

# Latest solutions for small parts machining



Productivity improvement when utilizing LFV \* and coolant

Citizen Machinery latest machine

**Cincom** **Miyano**



L12



L20



M32



BNJ42/51

\*LFV is a registered trademark of Citizen Machinery Co., Ltd.

## Solution

- Lineup expansion of direct coolant compatible machines
- Reducing down time and extending tool life by improving chip control

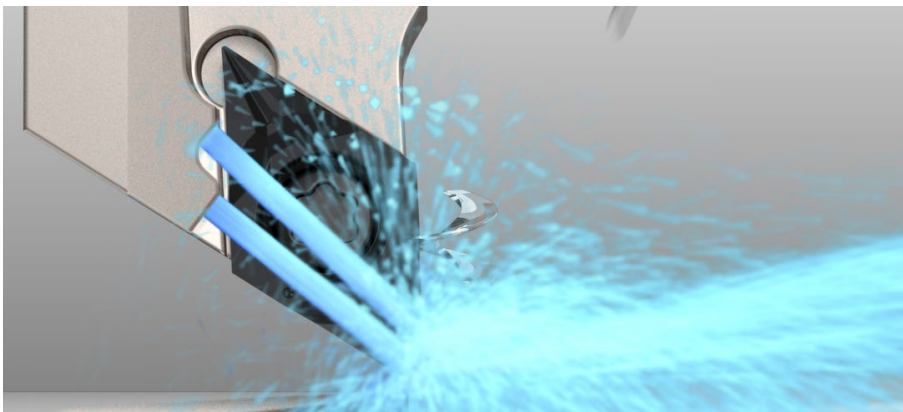
## New product

Direct coolant holder for small parts machining

# JCTM series

Applicable to different supply styles. Supports internal coolant with/without piping system  
Lineup of turning, grooving (KGBF), and cut-off (KGD/KTKF) holders

## 1 Using internal coolant to enhance tool performance



CG Image

### Advantages of internal coolant

- Reduction of piping components for compact machining
- Reduced installation time and interference checks
- Prevents chip winding around piping
- Reduced pressure loss

The JCTM series is compatible with internal coolant in a wide range of machines

Direct coolant machine made by Citizen Machinery



Cincom L20



Cincom D25



Cincom M32



Switching to internal coolant toolholder reduces chip entanglement

Internal coolant (2.5 MPa)



External coolant



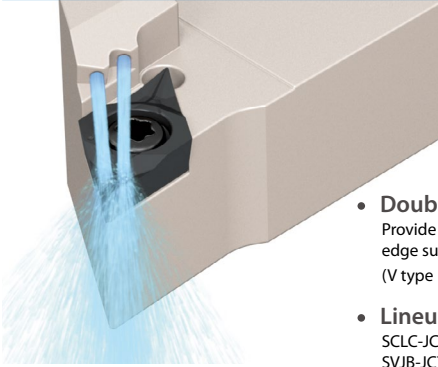
Pin SKS 93

$V_c = 180 \text{ m/min}$ ,  $a_p = 1.4 \text{ mm}$   
 $f = 0.13 \text{ mm/rev}$ , wet

SDJC / DCMT11T304 type (User evaluation)

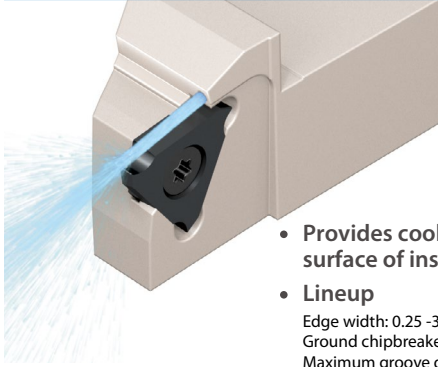
## 2 Lineup of turning, grooving, and cut-off holders

### Turning Screw clamp – JCTM



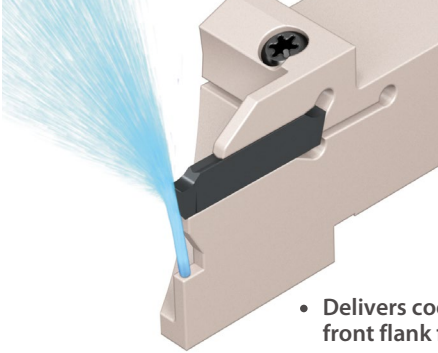
- **Double coolant holes**  
Provide coolant toward the cutting edge surface of the insert (V type 12: Single hole)
- **Lineup**  
SCLC-JCTM / SDJC-JCTM  
SVJB-JCTM / SVJP-JCTM

### External grooving KGBF-JCTM



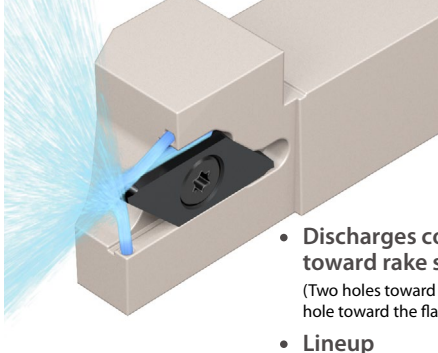
- **Provides coolant toward the rake surface of insert**
- **Lineup**  
Edge width: 0.25 - 3 mm  
Ground chipbreaker/Molded GL chipbreaker  
Maximum groove depth: 3 mm

### Cut-off KGD-JCTM



- **Delivers coolant directly to front flank face**
- **Lineup**  
Maximum cutting dia.: ~ 24 mm, ~ 32 mm

### Cut-off KTKF-JCTM



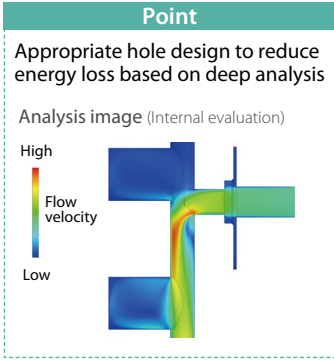
- **Discharges coolant in three directions toward rake surface of insert**  
(Two holes toward the rake face and one hole toward the flank face of the insert)
- **Lineup**  
TKF 12 type (Maximum cutting dia.  $\phi 5 - \phi 12$ )  
TKF 16 type (Maximum cutting dia.  $\phi 16$ )

