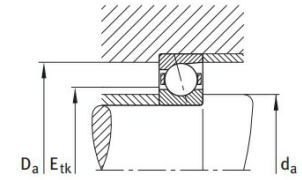
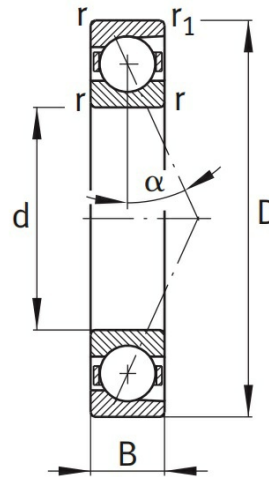
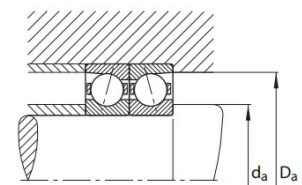


# HSS7009-E-T-P4S-UL

Super Precision Angular Contact Ball Bearing



Mounting dimensions



Mounting dimensions

## Technical sheet of HSS7009-E-T-P4S-UL

### What are the Benefits of choosing HSS7009-E-T-P4S-UL bearings?

- **High simultaneous load-bearing capacity:** Capable of simultaneously withstanding combined radial and axial loads and operating at high speeds.
- **High speed limit:** Optimized contact angle and cage design suitable for ultra-high-speed operation (e.g., machine tool spindles).
- **Rigidity and precision:** Provides extremely high rotational accuracy and system rigidity, ensuring precision in machining or operation.
- **Preload adjustment:** Precise preload adjustment is possible through paired installation (back-to-back/face-to-face), eliminating backlash and improving system stability.
- **Versatile design:** Offers different contact angles (e.g., 15°, 25°) to accommodate different speeds and load requirements.

<b>Type :</b>	Precision spindle bearings	
<b>Model :</b>	<a href="https://en.tradebearings.com/HSS7009-E-T-P4S-UL">HSS7009-E-T-P4S-UL</a>	
<b>Old Code :</b>	HSS7009ETP4SUL	
<b>Main dimensions :</b>	45 mm × 75 mm × 16 mm	Bore Dia × Outside Dia × Width Dia
<b>M kg:</b>	0.261	Mass
<b>d mm:</b>	45	inner ring diameter
<b>D mm:</b>	75	Outer ring diameter

<b>B(T) mm:</b>	16	Overall Width
<b>Cr kN:</b>	11.497	Radial dynamic load rating
<b>C<sub>0r</sub> kN:</b>	6.929	Radial static load rating
<b>Grease r/min:</b>	23907	Reference speed
<b>Oil r/min:</b>	35860	Limiting speed

#### Detailed parameters and installation dimensions:

Part Number	HSS7009-E-T-P4S-UL
Design Type	HSS = High Speed Bearing with small balls, Steel balls
Series	HSS70..-E-T-P4S-UL
Bearing Type	Super Precision Angular Contact Ball Bearing
Contact angle - $\alpha$	(E) 25 °
Dimension series	70 (Medium series)
Bearing set	UL
Accuracy class	P4S
Seal	2RSD = lip seals on both sides, non-contact
Arrangement	U = Single bearing arrangeable as desired
Preload	L = Preload Light
Row No.	One
Bore Type	Z = Cylindrical bore
Units	Metric
Bearing Mass - m	0.261 kg   0.575 lb
Cage	T = Laminated fabric, guidance on outer ring
Ball Material	GCr15SiMn
Ring Material	GCr15SiMn
Manufacturer Part Code	HSS7009ETP4SUL , HSS7009E-T-P4S-UL
Reference From	FAG HSS7009-E-T-P4S-UL
Dimension Inside - d $\phi$ (mm)	45
Dimension Outside - D $\Phi$ (mm)	75
Dimension Width - B (mm)	16
Dimension - r(min.)	1 mm   0.039 inch
Dimension - r <sub>1</sub> (min.)	1 mm   0.039 inch
Temperature - T(min)	-30°C
Temperature - T(max)	+100°C
Radial Dynamic Capacity - C <sub>r</sub>	11497 N   2584 lbf
Radial static Capacity - C <sub>0r</sub>	6929 N   1557 lbf
Reference speed (grease) - n <sub>B</sub>	23907 min <sup>-1</sup>
Limiting speed (oil) - n <sub>G</sub>	35860 min <sup>-1</sup>
Mounting dimensions - d <sub>a</sub> (h12)	51 mm   2.008 inch
Mounting dimensions - D <sub>a</sub> (H12)	69 mm   2.717 inch
Mounting dimensions - E <sub>tk</sub> (nom.)	58.2 mm   2.291 inch
Preload force - F <sub>v</sub> L	67 N   15 lbf

