6 | – |
| | 21NiCrMo2 | 1.6523 | 805M20 | 362 | 2506 | 8620 | 20NCD2 | 20NiCrMo2 | 20NiCrMo2 | SNCM220(H) |
| | 17CrNiMo6 | 1.6587 | 820A16 | – | – | – | 18NCD6 | – | 14NiCrMo13 | – |
| | 15Cr3 | 1.7015 | 523M15 | – | – | 5015 | 12C3 | – | – | SCr415(H) |
| | 55Cr3 | 1.7176 | 527A60 | 48 | – | 5155 | 55C3 | – | – | SUP9(A) |
| | 15CrMo5 | 1.7262 | – | – | 2216 | – | 12CD4 | – | 12CrMo4 | SCM415(H) |

# Comparison table of cutting materials

| Country Region | Europe | Germany | UK | | Sweden | The United States | France | Italy | Spain | Japan |
|---|---|---|---|---|---|---|---|---|---|---|
| Standard | DIN EN | W.–nr | BS | EN | SS | AISI | AFNOR | UNI | UNE | JIS |
| | Low-alloyed steel | | | | | | | | | |
| | 13CrMo4–5 | 1.7335 | 1501–620Gr27 | – | – | A182 F11;F12 | 15CD3.5 | 14CrMo4 5 | 14CrMo45 | – |
| | | | | | | | 15CD4.5 | | | |
| | 10CrMo9 10 | 1.738 | 1501–622 Gr.31;45 | – | 2218 | A182 F.22 | 12CD9, 10 | 12CrMo9, 10 | TU.H | – |
| | 14MoV6 3 | 1.7715 | 1503–660–440 | – | – | – | – | – | 13MoCrV6 | – |
| | 50CoMo4 | 1.7228 | 823M30 | 33 | 2512 | – | – | 653M31 | – | – |
| | 14NiCr10 | 1.5732 | – | – | – | 3415 | 14NC11 | 16NiCr11 | 15NiCr11 | SNC415(H) |
| | 14NiCr14 | 1.6582 | 655M13; A12 | 36A | – | 3415;3310 | 12NC15 | – | – | SNC815(H) |
| | 16MnCr5 | 1.7131 | (527M20) | – | 2511 | 5115 | 16MC5 | 16MnCr5 | 16MnCr5 | – |
| | 34CrMo4 | 1.722 | 708A37 | 19B | 2234 | 4137;4135 | 35CD4 | 35CrMo4 | 34CrMo4 | SCM432;SCCRM3 |
| | 41CrMo4 | 1.7223 | 708M40 | 19A | 2244 | 4140;4142 | 42CD4TS | 41CrMo4 | 42CrMo4 | SCM 440 |
| | 42CrMo4 | 1.7225 | 708M40 | 19A | 2244 | 4140 | 42CD4 | 42CrMo4 | 42CrMo4 | SCM440(H) |
| | 14NiCrMo134 | 1.6657 | 832M13 | 36C | – | – | – | 15NiCrMo13 | 14NiCrMo131 | – |
| | 31CrMo12 | 1.8515 | 722 M 24 | – | 2240 | – | 30 CD 12 | 30CrMo12 | F–1712 | – |
| | 39CrMoV13 9 | 1.8523 | 897M39 | 40C | – | – | – | 36CrMoV12 | – | – |
| | 41CrS4 | 1.7039 | 524A14 | – | 2092 | L1 | – | 105WCR 5 | – | – |
| | 50NiCr13 | 1.2721 | – | – | 2550 | L6 | 55NCV6 | – | F–528 | – |
| | 45WCrV7 | 1.2542 | BS1 | – | 2710 | S1 | – | 45WCrV8KU | 45WCrSi8 | – |
| | 36CrNiMo4 | 1.6511 | 816M40 | 110 | – | 9840 | 40NCD3 | 38NiCrMo4(KB) | 35NiCrMo4 | – |
| | 34CrNiMo6 | 1.3505 | 817M40 | 24 | 2541 | 4340 | 35NCD6 | 35NiCrMo6(KB) | – | – |
| | 34Cr4 | 1.7033 | 530A32 | 18B | – | 5132 | 32C4 | 34Cr4(KB) | 35Cr4 | SCr430(H) |
| | 41Cr4 | 1.7035 | 530A40 | 18 | – | 5140 | 42C4 | 41Cr4 | 42Cr4 | SCr440(H) |
| | 32CrMo12 | 1.7361 | 722M24 | 40B | 2240 | – | 30CD12 | 32CrMo12 | F.124.A | – |
| P | 51CrV4 | 1.8159 | 735A50 | 47 | 2230 | 6150 | 50CV4 | 50CrV4 | 51CrV4 | SUP10 |
| | 41CrAlMo7 | 1.8509 | 905M39 | 41B | 2940 | – | 40CAD6, 12 | 41CrAlMo7 | 41CrAlMo7 | – |
| | 100Cr6 | 1.5752 | 534A99 | 31 | 2258 | 52100 | 100C6 | 100Cr6 | F.131 | SUJ2 |
| | | | | | | | | | | |
| | 105WCr6 | 1.2419 | – | – | 2140 | – | 105WC13 | 10WCr6 | 105WCr5 | SKS31 |
| | – | – | – | – | – | – | – | 107WCr5KU | – | SKS2, SKS3 |
| | – | 1.2714 | – | – | – | L6 | 55NCDV7 | – | F.520.S | SKT4 |
| | 100Cr6 | 1.2067 | BL3 | – | – | L3 | Y100C6 | – | 100Cr6 | – |
| | 16MnCr5 | 1.7139 | – | – | 2127 | – | – | – | – | – |
| | 16Mo5 | 1.5423 | 1503–245–420 | – | – | 4520 | – | 16Mo5 | 16Mo5 | – |
| | 40NiCrMo8–4 | 1.6562 | 311–Type 7 | – | – | 8740 | – | 40NiCrMo2(KB) | 40NiCrMo2 | SNCM240 |
| | 42Cr4 | 1.7045 | – | – | 2245 | 5140 | – | – | 42Cr4 | SCr440 |
| | 31NiCrMo14 | 1.5755 | 830 M 31 | – | 2534 | – | – | – | F–1270 | – |
| | 36NiCr6 | 1.571 | 640A35 | 111A | – | 3135 | 35NC6 | – | – | SNC236 |
| | 22Mo4 | 1.5419 | 605A32 | – | 2108 | 8620 | – | – | F520.S | – |
| | 25CrMo4 | 1.7218 | 1717CDS110 | – | 2225 | 4130 | 25CD4 | 25CrMo4(KB) | AM26CrMo4 | SCM420;SCM430 |
| | – | – | – | – | 2223 | – | – | – | – | – |
| | 高合金钢 | | | | | | | | | |
| | X210Cr12 | 1.208 | BD3 | – | – | D3 | Z200C12 | X210Cr13KU | X210Cr12 | SKD1 |
| | | | | | | | | X250Cr12KU | | |
| | X43Cr13 | 1.2083 | – | – | 2314 | – | – | – | – | – |
| | X40CrMoV5 1 | 1.2344 | BH13 | – | 2242 | H13 | Z40CDV5 | X35CrMoV05KU | X40CrMoV5 | SKD61 |

| Country Region | Europe | Germany | UK | | Sweden | The United States | France | Italy | Spain | Japan |
|---|---|---|---|---|---|---|---|---|---|---|
| Standard | DIN EN | W.-nr | BS | EN | SS | AISI | AFNOR | UNI | UNE | JIS |
| | Low-alloyed steel | | | | | | | | | |
| | | | | | | | | X40CrMoV511KU | | |
| | X100CrMoV5 1 | 1.2363 | BA2 | – | 2260 | A2 | Z100CDV5 | X100CrMoV51KU | X100CrMoV5 | SKD12 |
| | X210CrW12 | 1.2436 | – | – | 2312 | – | – | X215CrW12 1KU | X210CrW12 | SKD2 |
| | X30WCrV9 3 | 1.2581 | BH21 | – | – | H21 | Z30WCV9 | X28W09KU | X30WCrV9 | SKD5 |
| | | | | | | | | X30WCrV9 3KU | | |
| | X165CrMoV 12 | 1.2601 | – | – | 2310 | – | – | X165CrMoW12KU | X160CrMoV12 | – |
| | X155CrMoV12–1 | 1.2379 | – | – | 2736 | HNV3 | – | – | – | – |
| | X8Ni9 | 1.5662 | 1501–509;510 | – | – | ASTM A353 | – | X10Ni9 | XBNi09 | – |
| | 12Ni19 | 1.568 | – | – | – | 2515 | Z18N5 | – | – | – |
| | S6–5–2 | 1.3343 | 4959BA2 | – | 2715 | D3 | Z40CSD10 | 15NiCrMo13 | – | SUH3 |
| | – | – | BM 2 | – | 2722 | M 2 | Z85WDCV | HS 6–5–2–2 | F–5603. | SKH 51 |
| | HS 6–5–2–5 | 1.3243 | BM 35 | – | 2723 | M 35 | 6–5–2–5 | HS 6–5–2–5 | F–5613 | SKH 55 |
| | HS 2–9–2 | 1.3348 | – | – | 2782 | M 7 | – | HS 2–9–2 | F–5607 | – |
| | G–X120Mn12 | 1.3401 | Z120M12 | – | 2183 | L3 | Z120M12 | XG120Mn12 | X120Mn12 | SCMnH/1 |
| | Ferrite/martensite stainless steel | | | | | | | | | |
| P | X10CrAL13 | 1.4724 | 403S17 | – | – | 405 | Z10C13 | X10CrAl12 | F.311 | SUS405 |
| | X10CrAL18 | 1.4742 | 430S15 | 60 | – | 430 | Z10CAS18 | X8Cr17 | F.3113 | SUS430 |
| | X10CrAL2–4 | 1.4762 | – | – | 2322 | 446 | Z10CAS24 | X16Cr26 | – | SUH446 |
| | X1CrMoTi18–2 | 1.4521 | – | – | 2326 | S44400 | – | – | – | – |
| | X6Cr13 | 1.4 | 403S17 | – | 2301 | 403 | Z6C13 | X6Cr13 | F.3110 | SUS403 |
| | X7Cr14 | 1.4001 | – | – | – | – | – | – | F.8401 | – |
| | X10Cr13 | 1.4006 | 410S21 | 56A | 2302 | 410 | Z10C14 | X12Cr13 | F.3401 | SUS410 |
| | X6Cr17 | 1.4016 | 430S15 | 960 | 2320 | 430 | Z8C17 | X8Cr17 | F3113 | SUS430 |
| | X6CrAL13 | 1.4002 | 405S17 | – | – | 405 | Z8CA12 | X6CrAl13 | – | – |
| | X20Cr13 | 1.4021 | 420S37 | – | 2303 | 420 | Z20C13 | X20Cr13 | – | – |
| | X6CrMo17–1 | 1.4113 | 434S17 | – | 2325 | 434 | Z8CD17.01 | X8CrMo17 | – | SUS434 |
| | X45CrS9–3–1 | 1.4718 | 401S45 | 52 | – | HW3 | Z45CS9 | X45GrSi8 | F322 | SUH1 |
| | X85CrMoV18–2 | 1.4748 | 443S65 | 59 | – | HNV6 | Z80CSN20.02 | X80CrSiNi20 | F.320B | SUH4 |
| | X20CrMoV12–1 | 1.4922 | – | – | 2317 | – | – | X20CrMoNi 12 01 | – | – |
| | X12CrS13 | 1.4005 | 416 S 21 | – | 2380 | 416 | Z11CF1 | X12 CrS 13 | F–3411 | SUS 416 |
| | X46Cr13 | 1.4034 | 420S45 | 56D | 2304 | – | Z40CM | X40Cr14 | F.3405 | SUS420J2 |
| | X19CrNi17–2 | 1.4057 | 431S29 | 57 | 2321 | 431 | Z15CNi6.02 | X16CrNi16 | F.3427 | SUS431 |
| | X5CrNiCuNb16–4 X4 | 1.4542 1.4548 | – | – | – | 630 | Z7CNU17–04 | – | – | – |
| | CrNiMo16–5 | 1.4418 | – | – | 2387 | – | Z6CND16–04–01 | – | – | – |
| | X14CrMoS17 | 1.4104 | – | – | 2383 | 430F | Z10CF17 | X10CrS17 | F.3117 | SUS430F |