## 3 Applicable to different supply styles. Supports internal coolant with/without piping system

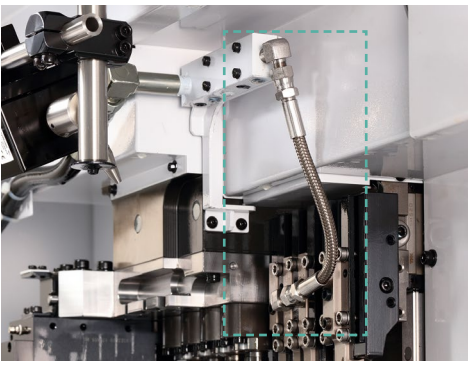
### Internal coolant without piping



\*When the tool turret supports direct coolant  
Coolant is supplied directly from tool turret into the holder.  
No need for piping just by installing tools



### Internal coolant with piping



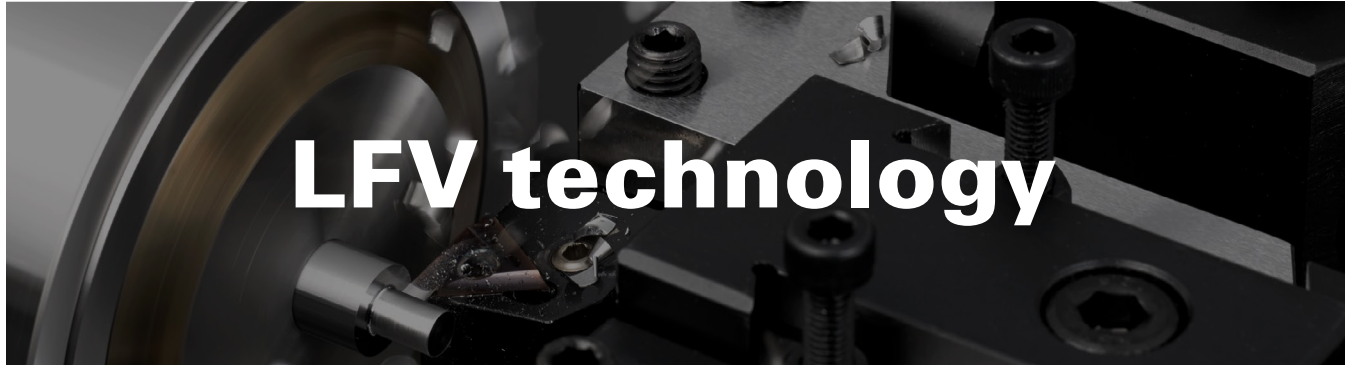
Compatible with internal coolant on any machine with standard piping parts  
Even under normal pressure, it is effective in improving chip control. Commercially available nylon hose can be substituted for normal pressure.

**For more information about JCTM, see the product catalog.**



Take your productivity to the next level with

# Next-generation processing technology

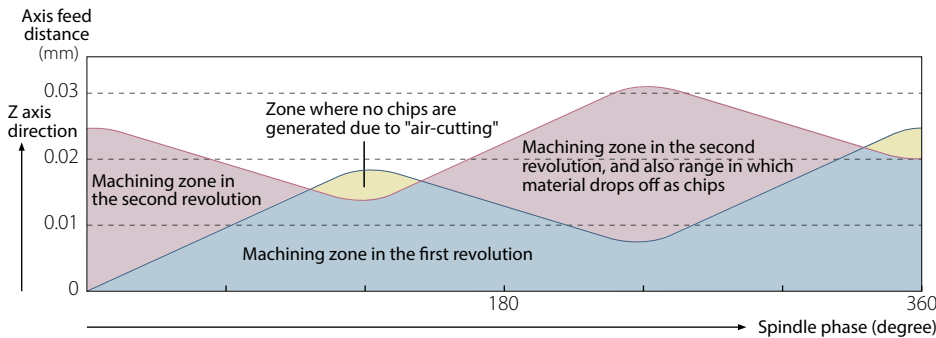


## What is low frequency vibration cutting?

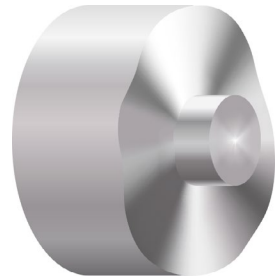
The servo axes are vibrated in the axial direction and cutting is performed while synchronizing this vibration with the rotation of the spindle. Because “air-cutting” times are provided during cutting, it is characterized by intermittent expulsion of chips. This widely applicable cutting technology – able to handle a broad range of machining shapes and materials – is ideal for cutting difficult-to-cut materials like inonel, stainless steel and copper. It is state-of-the-art and suppresses various risks associated with these materials, such as entanglement of chips and built-up edges.

\*LFV is a registered trademark of Citizen Machinery Co., Ltd.

- Z axis feed distance per spindle revolution and the low frequency vibration waveform



- Representation of the cutting



## Chip shapes

Depending on the material being cut, a variety of problems can be caused by chips getting entangled with each other, including increased cutting resistance, scarring, changes in the texture of the machined surface, tool nose damage, and built-up edges due to cutting heat. In low frequency vibration cutting, “air-cutting” time provided during cutting serves to break chips up finely and expel them. This “air-cutting” time also prevents the machining temperature rising, which both prolongs tool lives and gives relief from various problems caused by chips.

- Shape differences of chips of the same weight (SUS304)



Chips generated by low frequency vibration cutting

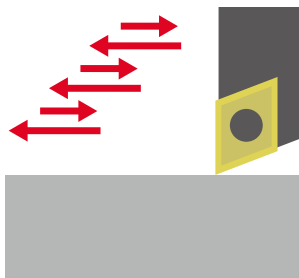


Chips generated by conventional cutting

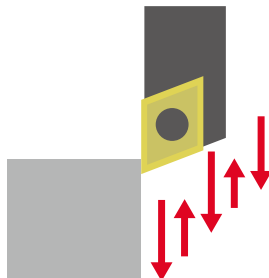
## Variety of machinable geometries

Vibration cutting can handle a variety of types of machining in addition to linear machining on faces, including tapers, arcs, and drilling. Vibration cutting can be turned ON and OFF just by inserting G codes into a program, giving relief from chip entanglement and problems with the tool nose, depending on the material being machined.

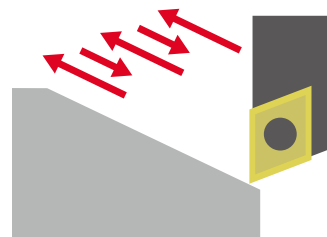
- Horizontal face



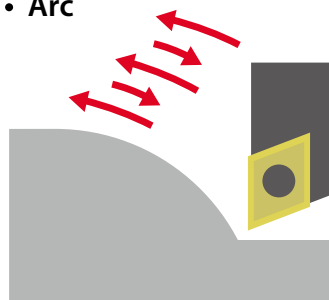
- Vertical face



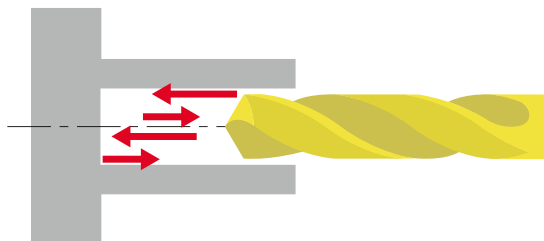
- Taper



- Arc



- Drilling



## Three vibration modes

The optimum vibration mode can be selected depending on the purpose of machining.