Preload force - $F_V$ M	206 N   46 lbf
Preload force - $F_V$ H	419 N   94 lbf
Axial rigidity - $c_a$ L	81.4 N/ $\mu$ m
Axial rigidity - $c_a$ M	125 N/ $\mu$ m
Axial rigidity - $c_a$ H	164 N/ $\mu$ m
Lift-off force - $K_{aE}$ L	199 N   44 lbf
Lift-off force - $K_{aE}$ M	618 N   138 lbf
Lift-off force - $K_{aE}$ H	1274 N   286 lbf

## What are the applications of the HSS7009-E-T-P4S-UL bearing?

- **Machine tool manufacturing (spindles, grinding heads):** Achieve extremely high speeds and machining accuracy, improving surface quality and production efficiency.
- **Aerospace (accessory gearboxes, gyroscopes):** Maintain high reliability and long lifespan during high-speed operation, adapting to harsh environments.
- **Precision instruments (measuring equipment, optical instruments):** Provide extremely low vibration and smooth operation, ensuring measurement accuracy.
- **High-speed motors (electric spindles, permanent magnet motors):** Support ultra-high speed operation, reducing temperature rise and power consumption.
- **Semiconductor equipment (wafer dicing machines, lithography machines):** Ensure micron-level positioning accuracy and long-term stability, improving yield.
- **Medical devices (CT scanners, surgical robots):** Achieve quiet and smooth rotation, meeting medical safety standards.
- **Robotics (joint reducers):** Improve joint response speed and repeatability, enhancing dynamic performance.

## How should choose the right model for a Precision spindle bearings?

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.

## What is the mounting procedure for HSS7009-E-T-P4S-UL bearings?

**Cleaning and Inspection:** Clean the bearing in a dust-free environment. After a rough wash to remove contaminants, perform a fine wash until the bearing feels smooth and responsive to the touch. Simultaneously check the accuracy of the mating surfaces of the shaft and bearing housing.

**Measurement and Fitting:** Precisely measure the bearing's inner and outer diameters. Mark the corresponding positions on the shaft and housing bores for alignment during assembly to compensate for any deviations.

**Installation and Positioning:** Apply pressure evenly using a specialized tool, focusing only on the interference fit rings. If heat fitting is used, tighten the inner ring during cooling to prevent clearance from affecting the preload.

**Preload Adjustment:** When installing in pairs, ensure the parallelism of the inner and outer spacers is  $\leq 1\mu\text{m}$ . Adjust the preload force to the specified value by grinding the spacers.

**Lubrication Inspection:** Add the specified amount of grease or oil mist lubricant. After installation, manually rotate the bearing to check its flexibility and operating noise.

## Special Note for mounting HSS7009-E-T-P4S-UL bearings?

**Clean Environment:** Operation must be performed in a dust-free cleanroom with humidity  $\leq 65\%$  to prevent dust and impurities from affecting accuracy.

**No Striking:** Direct striking of the bearings is strictly prohibited. Special tools must be used, and force must be applied evenly.

**Matching Marks:** Bearings used in pairs are not interchangeable. Installation must strictly follow the factory matching marks.

**Rust-Proof Storage:** Long-term storage requires regular rust-proofing treatment. Maintain ventilation and avoid corrosive gases.

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