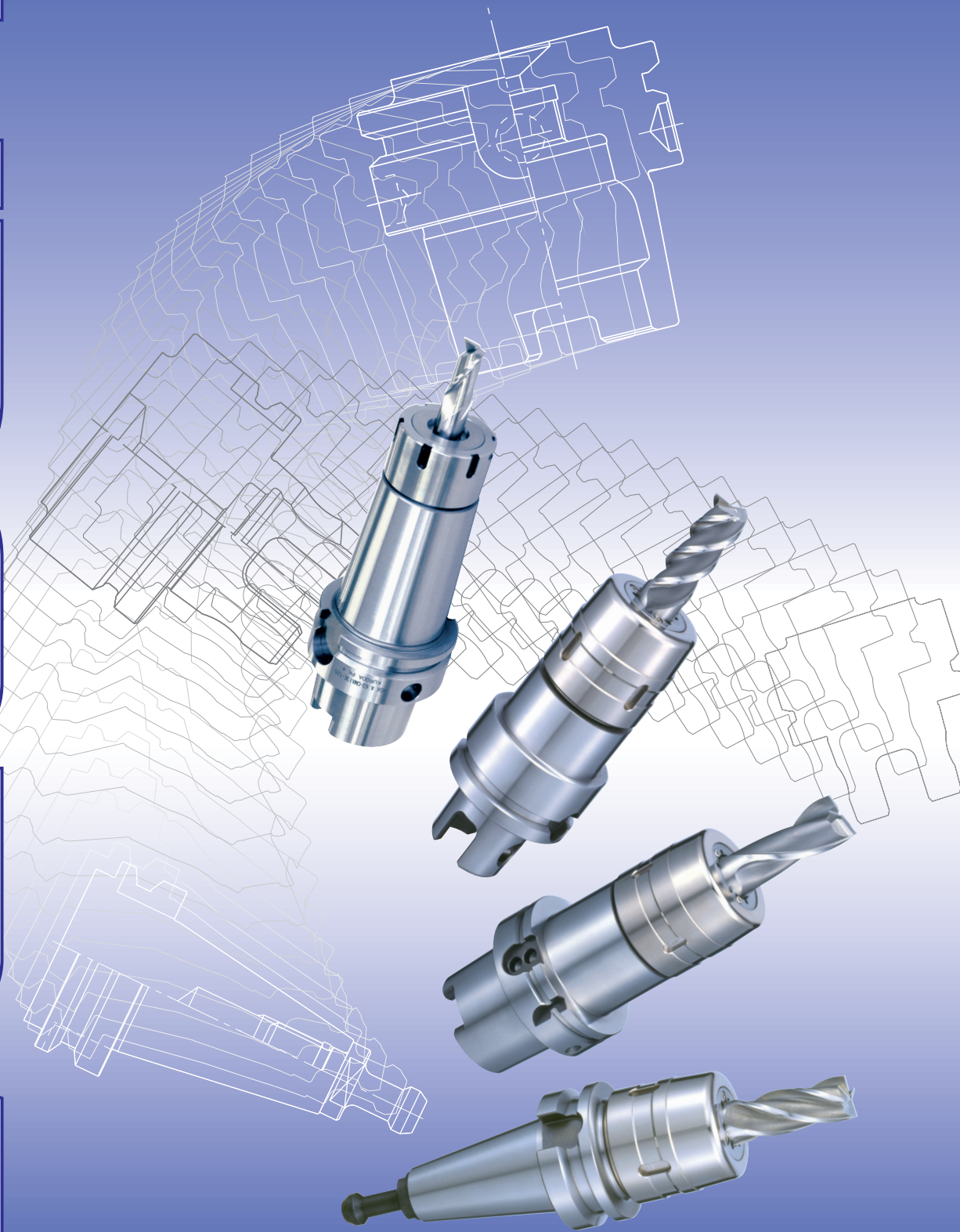
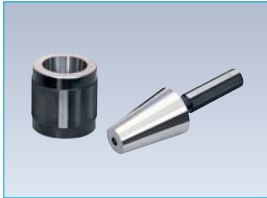


TYURBO

**TOOL HOLDERS
CATALOGUE**



TOOL HOLDERS



Taper Gauge

The needs of high speed, high precision and high rigidity is accurately met by our products.

Tooling for CNC Machining Center



Tool holder is a vital factor in the interface between machine tools and cutters. Taper gauge production technology is indispensable for firmly holding tooling to machine tools. With increasing use of numerical control in machine tools, users demand even greater accuracy and higher speeds. Face and taper contact tool holder has been developed which completely replaces the conventional holding format. It meets the requirements for high speed, high accuracy and high rigidity. Tool holder serves not only as a holding device; it is a complementary function of machine tools and is being developed into a total system that holds tool control information and supports CAD/CAM. KURODA aims to address market needs accurately. We will continue to offer solutions and new technological know-how, always pursuing greater efficiency, and we shall continue to explore new possibilities for tool holder.

Face and Taper Contact Tooling



Tooling for Multi-spindle & Proto type Machine



Hydraulic Tool



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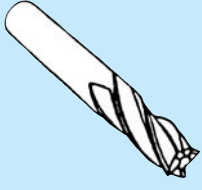




































CAT Shank Tooling

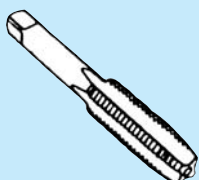
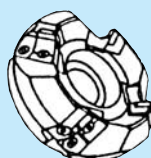
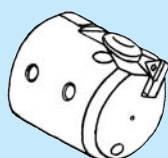

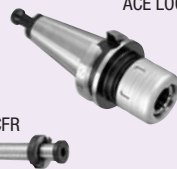



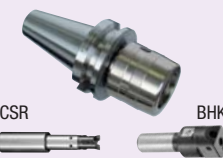





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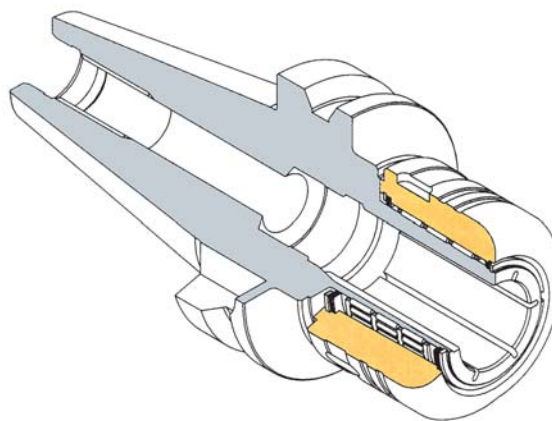
Drill		Reamer		End mill	
					
ACE LOCK MLR	Shank Page	ACE LOCK MLR	Shank Page	ACE LOCK MLR	Shank Page
	BT 27		BT 27		BT 27
	HSK 97		HSK 97		HSK 97
CSR CJA	CAT 139	CSR CJA	CAT 139	CSR	CAT 139
 	SK 189	 	SK 189		SK 189
MILL ACE MLA	Shank Page	MILL ACE MLA	Shank Page	MILL ACE MLA	Shank Page
	BT 39		BT 39		BT 39
	HSK 105		HSK 105		HSK 105
CSM	CAT 151	CSM	CAT 151	CSM	CAT 151
	SK 201		SK 201		SK 201
μ-ACE CMA/CMZ	Shank Page	μ-ACE CMA/CMZ	Shank Page	μ-ACE CMA/CMZ	Shank Page
	BT 41, 43		BT 41, 43		BT 41, 43
	HSK 107, 109		HSK 107, 109		HSK 107, 109
CMA	CAT 153, 155	CMA	CAT 153, 155	CMA	CAT 153, 155
	SK 203, 205		SK 203, 205		SK 203, 205
Unified-type keyless drill chuck KLC	Shank Page	Unified-type keyless drill chuck KLC	Shank Page	Side lock holder SLV	Shank Page
	BT 50, 53		BT 50, 53		BT 54
	HSK 124		HSK 124		HSK 118
Release proof keyless drill chuck		Release proof keyless drill chuck			CAT 162
					SK 212
Jacobs taper adaptor JTA	Shank Page	Jacobs taper adaptor JTA	Shank Page		
	BT 51		BT 51		
LC/ALB		LC/ALB			
					
