

# Machine Integration

Coromant Capto®



# Coromant Capto® system – the original

Coromant Capto is a machine tool interface, which is equally at home as a modular tool holding system providing almost unlimited combinations. It is one system that forms just as good a solution for turning, milling and drilling applications.

The total Coromant Capto range includes six different sizes, C3 to C10, with a broad programme of basic holders, clamping units, tool holders, integrated cutting tools, adaptors and chucks.

Included in over 5000 standard products are some unique solutions such as dampened boring and milling adaptors; and for high pressure coolant to take productivity and security to a new level.



*With over 5 000 standard products, Coromant Capto delivers almost unlimited options for all spindle interfaces.*



## Coromant Capto® – the design

The tapered polygon transmits torque and ensures centre without drive keys.

Face and taper contact combined with good cross-section strength allow higher clamping force ensuring excellent bending stiffness.

The male and female couplings are locked either using a draw bar pulling in the internal clamping groove for the machine interface or the threaded hole for modular assembly.

## Coromant Capto® – the coupling

*Provides a unique combination of properties:*

- high torque transmission
- high bending strength
- balanced and concentric
- self centering
- high basic stability and accuracy
- flexibility with extensive modularity
- quick-change and automated tool change
- through-tool delivery of coolant, from machine to cutting edge

*Fulfills the needs of a tooling system in all machine types:*

- lathes and turning centres – quick-change, modular tooling and high pressure coolant delivery.
- multi-task machines and machining centres – rotating spindle interface and modular tooling.



# Coupling comparison

When not machining, the spindle interface requires quick interchangeability. Yet when machining, it is vital that the joint between the spindle and coupling is solid, even if cutting forces do their best to disrupt this interface. Two of the main requirements/limitations of a coupling are;

- 1) Bending stiffness – created by long tools or high cutting forces
- 2) Torque transmission – force x radius – operations which are most sensitive are those with large cutting diameters or in turning with large radius offset



## Coromant Capto

- 1:20 taper with flange contact
- 2.88° (self-locking)
- Draw bar
- Tapered polygon drive
- Threaded hole for modular assembly
- Segmented gripper grooves for ATC

## HSK A

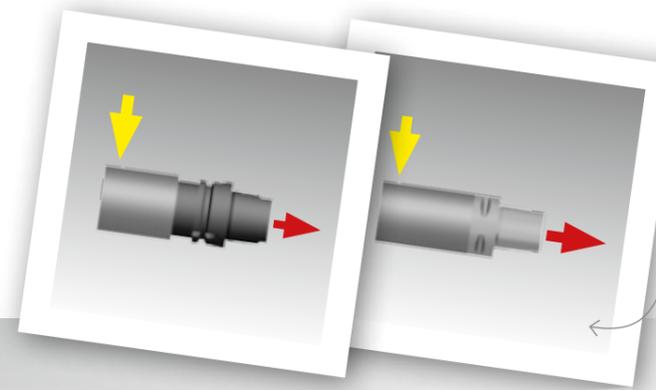
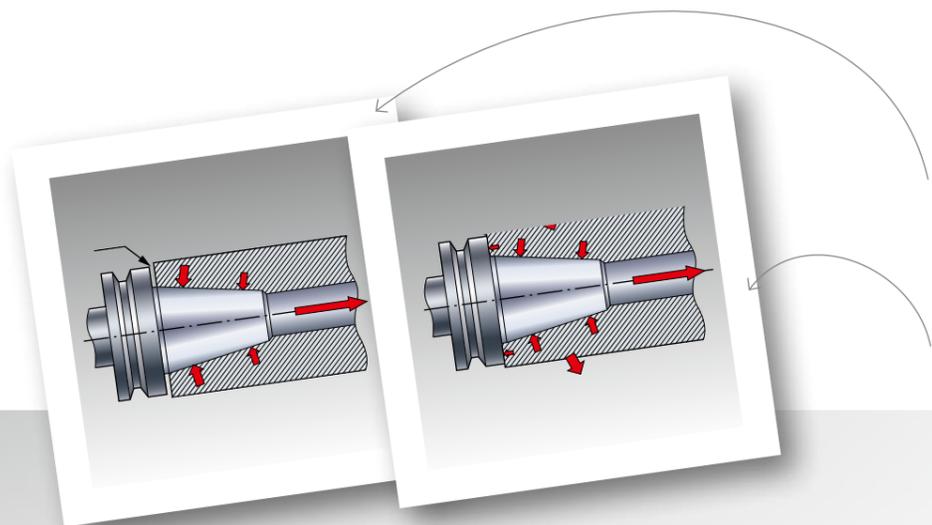
- 1:10 taper with flange contact
- 5.7°
- Draw bar
- Drive key