# Comparison table of cutting materials

| Country Region | Europe | | Germany | UK | | Sweden | The United States | France | Italy | Spain | Japan |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Standard | DIN | EN | W.-nr | BS | EN | SS | AISI | AFNOR | UNI | UNE | JIS |
| | Austenite stainless steel | | | | | | | | | | |
| | X3CrNiMo13–4 | | 1.4313 | 425C11 | – | 2385 | CA6–NM | Z4CND13.4M | (G)X6CrNi304 | – | SCS5 |
| | | | | | | | | Z38C13M | | | |
| | X53CrMnNiN21–9 | | 1.4871 | 349S54 | – | – | EV8 | Z52CMN21.09 | X53CrMnNiN21 9 | – | SUH35, SUH36 |
| | X2CrNiN18–10 | | 1.4311 | 304S62 | – | 2371 | 304LN | Z2CN18.10 | – | – | SUS304LN |
| | X2CrNiMoN17–13–3 | | 1.4429 | – | – | 2375 | 316LN | Z2CND17.13 | – | – | SUS316LN |
| | X2CrNiMo17–12–2 | | 1.4435 | 316S13 | – | 2348 | 316L | Z2CND17–12 | X2CrNiMo1712 | – | – |
| | X2CrNiMo18–14–3 | | 1.4404 | 316S13 | – | 2353 | 316L | Z2CND17.12 | X2CrNiMo17 12 | – | SCS16, SUS316L |
| | X3CrNiMo17–3–3 | | 1.4436 | 316S33 | – | 2343 2347 | 316 | Z6CND18–12–03 | X8CrNiMo1713 | – | – |
| | X2CrNiMo18–15–4 | | 1.4438 | 317S12 | – | 2367 | 317L | Z2CND19.15 | X2CrNiMo18 16 | – | SUS317L |
| | X6CrNiNb18–10 | | 1.455 | 347S17 | 58F | 2338 | 347 | Z6CNNb18.10 | X6CrNiNb18 11 | F.3552 F.3524 | SUS347 |
| | X6CrNiMoTi17–12–2 | | 1.4571 | 320S17 | 58J | 2350 | 316Ti | Z6NDT17.12 | X6CrNiMoTi17 12 | F.3535 | – |
| | X10CrNiMoNb 18–12 | | 1.4583 | – | – | – | 318 | Z6CNDNb17 13B | X6CrNiMoNb17 13 | – | – |
| | X15CrNiSi20–12 | | 1.4828 | 309S24 | – | – | 309 | Z15CNS20.12 | – | – | SUS303 |
| | X2CrNiMoN17–11–2 | | 1.4406 | 301S21 | 58C | 2370 | 308 | Z1NCDU25.20 | – | F.8414 | SCS17 |
| | X1CrNiMoCuN20–18–7 | | 1.4547 | – | – | 2378 | S31254 | Z1CNDU20–18–06AZ | – | – | – |
| | X9CrNi18–8 | | 1.431 | – | – | 2331 | 301 | Z12CN17.07 | X12CrNi17 07 | F.3517 | SUS301 |
| M | X7CrNiAL17–7 | | 1.4568 1.4504 | 316S111 | – | – | 17–7PH | Z8CNA17–07 | X2CrNiMo1712 | – | – |
| | X2CrNi19–11 | | 1.4306 | 304S11 | – | 2352 | 304L | Z2CN18–10 | X2CrNi18 11 | – | – |
| | | | | 304S12 | | | | | | | |
| | – | | – | 304S31 | 58E | 2332 2333 | 304 | Z6CN18.09 | X5CrNi18 10 | F.3504 F.3541 | SUS304 |
| | X5CrNi18–10 | | 1.4301 | 304S15 | 58E | 2332 | 304 | Z6CN18.09 | X5CrNi18 10 | F.3551 | SUS304 |
| | X5CrNiMo17–2–2 | | 1.4401 | 316S16 | 58J | 2347 | 316 | Z6CND17.11 | X5CrNiMo17 12 | F.3543 | SUS316 |
| | X6CrNiTi18–10 | | 1.4541 | 321S12 | 58B | 2337 | 321 | Z6CNT18.10 | X10CrNiS 18.09 | F.3553 F.3523 | SUS321 |
| | X8CrNiS18–9 | | 1.4305 | 303S21 | 58M | 2346 | 303 | Z10CNF 18.09 | X6CrNiTi18 11 | F.3508 | SUS303 |
| | High quality austenite (Ni>20%) stainless steel | | | | | | | | | | |
| | G–X40NiCrSi36–18 | | 1.4865 | 330C11 | – | – | – | – | XG50NiCr39 19 | – | SCH15 |
| | X1NiCrMoCu25–20–5 | | 1.4539 | – | – | 2562 | UNS V 0890A | Z2 NCDU25–20 | – | – | – |
| | X8CrNi25–21 | | 1.4845 | 310S24 | – | 2361 | 310S | Z12CN25 20 | X6CrNi25 20 | F.331 | SUH310 |
| | X12NiCrSi36 16 | | 1.4864 | – | – | – | 330 | Z12NCS35.16 | F–3313 | – | SUH330 |
| | X1NiCrMoCu31–27–4 | | 1.4563 | – | – | 2584 | NO8028 | Z1NCDU31–27–03 | – | – | – |
| | Duplex (austenite/ferrite) stainless steel | | | | | | | | | | |
| | X2CrNiN23–4 | | 1.4362 | – | – | 2376 | S31500 | – | – | – | – |
| | X8CrNiMo27–5 | | – | – | – | 2324 | S32900 | – | – | – | – |
| | X2CrNiN23–4 | | – | – | – | 2327 | S32304 | Z2CN23–04AZ | – | – | – |
| | – | | – | – | – | 2328 | – | – | – | – | – |
| | X2CrNiMoN22–53 | | – | – | – | 2377 | S31803 | Z2CND22–05–03 | – | – | – |

# Comparison table of hardness

- Conversion value approximate to brinell hardness of steel

| Brinell hardness 3000kgf HB | Rockwell hardness A Scale 60kgf brale Brale HRA | Rockwell hardness B Scale 100kgf 1/10in Ball HRB | Rockwell hardness C Scale 150kgf brale Brale HRC | Rockwell hardness D Scale 100kgf brale Brale HRD | Vickers hardness 50kgf HV | Shore hardness HS | Tensile strength (Gpa) |
|---|---|---|---|---|---|---|---|
| — | 85.6 | — | 68.0 | 76.9 | 940 | 97 | — |
| — | 85.3 | — | 67.5 | 76.5 | 920 | 96 | — |
| — | 85.0 | — | 67.0 | 76.1 | 900 | 95 | — |
| 767 | 84.7 | — | 66.4 | 75.7 | 880 | 93 | — |
| 757 | 84.4 | — | 65.9 | 75.3 | 860 | 92 | — |
| 745 | 84.1 | — | 65.3 | 74.8 | 840 | 91 | — |
| 733 | 83.8 | — | 64.7 | 74.3 | 820 | 90 | — |
| 722 | 83.4 | — | 64.0 | 73.8 | 800 | 88 | — |
| 712 | — | — | — | — | — | — | — |
| 710 | 83.0 | — | 63.3 | 73.3 | 780 | 87 | — |
| 698 | 82.6 | — | 62.5 | 72.6 | 760 | 86 | — |
| 684 | 82.2 | — | 61.8 | 72.1 | 740 | | — |
| 682 | 82.2 | — | 61.7 | 72.0 | 737 | 84 | — |
| 670 | 81.8 | — | 61.0 | 71.5 | 720 | 83 | — |
| 656 | 81.3 | — | 60.1 | 70.8 | 700 | — | — |
| 653 | 81.2 | — | 60.0 | 70.7 | 697 | 81 | — |
| 647 | 81.1 | — | 59.7 | 70.5 | 690 | — | — |
| 638 | 80.8 | — | 59.2 | 70.1 | 680 | 80 | — |
| 630 | 80.6 | — | 58.8 | 69.8 | 670 | — | — |
| 627 | 80.5 | — | 58.7 | 69.7 | 667 | 79 | — |
| 601 | 79.8 | — | 57.3 | 68.7 | 640 | 77 | — |
| 578 | 79.1 | — | 56.0 | 67.7 | 615 | 75 | — |
| 555 | 78.4 | — | 54.7 | 66.7 | 591 | 73 | 2.06 |
| 534 | 77.8 | — | 53.5 | 65.8 | 569 | 71 | 1.98 |
| 514 | 76.9 | — | 52.1 | 64.7 | 547 | 70 | 1.89 |
| 495 | 76.3 | — | 51.0 | 63.8 | 528 | 68 | 1.82 |
| 477 | 75.6 | — | 49.6 | 62.7 | 508 | 66 | 1.73 |
| 461 | 74.9 | — | 48.5 | 61.7 | 491 | 65 | 1.67 |
| 444 | 74.2 | — | 47.1 | 60.8 | 472 | 63 | 1.59 |
| 429 | 73.4 | — | 45.7 | 59.7 | 455 | 61 | 1.51 |
| 415 | 72.8 | — | 44.5 | 58.8 | 440 | 59 | 1.46 |
| 401 | 72.0 | — | 43.1 | 57.8 | 425 | 58 | 1.39 |
| 388 | 71.4 | — | 41.8 | 56.8 | 410 | 56 | 1.33 |
| 375 | 70.6 | — | 40.4 | 55.7 | 396 | 54 | 1.26 |
| 363 | 70.0 | — | 39.1 | 54.6 | 383 | 52 | 1.22 |
| 352 | 69.3 | (110.0) | 37.9 | 53.8 | 372 | 51 | 1.18 |
| 341 | 68.7 | (109.0) | 36.6 | 52.8 | 360 | 50 | 1.13 |
| 331 | 68.1 | (108.5) | 35.5 | 51.9 | 350 | 48 | 1.10 |