Vibration mode 1

### Breaking up chips

Designate the number of vibrations per workpiece rotation when fine swarf fragments are required



Vibration mode 2

### Drilling, or turning where high peripheral speed is required

Designate the amount of workpiece rotation per vibration when high peripheral speed is required for fine machining or deep, small-diameter holes



Vibration mode 3

### Breaking up chips in thread cutting

Processing method which alters the vibration timing within the threading pass when breaking up chips during threading processing is desired

**For more information, please visit the Citizen Machinery LFV special site.**

<https://cmj.citizen.co.jp/english/product/lfv/>



## What tools are suitable for LFV?

- It is desirable to use a sharp edge chipbreaker to improve chip control.
- Reduction of cutting force is required due to frequent biting of workpieces.

### Recommended

Molded sharp edge chipbreaker

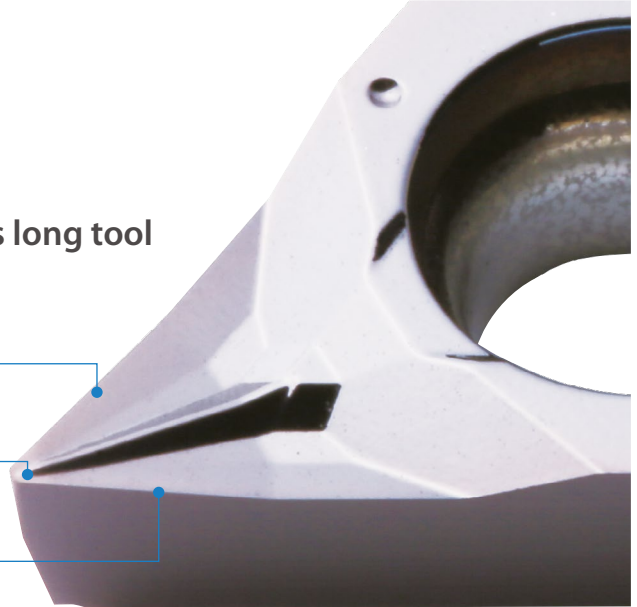
# SK chipbreaker

Unique sharp edge chipbreaker maintains long tool life and stable machining in LFV.

Stable chip evacuation in large D.O.C. due to large rake angle.

Chip control is improved in small depths of cut due to chipbreaker projecting out to the corner tip

Cutting force is reduced as the cutting edge is lowered towards the center of the workpiece



## Surface finish comparison

### SK chipbreaker



Good

### Standard chipbreaker (Conventional chipbreaker)



Damaged

Cutting conditions:  $V_c = 50$  m/min,  $a_p = 2.8$  mm  $f = 0.05$  mm/rev  
 LFV conditions: Q2.0 (Amplitude ratio), D1.5 (The number of vibration) Insert: DCGT11T302 type (SK, standard)  
 Workpiece: SUS630

## Wear comparison

### Challenges

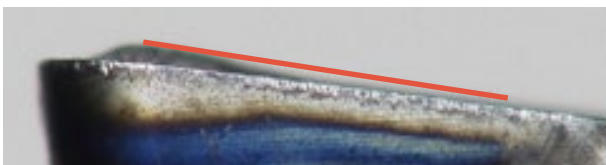
- Unstable machining can cause biting of the workpiece to occur frequently

### Solution

- SK chipbreaker reduces cutting force when biting. Sloped cutting edge prevents insert fracture

<Flank wear condition> 10 min machining

### SK chipbreaker



### Conventional chipbreaker



# Insert grade for LFV

Recommended insert grade

Small parts machining

Tough machining: PR1535

Normal machining: PR1725

## Recommended

MEGACOAT NANO

# PR1535

Website



Fracture resistant with a tough substrate and high heat-resistant coating.  
Stable machining of general steel, mold steel, and difficult-to-cut materials

## MEGACOAT NANO®

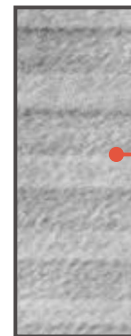
- 1 Toughening by a new cobalt mixing ratio \*Internal evaluation
- 2 Improved stability by optimization and homogenization of grains in the base material
- 3 MEGACOAT NANO coating technology for long tool life and stable machining

↑ 23%  
Fracture toughness \*

Cracking comparison by diamond indenter (Internal evaluation)