Side lock holder SLV	Shank Page	Side lock holder SLB	Shank Page		
	BT 54		BT 55		
	HSK 118				
	CAT 162	DSA-MT	CAT 163		
	SK 212		SK 213		
Side lock holder SLB	Shank Page	Morse taper holder MTA	Shank Page		
	BT 55		BT 61		
			HSK 120		
DSA-MT	CAT 163		CAT 169		
	SK 213		SK 219		
Side lock holder SLDA	Shank Page				
	BT 59				
	HSK 119				
CFCA	CAT 167				
	SK 217				
Morse taper holder MTA	Shank Page				
	BT 61				
	HSK 120				
	CAT 169				
	SK 219				

Tap		Milling		Boring						
										
Torque control tap holder TPT  TPT	Shank	Page	ACE LOCK MLR  CFR	Shank	Page	ACE LOCK MLR  CSR BHK	Shank	Page		
	BT	62		BT	27		HSK	97	BT	27
	CAT	170		CAT	139		CAT	139	HSK	97
	SK	220		SK	189		SK	189	CAT	139
Rigid tap holder TPJ  JT	Shank	Page	MILL ACE MLA  CFR	Shank	Page	MILL ACE MLA  CSR BHK	Shank	Page		
	BT	65		BT	39		HSK	105	BT	39
	HSK	121		CAT	151		CAT	151	HSK	105
	CAT	173		SK	201		SK	201	CAT	151
			Face mill arbor FMA 	Shank	Page	Modular Boring tool BBT/BH/BHJ 	Shank	Page		
		BT		69	BT		73, 75, 77	HSK	127, 129, 131	
		HSK		125	CAT		179, 181, 183	CAT	179, 181, 183	
		CAT		177	SK		229, 231, 233	SK	229, 231, 233	
			Face mill arbor FMC 	Shank	Page	Boring head BHK 	Shank	Page		
		BT		70	BT		91			
		HSK		126						
		CAT		178						
			Side cutter arbor SCA 	Shank	Page					
		BT		68						
		CAT		176						
		SK		226						

Milling Chuck "ACE LOCK"/MLR

These high rigidity, high accuracy milling chucks are applicable to high pressure coolant and MQL.

Center-through

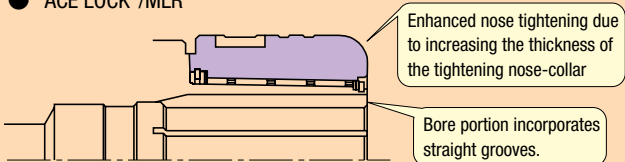


Enhanced Holding Power using Nose Tightening

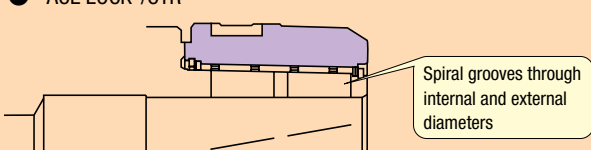
The thickness of the tightening nose-collar has been increased and the chuck bore has been improved by incorporating straight grooves to enhance nose tightening and allow increased holding power.

This prevents tools from becoming detached due to precession, and enables powerful machining work.

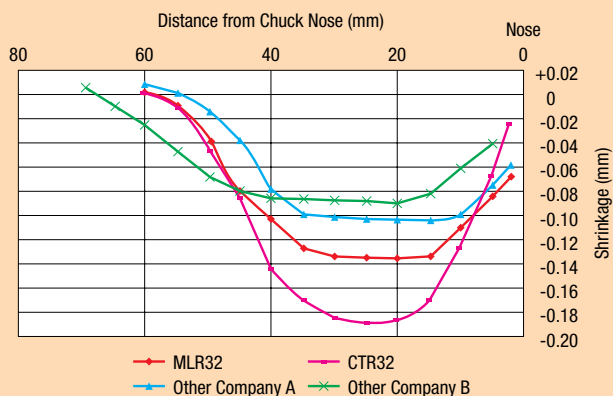
● "ACE LOCK"/MLR



● "ACE LOCK"/CTR



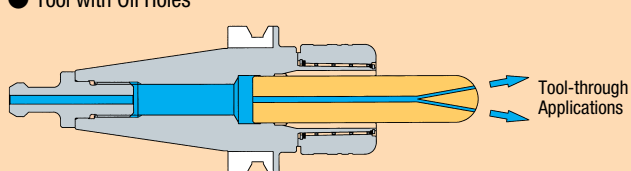
■ MLR32 Chuck Bore Shrinkage (When tightening without tool)



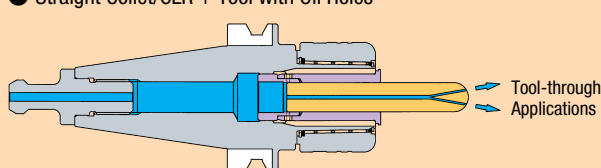
Coolant Applications Possible

These milling chucks allow coolant applications regardless of whether tools have oil holes or not. Tools with oil holes allow coolant application from the blade tip using the labyrinth seal inside the chuck, while tools without oil holes allow coolant application along the outside circumference of the tool shank via the straight grooves of the chuck bore. This also allows flexible response to high pressure coolant applications and MQL.

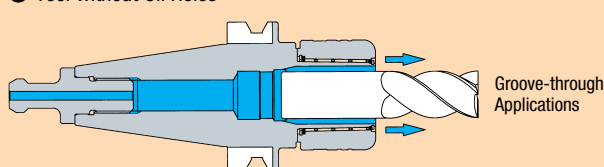
● Tool with Oil Holes



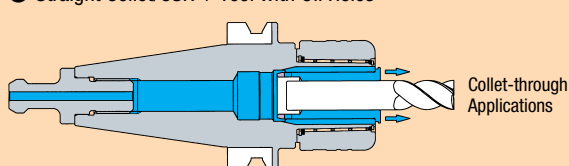
● Straight Collet/CLR + Tool with Oil Holes



● Tool without Oil Holes



● Straight Collet/CSR + Tool with Oil Holes





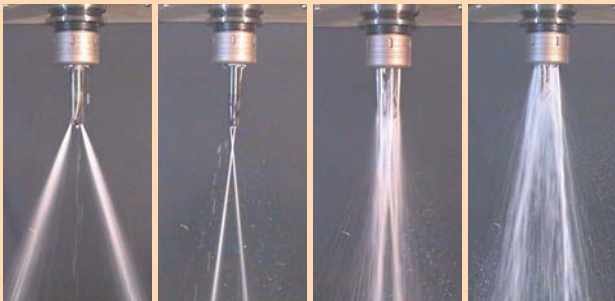
BT Shank



HSK Shank

Coolant Application Conditions

Tool with Oil Holes Straight Collet/CLR + Tool with Oil Holes Tool without Oil Holes Straight Collet/CSR + Tool with Oil Holes



High Rigidity and High Accuracy

Due to the continued use of the tightening nose-collar end face contact method (face and taper contact), rigidity is high and a concentricity of 0.005mm is realized between the shank part and the chuck internal diameter, allowing an adequate run-out accuracy to be practically maintained.

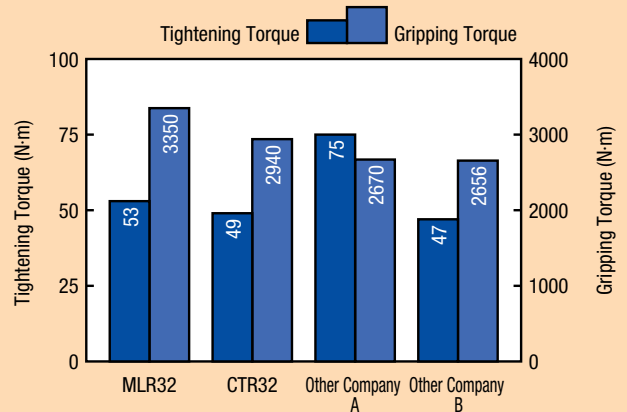
Durability

Due to the normal construction of the roller rotating surface, equipment durability is extended when using the selected lubricating oils.