## Conventional 7/24 taper

- ISO 7388/1, DIN 69871,
- 16.26°
- Drive key
- Pull stud

## 7/24 taper with flange contact surface

- BIG-PLUS
- 16.26°
- Drive key
- Pull stud



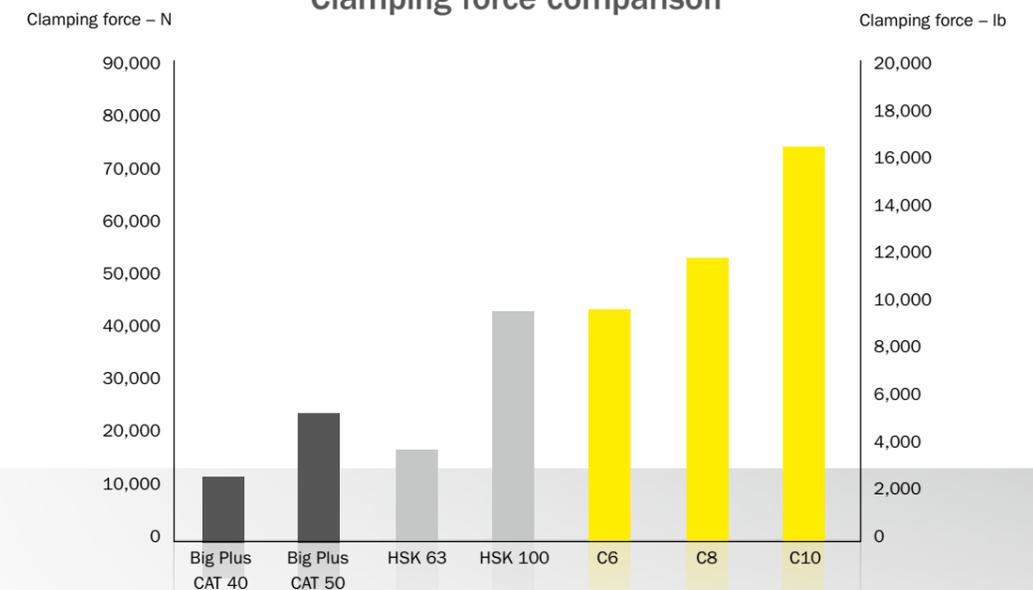
*With segmented gripper grooves for tool changing, the increased cross sectional area & clamping force provide unrivalled bending stiffness.*

## The coupling characteristics

The coupling characteristics which are vital to withstand high bending- or radial cutting forces are;

- Flange contact diameter – flange face contact increases the platform base reducing the leverage of the cutting force.
- Clamping force – the greater the clamping force to restrain a coupling, the greater the cutting force required to ‘topple’ the coupling.
- Cross-sectional area – reduction of the tool diameter relative to the flange contact diameter will reduce the stiffness of the tool.
- Torque transmission – most clearly evident in turning, inability to withstand torque will immediately mean loss of centre height and precision.

## Clamping force comparison



Sources: HSK Handbook, copyright 1999.  
Big Daishowa (Big plus spindle system.)

# Independent comparative data

The well-reputed RWTH Aachen University in Germany has recently carried out a new, interesting study of Coromant Capto and comparable holding systems.

A test series carried out by the University's machine tool laboratory (WZL) in 2009 compared bending stiffness and torque resistance of Coromant Capto with comparable sizes of other standardized couplings.

And the results were striking: none of the competing tool-holding systems could achieve even close to the same results as the Coromant Capto coupling.

Among other things, the study showed that the larger wall thickness of Coromant Capto in comparison to HSK allows for higher clamping forces. These higher clamping forces translate into increased bending stiffness.

*By using a tapered polygon rather than drive keys, Coromant Capto provides unrivalled torsional resistance with no 'click clack' - a vital factor for turning operations which makes Coromant Capto the optimum spindle solution for multi-task machines.*



