



High Speed Spindle Bearings



HQW Precision GmbH
The Barden Corporation (UK) Ltd

Partners in Precision



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70 years of expertise

The Barden Corporation UK and HQW Precision work in partnership, leading the market in super precision ball bearings. With a solid reputation for excellence, our customers are assured of the highest quality precision bearings and services.

Barden has more than 70 years of market-leading expertise in the design and manufacture of super precision ball bearings. Working together with HQW Precision as Partners in Precision, we share best practices and knowledge, delivering high-end bearings and assemblies tailor-made to the demands and requirements of our customers.

Our products are manufactured to the highest quality standards, and we are also able to offer a full range of engineering support services. We pride ourselves on having a fast and flexible mindset which is rooted in all areas of the business.



The Barden Corporation UK Ltd, Plymouth, United Kingdom

Our Spindle Bearings

We specialise in the production of spindle ball bearings which are manufactured to the highest precision standards. Our product range covers bearings from 3mm inner diameter up to 180mm outer diameter. The bearings are specially designed to offer an exceptionally long lifetime, are suitable for the highest operating speeds and, through optional materials, extreme corrosion resistance.

Product quality is of utmost importance, and a Class 7 cleanroom is an integral part of our manufacturing process. Our flexible approach in manufacturing combined with a large stock of different product types means we can fully meet the demands of our customers at all times and deliver product quickly.



Quality

As a premium manufacturer, we place the utmost importance on the quality of our production processes. The tolerances for size, geometry and running accuracy of our spindle bearings fully comply with international ISO 492 and national DIN 620 standards, as well as American ABMA Standard 20 ABEC tolerance classes. Our bearings are fitted with balls which meet the highest tolerance standards, 'Grade 5' as a minimum, and our spindle bearings are manufactured to P4S (P2/P4 Internal/external precision) as standard and up to P2 where required.

Customers are assured of exceptional quality and precision. Full traceability of our products is available when needed, from initial enquiry, through the complete design and manufacturing process. We have world leading systems and processes in place: our site in Plymouth (UK) is fully certified to aerospace standards AS9100 and AS9120 for manufacturing and distributing flight critical components for the aviation and space industries, and our site in Kürnach (Germany), is certified to ISO 9001 for quality and process management.

After assembly in a Class 7 cleanroom our bearings are subjected to 100% noise testing to ensure that our customers always receive bearings which meet the best noise standard for their application. The overall result is a high precision product with a long operating life.



HQW Precision plant, Kürnach, Germany



Engineering Support

We are a global development and service partner for our customers worldwide. In addition to offering expert technical advice, we have state-of-the-art laboratory equipment and test rigs which are used for bearing analysis and testing.

As well as basic bearing analysis, our team of bearing specialists also offer the following:

- Bearing lifetime calculations and evaluation of kinematics
- Rigidity and preload design
- Thermal inspection
- Shaft calculation
- Lubricant recommendation

Services offered by our laboratory:

- Bearing damage analysis
- Grease analysis
- Dimensional check
- Friction measurement