High Holding Power realized from a Light Tightening Torque

Inheriting the outstanding operability of the "ACE LOCK"/CTR, which has been favorably used for many years, these highly efficient milling chucks realize a high gripping power from a light tightening torque. (In the MLR32, a tightening torque of 53N·m creates a gripping torque of 3350N·m, 63 times larger.)

Comparison of MLR32 gripping power with other products of similar size



Compatibility

The "ACE LOCK"/MLR milling chucks can use the accessories for the "ACE LOCK"/CTR as they are, without modification.

Milling Chuck “MILL ACE”/MLA

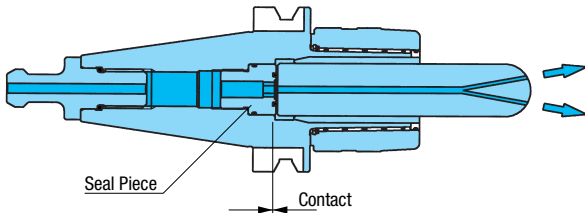
This milling chucks are applicable to high spindle speeds and high pressure coolant applications.



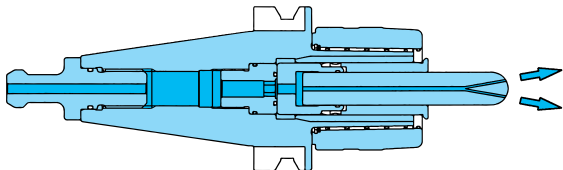
Applicable to High Pressure Coolant Applications

This milling chucks can handle coolant pressures up to a maximum of 7MPa utilizing the center-through coolant supply method that is applicable both to tool with and without oil holes.

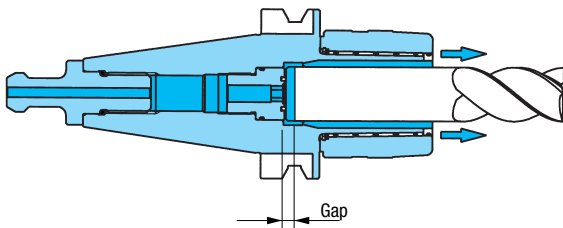
● Tools with Oil Holes



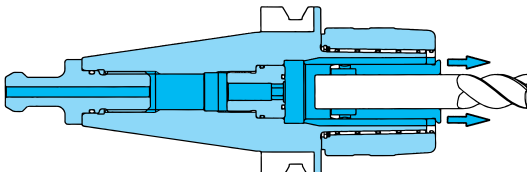
● Straight Collet/CSM + Tool with Oil Holes



● Tools without Oil Holes



● Straight Collet/CSR + Tool without Oil Holes Collet Coolant Injection



Applicable to High Spindle Speeds

"MILLACE" chucks may be utilized as milling chucks for high spindle speeds due to their high rotation balance realized by comprehensive grinding of the external circumference.

Model No.	Allowable Spindle Speed (min ⁻¹)
BT30-MLA20	30,000
HSK A63-MLA20	
KM6350-MLA20	

The allowable spindle speed is the value for the dynamic balance corrected models.

The allowable spindle speed is greatly affected by the machine rigidity.

When using at high spindle speeds, increase the speed gradually from a low rotation speed to select the appropriate rotation speed.

Center-through



Cutting Samples

HSK A63-MLA20-115
A5056
ϕ 8 Four-flute End Mill
N = 20000min⁻¹
V = 500m/min
F = 4000mm/min
f = 0.05mm/tooth

HSK A63-MLA20-115
S45C
ϕ 8 Four-flute End Mill
N = 16000min⁻¹
V = 400m/min
F = 2500mm/min
f = 0.04mm/tooth

HSK A63-MLA20-115
S45C
ϕ 20 Four-flute End Mill
N = 6300min⁻¹
V = 400m/min
F = 2120mm/min
f = 0.084mm/tooth

HSK A63-MLA20-115
A5056
ϕ 20 Four-flute End Mill
N = 20000min⁻¹
V = 1250m/min
F = 4000mm/min
f = 0.05mm/tooth

High Rigidity

The nose-collar contacts the precision-ground end face of the body to ensure high tool holding power and a high dynamic rigidity against bending and torsion.

High Holding Power

The tool-holding portion of the body with the spiral grooves has outstanding shrinkability and adopts a structure that is designed to tighten further when the cutting torque is applied. This ensures a high holding power to firmly secure the blade.

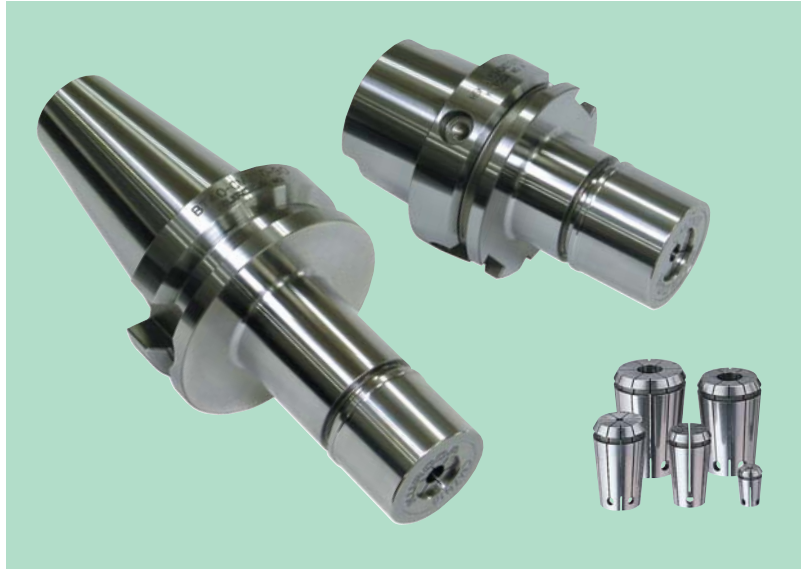
Applicable to Three Types of Shanks

In addition to BT shanks, the face and taper contact HSK shanks and KM shanks are available in various sizes.

Shank	Size
BT Shank	BT30, BT40, BT50
HSK Shank	HSK A63, HSK A100
KM Shank	KM6350, KM10080

Precision Small Bore Collet Chuck for Extremely High Spindle Speed
 μ -ACE/CMZ

Center-through



High accuracy tool holder which leads extremely high machining !

Applicable to extremely high spindle speed

To reduce wind noise caused by high spindle speed, groove of the nut for spanner was removed from CMZ.

Both nut and collet are structurally well balanced to meet extremely high spindle speed of 40000 min⁻¹.

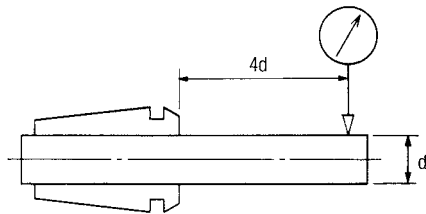
High rigidity and high holding power

High rigidity is secured by fitting part which is longer than CMA's.

As is conventionally done, nut incorporates ball bearing to provide high holding force with light tightening torque. (Please use a sole spanner.)

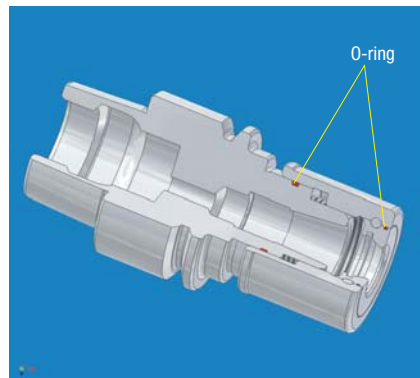
High accuracy

Run out of collet : 3 μ m/4d maximum (Accuracy grade AA)



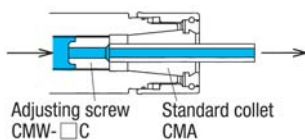
High seal performance

O-ring is built into between nut and body. This structure protects of an invasion of chip.