# Comparison table of hardness

- Conversion value approximate to brinell hardness of steel

| Brinell hardness 3000kgf HB | Rockwell hardness A Scale 60kgf brale Brale HRA | Rockwell hardness B Scale 100kgf 1/10in Ball HRB | Rockwell hardness C Scale 150kgf brale Brale HRC | Rockwell hardness D Scale 100kgf brale Brale HRD | Vickers hardness 50kgf HV | Shore hardness HS | Tensile strength (Gpa) |
|---|---|---|---|---|---|---|---|
| 321 | 67.5 | (108.0) | 34.3 | 50.1 | 339 | 47 | 1.06 |
| 311 | 66.9 | (107.5) | 33.1 | 50.0 | 328 | 46 | 1.03 |
| 302 | 66.3 | (107.0) | 32.1 | 49.3 | 319 | 45 | 1.01 |
| 293 | 65.7 | (106.0) | 30.8 | 48.3 | 309 | 43 | 0.97 |
| 285 | 65.3 | (105.5) | 29.9 | 47.6 | 301 | — | 0.95 |
| 277 | 64.6 | (104.5) | 28.8 | 46.7 | 292 | 41 | 0.92 |
| 269 | 64.1 | (104.0) | 27.6 | 45.9 | 284 | 40 | 0.89 |
| 262 | 63.6 | (103.0) | 26.6 | 45.0 | 276 | 39 | 0.87 |
| 255 | 63.0 | (102.0) | 25.4 | 44.2 | 269 | 38 | 0.84 |
| 248 | 62.5 | (101.0) | 24.2 | 43.2 | 261 | 37 | 0.82 |
| 241 | 61.8 | (100.0) | 22.8 | 42.0 | 253 | 36 | 0.80 |
| 235 | 61.4 | 99.0 | 21.7 | 41.4 | 247 | 35 | 0.78 |
| 229 | 60.8 | 98.2 | 20.5 | 40.5 | 241 | 34 | 0.76 |
| 223 | — | 97.3 | (18.8) | — | 234 | — | — |
| 217 | — | 96.4 | (17.5) | — | 228 | 33 | 0.73 |
| 212 | — | 95.5 | (16.0) | — | 222 | — | 0.71 |
| 207 | — | 94.6 | (15.2) | — | 218 | 32 | 0.69 |
| 201 | — | 93.8 | (13.8) | — | 212 | 31 | 0.68 |
| 197 | — | 92.8 | (12.7) | — | 207 | 30 | 0.66 |
| 192 | — | 91.9 | (11.5) | — | 202 | 29 | 0.64 |
| 187 | — | 90.7 | (10.0) | — | 196 | — | 0.62 |
| 183 | — | 90.0 | (9.0) | — | 192 | 28 | 0.62 |
| 179 | — | 89.0 | (8.0) | — | 188 | 27 | 0.60 |
| 174 | — | 87.8 | (6.4) | — | 182 | — | 0.59 |
| 170 | — | 86.8 | (5.4) | — | 178 | 26 | 0.57 |
| 167 | — | 86.0 | (4.4) | — | 175 | — | 0.56 |
| 163 | — | 85.0 | (3.3) | — | 171 | 25 | 0.55 |
| 156 | — | 82.9 | (0.9) | — | 163 | — | 0.52 |
| 149 | — | 80.8 | — | — | 156 | 23 | 0.50 |
| 143 | — | 78.7 | — | — | 150 | 22 | 0.49 |
| 137 | — | 76.4 | — | — | 143 | 21 | 0.46 |
| 131 | — | 74.0 | — | — | 137 | — | 0.45 |
| 126 | — | 72.0 | — | — | 132 | 20 | 0.43 |
| 121 | — | 69.8 | — | — | 127 | 19 | 0.41 |
| 116 | — | 67.6 | — | — | 122 | 18 | 0.40 |
| 111 | — | 65.7 | — | — | 117 | 15 | 0.38 |

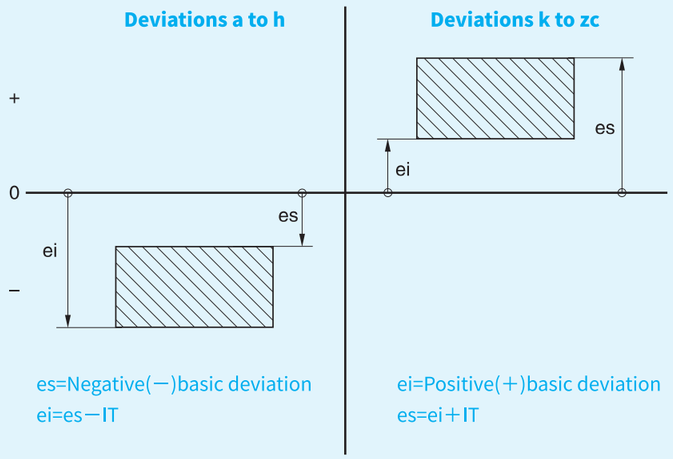
1) Generally value in ( ) is not used in the table.
2) Brales of Rockwell hardness A, C and D are made of diamond.
3) This table is excerpted from the JIS Steel Standard (1980).

## Fit dimension tolerance

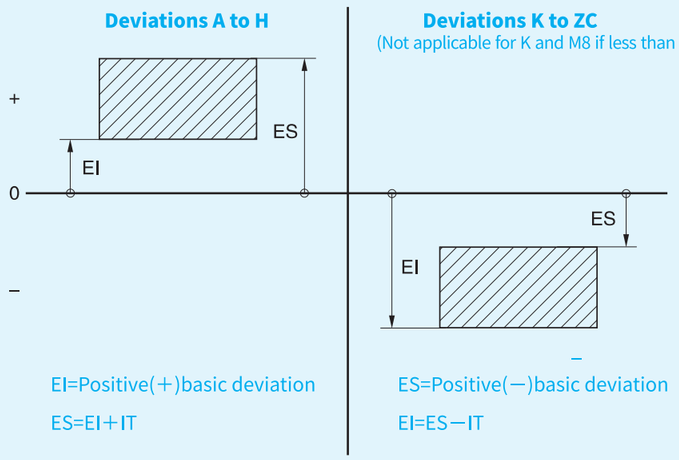
| Basic dimension mm | | Standard tolerance class | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | IT1 | IT2 | IT3 | IT4 | IT5 | IT6 | IT7 | IT8 | IT9 | IT10 | IT11 | IT12 | IT13 | IT14 | IT15 | IT16 | IT17 | IT18 |
| > | To | μ m | | | | | | | | | | | mm | | | | | | |
| ––– | 3 | 0.8 | 1.2 | 2 | 3 | 4 | 6 | 10 | 14 | 25 | 40 | 60 | 0.1 | 0.14 | 0.25 | 0.4 | 0.6 | 1 | 1.4 |
| 3 | 6 | 1 | 1.5 | 2.5 | 4 | 5 | 8 | 12 | 18 | 30 | 48 | 75 | 0.12 | 0.18 | 0.3 | 0.48 | 0.75 | 1.2 | 1.8 |
| 6 | 10 | 1 | 1.5 | 2.5 | 4 | 6 | 9 | 15 | 22 | 36 | 58 | 90 | 0.15 | 0.22 | 0.36 | 0.58 | 0.9 | 1.5 | 2.2 |
| 10 | 18 | 1.2 | 2 | 3 | 5 | 8 | 11 | 18 | 27 | 43 | 70 | 110 | 0.18 | 0.27 | 0.43 | 0.7 | 1.1 | 1.8 | 2.7 |
| 18 | 30 | 1.5 | 2.5 | 4 | 6 | 9 | 13 | 21 | 33 | 52 | 84 | 130 | 0.21 | 0.33 | 0.52 | 0.84 | 1.3 | 2.1 | 3.3 |
| 30 | 50 | 1.5 | 2.5 | 4 | 7 | 11 | 16 | 25 | 39 | 62 | 100 | 160 | 0.25 | 0.39 | 0.62 | 1 | 1.6 | 2.5 | 3.9 |
| 50 | 80 | 2 | 3 | 5 | 8 | 13 | 19 | 30 | 46 | 74 | 120 | 190 | 0.3 | 0.46 | 0.74 | 1.2 | 1.9 | 3. | 4.6 |
| 80 | 120 | 2.5 | 4 | 6 | 10 | 15 | 22 | 35 | 54 | 87 | 140 | 220 | 0.35 | 0.54 | 0.87 | 1.4 | 2.2 | 3.5 | 5.4 |
| 120 | 180 | 3.5 | 5 | 8 | 12 | 18 | 25 | 40 | 63 | 100 | 160 | 250 | 0.4 | 0.63 | 1 | 1.6 | 2.5 | 4 | 6.3 |
| 180 | 250 | 4.5 | 7 | 10 | 14 | 20 | 29 | 46 | 72 | 115 | 185 | 290 | 0.46 | 0.72 | 1.15 | 1.85 | 2.9 | 4.6 | 7.2 |
| 250 | 315 | 6 | 8 | 12 | 16 | 23 | 32 | 52 | 81 | 130 | 210 | 320 | 0.52 | 0.81 | 1.3 | 2.1 | 3.2 | 5.2 | 8.1 |
| 315 | 400 | 7 | 9 | 13 | 18 | 25 | 36 | 57 | 89 | 140 | 230 | 360 | 0.57 | 0.89 | 1.4 | 2.3 | 3.6 | 5.7 | 8.9 |
| 400 | 500 | 8 | 10 | 15 | 20 | 27 | 40 | 63 | 97 | 155 | 250 | 400 | 0.63 | 0.97 | 1.55 | 2.5 | 4 | 6.3 | 9.7 |
| 500 | 630 | 9 | 11 | 16 | 22 | 32 | 44 | 70 | 110 | 175 | 280 | 440 | 0.7 | 1.1 | 1.75 | 2.8 | 4.4 | 7 | 11 |
| 630 | 800 | 10 | 13 | 18 | 25 | 36 | 50 | 80 | 125 | 200 | 320 | 500 | 0.8 | 1.25 | 2 | 3.2 | 5 | 8 | 12.5 |
| 800 | 1000 | 11 | 15 | 21 | 28 | 40 | 56 | 90 | 140 | 230 | 360 | 560 | 0.9 | 1.4 | 2.3 | 3.6 | 5.6 | 9 | 14 |
| 1000 | 1250 | 13 | 18 | 24 | 33 | 47 | 66 | 105 | 165 | 260 | 420 | 660 | 1.05 | 1.65 | 2.6 | 4.2 | 6.6 | 10.5 | 16.5 |
| 1250 | 1600 | 15 | 21 | 29 | 39 | 55 | 78 | 125 | 195 | 310 | 500 | 780 | 1.25 | 1.95 | 3.1 | 5 | 7.8 | 12.5 | 19.5 |
| 1600 | 2000 | 18 | 25 | 35 | 46 | 65 | 92 | 150 | 230 | 370 | 600 | 920 | 1.5 | 2.3 | 3.7 | 6 | 9.2 | 15 | 23 |
| 2000 | 2500 | 22 | 30 | 41 | 55 | 78 | 110 | 175 | 280 | 440 | 700 | 1100 | 1.75 | 2.8 | 4.4 | 7 | 11 | 17.5 | 28 |
| 2500 | 3150 | 26 | 36 | 50 | 68 | 96 | 135 | 210 | 330 | 540 | 860 | 1350 | 2.1 | 3.3 | 5.4 | 8.6 | 13.5 | 21 | 33 |

Notice
1. Standard tolerance values from IT1 to IT5 with basic sizes greater than 500mm are on trial.
2. IT4 to IT18 is not applicable if the basic size is less than or equal to 1mm.

The lower deviation (ei) and upper deviation (es) of the shaft can be obtained from the basic deviation and standard tolerance (IT) of the shaft.




The lower deviation (EI) and upper deviation (ES) of the hole can be obtained from the basic deviation and standard tolerance (IT) of the hole.