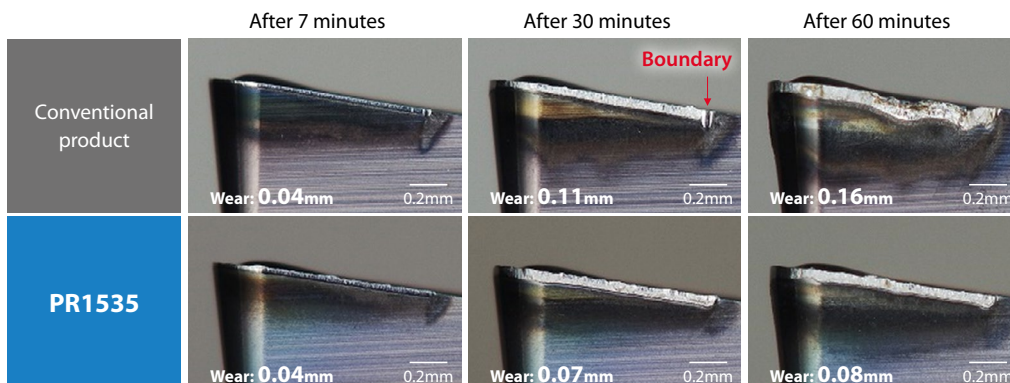
↑  
Shock Resistance



MEGACOAT Base layer structure

PR1535 shows superior performance in steel machining under unstable conditions

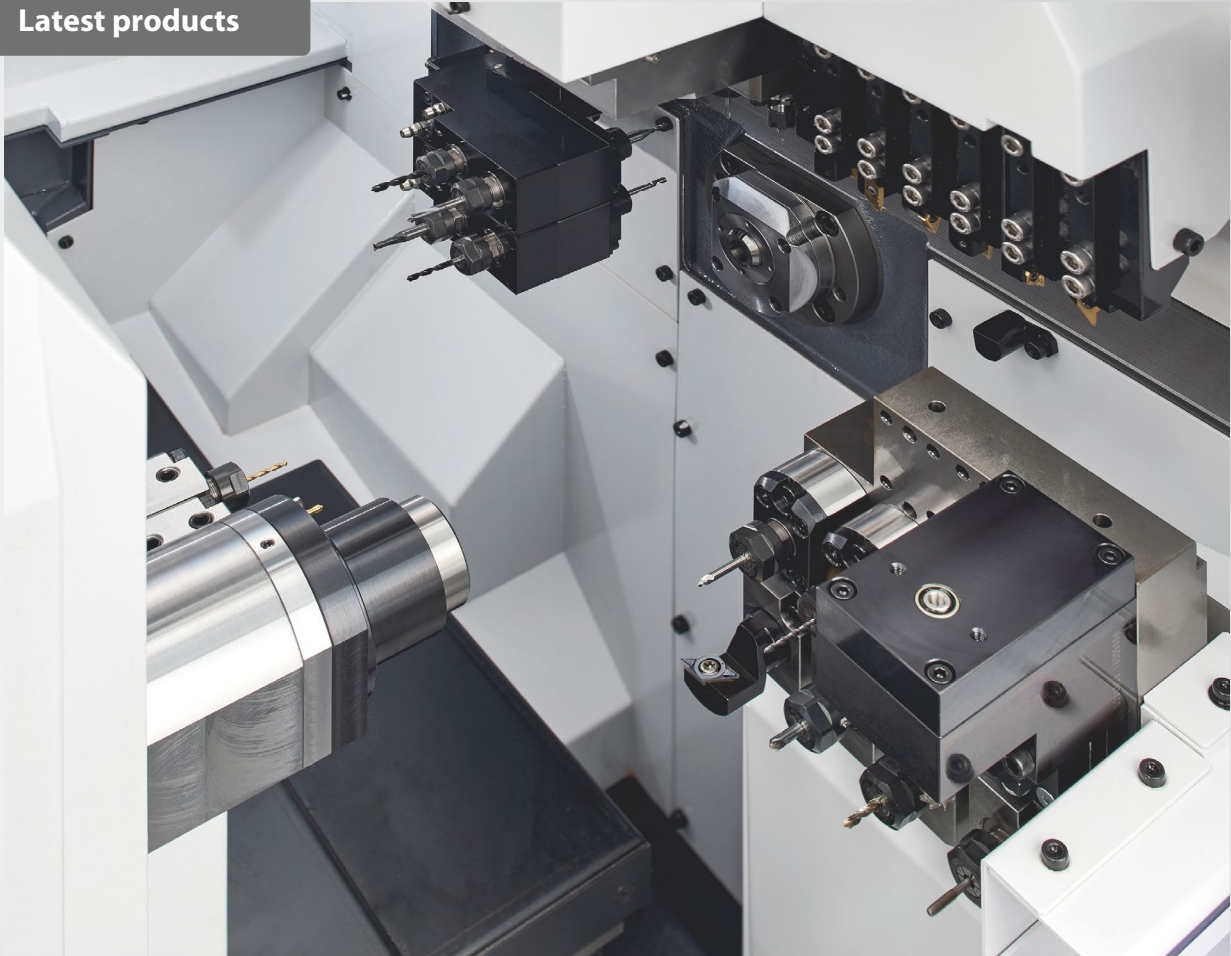
## Wear comparison (Internal evaluation)



Cutting conditions: LFV Q 1.5, D 0.5, Vc = 120 m/min, ap = 1.5 mm, f = 0.03 mm/rev (Instant ceed 0.1 mm/rev) Workpiece: SK4

PR1535 of high toughness base material was effective for stable LFV machining.

**CITIZEN MACHINERY**  
Latest products



**Cincom**  
**L12**



### L12 premium model with modular tooling and Y2 axis

L12 for small-diameter machining with 5-axis control equipped with a high-speed spindle adapted a modular tooling system with Y2 axis on back spindle for even higher functionality. The built-in motor is used for the back spindle to support high-speed back machining. With the popular LFV function, it has evolved into a machine with high speed, high function and high productivity.

**Learn more about L12 machine**

\*Link to Citizen Machinery website



**Featured product**



## Molded PCD chipbreaker

APD chipbreaker, AGT chipbreaker

**Newly designed molded chipbreaker controls chips provides improved productivity**

- Molded chipbreaker with complex shape developed by Kyocera advanced technology
- Good chip control improves productivity
- Improves down time due to winding chips, smearing of the finished surface, and suppresses quality degradation and yield deterioration

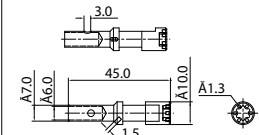




## L12 Tooling proposal A5052

- "Adjustable angle end-face spindle" that allows for slanted hole drilling, enable you to perform various kinds of machining.
- Equipping of a Y2 axis to the back spindle enables drilling circumference of the hole and complex shape machining by end mill.

Workpiece dimension image



### Front

#### Opposite tool post

##### ① T22 Drilling

Gamma Drill: 258870.0600  
(D6.0 5xD)



#### Rotary tools

##### ③ T8 Drilling (Cross hole)

2ZDK030HP-1.5D

##### ④ T11 Drilling (Diagonal hole)

2ZDK016HP-1.5D

##### 2ZDK-HP

New generation flat bottom drill. Stable machining in a wide range of applications including counterboring and drilling in cylinder surfaces



#### Rotary tools

##### ⑥ T10 End mill machining

3AFK060-090

#### Gang tool post

##### ② T5 Front turning

DCMT11T302APD(KPD001)  
SDJCR1010JX-11FF



##### APD chipbreaker

The uniquely designed molded chipbreaker controls chips and achieves excellent surface finish quality.

##### ⑦ T1 Cut-off machining

TKF12R100-S(PDL025)  
KTKFR1010JX-12

##### ⑤ T3 Back turning

TKF12R200-AGT(KPD001)  
KTKFR1010JX-12

Excellent cutting edge profile and good finished surface due to ultra fine particles (Average particle size of 0.5 μm)

### Back spindle

#### Back tool post

##### ④ T35 Front turning

Pickup

DCGT11T302MFP-SK(PDL010)  
S19G-SDUCL11

##### PDL010

Hardness close to that of diamond with aluminum welding resistance. Delivers a high-gloss surface finish