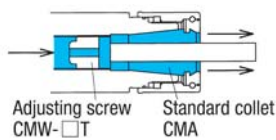


Coolant applications

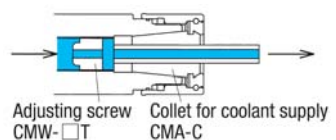
- Tool-through Applications (Using tool with oil holes)



- Collet-through Applications (Using tool without oil holes)



- Tool-through Applications (Using tool with oil holes)



Precision Small Bore Collet Chuck “μ-ACE”/CMA

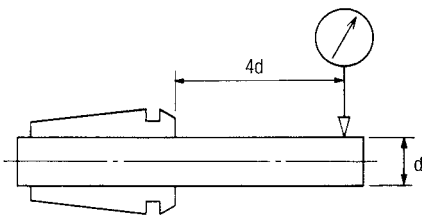


Center-through

Applicable to Chucking of Drills, End Mills, Reamers and Taps



Run-out of Collet is $3\mu\text{m}/4d$ Maximum (Grade AA)



Durability at High Spindle Speeds

Due to the design that considers the balance, “μ-ACE” collet chucks support high spindle speeds of $40,000 \text{ min}^{-1}$ (HSK).

(When using for spindle speeds greater than $20,000 \text{ min}^{-1}$, the body will be given a comprehensive grinding specification. In this case, contact KURODA beforehand.)

Powerful Clamping Force and High Rigidity

Use of an optimum 1/5 collet taper ensures a powerful clamping force. The clamping force, clamping stroke, shrinkage of the collet bore and other factors are all highly balanced. All sizes of nuts incorporate ball bearings to achieve a large clamping force from a light tightening torque. High rigidity is provided through increasing the thickness of the taper portion that holds the collet.

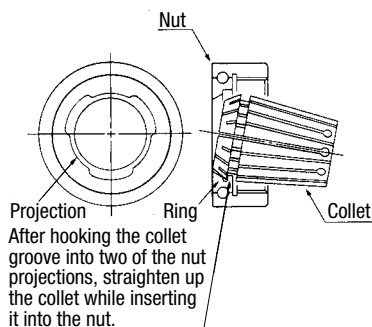
Wide Variety of Accessories Available

- Five types of collets are available for holding a wide range of cutting tools with diameters between 0.5 to 20mm.
- Tap collets



Easy Collet Change

Use of a unique 3-point hooking ring allows easy collet change without requiring extraction tools. The symmetrical nut design realizes outstanding rotational balance.



Face and Taper Contact Tooling System

Applicable to all face and taper contact tooling systems.

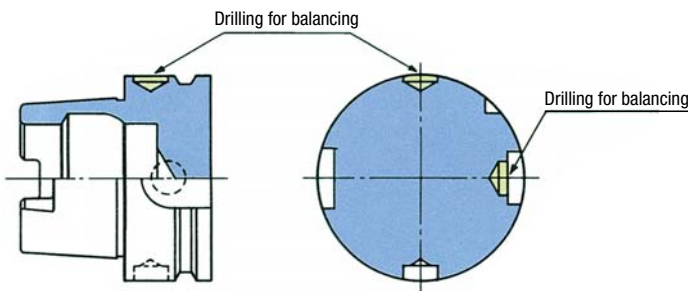
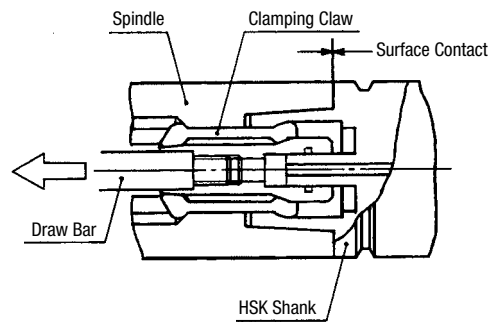
KURODA offers three types of face and taper contact tooling systems, the HSK, KM, and Super BT.

Center-through



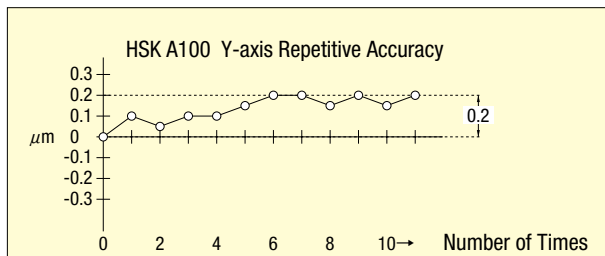
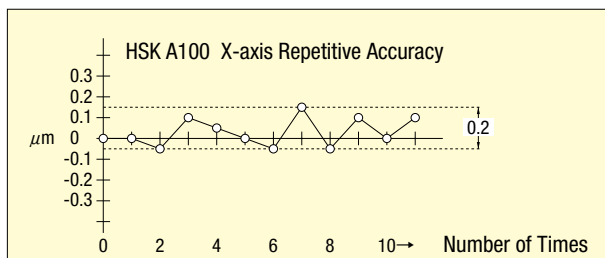
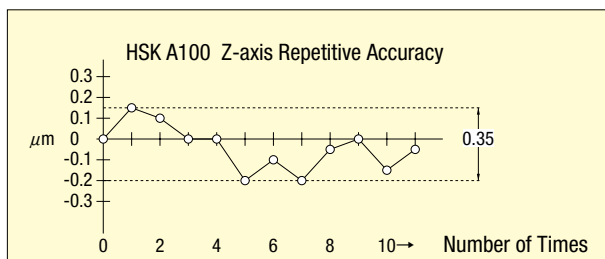
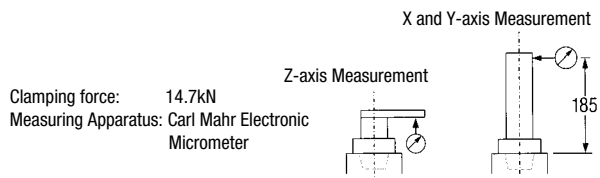
HSK Tooling

- The two-surface contact of the flange end face and the short taper part of the holder causes simultaneous contact and clamping of the machine spindle, ensuring high tooling rigidity.
- The position of the end face in the spindle direction and the taper part in the bore direction ensures high repetitive precision of tool setting and allows high precision machining.
- The short taper shank and light weight makes ATC (Automatic Tool Change) easy.
- In HSK tooling, the asymmetrical DIN standard is given a balanced mass design by KURODA to support high spindle speeds.
- Supports high pressure coolant applications.
- Has a design that prevents fretting corrosion.

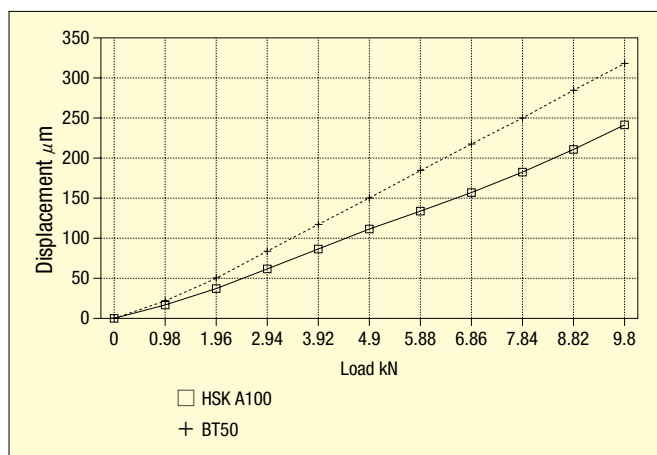
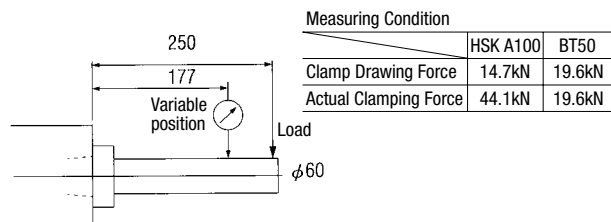


KURODA Standard Design is without hole for manual clamping, and with hole Design is option.