For example:
for a hole with diameter of ϕ3 and tolerance class of H7, it can be found from the Value Table of Hole Basic Deviation that the lower deviation (EI) of tolerance class H within this size range is 0, while the corresponding standard tolerance (IT) of class 7 is 10ϕm, so the upper deviation ES=EI+IT=10ϕm.
Therefore, the fit dimension of this hole is $\phi 3^{+0.01}_{0}$ mm.

## Basic deviation value of the shaft

| Basic dimension mm | | Basic deviation value | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Upper deviation es | | | | | | | | | | | |
| | | All standard tolerance classes | | | | | | | | | | | |
| > | to | a | b | c | cd | d | e | ef | f | fg | g | h | js |
| --- | 3 | −270 | −140 | −60 | −34 | −20 | −14 | −10 | −6 | −4 | −2 | 0 | |
| 3 | 6 | −270 | −140 | −70 | −46 | −30 | −20 | −14 | −10 | −6 | −4 | 0 | |
| 6 | 10 | −280 | −150 | −80 | −56 | −40 | −25 | −18 | −13 | −8 | −5 | 0 | |
| 10 | 14 | −290 | −150 | −95 | | −50 | −32 | | −16 | | −6 | 0 | |
| 14 | 18 | | | | | | | | | | | | |
| 18 | 24 | −300 | −160 | −110 | | −65 | −40 | | −20 | | −7 | 0 | |
| 24 | 30 | | | | | | | | | | | | |
| 30 | 40 | −310 | −170 | −120 | | −80 | −50 | | −25 | | −9 | 0 | |
| 40 | 50 | −320 | −180 | −130 | | | | | | | | | |
| 50 | 65 | −340 | −190 | −140 | | −100 | −60 | | −30 | | −10 | 0 | |
| 65 | 80 | −360 | −200 | −150 | | | | | | | | | |
| 80 | 100 | −380 | −220 | −170 | | −120 | −72 | | −36 | | −12 | 0 | |
| 100 | 120 | −410 | −240 | −180 | | | | | | | | | |
| 120 | 140 | −460 | −260 | −200 | | −145 | −85 | | −43 | | −14 | 0 | Deviation=±(ITn/2), in which ITn is the IT value |
| 140 | 160 | −520 | −280 | −210 | | | | | | | | | |
| 160 | 180 | −580 | −310 | −230 | | | | | | | | | |
| 180 | 200 | −660 | −340 | −240 | | −170 | −100 | | −50 | | −15 | 0 | |
| 200 | 225 | −740 | −380 | −260 | | | | | | | | | |
| 225 | 250 | −820 | −420 | −280 | | | | | | | | | |
| 250 | 280 | −920 | −480 | −300 | | −190 | −110 | | −56 | | −17 | 0 | |
| 280 | 315 | −1050 | −540 | −330 | | | | | | | | | |
| 315 | 355 | −1200 | −600 | −360 | | −210 | −125 | | −62 | | −18 | 0 | |
| 355 | 400 | −1350 | −680 | −400 | | | | | | | | | |
| 400 | 450 | −1500 | −760 | −440 | | −230 | −135 | | −68 | | −20 | 0 | |
| 450 | 500 | −1650 | −840 | −480 | | | | | | | | | |
| 500 | 560 | | | | | −260 | −145 | | −76 | | −22 | 0 | |
| 560 | 630 | | | | | | | | | | | | |
| 630 | 710 | | | | | −290 | −160 | | −80 | | −24 | 0 | |
| 710 | 800 | | | | | | | | | | | | |
| 800 | 900 | | | | | −320 | −170 | | −86 | | −26 | 0 | |
| 900 | 1000 | | | | | | | | | | | | |
| 1000 | 1120 | | | | | −350 | −195 | | −98 | | −28 | 0 | |
| 1120 | 1250 | | | | | | | | | | | | |
| 1250 | 1400 | | | | | −390 | −220 | | −110 | | −30 | 0 | |
| 1400 | 1600 | | | | | | | | | | | | |
| 1600 | 1800 | | | | | −430 | −240 | | −120 | | −32 | 0 | |
| 1800 | 2000 | | | | | | | | | | | | |
| 2000 | 2240 | | | | | −480 | −260 | | −130 | | −34 | 0 | |
| 2240 | 2500 | | | | | | | | | | | | |
| 2500 | 2800 | | | | | −520 | −290 | | −145 | | −38 | 0 | |
| 2800 | 3150 | | | | | | | | | | | | |

Notes:
1. The basic deviations a and b are not applicable if the basic size is less than or equal to 1mm.
2. Deviation=±[(ITn-1)/2] if the ITn value is odd from js7 to js11 in the tolerance zone.

## Basic deviation value of the shaft

μm

| Basic deviation value | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lower deviation ei | | | | | | | | | | | | | | | | | | |
| IT5 & IT6 | IT7 | IT8 | IT4 & IT7 | ≤IT3 >IT7 | All standard tolerance classes | | | | | | | | | | | | | |
| j | | | k | | m | n | p | r | s | t | u | v | x | y | z | zn | zb | zc |
| −2 | −4 | −6 | 0 | 0 | +2 | +4 | +6 | +10 | +14 | | +18 | | +20 | | +26 | +32 | +40 | +60 |
| −2 | −4 | | +1 | 0 | +4 | +8 | +12 | +15 | +19 | | +23 | | +28 | | +35 | +42 | +50 | +80 |
| −2 | −5 | | +1 | 0 | +6 | +10 | +15 | +19 | +23 | | +28 | | +34 | | +42 | +52 | +67 | +97 |
| −3 | −6 | | +1 | 0 | +7 | +12 | +18 | +23 | +28 | | +33 | | +40 | | +50 | +64 | +90 | +130 |
| | | | | | | | | | | | | +39 | +45 | | +60 | +77 | +108 | +150 |
| −4 | −8 | | +2 | 0 | +8 | +15 | +22 | +28 | +35 | | +41 | +47 | +54 | +63 | +73 | +98 | +136 | +188 |
| | | | | | | | | | | +41 | +48 | +55 | +64 | +75 | +88 | +118 | +160 | +218 |
| −5 | −10 | | +2 | 0 | +9 | +17 | +26 | +34 | +43 | +48 | +60 | +68 | +80 | +94 | +112 | +148 | +200 | +274 |
| | | | | | | | | | | +54 | +70 | +81 | +97 | +114 | +136 | +180 | +242 | +325 |
| −7 | −12 | | +2 | 0 | +11 | +20 | +32 | +41 | +53 | +66 | +87 | +102 | +122 | +144 | +172 | +226 | +300 | +405 |
| | | | | | | | | +43 | +59 | +75 | +102 | +120 | +146 | +174 | +210 | +274 | +360 | +480 |
| −9 | −15 | | +3 | 0 | +13 | +23 | +37 | +51 | +71 | +91 | +124 | +146 | +178 | +214 | +258 | +335 | +445 | +585 |
| | | | | | | | | +54 | +79 | +104 | +144 | +172 | +210 | +254 | +310 | +400 | +525 | +690 |
| −11 | −18 | | +3 | 0 | +15 | +27 | +43 | +63 | +92 | +122 | +170 | +202 | +248 | +300 | +365 | +470 | +620 | +800 |
| | | | | | | | | +65 | +100 | +134 | +190 | +228 | +280 | +340 | +415 | +535 | +700 | +900 |
| | | | | | | | | +68 | +108 | +146 | +210 | +252 | +310 | +380 | +465 | +600 | +780 | +1000 |
| −13 | −21 | | +4 | 0 | +17 | +31 | +50 | +77 | +122 | +166 | +236 | +284 | +350 | +425 | +520 | +670 | +880 | +1150 |
| | | | | | | | | +80 | +130 | +180 | +258 | +310 | +385 | +470 | +575 | +740 | +960 | +1250 |
| | | | | | | | | +84 | +140 | +196 | +284 | +340 | +425 | +520 | +640 | +820 | +1050 | +1350 |
| −16 | −26 | | +4 | 0 | +20 | +34 | +56 | +94 | +158 | +218 | +315 | +385 | +475 | +580 | +710 | +920 | +1200 | +1550 |
| | | | | | | | | +98 | +170 | +240 | +350 | +425 | +525 | +650 | +790 | +1000 | +1300 | +1700 |
| −18 | −28 | | +4 | 0 | +21 | +37 | +62 | +108 | +190 | +268 | +390 | +475 | +590 | +730 | +900 | +1150 | +1500 | +1900 |
| | | | | | | | | +114 | +208 | +294 | +435 | +530 | +660 | +820 | +1000 | +1300 | +1650 | +2100 |
| −20 | −32 | | +5 | 0 | +23 | +40 | +68 | +126 | +232 | +330 | +490 | +595 | +740 | +920 | +1100 | +1450 | +1850 | +2400 |
| | | | | | | | | +132 | +252 | +360 | +540 | +660 | +820 | +1000 | +1250 | +1600 | +2100 | +2600 |
| | | | 0 | 0 | +26 | +44 | +78 | +150 | +280 | +400 | +600 | | | | | | | |
| | | | | | | | | +155 | +310 | +450 | +660 | | | | | | | |
| | | | 0 | 0 | +30 | +50 | +88 | +175 | +340 | +500 | +740 | | | | | | | |
| | | | | | | | | +185 | +380 | +560 | +840 | | | | | | | |
| | | | 0 | 0 | +34 | +56 | +100 | +210 | +430 | +620 | +940 | | | | | | | |
| | | | | | | | | +220 | +470 | +680 | +1050 | | | | | | | |
| | | | 0 | 0 | +40 | +66 | +120 | +250 | +520 | +780 | +1150 | | | | | | | |
| | | | | | | | | +260 | +580 | +840 | +1300 | | | | | | | |
| | | | 0 | 0 | +48 | +78 | +140 | +300 | +640 | +960 | +1450 | | | | | | | |
| | | | | | | | | +330 | +720 | +1050 | +1600 | | | | | | | |
| | | | 0 | 0 | +58 | +92 | +170 | +370 | +820 | +1200 | +1850 | | | | | | | |
| | | | | | | | | +400 | +920 | +1350 | +2000 | | | | | | | |
| | | | 0 | 0 | +68 | +110 | +195 | +440 | +1000 | +1500 | +2300 | | | | | | | |
| | | | | | | | | +460 | +1100 | +1650 | +2500 | | | | | | | |
| | | | 0 | 0 | +76 | +135 | +240 | +550 | +1250 | +1900 | +2900 | | | | | | | |
| | | | | | | | | +580 | +1400 | +2100 | +3200 | | | | | | | |