##### ① T33 Drilling

2ZDK045HP-1.5D

##### ② T32 Drilling

2ZDK013HP-1.5D

##### 2ZDK-HP

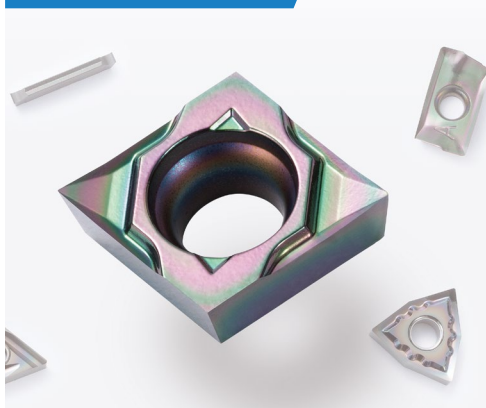
New generation flat drill. Chisel edge with S-curve provides high precision and stable machining results



##### ③ T31 End mill machining

2FESS010-015-04

### Featured product



DLC coating

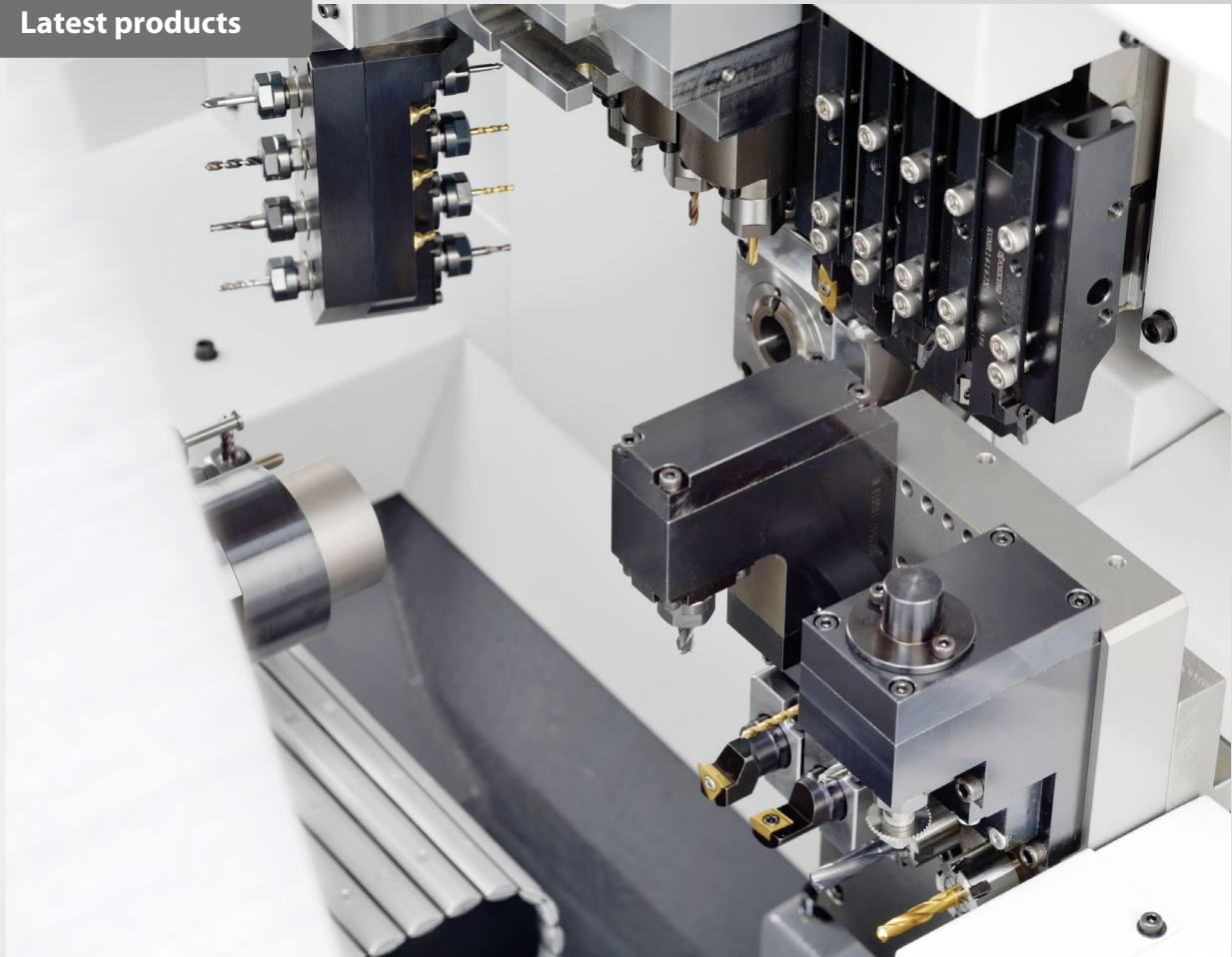
## PDL010

High quality and long tool life for machining aluminum

- Achieves long tool life with hardness close to that of diamond
- Excellent surface finish with aluminum welding resistance
- Large lineup for turning, cut-off, and milling



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Latest products



**Cincom**  
**L20**



**CITIZEN's best-seller L20 has been designed for the new age in modular design**

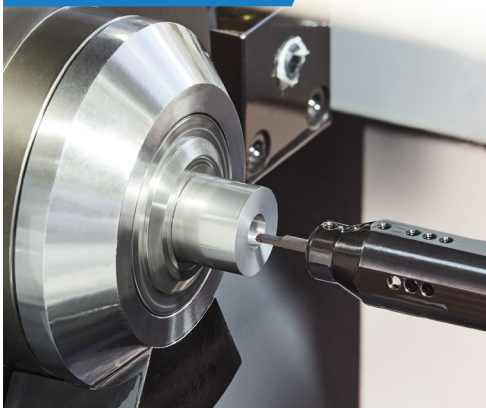
Ranging from a 5-axis machine with excellent cost performance to a high-end machine equipped with B axis and a back spindle Y axis, you can select the applicable machine from 4 models. Individual optimized specifications for flexibility from simple machining to complex machining.

**Learn more about L20 machine**

\*Link to Citizen Machinery website



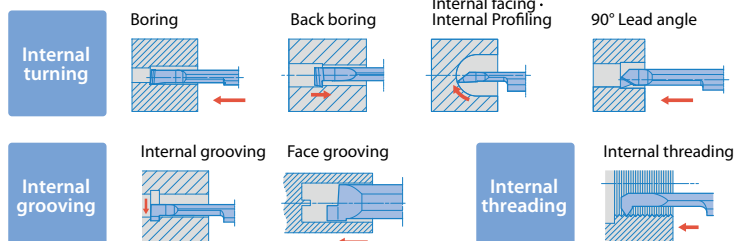
**Featured product**

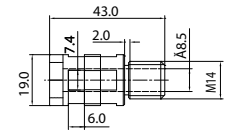


For micro boring

**EZ Bar**

Easy adjustment and high precision for a wide range of machining applications





- Standard models for a wide range of products and machining
- Supports various drilling and end mill machining with B-axis and C-axis control

Front

Opposite tool post

② T23 Drilling

KDA0800X05S080C

Pickup

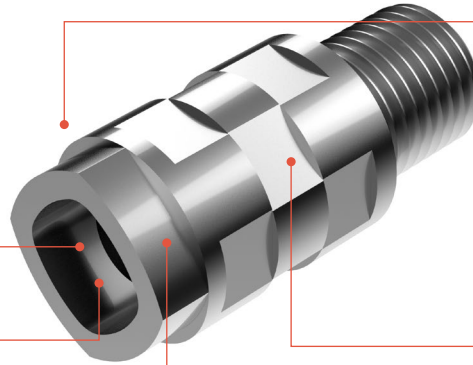
① T21 Drilling

KDA1000X05S100C

Pickup

**KDA**

New general purpose solid carbide drill KDA. Curved cutting-edge design and special flute shape provides stable machining.