Repetitive Accuracy



Comparison of Static Rigidity



Modular Boring System/MS



In the modular boring system, boring tools, which were conventionally single units, have been prepared as standardized modules by separating them into a tool holder and shank portion. By using intermediate adaptors, it is also possible to easily adapt to changes in work piece specifications such as changes in the projection length or bore.

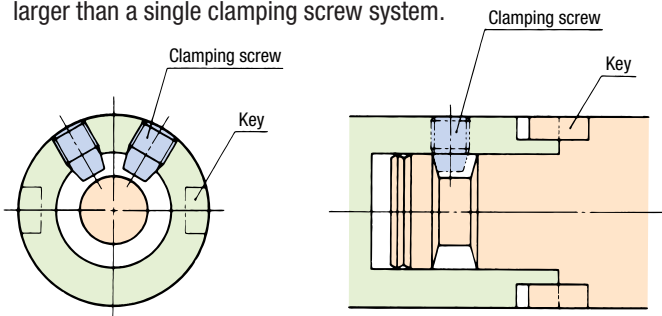
Further, the use of ultra-precise machining technology to maintain the rigidity of the end surface connection has realized a high finishing precision from rough machining to fine boring.

For the tips, commercially available products (ISO standards) can be used.

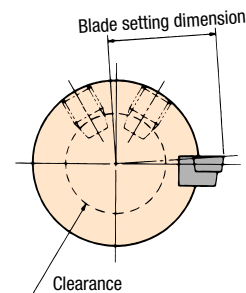


Coolant applications possible (SBH only)
(Spindle-through 4MPa)

■ Use of a unique two-directional clamp and key drive method realizes a firm end face contact and high torque transmission. The tightening torque of the two clamping screws is 1.8 times larger than a single clamping screw system.



■ The unique clamping system almost completely eliminates changes in the blade tip setting dimension caused by clearance.



■ A pilot portion is provided in the tool holder and intermediate adaptor to allow easy assembly. This is particularly effective when carrying out assembly on the machine.



■ The blade tip position can be assembled so that it is always in same phase with the drive key groove.



■ Since the mounting direction can be changed 180°, the run-out precision in multi-stage assembly is improved.



Tap Holder Series

Using KURODA tap holders allows more certain tapping!

Torque Control Tap Holder/TPT



Prevention of Tap Break

Tension and Compression

Quick Change

- Stable torque control completely eliminates tap breakage.
- Mounting and dismounting of the tap collet can be carried out in a one-touch motion consisting only of pushing and pulling.
- A one-way clutch allowing certain tap extraction realizes perfect tapping.
- Slim design offers good workability.

Rigid Tap Holder/TPJ



- Tap holder for machining centers and tapping machines that have built-in synchronized feed mechanisms.
- When tapping is carried out using a machining center that has a built-in synchronized feed mechanism, the floating functions (F1, F2) are not required.
- Because taps are held using the same method as collet chucks, taps will not become detached.






To Ensure Safe Use of Products

Be sure to read the following cautions before use.
For common and individual cautions, refer to the text of this catalogue.

The following cautions are given to allow safe and correct use of KURODA products and to prevent the occurrence of injuries and damage.


Cautions are classified into three categories: "DANGER", "WARNING" and "CAUTIONS" according to the degree of danger and imminence of possible injury and damage resulting from mistaken use of products.

Be sure to observe all the cautions, since each contains important information relating to safety.

 DANGER	 WARNING	 CAUTION
Indicates situation in which mistaken or improper operation may result in impending danger of death or serious injury.	Indicates situation in which mistaken or improper operation may result in danger of death or serious injury.	Indicates situation in which mistaken or improper operation may result in danger of injury, or of material damage only.

Be sure also to observe the Industrial Safety and Health Law and other safety regulations.

Note that depending on the situation, the items described in "CAUTIONS" may lead to a more serious result. Be sure to observe all cautions, since each contains important information about safety.

 **WARNINGS**

- Be sure to select tooling correctly**

Various usage conditions apply to the products described in this catalogue. The decision about whether products are applicable to the system should be made by the designer of the overall system or the person responsible for determining the specifications, after conducting analysis and testing as required.

The anticipated performance and safety assurance of this system will be the responsibility of the person charged with determining the system conformity. In the future as now, when configuring systems, examine all of the specifications described in the latest version of the product catalogues and data, and consider the conditions under which it is possible for equipment breakdowns to occur.
- Ensure that the tooling is operated by persons who have adequate knowledge and experience**

Before using the products, carefully read this catalogue and the operation manual.

Mistaken or improper use of tooling may cause injury or damage to property. Tooling is designed for use with machine tools, and should be operated by persons who have adequate knowledge of the operation and maintenance of the products concerned and of the machine tools and equipment being used.
- Tooling has been designed and manufactured for machine tools. Do not use for any other applications.**



Tooling/ Common Cautions (1)

Be sure to read these cautions before use.

Also confirm "To Ensure Safe Use of Products" and individual caution points.

When Selecting Products

WARNINGS

- Check the machine spindle hole and the tooling shank dimensions and shape.

If the dimensions and shape are inappropriate, mounting will be incomplete and there will be a danger of the tool becoming detached or that vibration will occur during rotation, possibly causing damage to the machine tool spindle or the cutting tool.

- Select cutting tools that are an appropriate size and shape that matches the tooling holder.

If the size and shape of the cutting tool and the tooling holder are not matched, the cutting tool may slip or become detached, and there will be a danger of scattering.

- Select appropriate cutting conditions

Conducting cutting under conditions that exceed the tooling performance will result in damage to the cutting tool and the tooling.

When Handling Products

WARNINGS

- When transporting products, and when taking them out of their cases, take care to avoid the products jumping out or being dropped.

This may result in injury.

- When handling many packaged products together, or handling heavy tooling, take adequate care.

If necessary, use a transporter.

- Do not attempt to modify or disassemble the tooling

There is a danger that the functions and performance will be lost.

If modification or disassembly is required, contact KURODA for more information.

CAUTIONS

- Take care that the tooling shank parts and holder do not become scratched or gouged, or coated with chips or rust.

This will result in decreased coaxiality and reduced holding power, causing abnormal run-out or vibration that may damage the cutting tool.

- Do not directly touch the raised parts of threads.

The raised parts of threads and unfinished screw parts are sharp and may cause injury.

When Mounting Cutting Tools

WARNINGS

- When mounting cutting tools in the tooling, wear protective equipment.

Because cutting tools have sharp cutting blades, directly touching them with your hand may result in injury.

- When mounting the cutting tool in the tooling, make sure it is securely fixed.

Only use the tightening spanner specified by KURODA. Securely fix it to the hook for the spanner and carry out tightening slowly. Do not hit the spanner with a hammer or other tool to further tighten the tooling.

When Mounting in Machine Tools

WARNING

- Before use, be sure to read the operation manual.

Mount and use the tooling after first reading and understanding the contents of the operation manual. Store the operation manual in a handy location where it can be read at any time.

CAUTIONS

- When mounting the tooling, be sure that there is no dust, scratching or rust on the machine spindle hole or the tooling shank or holder.

The condition of the tooling shank part, holder, and machine spindle hole will influence the run-out precision.

- Regularly check the degree of run-out

Periodically mount a test bar in the machine spindle hole and tooling holder to check that there is no abnormality in the run-out precision.

- The pull stud is a consumable part and should be replaced at regular intervals

Fatigue fractures may occur, causing damage to the machine, cutting tools, and tooling. (Fatigue fractures may occur after 5 months.)



Tooling/ Common Cautions (2)

Be sure to read these cautions before use.

Also confirm "To Ensure Safe Use of Products" and individual caution points.

