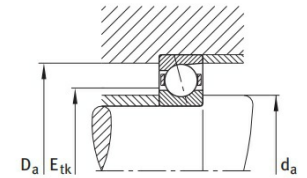
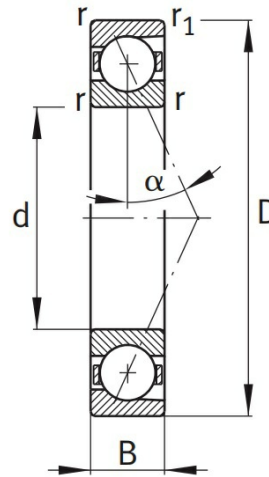
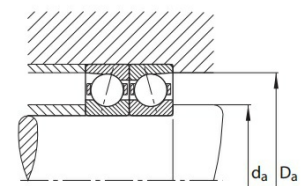


HCB7009-C-T-P4S-UL

Super Precision Hybrid Angular Contact Ball Bearing



Mounting dimensions



Mounting dimensions

Technical sheet of HCB7009-C-T-P4S-UL

What are the Benefits of choosing HCB7009-C-T-P4S-UL bearings?

- **Ultra-high speed:** The low density of ceramic balls (approximately 40% of steel balls) results in low centrifugal force, significantly increasing the maximum speed.
- **Long lifespan:** High hardness and low coefficient of friction lead to minimal wear; the material itself is corrosion-resistant, high-temperature resistant, and has a long fatigue life.
- **Low heat generation:** Good self-lubricating properties result in low temperature rise during operation and excellent thermal stability.
- **High rigidity:** High elastic modulus (approximately 1.5 times that of steel) provides strong resistance to deformation and more stable machining accuracy.
- **Insulation:** Excellent electrical insulation properties (high resistivity) prevent electrolytic corrosion damage, making it suitable for applications such as motors.
- **Low maintenance:** Low lubrication requirements ensure high long-term operational reliability and reduce downtime for maintenance.

Type :	Angular contact ball bearings, super-precision	
Model :	HCB7009-C-T-P4S-UL	
Old Code :	HCB7009CTP4SUL	
Main demensions :	45 mm × 75 mm × 16 mm	Bore Dia × Outside Dia × Width Dia
M kg:	0.191	Mass
HS Code :	8482103000	Bearing customs code

d mm:	45	inner ring diameter
D mm:	75	Outer ring diameter
B(T) mm:	16	Overall Width
Cr kN:	27.886	Radial dynamic load rating
C_{0r} kN:	14.237	Radial static load rating
Grease r/min:	25883	Reference speed
Oil r/min:	39823	Limiting speed

Detailed parameters and installation dimensions:

Part Number	HCB7009-C-T-P4S-UL
Design Type	HCB = Hybrid Standard bearing, Lager balls, Ceramic balls
Series	HCB70..-C-T-P4S-UL
Bearing Type	Super Precision Hybrid Angular Contact Ball Bearing
Contact angle - α	(C) 15 °
Dimension series	70 (Medium series)
Bearing set	UL
Accuracy class	P4S
Seal	Open
Arrangement	U = Single bearing arrangeable as desired
Preload	L = Preload Light
Row No.	One
Bore Type	Z = Cylindrical bore
Units	Metric
Bearing Mass - m	0.191 kg 0.421 lb
Cage	T = Laminated fabric, guidance on outer ring
Ball Material	Ceramic
Ring Material	GCr15SiMn
Manufacturer Part Code	HCB7009CTP4SUL , HCB7009C-T-P4S-UL
Reference From	FAG HCB7009-C-T-P4S-UL
Dimension Inside - d ϕ (mm)	45
Dimension Outside - D Φ (mm)	75
Dimension Width - B (mm)	16
Dimension - r(min.)	1 mm 0.039 inch
Dimension - r ₁ (min.)	1 mm 0.039 inch
Temperature - T(min)	-30°C
Temperature - T(max)	+100°C
Radial Dynamic Capacity - C _r	27886 N 6268 lbf
Radial static Capacity - C _{0r}	14237 N 3200 lbf
Reference speed (grease) - n _B	25883 min ⁻¹
Limiting speed (oil) - n _G	39823 min ⁻¹
Mounting dimensions - d _a (h12)	51 mm 2.008 inch

Mounting dimensions - D_a (H12)	69 mm 2.717 inch
Mounting dimensions - E_{tk} (nom.)	57.3 mm 2.256 inch
Preload force - F_v L	68 N 15 lbf
Preload force - F_v M	256 N 57 lbf
Preload force - F_v H	546 N 122 lbf
Axial rigidity - c_a L	38.9 N/ μ m
Axial rigidity - c_a M	69.9 N/ μ m
Axial rigidity - c_a H	99 N/ μ m
Lift-off force - K_{aE} L	207 N 46 lbf
Lift-off force - K_{aE} M	825 N 185 lbf
Lift-off force - K_{aE} H	1886 N 423 lbf

What are the applications of the HCB7009-C-T-P4S-UL bearing?