Gang tool post

⑤ T5 Front turning

DCGT11T302MFP-SKS(PR1725)  
SDJCR1218JX-11FFJCTM

**PR1725**

Newly developed PVD coating MEGACOAT NANO PLUS provides excellent surface finish and long tool life



⑦ T1 Cut-off machining

GDM2020N-020PM(PR1535)  
KGDR1625H-JCTM

Milling

③ T11 End mill machining (Internal)

4QFSM...-VE

**Q Series**

High feed machining for difficult-to-cut materials such as stainless steel. Unequal flute spacing and variable lead design provide greater chatter resistance

④ T13 End mill machining (External)

⑥ T8 End mill machining (Cross)



Back spindle

Back tool post

① T34 Front turning

DCGT11T302MFP-SK(PR1725)  
S19G-SDUCL11

**Molded sharp edge SK chipbreaker**

Improved chip control and reduced cutting force

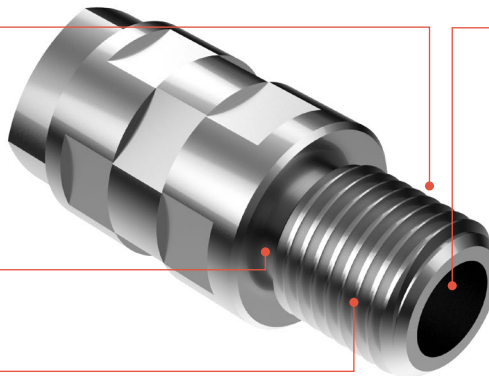


② T33 Grooving

GBF32R150-010(PR1535)  
S19G-KGBFL16

③ T32 Threading

TTX32R6001(PR1115)  
S19G-KTTXL16



④ T31 Boring

Pickup

EZBR080080HP-015F (PR1225)  
EZH08019HP-120

**EZBar**

Adjustable overhang length (EZ adjust structure)



Featured product



High efficiency coated solid carbide drill

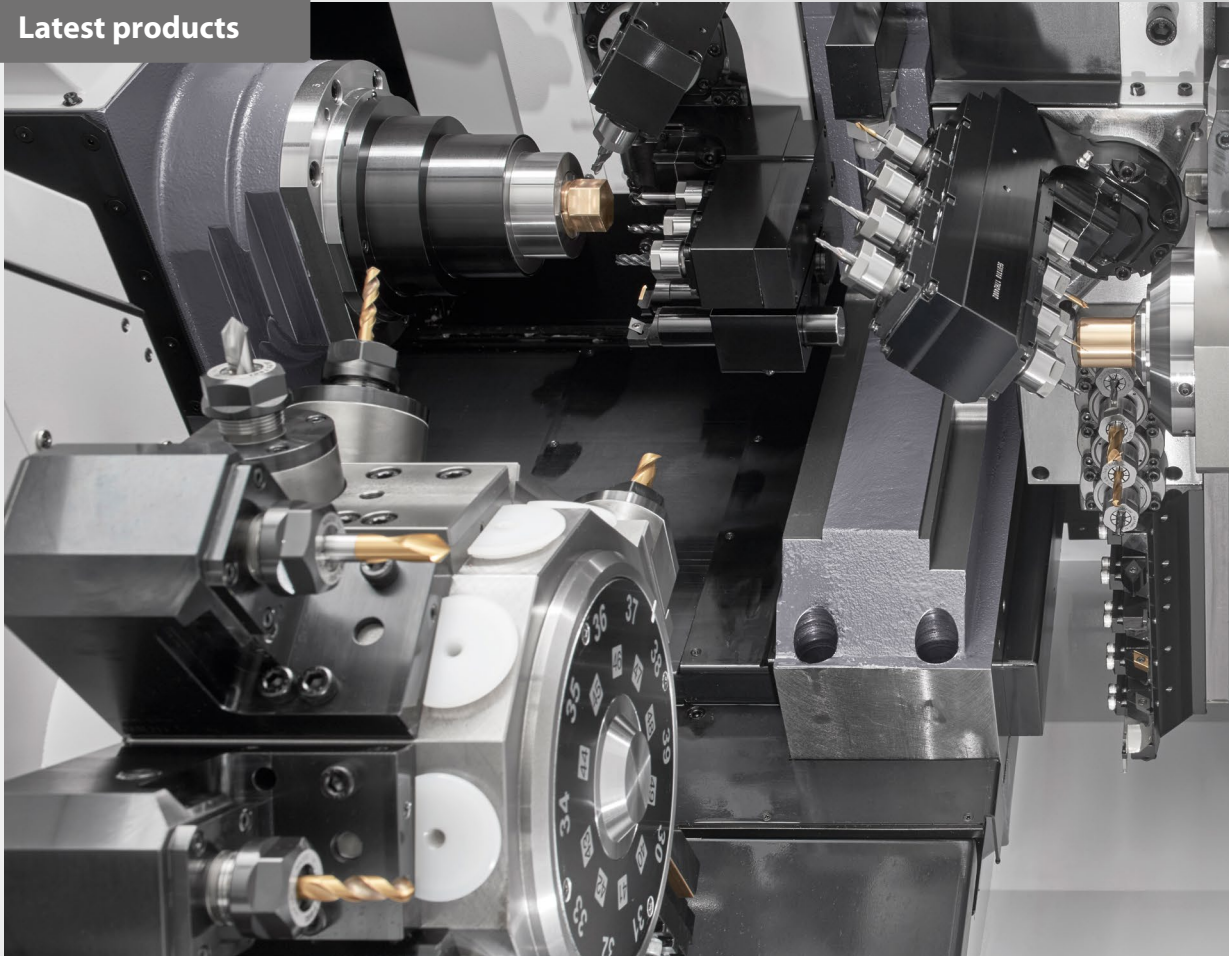
**KDA**

Excellent all-around drilling performance

The perfect balance between performance and cost  
Large lineup accommodates a wide variety of applications



**CITIZEN MACHINERY**  
Latest products



**Cincom**  
**M32**



**Ultimate gang tool + turret configuration machine revamped M32**

The new M 32, which is a synonym for the high-performance cincom, has been fully remodeled. In addition to the improved operability and workability of the new design, the newly redesigned turret tooling adopts "single drive" which is driven only by the selected rotary tool. The M32 leads improved machining capabilities, improved tooling life, low vibration and low heat generation.