During Machining

WARNINGS

- **Do not touch tooling while it is rotating.**

Touching the tooling or cutting tool while it is rotating may result in injury or having your clothing caught up in the machine.

- **Do not run the machine with no cutting tool mounted in the tooling.**

If the equipment is run in this condition, the set screws and tightening nut may become loosened and may be scattered.

When the equipment is to be run without a cutting tool, first inspect the parts, and then either utilize scattering prevention equipment or mount a dummy tool.

- **Take care not to conduct reverse rotation.**

It is dangerous to use the tooling in the reverse rotation, since it may damage the cutting tool and cause parts scattering.

- **During machining, safety covers and protective goggles should be worn.**

High-temperature chips will be scattered, possibly causing cuts and burns.

- **When setting up high pressure coolant machining applications, do not place your hands or body near the cutting tool tip.**

This will be dangerous in the situation where mistaken operation may cause the cutting tool to fly out.

For Storage

CAUTIONS

- **Carefully wipe off chips and other debris from the tooling and apply corrosion prevention oil before storing products in a location where the shank and holder will not become scratched or gouged.**

- **When storing the tool holder for a long period of time, store it in the condition where the cutting tool has been removed.**

If the cutting tool is left attached, the holding power will be reduced.

In the situation where the tool holder has been stored for a long period with the cutting tool attached, before using it again first loosen and retighten the collar.

Main Terms and Definitions in Tooling

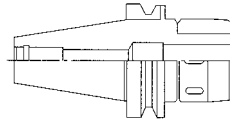
"Tooling" (holding tools) is the generic name for machine tool peripheral equipment such as tool holders and tool adaptors. Tooling terms are defined in the Japan Machine Accessory Association Tooling and Equipment Standards (T-1003) as follows:

- **Tool Holder**

This is directly mounted on the spindle nose of a machine tool to hold cutting tools (known as "tools" below) including drills, reamers, milling cutters, end mills, cutters, taps and cutting tools, or tool adaptors.

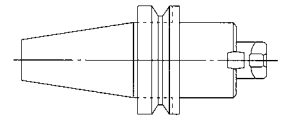
Tool holders are broadly classified into holders and arbors according to the shape of the holding part.

Holder:



Tool or adaptor that has a recessed holding part. Milling chucks are also classified as holders.

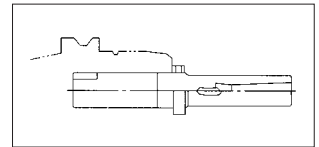
Arbor:



Tool or adaptor that has a projecting holding part.

- **Tool Adaptor**

In general, this is an adaptor for mounting tools or additional adaptors that is mounted in a tool holder rather than directly onto the spindle nose of a machine tool.



- **Pull Stud**

This is mounted in a tool holder and mainly used in machining centers with automatic tool changing devices as a pulling part when mounting tool holders on to the spindle.

Tool Holder Characteristics

- **Holding Power**

This differs according to the holding mechanism and the shape. Use after confirming the various specifications and performances.

- **Precision**

This differs according to the holding mechanism and the shape. Use after confirming the various specifications and performances.

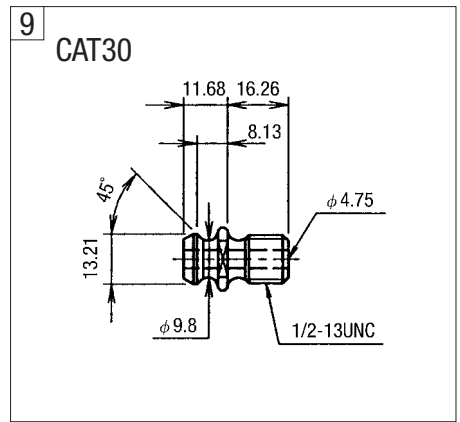
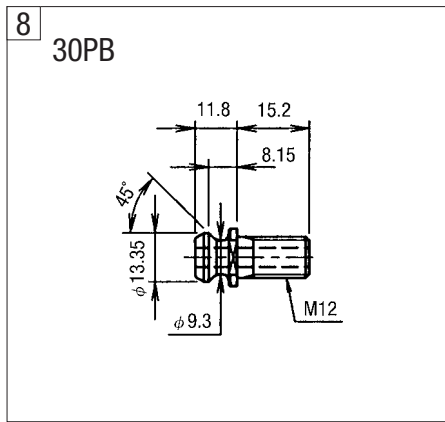
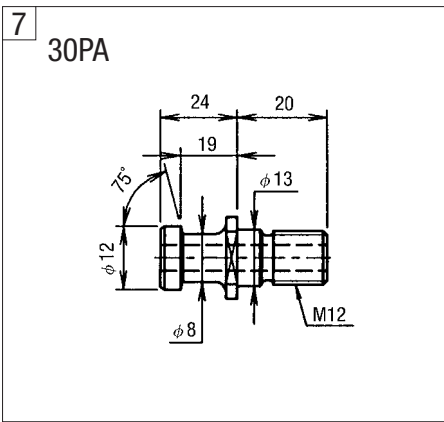
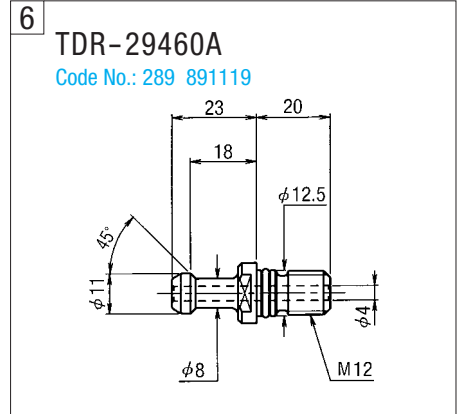
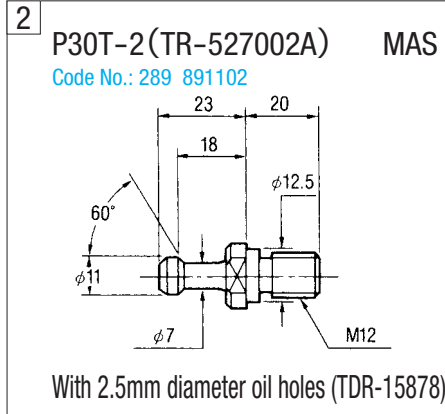
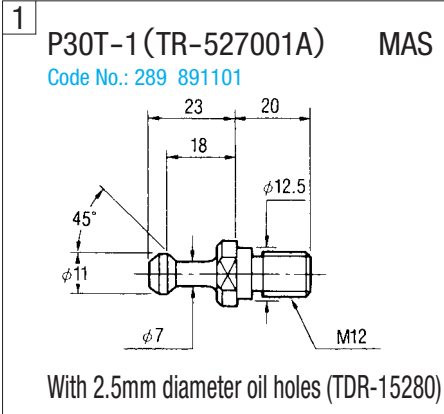
- **Rigidity**

Tool holders are designed to maintain complete rigidity. However, tool holders that incorporate functions into the holder, those that have been slimmed down to prevent interference, and holders that have extended lengths will not have adequate rigidity. Depending on the cutting conditions, problems may occur during operation, so pay particular attention to the cutting conditions.