## Basic deviation value of the hole

| Basic dimension mm | | Basic deviation value | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Lower deviation EI | | | | | | | | | | | Upper deviation ES | | | | | | | | | |
| | | All standard tolerance classes | | | | | | | | | | | IT6 | IT7 | IT8 | ≤IT8 | >IT8 | ≤IT8 | >IT8 | ≤IT8 | >IT8 | ≤IT7 |
| > | to | A | B | C | CD | D | E | EF | F | FG | G | H | JS | J | | | K | | M | | N | | P To ZC |
| −−− | 3 | +270 | +140 | +60 | +34 | +20 | +14 | +10 | +6 | +4 | +2 | 0 | Deviation=±(ITn/2), in which ITn is the IT value | +2 | +4 | +6 | 0 | 0 | −2 | −2 | −4 | −4 | Add a Δ value to the corresponding value greater than IT7 |
| 3 | 6 | +270 | +140 | +70 | +46 | +30 | +20 | +14 | +10 | +6 | +4 | 0 | | +5 | +6 | +10 | −1+Δ | | −4+Δ | −4 | −8+Δ | 0 | |
| 6 | 10 | +280 | +150 | +80 | +56 | +40 | +25 | +18 | +13 | +8 | +5 | 0 | | +5 | +8 | +12 | −1+Δ | | −6+Δ | −6 | −10+Δ | 0 | |
| 10 | 14 | +290 | +150 | +95 | | +50 | +32 | | +16 | | +6 | 0 | | +6 | +10 | +15 | −1+Δ | | −7+Δ | −7 | −12+Δ | 0 | |
| 14 | 18 | | | | | | | | | | | | | | | | | | | | | | |
| 18 | 24 | +300 | +160 | +110 | | +65 | +40 | | +20 | | +7 | 0 | | +8 | +12 | +20 | −2+Δ | | −8+Δ | −8 | −15+Δ | 0 | |
| 24 | 30 | | | | | | | | | | | | | | | | | | | | | | |
| 30 | 40 | +310 | +170 | +120 | | +80 | +50 | | +25 | | +9 | 0 | | +10 | +14 | +24 | −2+Δ | | −9+Δ | −9 | −17+Δ | 0 | |
| 40 | 50 | +320 | +180 | +130 | | | | | | | | | | | | | | | | | | | |
| 50 | 65 | +340 | +190 | +140 | | +100 | +60 | | +30 | | +10 | 0 | | +13 | +18 | +28 | −2+Δ | | −11+Δ | −11 | −20+Δ | 0 | |
| 65 | 80 | +360 | +200 | +150 | | | | | | | | | | | | | | | | | | | |
| 80 | 100 | +380 | +220 | +170 | | +120 | +72 | | +36 | | +12 | 0 | | +16 | +22 | +34 | −3+Δ | | −13+Δ | −13 | −23+Δ | 0 | |
| 100 | 120 | +410 | +240 | +180 | | | | | | | | | | | | | | | | | | | |
| 120 | 140 | +460 | +260 | +200 | | +145 | +85 | | +43 | | +14 | 0 | | +18 | +26 | +41 | −3+Δ | | −15+Δ | −15 | −27+Δ | 0 | |
| 140 | 160 | +520 | +280 | +210 | | | | | | | | | | | | | | | | | | | |
| 160 | 180 | +580 | +310 | +230 | | | | | | | | | | | | | | | | | | | |
| 180 | 200 | +660 | +340 | +240 | | +170 | +100 | | +50 | | +15 | 0 | | +22 | +30 | +47 | −4+Δ | | −17+Δ | −17 | −31+Δ | 0 | |
| 200 | 225 | +740 | +380 | +260 | | | | | | | | | | | | | | | | | | | |
| 225 | 260 | +820 | +420 | +280 | | | | | | | | | | | | | | | | | | | |
| 260 | 280 | +920 | +480 | +300 | | +190 | +110 | | +56 | | +17 | 0 | | +25 | +36 | +55 | −4+Δ | | −20+Δ | −20 | −34+Δ | 0 | |
| 280 | 315 | +1050 | +540 | +330 | | | | | | | | | | | | | | | | | | | |
| 315 | 355 | +1200 | +600 | +360 | | +210 | +125 | | +62 | | +18 | 0 | | +29 | +39 | +60 | −4+Δ | | −21+Δ | −21 | −37+Δ | 0 | |
| 355 | 400 | +1350 | +680 | +400 | | | | | | | | | | | | | | | | | | | |
| 400 | 450 | +1500 | +760 | +440 | | +230 | +135 | | +68 | | +20 | 0 | | +33 | +43 | +66 | −5+Δ | | −23+Δ | −23 | −40+Δ | 0 | |
| 450 | 500 | +1650 | +840 | +480 | | | | | | | | | | | | | | | | | | | |
| 500 | 560 | | | | | +260 | +145 | | +76 | | +22 | 0 | | | | | 0 | | −26 | | −44 | | |
| 560 | 630 | | | | | | | | | | | | | | | | | | | | | | |
| 630 | 710 | | | | | +290 | +160 | | +80 | | +24 | 0 | | | | | 0 | | −30 | | −50 | | |
| 710 | 800 | | | | | | | | | | | | | | | | | | | | | | |
| 800 | 900 | | | | | +320 | +170 | | +86 | | +26 | 0 | | | | | 0 | | −34 | | −56 | | |
| 900 | 1000 | | | | | | | | | | | | | | | | | | | | | | |
| 1000 | 1120 | | | | | +350 | +195 | | +98 | | +28 | 0 | | | | | 0 | | −40 | | −66 | | |
| 1120 | 1250 | | | | | | | | | | | | | | | | | | | | | | |
| 1250 | 1400 | | | | | +390 | +220 | | +110 | | +30 | 0 | | | | | 0 | | −48 | | −78 | | |
| 1400 | 1600 | | | | | | | | | | | | | | | | | | | | | | |
| 1600 | 1800 | | | | | +430 | +240 | | +120 | | +32 | 0 | | | | | 0 | | −58 | | −92 | | |
| 1800 | 2000 | | | | | | | | | | | | | | | | | | | | | | |
| 2000 | 2240 | | | | | +480 | +260 | | +130 | | +34 | 0 | | | | | 0 | | −68 | | −110 | | |
| 2240 | 2500 | | | | | | | | | | | | | | | | | | | | | | |
| 2500 | 2800 | | | | | +520 | +290 | | +145 | | +38 | 0 | | | | | 0 | | −76 | | −135 | | |
| 2800 | 3150 | | | | | | | | | | | | | | | | | | | | | | |

Notes:
1. The basic deviation A and B as well as N which is greater than IT8 are not applicable if the basic size is less than or equal to 1mm.
2. Deviation=±[(ITn-1)/2] if the ITn value is odd from JS7 to JS11 in the tolerance zone.
3. The desired Δ value can be selected from the right side of the table for K, M, N which is less than or equal to IT8, and P to ZC which is less than or equal to IT7.
For example: K7 in segment 18-30mm: Δ=8 μm, so ES=-2+8=+6 μm
S6 in segment 18-30mm: Δ=4 μm, so ES=-35+4=-31 μm
4) An exceptional circumstance: M5 in segment 250 - 315mm, ES=-9 μm (instead of-11 μm).

● Basic deviation value of the hole

μm

| Basic deviation value | | | | | | | | | | | | Δvalue | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Upper deviation ES | | | | | | | | | | | | | | | | | |
| Standard tolerance class > IT7 | | | | | | | | | | | | All standard tolerance classes | | | | | |
| P | R | S | T | U | V | X | Y | Z | ZA | ZB | ZC | IT3 | IT4 | IT5 | IT6 | IT7 | IT8 |
| –6 | –10 | –14 | | –18 | | –20 | | –26 | –32 | –40 | –60 | 0 | 0 | 0 | 0 | 0 | 0 |
| –12 | –15 | –19 | | –23 | | –28 | | –35 | –42 | –50 | –80 | 1 | 1.5 | 1 | 3 | 4 | 6 |
| –15 | –19 | –23 | | –28 | | –34 | | –42 | –52 | –67 | –97 | 1 | 1.5 | 2 | 3 | 6 | 7 |
| –18 | –23 | –28 | | –33 | | –40 | | –50 | –64 | –90 | –130 | 1 | 2 | 3 | 3 | 7 | 9 |
| | | | | | –39 | –45 | | –60 | –77 | –108 | –150 | | | | | | |
| –22 | –28 | –35 | | –41 | –47 | –54 | –63 | –73 | –98 | –136 | –188 | 1.5 | 2 | 3 | 4 | 8 | 12 |
| | | | –41 | –48 | –55 | –64 | –75 | –88 | –118 | –160 | –218 | | | | | | |
| –26 | –34 | –43 | –48 | –60 | –68 | –80 | –94 | –112 | –148 | –200 | –274 | 1.5 | 3 | 4 | 5 | 9 | 14 |
| | | | –54 | –70 | –81 | –97 | –114 | –136 | –180 | –242 | –325 | | | | | | |
| –32 | –41 | –53 | –66 | –87 | –102 | –122 | –144 | –172 | –226 | –300 | –405 | 2 | 3 | 5 | 6 | 11 | 16 |
| | –43 | –59 | –75 | –102 | –120 | –146 | –174 | –210 | –274 | –360 | –480 | | | | | | |
| –37 | –51 | –71 | –91 | –124 | –146 | –178 | –214 | –258 | –335 | –445 | –585 | 2 | 4 | 5 | 7 | 13 | 19 |
| | –54 | –79 | –104 | –144 | –172 | –210 | –254 | –310 | –400 | –525 | –690 | | | | | | |
| –43 | –63 | –92 | –122 | –170 | –202 | –248 | –300 | –365 | –470 | –620 | –800 | 3 | 4 | 6 | 7 | 15 | 23 |
| | –65 | –100 | –134 | –190 | –228 | –280 | –340 | –415 | –535 | –700 | –900 | | | | | | |
| | –68 | –108 | –146 | –210 | –252 | –310 | –380 | –465 | –600 | –780 | –1000 | | | | | | |
| –50 | –77 | –122 | –166 | –236 | –284 | –350 | –425 | –520 | –670 | –880 | –1150 | 3 | 4 | 6 | 9 | 17 | 26 |
| | –80 | –130 | –180 | –258 | –310 | –385 | –470 | –575 | –740 | –960 | –1250 | | | | | | |
| | –84 | –140 | –196 | –284 | –340 | –425 | –520 | –640 | –820 | –1050 | –1350 | | | | | | |
| –56 | –94 | –158 | –218 | –315 | –385 | –475 | –580 | –710 | –920 | –1200 | –1550 | 4 | 4 | 7 | 9 | 20 | 29 |
| | –98 | –170 | –240 | –350 | –425 | –525 | –650 | –790 | –1000 | –1300 | –1700 | | | | | | |
| –62 | –108 | –190 | –268 | –390 | –475 | –590 | –730 | –900 | –1150 | –1500 | –1900 | 4 | 5 | 7 | 11 | 21 | 32 |
| | –114 | –208 | –294 | –435 | –530 | –660 | –820 | –1000 | –1300 | –1650 | –2100 | | | | | | |
| –68 | –126 | –232 | –330 | –490 | –595 | –740 | –920 | –1100 | –1450 | –1850 | –2400 | 5 | 5 | 7 | 13 | 23 | 34 |
| | –132 | –252 | –360 | –540 | –660 | –820 | –1000 | –1250 | –1600 | –2100 | –2600 | | | | | | |
| –78 | –150 | –280 | –400 | –600 | | | | | | | | | | | | | |
| | –155 | –310 | –450 | –660 | | | | | | | | | | | | | |
| –88 | –175 | –340 | –500 | –740 | | | | | | | | | | | | | |
| | –185 | –380 | –560 | –840 | | | | | | | | | | | | | |
| 100 | –210<br>–220 | –430<br>–470 | –620<br>–680 | –940<br>–1050 | | | | | | | | | | | | | |
| –120 | –250<br>–260 | –520<br>–580 | –780<br>–840 | –1150<br>–1300 | | | | | | | | | | | | | |
| –140 | –300<br>–330 | –640<br>–720 | –960<br>–1050 | –1450<br>–1600 | | | | | | | | | | | | | |
| –170 | –370 | –820 | –1200 | –1850 | | | | | | | | | | | | | |
| | –400 | –920 | –1350 | –2000 | | | | | | | | | | | | | |
| –195 | –440<br>–460 | –1000<br>–1100 | –1500<br>–1650 | –2300<br>–2500 | | | | | | | | | | | | | |
| –240 | –550<br>–580 | –1250<br>–1400 | –1900<br>–2100 | –2900<br>–3200 | | | | | | | | | | | | | |