**Learn more about M32 machine**

\*Link to Citizen Machinery website



**Featured product**



**Grooving tools for small parts machining**

**GBF**

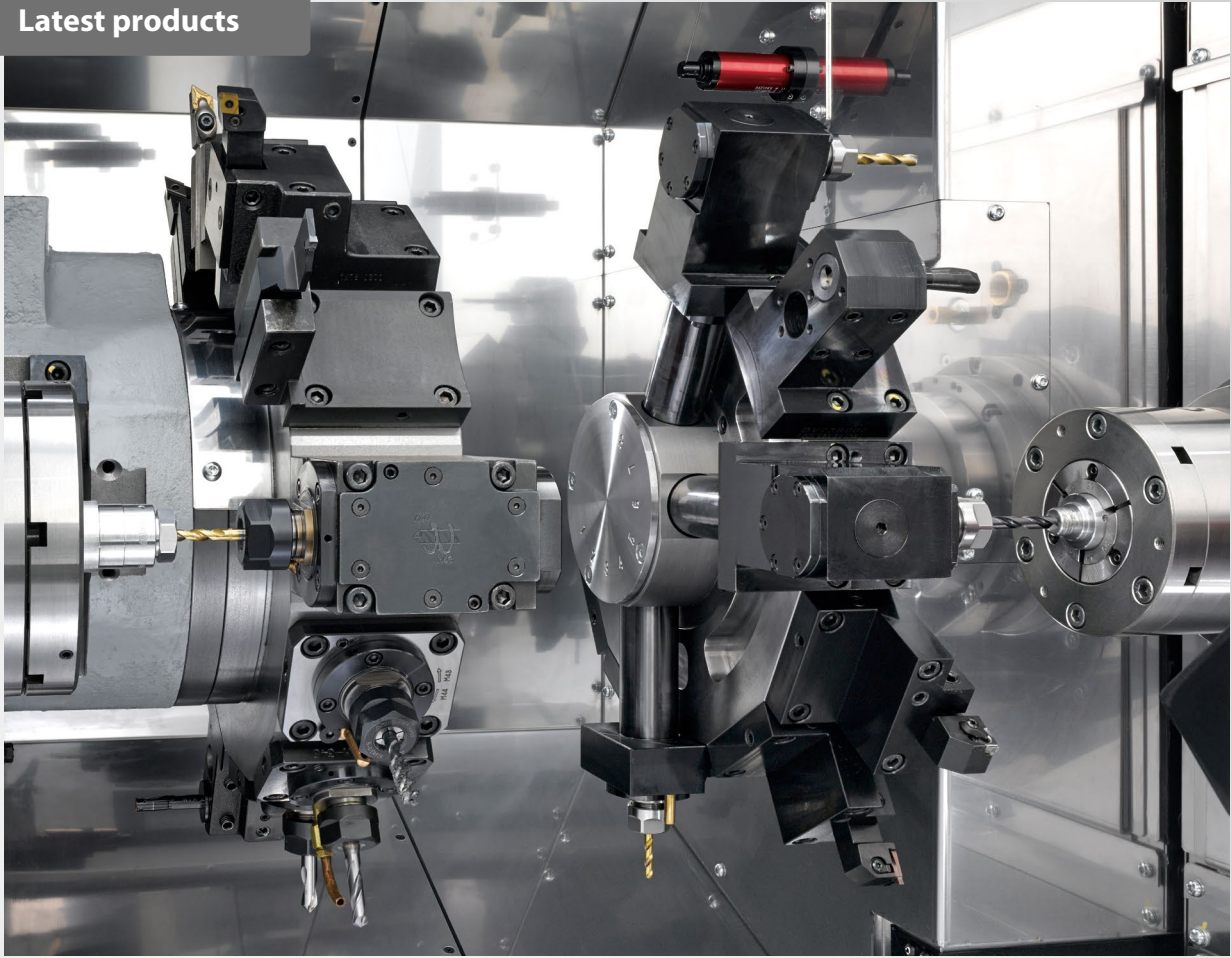
**Stable chip control and excellent surface finish**  
**High precision, the edge width tolerance:  $\pm 0.02\text{mm}$**

- Groove widths from 0.25 mm to 3.00 mm and maximum groove depths up to 3 mm
- Long tool life and high efficiency machining achieved by MEGACOAT technology
- Cermet is available. Provides excellent surface finish





**CITIZEN MACHINERY**  
Latest products



**Miyano**  
**BNJ42/51**



**Proprietary back working turret dramatically reduces idle time**

In addition to the high efficiency machining by simultaneous machining at right and left, the superimposition machining drastically shortened machining time. Superimposition control, where the move commands of turret No. 2 that can move in the X and Z directions are overlapped on the movement of turret No.1, can achieve substantial reductions in machining time. In addition, the Y-axis function of the main turret allows easy side milling, enabling large-diameter threading and machining with uneven parts that were previously impossible.

**Learn more about  
BNJ42/51 machine**

\*Link to Citizen Machinery website



**Featured product**



High-performance cut-off solutions

**KPK series**

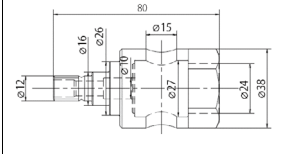
**Unique design for superior performance in cut-off operations**

- Easy insert replacement reduces downtime
- Features new insert, blade, and tool block
- Unique chipbreaker for long tool life and stable machining



## Miyano BNJ51 tooling proposal SUJ2

Workpiece dimension image



- High efficiency machining by simultaneous machining at right and left with 2 spindles and 2 turrets
- Main turret provides easy side milling and polygon machining

### Front

#### ⑦ T11 Boring

TPGT090204MFP-PF(PR1725)  
E08L-STLPR09-10AN  
SHA0825.0-135

#### ⑥ T24 Drilling

DA0900M-HQP(PR1535)  
SS10-DRA090M-8

#### DRA-HQP

Improved centripetal forces with special two-step bottom  
Excellent cylindricity, roundness and surface finish in steel machining



#### ⑤ T9 Cross hole machining

ZZDK150HP-1.5D

#### ⑧ T12 Cut-off machining

PKM30N-025PM(PR1625)  
KPKB26-3JCT(Blade)  
KPKTB20-26JCT(Block)

#### KPK series

Reduce down time with fast insert replacement  
JCT type compatible with internal coolant



#### ① T1 External, face finishing

CNMG120408PP(CA025P)  
DCLNR2020K-12JCT

#### Double-clip JCT

The unique coolant structure improves tool life and chip control. Tool life is improved even under normal pressure.