Pull Stud Shapes and Dimensions

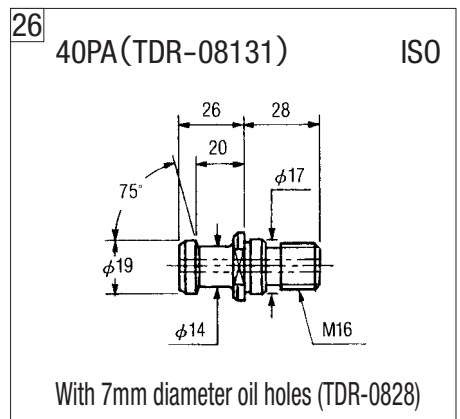
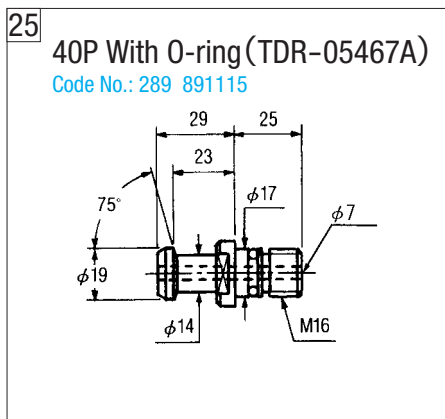
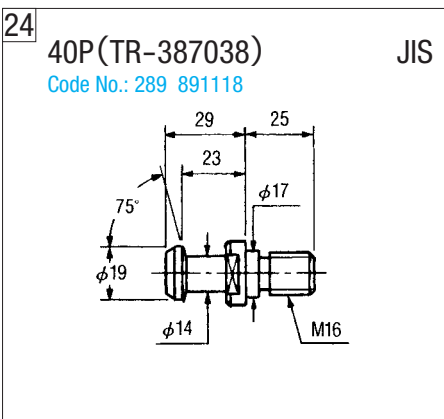
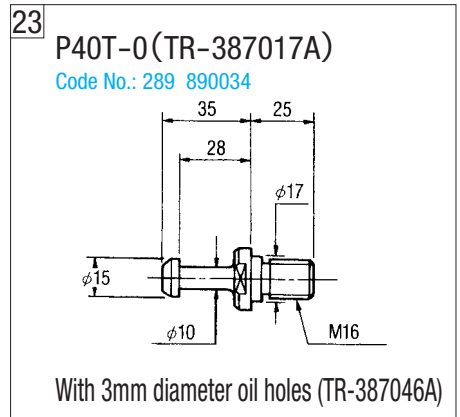
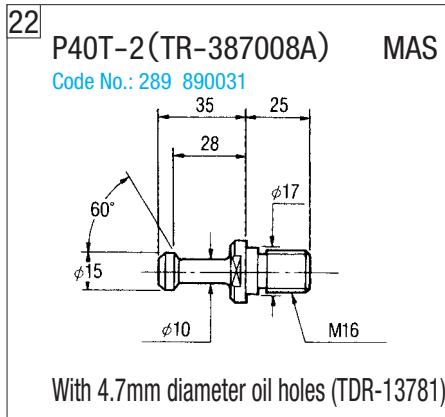
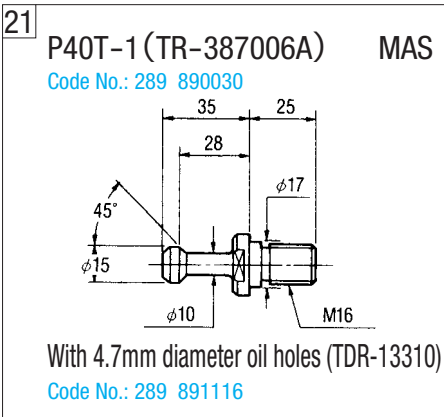
BT30

(Unit: mm)



BT40

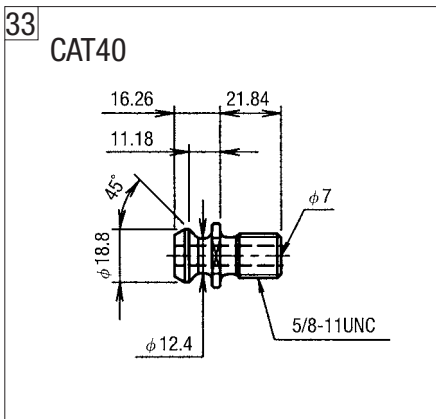
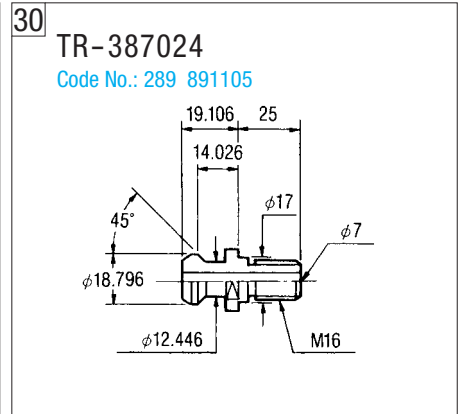
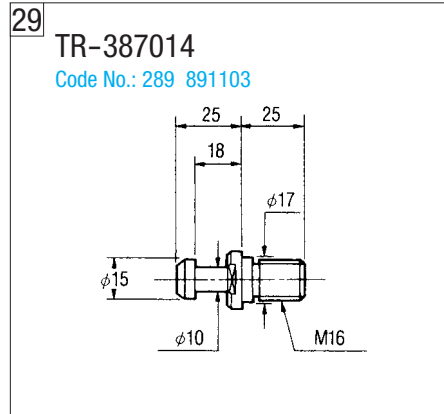
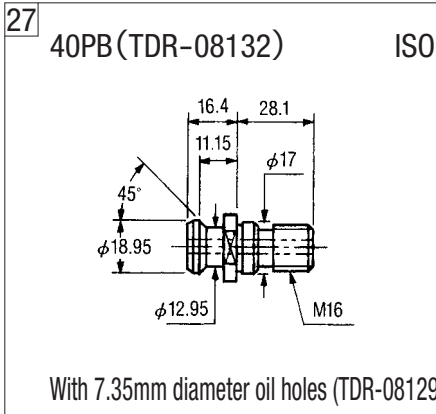
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Pull Stud Shapes and Dimensions

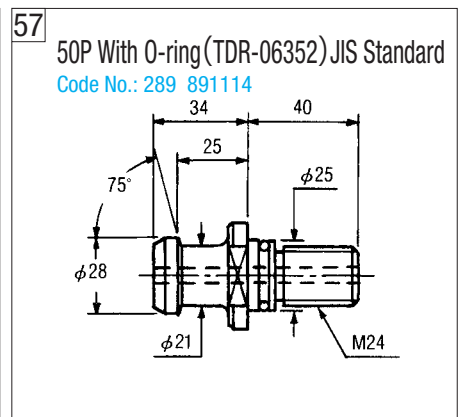
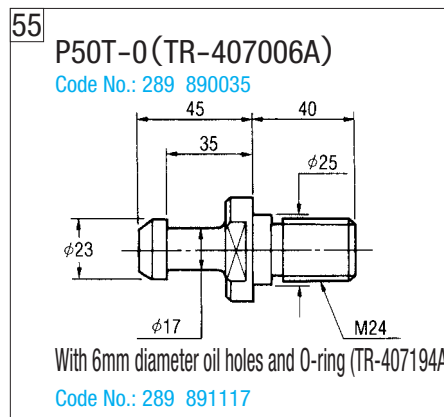
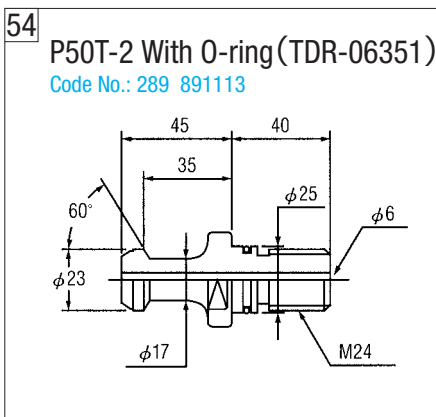
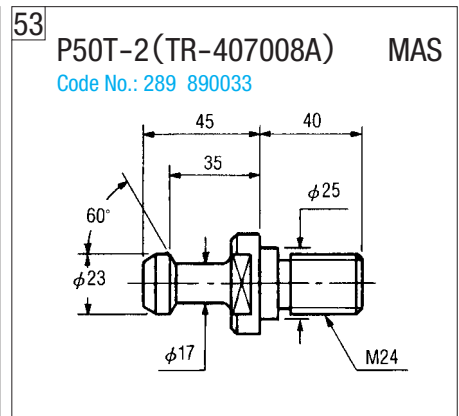
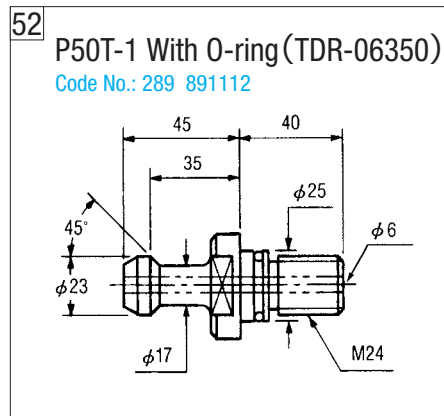
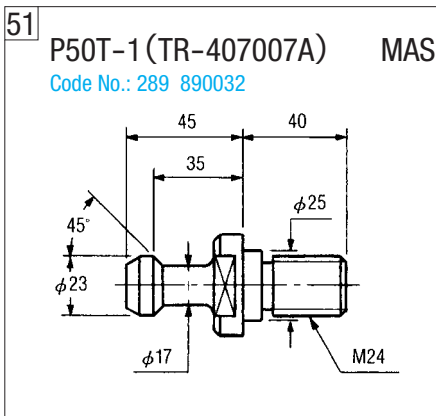
BT40