# Comparison table of PVD turning grades

| Type | Classification codes | | HUAREAL | SANDVIK | KENNAMETAL | ISCAR | MiTSUBiSHi | TUNGALOY | KYOCERA | SUMITOMO | TEAGUTEC | ZCC.CT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IOS classification | Groups of materials | | | | | | | | | | |
| PVD milling | P | P10 | HR5225<br>HR1135 | GC1025<br>GC1125 | KCS10<br>KCU10<br>KC5010 | IC807 | VP10MF<br>MS6015 | AH710 | PR930<br>PR1005<br>PR1025<br>PR1115<br>PR1215<br>PR1425<br>PR1225 | AC1030U<br>ACZ150<br>AC5025S<br>AC520U | | YBG102 |
| | | P20 | HR5125<br>HR5225<br>HR7125<br>HR7225 | GC1025<br>GC1125 | KCS10<br>KCU10<br>KCU25<br>KC5010<br>KC5025 | IC807<br>IC808<br>IC810 | VP10RT<br>VP20RT<br>VP15TF<br>VP20MF | AH120<br>AH725<br>AH730<br>SH725<br>SH730<br>J740 | PR930<br>PR1025<br>PR1115<br>PR1215<br>PR1225<br>PR1625 | AC1030U<br>AC5025S<br>AC520U<br>AC530U | TT9020<br>TT9030 | YBG202 |
| | | P30 | HR5125<br>HR5225<br>HR7125<br>HR7225 | GC1025<br>GC1125 | KCU25<br>KC5025 | IC328<br>IC330<br>IC830<br>IC928 | VP10RT<br>VP20RT<br>VP15TF<br>VP20MF | AH725<br>AH7025<br>AH730<br>SH725<br>SH730<br>GH730<br>GH330<br>J740 | PR1025<br>PR1225<br>PR1535 | AC1030U<br>AC530U | TT8020<br>TT8080<br>TT9030 | YBG202 |
| | | P40 | HR5125<br>HR7125 | GC1025 | | IC830 | | AH120<br>AH725<br>AH645 | | AC1030U | TT8020<br>TT8080<br>TT9080 | |
| | M | M10 | HR9105<br>HR7115 | GC1115<br>GC1125 | KCS10<br>KCU10<br>KC5010 | IC807<br>IC808<br>IC907<br>IC908 | VP10MF<br>MS6015 | AH8005<br>AH630 | PR1025<br>PR1215<br>PR1225 | AC515S<br>AC5025S<br>AC510U<br>AC520U<br>ACZ150 | TT5080 | YBG202<br>YBG205 |
| | | M20 | HR5125<br>HR5225<br>HR7115<br>HR7125<br>HR7225 | GC1115<br>GC1125<br>GC2035 | KCS10<br>KCU10<br>KCU25<br>KC5010<br>KC5025 | IC330<br>IC806<br>IC808<br>IC830<br>IC908<br>IC330<br>IC806<br>IC808<br>IC830<br>IC908<br>IC928 | VP10RT<br>VP20RT<br>VP15TF<br>VP20MF | AH8015<br>AH630<br>AH120<br>AH7025<br>AH725<br>SH725<br>SH730 | PR930<br>PR1025<br>PR1125<br>PR1215<br>PR1425<br>PR1225<br>PR1515 | AC5015S<br>AC5025S<br>AC1030U<br>AC520U | TT5080<br>TT9080 | YBG202<br>YBG205 |
| | | M30 | HR5125<br>HR5225<br>HR7125<br>HR7225 | GC1125<br>GC2035 | KCU25<br>KC5025 | IC328<br>IC330<br>IC830<br>IC840<br>IC882 | VP10RT<br>VP20RT<br>VP15TF<br>VP20MF<br>MP7035 | AH645<br>AH120<br>AH725<br>SH725<br>SH730<br>J740 | PR1125<br>PR1535 | AC5025S<br>AC6040M<br>AC1030U<br>AC520U<br>AC530U | TT8020<br>TT8080<br>TT9020<br>TT9080 | |
| | | M40 | HR5125<br>HR7125 | GC2035 | | IC830<br>IC928 | MP7035 | AH645 | | AC6040M<br>AC1030U<br>AC530U | TT8020<br>TT8080<br>TT9020<br>TT9080 | |

# Comparison table of PVD turning grades

| Type | Classification codes | | HUAREAL | SANDVIK | KENNAMETAL | ISCAR | MiTSUBiSHi | TUNGALOY | KYOCERA | SUMITOMO | TEAGUTEC | ZCC.CT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IOS classification | Groups of materials | | | | | | | | | | |
| PVD milling | K | K10 | | GC3330<br>GC3220<br>K20W<br>K20D<br>K20M<br>K15W | KCS10<br>KCU10<br>KC5010 | IC810 | | GH110<br>AH110 | PR905<br>PR1215 | AC1030U<br>AC510U<br>ACZ150 | | |
| | | K20 | | GC3330<br>GC3220<br>GC3040<br>K20W<br>K20D<br>GC4230<br>K20M<br>K15W | KCS10<br>KCU10<br>KCU25<br>KC5010<br>KC5025 | | VP10RT<br>VP20RT<br>VP15TF | AH120<br>AH725<br>AH730<br>SH725<br>SH730<br>J740 | PR905<br>PR1215 | AC1030U<br>AC5025S<br>AC520U<br>AC530U | | |
| | | K30 | | GC3330<br>GC3040<br>K20W<br>GC4240<br>GC4230 | | IC830<br>IC908<br>IC910<br>IC928 | VP10RT<br>VP20RT<br>VP15TF | AH725<br>AH7025<br>AH730<br>SH725<br>SH730<br>GH730<br>GH330<br>J740 | | AC1030U<br>AC530U | | |
| | S | S01 | | | | IC804<br>IC806 | MP9005<br>VP05RT | AH8005<br>AH905 | | | PR005S | YBG102 |
| | | S10 | HR9105<br>HR7115 | GC1105<br>GC1005<br>GC1025 | KC5010<br>KC5510<br>KCU10<br>KCS10 | IC807<br>IC808<br>IC907<br>IC908 | MP9005<br>MP9015<br>VP10RT | AH8015<br>AH905<br>SH730<br>AH110 | PR005S<br>PR015S | AC510U<br>AC5015S | TT9080<br>TT9030 | YBG102<br>YBG105<br>YBG202<br>YBG103 |
| | | S20 | HR7115 | GC1025<br>GC1125 | KC5025<br>KC5525<br>KCU25 | IC806<br>IC808<br>IC908 | MP9015<br>MT9015<br>VP20RT<br>MP9025 | AH8015<br>AH120<br>AH725 | PR015S<br>PR1535 | AC510U<br>AC520U<br>AC5025S | TT8080<br>TT8020 | YBG212<br>YBG105<br>YBS103 |
| | | S30 | HR7225 | GC1125 | | IC3028 | MP9025 | AH725 | PR1535 | AC520U | | YBG212 |



Comparison table of PVD turning grades

| Type | Classification codes | | HUAREAL | SANDVIK | KENNAMETAL | ISCAR | MiTSUBiSHi | TUNGALOY | KYOCERA | SUMITOMO | TEAGUTEC | ZCC.CT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IOS classification | Groups of materials | | | | | | | | | | |
| PVD milling | P | P10 | HR5110<br>HR5210 | GC1010<br>GC1025<br>GC1030 | KC5010M<br>KC515M | IC807<br>IC903 | | AH120<br>AH725 | PR830<br>PR1025<br>PR1225 | ACP2500<br>ACP200 | TT2510<br>TT7080 | YBG252 |
| | | P20 | HR5120<br>HR5220<br>HR5130 | GC1025<br>GC1030<br>GC2030 | KC522M<br>KC525M<br>KCSM30<br>SP6519 | IC807<br>IC808<br>IC810<br>IC380<br>IC330 | MP6120<br>VP15TF | AH120<br>AH725<br>AH3135<br>AH9030<br>AH3225<br>AH9130 | PR1525<br>PR830<br>PR1025<br>PR1225<br>PR1230 | ACP3000<br>ACU2500<br>ACP200<br>ACP300 | TT2510<br>TT7080<br>TT8020<br>TT9030<br>TT9080 | YBG202<br>YBG205<br>YBG9320<br>YBG252 |
| | | P30 | HR5120<br>HR5130<br>HR530<br>HR7130 | GC1030<br>GC1010<br>GC2030 | KC525M<br>KC530<br>KC725M<br>KC735M<br>KCPM40<br>KCSM30<br>X400 | IC328<br>IC330<br>IC380<br>IC830<br>IC928 | MP6120<br>VP15TF<br>MP6130<br>VP30RT | AH120<br>AH725<br>AH3135<br>AH130<br>AH3225<br>AH9130 | PR1230<br>PR1535 | ACP3000<br>ACU2500<br>ACP200<br>ACP300 | TT8020<br>TT8080<br>TT9030<br>TT9080 | YBG302 |
| | | P40 | HR7130 | GC1030<br>GC2030 | KC725M<br>KC735M<br>KCPM40 | IC830 | VP30RT | AH120<br>AH725<br>AH645 | | ACP3000<br>ACU2500<br>ACP300 | TT8020<br>TT8080<br>TT9030<br>TT9080 | YBG302 |
| | M | M10 | HR5110<br>HR5120<br>HR5220 | GC1010<br>GC1030 | KC515M<br>SP4019<br>SP6519 | IC807<br>IC808<br>IC903<br>IC907<br>IC908 | | AH725 | PR1025<br>PR1225 | ACU2500<br>ACM100<br>ACK300<br>ACP300 | | YBG252 |
| | | M20 | HR5110<br>HR5120<br>HR5220<br>HR5130 | GC1030<br>GC1040<br>GC2030<br>S30T | KC522M<br>KC525M<br>SP4019<br>SP6519<br>X700 | IC330<br>IC808<br>IC830<br>IC840<br>IC882<br>IC908<br>IC928 | VP15TF<br>MP7130<br>MP7030<br>VP20RT | AH725<br>AH3135<br>AH130<br>AH6030<br>AH3225<br>AH9130 | PR1525<br>PR1025<br>PR1225 | ACU2500<br>ACK300<br>ACP300 | TT9030<br>TT9080 | YBG202<br>YBG205<br>YBG9320<br>YBG252 |
| | | M30 | HR5120<br>HR5130<br>HR530 | GC1040<br>S30T<br>GC2030 | KC522M<br>KC525M<br>KC725M<br>KC735M<br>KCPM40<br>KCSM30<br>KCSM40<br>SC6525<br>X700 | IC328<br>IC330<br>IC830<br>IC840<br>IC882 | VP15TF<br>MP7130<br>MP7030<br>VP20RT<br>MP7140 | AH3135<br>AH130<br>AH9130 | PR1535 | TT8020<br>TT8080<br>TT9030<br>TT9080 | TT8020<br>TT8080<br>TT9020<br>TT9080 | YBG302 |
| | | M40 | HR7130 | | KC725M<br>KCPM40<br>KCSM40 | IC830<br>IC928 | MP7140<br>VP30RT | AH140 | | TT8020<br>TT8080<br>TT9030<br>TT9080 | TT8020<br>TT8080<br>TT9020<br>TT9080 | YBG302 |