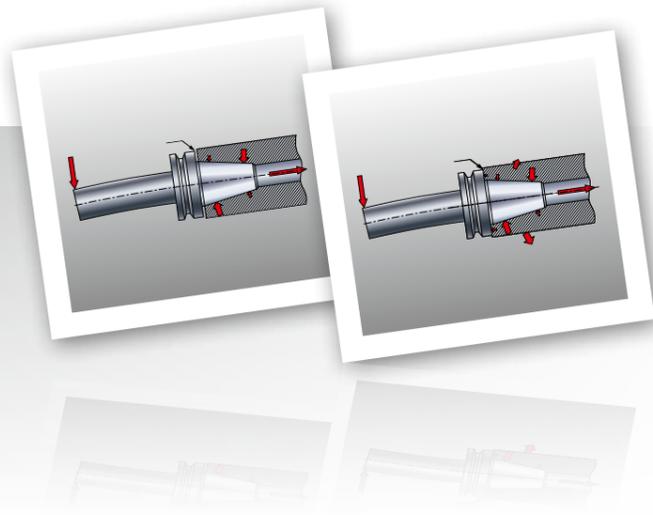
Conventional 7/24 taper



HSK-A



Coromant Capto



## Bending characteristics

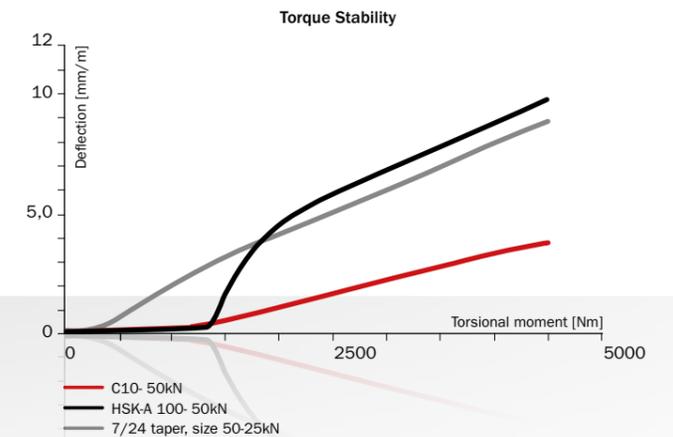
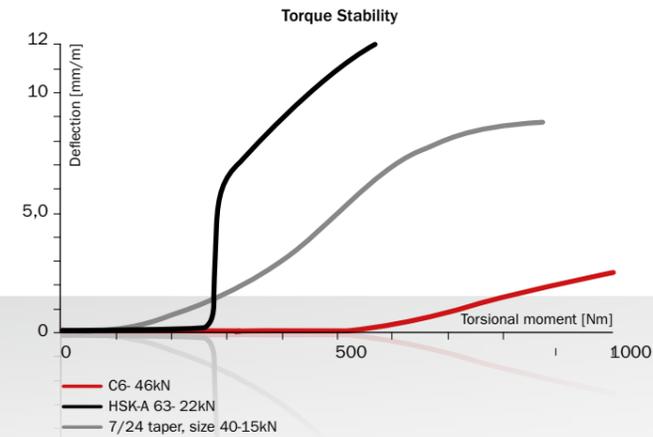
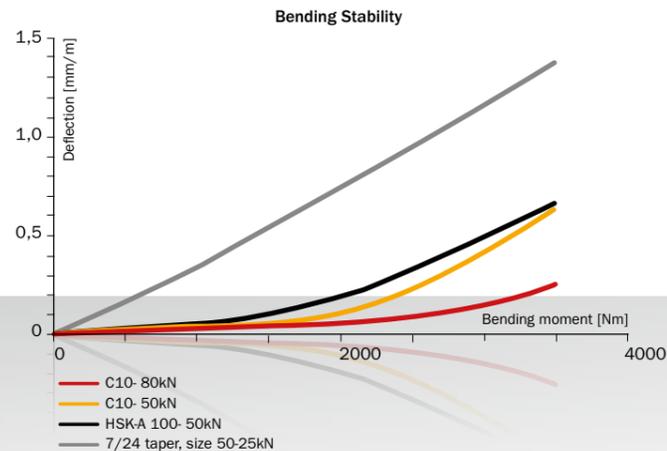
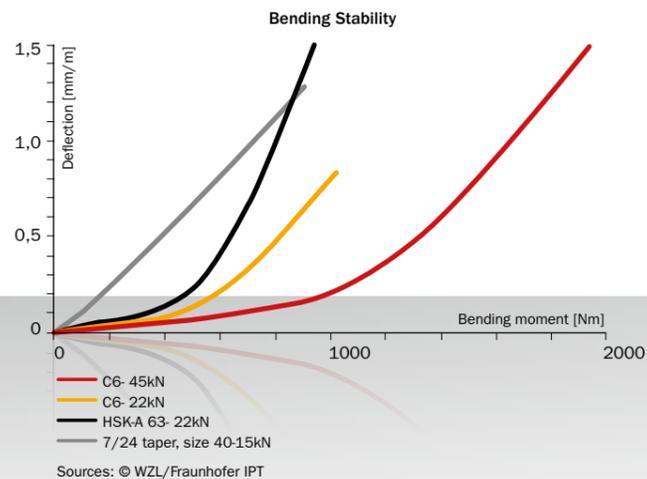
The left graph shows that Coromant Capto C6 has 1.65 times better interface stiffness than HSK-A 63. The toppling of the face contact was 2.88 times better.