(Unit: mm)



BT50

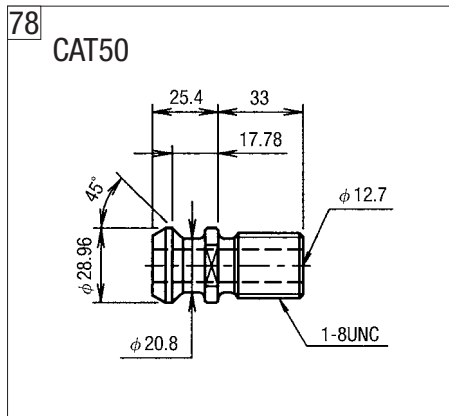
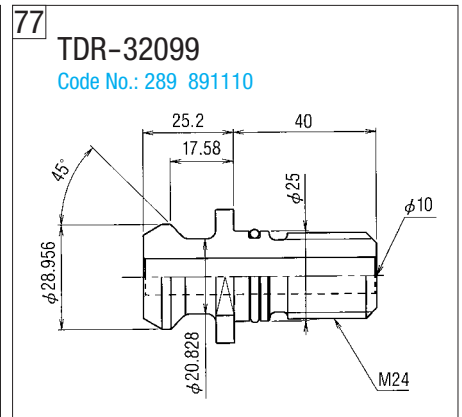
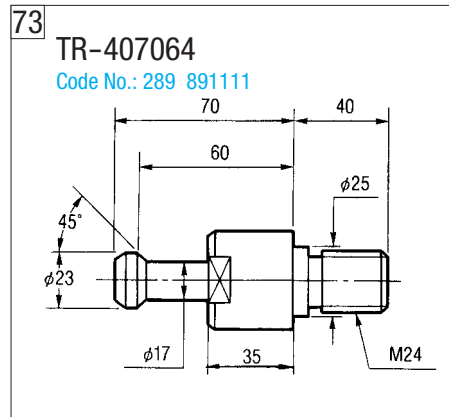
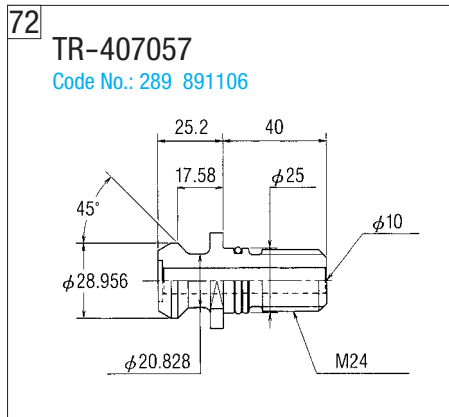
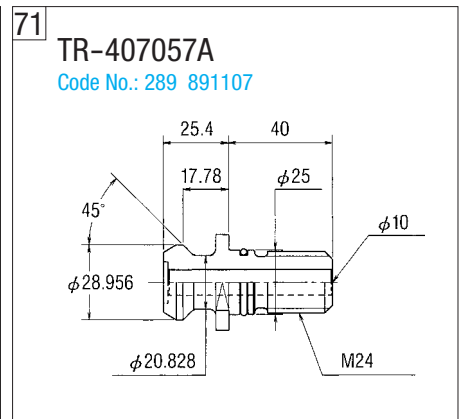
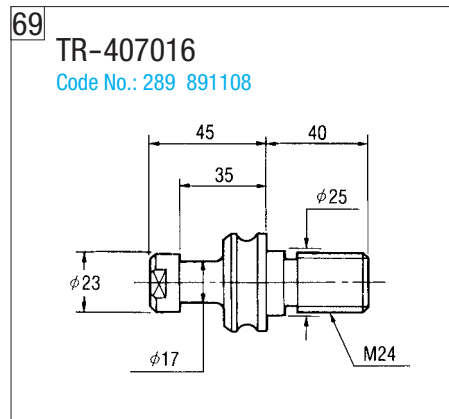
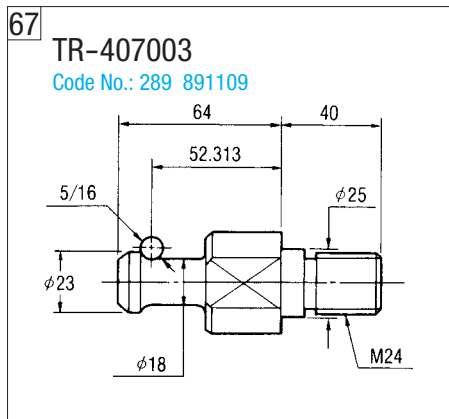
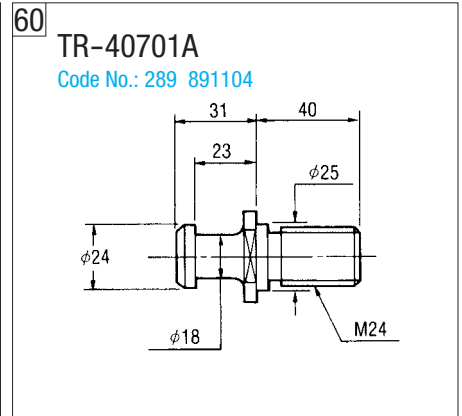
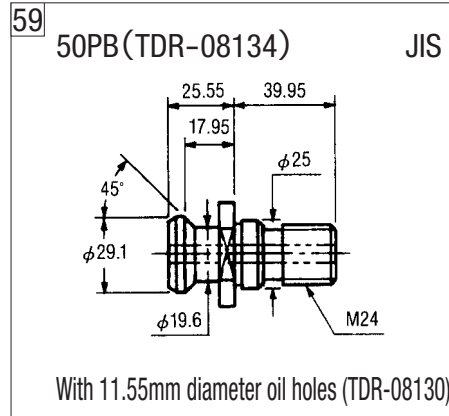
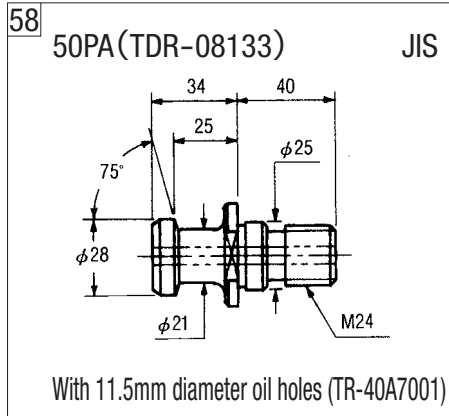
(Unit: mm)



Pull Stud Shapes and Dimensions

BT50

(Unit: mm)



Notes:

- Pull studs with oil holes have a machined finish on the left end surface of the grip portion.
- Pull studs that have oil holes and O-rings are applicable to high pressure specifications (Max. 13.7MPa).
- Pull stud specifications are described in equipment manufacturers' operation manuals. Use a pull stud that matches the dimensions and specifications after checking the manual.