# Comparison table of PVD turning grades

| Type | Classification codes | | HUAREAL | SANDVIK | KENNAMETAL | ISCAR | MiTSUBiSHi | TUNGALOY | KYOCERA | SUMITOMO | TEAGUTEC | ZCC.CT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IOS classification | Groups of materials | | | | | | | | | | |
| PVD milling | K | K10 | HR5120<br>HR5220 | GC1010<br>GC1020 | KC514M<br>KC515M<br>KCK20<br>SP4019 | IC810 | MP8010 | AH110<br>GH120 | PR510<br>PR905<br>PR1210 | ACK3000<br>ACU2500 | TT6080 | YBG102<br>YBG252 |
| | | K20 | HR5120 | GC1020 | KC514M<br>KC520M<br>KC524M<br>KCK20<br>SP6519 | IC808<br>IC810<br>IC83 | VP15TF<br>VP20RT | AH120<br>AH9030<br>AH9130 | PR905<br>PR1210 | ACK3000<br>ACU2500<br>ACK300 | TT6080 | YBG152 |
| | | K30 | HR5130 | | KC522M<br>KC524M<br>SP6519 | IC830<br>IC810<br>IC908<br>IC910<br>IC928<br>IC950 | VP15TF<br>VP20RT | AH120 | | ACK3000<br>ACU2500<br>ACK300 | | |

# Comparison table of CVD turning grades

| Type | Classification codes | | HUAREAL | SANDVIK | KENNAMETAL | ISCAR | MiTSUBiSHi | TUNGALOY | KYOCERA | SUMITOMO | TEAGUTEC | ZCC.CT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IOS classification | Groups of materials | | | | | | | | | | |
| CVD turning | P | P01 | HR8105<br>HR8115 | GC4305<br>GC4315 | KCP05B<br>KCPK05<br>KCK05B<br>KCK15B | IC8005<br>IC8150<br>IC428 | UE6105 | T9205<br>T9105 | CA510<br>CA5505 | AC8015P<br>AC810P | TT8105 | |
| | | P10 | HR8115 | GC4305<br>GC4415<br>GC4325 | KCP05B<br>KCPK05<br>KCP10B<br>KCK15B<br>KCK20B | IC5100<br>IC8150<br>IC8250<br>IC9015 | UE6105<br>MC6015<br>UE6110<br>MY5015 | T9205<br>T9105<br>T9215<br>T9115 | CA510<br>CA515<br>CA5505<br>CA5515 | AC8015P<br>AC810P | TT8105<br>TT8115 | YBC151<br>YBC152 |
| | | P20 | HR8125<br>HR8225 | GC4225<br>GC4325<br>GC4425 | KCP10B<br>KCP25B<br>KCM15B | IC8150<br>IC8250<br>IC8350<br>IC9015 | MC6015<br>UE6110<br>MC6025<br>UE6020<br>MY5015 | T9215<br>T9115<br>T9225<br>T9125 | CA025P<br>CA525<br>CA5515<br>CA5525<br>CR9025 | AC8025P<br>AC820P | TT5100<br>TT8125 | YBC251<br>YBC252 |
| | | P30 | HR8225<br>HR8135 | GC4315<br>GC4325<br>GC4335<br>GC2025 | KCP25B<br>KCP30B<br>KCM15B | IC8350<br>IC8025 | MC6025<br>UE6020<br>MC6035<br>UE6035<br>UH6400 | T9225<br>T9125<br>T9235<br>T9135<br>T6130 | CA025P<br>CA525<br>CA5525<br>CA530<br>CA5535<br>CA9025 | AC8035P<br>AC830P<br>AC6030M<br>AC630M | TT8125<br>T5100 | YBC252<br>YBC351<br>YBC352 |
| | | P40 | HR8225<br>HR8135 | GC4325<br>GC4335 | KCP30B<br>KCP40B<br>KCM25B<br>KCM35B | IC8350<br>IC8025 | MC6035<br>UE6035<br>UH6400 | | CA530<br>CA5535 | AC8035P<br>AC830P<br>AC6030M<br>AC630M | TT8135<br>TT7100 | YBC351<br>YBC352 |
| | M | M10 | | GC2015<br>GC1515 | KCM15B | IC6015<br>IC8025<br>IC8150<br>IC8250<br>IC5820 | MC7015<br>US7020 | T9235<br>T9135<br>T6130 | CA6515 | AC6020M<br>AC610M | TT9215 | |
| | | M20 | | GC2015<br>GC2025<br>GC2020 | KCP30B<br>KCP40B<br>KCM15B<br>KCM25B | IC6015<br>IC6025<br>IC8320 | MC7015<br>US7020<br>MC7025 | T9215<br>T9115 | CA6525 | AC6020M<br>AC6030M<br>AC610M<br>AC630M | TT9225 | YBM151<br>YBM153 |
| | | M30 | | GC2025<br>GC2020 | KCP40B<br>KCM25B<br>KCM35B | IC6025 | MC7025<br>US735 | T6120<br>T9215<br>T9115 | | AC6030M<br>AC630M<br>AC8035P<br>AC830P | TT9235 | YBM151<br>YBM251 |
| | | M40 | | | KCM35B<br>KCM35 | | US735 | T6130 | | AC6030M<br>AC630M | TT9235 | YB253 |

# Comparison table of CVD turning grades

| Type | Classification codes | | HUAREAL | SANDVIK | KENNAMETAL | ISCAR | MiTSUBiSHi | TUNGALOY | KYOCERA | SUMITOMO | TEAGUTEC | ZCC.CT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IOS classification | Groups of materials | | | | | | | | | | |
| CVD turning | K | K01 | | GC3210 | KCK05B<br>KCK05 | IC5005 | MC5005<br>UC5105 | T5105 | CA310<br>CA4010<br>CA4505<br>CA5505 | AC4010K<br>AC405K | TT7005 | YBD052 |
| | | K10 | HR6115 | GC3210 | KCK05B<br>KCK05<br>KCK15B<br>KCK15 | IC5005<br>IC5010<br>IC5100 | MC5015<br>UC5115<br>MY5015 | T5105<br>T515<br>T5115<br>T9215 | CA310<br>CA315<br>CA4010<br>CA4115<br>CA4505<br>CA4515<br>CA5505 | AC4010K<br>AC4015K<br>AC405K<br>AC415K | TT7015 | YBD102 |
| | | K20 | HR6115 | GC3210<br>GC3225 | KCK15B<br>KCK15<br>KCK20B<br>KCK20 | IC5010<br>IC8150 | MC5015<br>UC5115<br>UE6110<br>MY5115 | T515<br>T5115<br>T5125<br>T9215 | CA315<br>CA320<br>CA4115<br>CA4120<br>CA4515 | AC4015K<br>AC415K<br>AC420K<br>AC425K<br>AC8025P | TT7015<br>TT7025 | YBD152<br>YBD252 |
| | | K30 | HR6115 | GC3225 | KCP05B<br>KCPK05<br>KCP10B<br>KCP25B<br>KCK20B | | UE6110 | T5125 | CA320 | | | |

# Comparison table of CVD turning grades

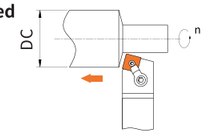
| Type | Classification codes | | HUAREAL | SANDVIK | KENNAMETAL | ISCAR | MiTSUBiSHi | TUNGALOY | KYOCERA | SUMITOMO | TEAGUTEC | ZCC.CT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IOS classification | Groups of materials | | | | | | | | | | |
| CVD milling | P | P10 | | GC4220<br>GC4230<br>GC3040 | KC930M<br>KC935P | IC4100<br>IC520M<br>IC4050<br>DT7150<br>IC5400 | | | | ACP2000<br>ACP100 | TT7515 | |
| | | P20 | HR6130 | GC4220<br>GC4230<br>GC3040 | SC6525<br>SP6519 | | F7030<br>MC7020 | T3225 | | ACP2000<br>ACP100 | TT7515 | YBC301<br>YBC251 |
| | | P30 | HR6130<br>HR8140 | GC4230<br>GC3040<br>GC2040<br>M30B | MP91M<br>SC6525<br>KCPK30<br>X500 | | F7030<br>MC7020 | T3130<br>T3225 | | ACP2000<br>ACP100 | TT7800 | YBM351 |
| | | P40 | HR8140 | GC4240<br>GC4230<br>GC3040<br>GC2040<br>M30B | KCPK30<br>X500 | | | | | | TT7800 | YBC302 |
| | M | M10 | | | | | | | | ACM200 | | |
| | | M20 | | GC2040<br>GC4230 | SC6525 | | F7030<br>MC7020 | T3225 | CA6535 | ACM200 | | YBM251<br>YBM253 |
| | | M30 | | GC2040<br>GC4230<br>GC4240<br>M30B<br>S40T | SC6525<br>X500 | IC5820 | F7030<br>MC7020 | T3225<br>T3130 | | ACM200 | TT7800 | YBM302 |
| | | M40 | | GC2040<br>M30B<br>S40T<br>GC4240 | X500 | | | | | ACM200 | TT7800 | |
| | K | K10 | | | SC3025<br>KCK15 | IC5100 | MC5020 | T1215<br>T1115 | | ACK2000<br>ACK100<br>ACK200 | TT7515 | YBD151 |
| | | K20 | HR6130 | GC3220<br>K20W | KCK15<br>SC3025<br>MP91M | IC5100<br>DT7150<br>IC4010<br>IC4050<br>IC4100 | MC5020 | T1215 | CA420M | ACK200<br>ACK200 | TT7515 | YBD252 |
| | | K30 | HR6130<br>HR8140 | GC3040 | MP91M<br>KCPK30<br>SC6525 | | | | | | | YBD252 |

# Comparison table of cermet grades

| Type | Classification codes | | HUAREAL | SANDVIK | KENNAMETAL | ISCAR | MiTSUBiSHi | TUNGALOY | KYOCERA | SUMITOMO | TEAGUTEC | ZCC.CT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IOS classification | Groups of materials | | | | | | | | | | |
| Cermet | P | P10 | HRC10 | | KT1120 | IC20N | NX1010 | NS520 | TN610 | T110A<br>T1000A | | |
| | | P20 | HRC10 | CT5015 | KT1120<br>KT175 | IC20N<br>IC75T | NX2525 | NS520<br>NS9530 | TN610<br>TN60 | T1200A<br>T1500A | CT3000 | YNG151<br>YNG151C |
| | | P30 | HRC10 | CT5015 | KT125 | IC20N<br>IC75T<br>IC30N | NX2525<br>NX3035 | NS9530<br>NS530<br>NS730 | TN620<br>TN90 | T1200A<br>T1500A | CT3000 | |
| | | P40 | | | | IC75T<br>IC30N | NX3035<br>NX4545 | NS740 | | T250A | | |

## Formulas for turning

● **Cutting speed**




$$Vc = \frac{\pi * Dc * n}{1000} (m/min)$$

Vc :Cutting speed(m/min) π: ≈ 3.14
Dc:Workpiece diameter(mm) n:Spindle speed~(rev/min)

● **Feed rate**

$$Vf = f * n \ (mm/min)$$

Vf :Feed rate (mm/min) f :Feed pre revolutio(mm/rev)
n: Spindle speed~(rev/min)

● **Chip thickness**

$$h = f * sinkr \ (mm)$$

h :Chip thickness (mm) f:Feed pre revolutio(mm/rev)

● **Chip width**

$$b = \frac{ap}{sinkr} (m/min)$$

b :Chip width (mm) ap :Cutting depth (mm)