- **Machine tool spindles:** Improve ultimate speed and machining accuracy, extend tool life.
- **Semiconductor equipment:** Meet clean vacuum environment requirements, ensure micron-level positioning.
- **Aerospace:** Reduce weight, withstand temperature differences, and meet high reliability requirements.
- **High-speed motors:** Reduce centrifugal force and temperature rise, achieve ultra-high speed operation.
- **Medical devices:** Quiet and stable operation, meet sterility and long lifespan requirements.
- **Precision instruments:** Reduce vibration and thermal deformation, ensure measurement repeatability.
- **Robotics:** Improve joint response speed and enhance motion trajectory accuracy.

How should choose the right model for a Angular contact ball bearings, super-precision?

Following the naming logic of "basic model + suffix," the key steps for selection are as follows:

Step 1: Contact Angle Determines Basic Load-Bearing Direction

Ultra-precision angular contact ball bearings have contact angles indicated by letters following their basic model number:

C = 15° Contact Angle: Suitable for ultra-high-speed rotation, relatively weak axial load-bearing capacity, a typical choice for high-precision, high-speed operation scenarios.

D (or AC) = 25° Contact Angle: General purpose, balancing high speed and axial rigidity.

E (or B) = 40° Contact Angle: Suitable for heavy-duty applications, good axial rigidity, but lower limiting speed.

Step 2: Design Variations Determine Performance Orientation

Ultra-precision spindle bearings have various internal design variations, identified by prefixes or suffixes:

No Code: Standard design, steel balls.

HC: Hybrid ceramic balls (silicon nitride balls + steel rings), enabling higher speeds, electrical insulation,

lower heat generation, and longer lifespan.

X-life: Schaeffler's top-quality designation, representing higher load-bearing capacity, lower friction, and longer lifespan.

E: High-performance design, usually indicating superior performance. Internal Geometry

Step 3: Cage Code

Cage material directly affects high-speed performance and operational stability:

T: Laminated phenolic resin cage, outer ring guided (standard high-speed design)

TP: Also phenolic resin cage, but for rolling elements guided

P: Plastic cage (e.g., PEEK material)

G: Solid brass cage, suitable for higher temperatures or special operating conditions

Step 4: Universal Pairing and Preload

Ultra-precision bearings are all universally paired, allowing for arbitrary back-to-back, face-to-face, or tandem configurations. Preload is indicated by the following suffixes:

UL: Universal Light – Suitable for high-speed applications

UM: Universal Medium – Suitable for high-speed applications

UH: Universal Heavy – Suitable for high-rigidity applications

LO: Light Preload

L: Another way to indicate light preload

Step 5: Accuracy Grade

FAG ultra-precision bearing accuracy grade suffixes:

P4: ISO Class 4 accuracy, standard ultra-precision grade

P4S: Schaeffler standard, a higher accuracy grade than P4 (operating accuracy can reach P2 level), the standard configuration for FAG spindle bearings

P2: ISO Class 2 accuracy, the highest grade

Typical Model Interpretation

Using HC7008-E-T-P4S-UL For example:

HC: Hybrid ceramic ball bearing (ceramic ball + steel ring)

7008: 70 series, 40mm inner diameter

E: High-performance design (25° contact angle)

T: Phenolic resin cage, outer ring guided

P4S: Ultra-precision grade (higher than P4)

UL: Universal mating, light preload

This model designation indicates: a 70 series hybrid ceramic ball bearing with a 40mm inner diameter, 25° contact angle, phenolic resin cage, P4S precision grade, universal mating, and light preload—suitable for general applications such as high-speed machining center spindles.

Key Selection Points Summary

Determine Contact Angle: C (15° high speed), D/AC (25° general purpose), E/B (40° heavy load)

Select Material: No designation = steel balls, HC = ceramic balls (higher performance)

Match Cage: T (phenolic resin) suitable for most high-speed applications

Set Preload: UL (light preload) general purpose, UM/UH for high rigidity requirements

Confirm Accuracy: P4S is the standard configuration for FAG ultra-precision bearings

Following the order of "Contact Angle → Material → Cage → Preload → Accuracy" will provide a complete understanding of the FAG ultra-precision angular contact ball bearing models.

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