#### ② T2 Polygon machining

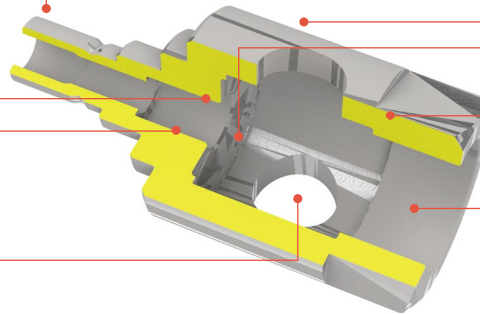
Custom polygon cutter

#### ③ T3 Drilling

DA2400M-FTP(PR1535)  
SF25-DRA240M-3

#### ④ T6 Internal grooving

KGDIR2016B-3  
GDM3015N-040GMI(PR1225)



### Back spindle

#### ① T1 External roughing

TNMG160404R-LD(PR1725)  
DTGMR2020K-16JCT

#### ② T2 External finishing

DNMG150404PP(PV730)  
DDJNR2020K-15JCT



#### ③ T7 Threading

16ER125ISO-TQ(PR1515)  
KTNR2020M-16JCT

#### ④ T4 Drilling

KDA0700X05S080C

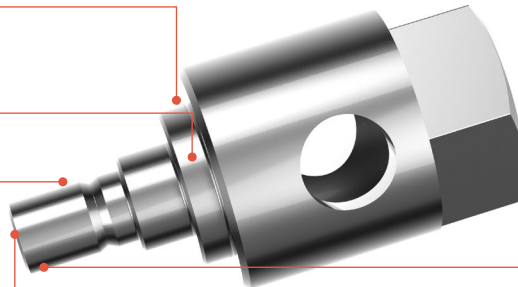


#### ⑤ T5 Boring

EZBR070070HP-015F(PR1725)  
EZHO7025.0CT-135

#### EZ Bar

Easy adjustment and high precision for a wide range of machining applications. Newly developed PVD coating PR1725 added to the lineup. Provides long tool life and excellent surface finish.



### Featured product



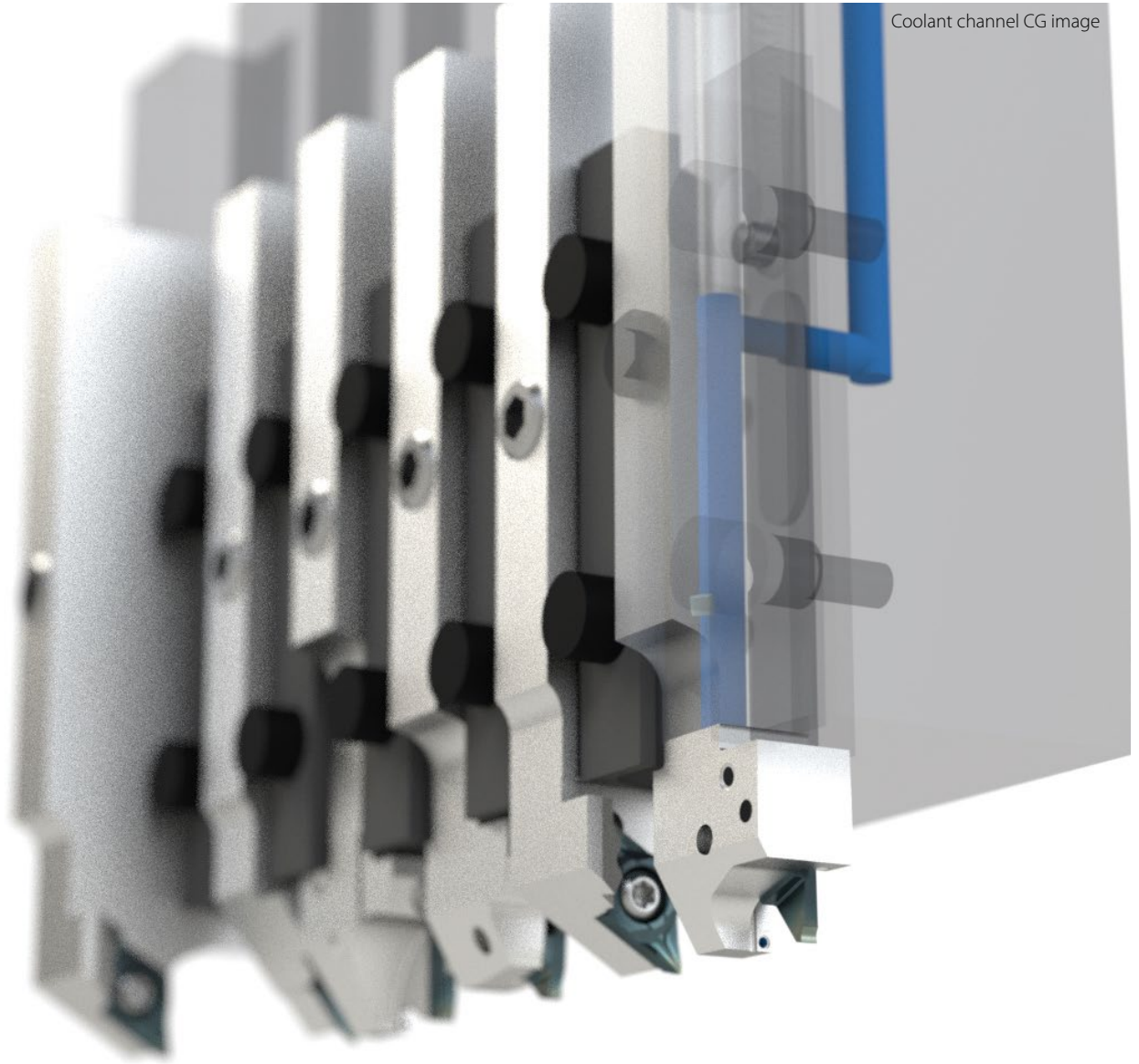
High efficiency modular drill

## MagicDrill DRA High precision insert for steel machining HQP

Newly developed insert provides high-precision drilling capabilities

- Special two-step bottom, large rake angle and double margin design reduce initial shock for higher-precision machining
- Excellent surface finish with unique flute shape. Controlled chips reduce scratches on the hole wall.





Drastically improve machining performance  
by using **internal coolant**