● **Chip cross section**

$$A = h * b = ap * f \ (mm^2)$$

A :Chip cross section ($mm^2$) ap :Cutting depth (mm)
f:Feed pre revolutio (mm/rev)

● **Cutting force**

$$Fc = Kc * ap * f \ (N)$$

Fc :Cutting force (N) Kc:Specific cutting force ($N/mm^2$)
ap :Cutting depth(mm) f:Feed pre revolutio(mm/rev)

● **Cutting power**

$$Pmot = \frac{Kc * Vc * ap * f}{60000 * \eta} (KW)$$

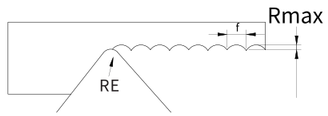
Pmot:Cutting power (KW) Kc:Specific cutting force($N/mm^2$)
Vc:Cutting speed (m/min) ap:Cutting depth(mm)
f:Feed pre revolutio(mm/rev) η: Efficient of machine

● **Metal removal rate**

$$Q = ap * f * Vc \ (cm^3/min)$$

Q:Metal removal rate ($cm^3$/min) ap:Cutting depth(mm)
f :Feed pre revolutio(mm/rev) Vc:Cutting speed (m/min)

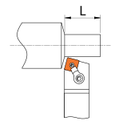
● **Roughness profile depth**




$$Rmax = \frac{f^2}{8 * RE} * 1000 \ (um)$$

Rmax: Roughness profile depth (um)
f:Feed pre revolutio(mm/rev) **RE:** Corner radius of insert(mm)

● **Machining time**




$$Tc = \frac{L}{f * n} (min)$$

Tc: Machining time f:Feed pre revolutio(mm/rev)
n: Spindle speed(rev/min) L:Machined length (mm)

## Formulas for milling

● **Cutting Speed**

$$Vc = \frac{\pi * Dc * n}{1000} (m/min)$$

Vc :Cutting speed (m/min) π : ≈ 3.14
Dc :Cutter diameter (mm) n: Spindle speed (rev/min)

● **Spindle Speed**

$$n = \frac{1000 * Vc}{\pi * Dc} (rev/min)$$

Vc :Cutting speed (m/min) π : ≈ 3.14
Dc :Cutter diameter (mm) n: Spindle speed (rev/min)

● **Feed Rate**

$$Vf = fz * n * Z (mm/min)$$

Vf :Feed rate (mm/min) fz :Feed per tooth (mm/z)
n: Spindle speed (rev/min) Z :Number of tooth

● **Feed Per Tooth**

$$fz = \frac{Vf}{n * Z} (mm/z)$$

fz :Feed per tooth (mm/z) Vf :Feed rate (mm/min)
n: Spindle speed (rev/min) Z :Number of tooth

● **Feed per revolution**

$$f = \frac{Vf}{n} (mm/rev)$$

f :Feed per revolution (mm/rev) Vf :Feed rate (mm/min)
n: Spindle speed (rev/min)

● **Cutting Time**

$$Tc = \frac{L}{Vf} (min)$$

Tc :Cutting time (min) L :Length of cut (mm)
Vf :Feed rate (mm/min)

● **Horse Power**

$$Hp = \frac{Pmot}{0.75}$$

Hp :Horse power Pmot :Cutting power (KW)

● **Power Requirement**

$$Pmot = \frac{ap * ae * Vf * Kc}{6 * 10^7 * \eta} (KW)$$

Pmot: Cutting power (KW) ap: Cutting depth ae: Cutting width
Kc: Sepecific cutting force ($N/mm^2$) η: Machine efficiency rate (0.7-0.95)

● **Medium Chip Thickness**

$$hm = \frac{114.7 * fz * \sin k * (ae/Dc)}{\psi s} (mm)$$

hm: Medium chip thickness fz: Feed per tooth (mm/z) ae: Cutting width
Dc :Cutter diameter (mm) ψs :Engagement angle

● **Feed Force**

Where cutter is positioned centrally

$$\psi s = 2 * \arcsin\left(\frac{ae}{Dc}\right) [^\circ]$$

Where cutter is positioned eccentrically

$$\psi s = 90^\circ + \arcsin\frac{ae-(Dc/2)}{(Dc/2)} [^\circ]$$

ψs :Engagement angle
ae: Cutting width Dc :Cutter diameter (mm)

● **Metal Removal Rate**

$$Q = \frac{ap * ae * Vf}{1000} (cm^3/min)$$

Q: Metal removal rate ($cm^3/min$) ap: Cutting depth ae: Cutting width
Vf :Feed rate (mm/min)

## Formulas for drilling

● **Cutting speed**

$$Vc = \frac{\pi * Dc * n}{1000} (m/min)$$

Vc :Cutting speed (m/min) π : ≈ 3.14
Dc :Cutter diameter (mm) n: Spindle speed (rev/min)

● **Spindle speed**

$$n = \frac{1000 * Vc}{\pi * Dc} (rev/min)$$

Vc :Cutting speed (m/min) π : ≈ 3.14
Dc :Cutter diameter (mm) n: Spindle speed (rev/min)

● **Feed rate**

$$Vf = fz * n * Z (mm/min)$$

Vf :Feed rate (mm/min) fz :Feed per tooth (mm/z)
n: Spindle speed (rev/min) Z :Number of tooth

● **Feed per revolution**

$$fz = \frac{Vf}{n * Z} (mm/z)$$

fz :Feed per tooth (mm/z) Vf :Feed rate (mm/min)
n: Spindle speed (rev/min) Z :Number of tooth

● **Feed per revolution**

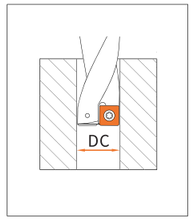
$$f = \frac{Vf}{n} (mm/rev)$$

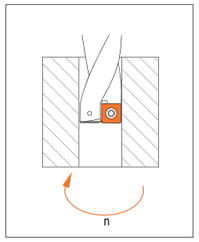
f :Feed per revolution (mm/rev) Vf :Feed rate (mm/min)
n: Spindle speed (rev/min)

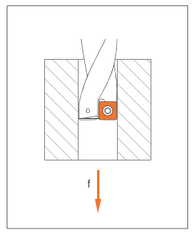
● **Metal removal rate**

$$Q = \frac{Vf * \pi * Dc^2}{4 * 1000} (cm^3/min)$$

Q: Metal removal rate ($cm^3/min$) Vf :Feed rate (mm/min)
π : ≈ 3.14 Dc :Drilling tool diameter (mm)




● **Horse power**

$$Hp = \frac{Pmot}{0.75}$$

Hp :Horse power Pmot: Cutting power (KW)

● **Power requirment**

$$Pmot = \frac{Q * Kc}{60000 * \eta} (KW)$$

Pmot: Cutting power (KW) Q: Metal removal rate ($cm^3/min$)
Kc: Sepecific cutting force ($N/mm^2$) η: Machine efficiency rate (0.7-0.95)

● **Torque**

$$Mc = \frac{Dc^2 * Kc * f}{8000} (N*m)$$

Mc: Torque Dc :Drilling tool diameter (mm)
Kc: Sepecific cutting force ($N/mm^2$) f :Feed per revolution (mm/rev)

● **Feed force**

$$Ff = 0.63 * \frac{f * Dc * Kc}{2} (N)$$

Ff: Feed force f :Feed per revolution (mm/rev)
Dc :Drilling tool diameter (mm) Kc: Sepecific cutting force ($N/mm^2$)

● **Chip thickness**

$$h = fz * \sin k (mm)$$

h :Chip thickness (mm) fz :Feed pre revolution (mm/rev)

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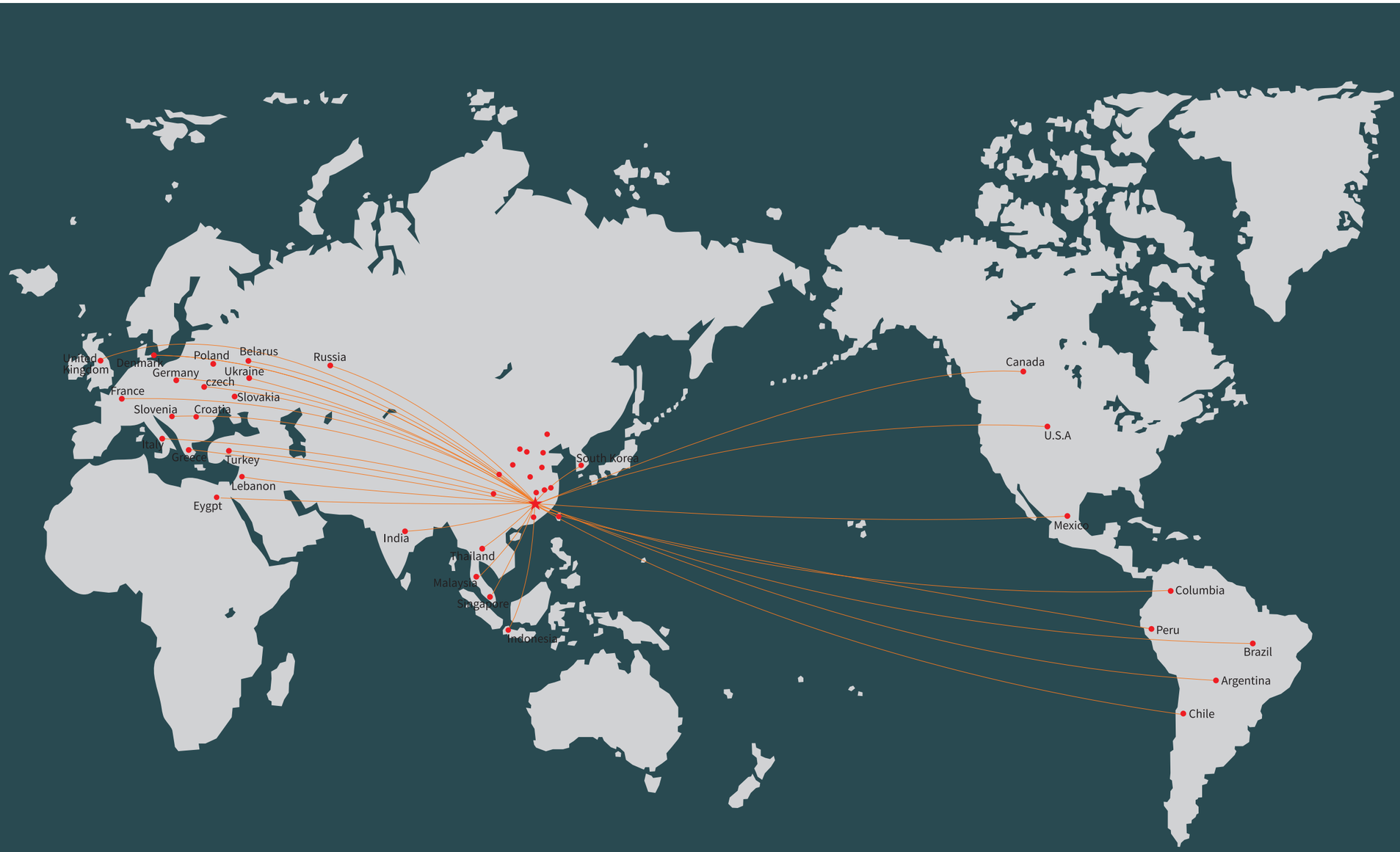
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