Corresponding figures for Coromant Capto C10 were 1.51 for the interface stiffness and 2.15 for the toppling of the face contact compared to HSK-A 100.

## Torsion characteristics

The left graph shows that Coromant Capto C6 has 2.29 times better torque resistance than HSK-A 63. The twisting angle was 7.1 times better.

Corresponding figures for Coromant Capto C10 were 1.85 for the torque resistance and 4.0 for the twisting angle compared to HSK-A 100.



# Rotating spindles

The Coromant Capto rotating spindle is mainly recognized today for multi-task machine (B-axis) applications due to its unique diversity, being able to make the transition from rotating to static applications seamlessly. Driven tool holders for turret applications are another typical area providing a quick change solution in a restricted space.

Trends show that industry and machine tool makers continue to consolidate production by utilizing flexible machines. With this, 5-axes machining centres with turning capabilities increase the demand for Coromant Capto.

Equally important as the actual spindle interface itself, is the clamping mechanism and the level of force applied to the coupling. This keeps the spindle and coupling united as cutting force is applied.



Gas Spring



Mechanical Spring



Hydraulic

## For spindle applications the segmented draw bar can utilize four methods of clamping:

- Manual cam shaft actuated – used predominantly for driven tool holders on turning centers
- Mechanical spring – the traditional method used for the last 30 to 40 years since automatic tool changing became popular. Springs or bell-ville washers will lose some force over time due to fatigue as well as being harder to balance.
- Gas spring – a patented solution only available for Coromant Capto spindles. A nitrogen-charged cylinder provides a high clamping force with the benefits of being shorter and smaller in diameter than a comparable mechanical spring. Additionally, the reduction of clamping force is only 10% (maximum) over 1 million cycles, compared to typically 30 to 50% in up to 1 million cycles with mechanical spring. The result being higher performance for longer, reducing service requirements and production variation.
- Hydraulic – this offers the highest clamping force with good longevity. The only limitations are that a rotary coupling is required which limits the rpm and increases the spindle/housing size requirement.

When specifying a machine, as well as dedicating time to choose the correct spindle interface, it is equally important to select the optimum clamping mechanism and force for the machine and application.

Clamping options – table of clamping force by method/size

Coupling	Size and clamping type	Pull force (pull stud or draw bar)	
		N	lbs
ISO&CAT 7/24 taper	Big Plus 40	12,000	2,697
	Big Plus 50	24,000	5,395
HSK-A	HSK 63	17,460	3,925
	HSK 100	43,570	9,813
Coromant Capto	C6 gas/mechanical spring	36,000	8,093
	C6 hydraulic	63,000	14,162
	C8 gas/mechanical spring	44,000	9,891
	C8 hydraulic	86,000	19,333
	C10 gas/mechanical spring	80,000	18,018
	C10 hydraulic	115,000	25,901

# Turning centre applications

Coromant Capto is widely used in turning centres with manual clamping via a CAM-shaft actuated clamp set. Quick changing of tools maximizes machine efficiency with an average of 25% more time for producing chips.



## Turret evolution

Turrets have evolved into two main groups where Coromant Capto applications are typical for both static and driven applications

- **CDI – Coromant Capto Disc Interface**  
New solution to replace VDI turrets  
Same adaptors fit multiple machine brands and models  
Cam actuation screw inside turret
- **CBI – Coromant Capto ‘Bolt on’ Interface**  
‘Bolt on’ solution  
Unique hole pattern for each machine brand  
Cam actuation screw-in bolt on unit

## Vertical automation

Large components dictate vertical ram solutions where tool capacity has long been a major challenge. But with Coromant Capto either: hydraulic automatic tool change (ATC), or dedicated manual clamping units, are now most commonly used.



## High pressure coolant

In addition to the benefits of quick change, high pressure coolant of up to 80 bars has developed into a widespread standard option on lathes and multi-task machines today



## CoroTurn® HP for ‘green light’ production

Coromant Capto automatically directs the coolant to the nozzles. The precision nozzles target the correct point on the insert at a low trajectory angle, creating a hydraulic wedge between the chip and the rake face of the insert.

- The benefits:*
- Chip control – reduced stoppages
  - Fixed precision nozzle – consistent process
  - Increased tool life +50%
  - Increased productivity +20% cutting speed

The relatively small investment to have the machine optimized for high pressure offers a very fast payback with continual delivery.

# ISO26623

Coromant Capto® system  
The original



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