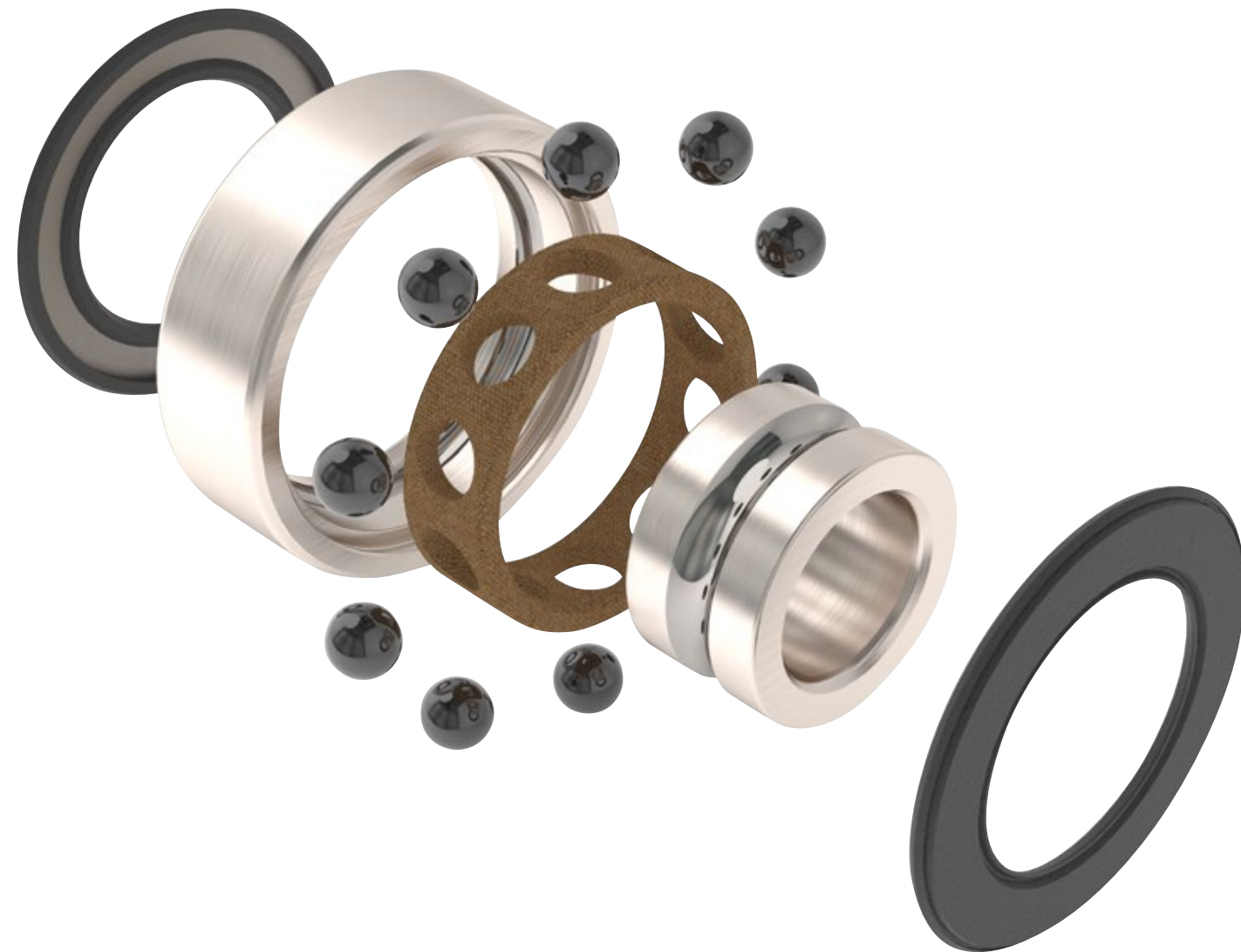


Spindle Bearings

Spindle bearings are single row angular contact ball bearings which are designed for the highest speeds and highest load ratings. They support thrust loads in one direction, and at very high speeds can simultaneously absorb high radial forces and single direction axial forces.

These bearings typically have one open shoulder on the outer ring as standard. This design allows a larger ball complement than found in comparable deep groove bearings, giving a greater load capacity. They also include a halo cage to maximise the bearing's speed, and they have exceptional high running accuracy.

Barden spindle bearings have a nominal contact angle of 15° or 25°. They can be used in pre-loaded duplex sets, back to back (DB) or face to face (DF) for supporting thrust loads in both directions or in tandem (DT) for additional capacity.



Applications

Spindle bearings are predominantly used in machine tool spindles. They are specially designed to handle the demanding operating conditions of the application. Depending on the size and type of material being machined by the spindle, the bearing has to cope with a variety of machine speeds, whilst offering maintenance-free and reliable performance.

Modern grinding motor spindles reach speeds of up to 180,000 rpm. Running accuracy and low noise are key requirements in this application. These conditions are met by ensuring that all rotating components are very finely balanced and that the bearings meet the highest quality standards. Our bearings meet these requirements down to the last micron.

Our spindle bearings are suitable for a variety of applications including motorised spindles, belt driven mechanical spindles, and specialist applications such as rotary unions for machine tool spindles. In this case, cooling liquids are supplied through the rotating spindle shaft at pressures of up to 150 bar and at high operating speeds, which places extreme demands on the bearing in terms of high speed and increased axial loads. Our bearings provide excellent performance in these conditions.

Operating Temperature

Standard spindle bearings can be used at temperatures up to 120°C due to the limiting temperature of the phenolic resin cages and high-speed grease. Other materials can be specified for higher temperature environments, please contact our Engineering Department for more information.



Materials and Components

The components of the bearing design will vary according to the application and choices should be based on anticipated operating conditions.

Design choices include:

- **Materials (rings and balls)**
- **Cages**
- **Lubrication**
- **Internal design parameters**
- **Preloading (Duplexing)**
- **Tolerances & geometric accuracy**
- **Closures**

Please consult our bearing specialists for particular requirements.



Rings

Carbon chrome bearing steels such as 100Cr6 and SAE52100 are used as standard in this application. They have good load carrying capacity, fatigue resistance and stability.

The high-performance stainless steel material AMS5898 can also be specified. This highly refined material has a very fine grain structure which enhances its mechanical properties. It also provides excellent corrosion resistance, fatigue resistance and stability.

The composition of these materials is shown in the table below.



Material Composition									
Designation	Chemical Reference	Cr	C	Si	Mn	P	S	Mo	N
Carbon Chrome	100Cr6/SAE52100	1.35 – 1.60	0.93 – 1.05	0.15 – 0.35	0.25 – 0.45	<0.025	<0.015	<0.1	-
Stainless Steel	X65Cr13 AISI440C	12.50 – 14.50	0.43 – 0.50	<1.00	<1.00	<0.040	<0.030	-	-
		16.00 – 18.00	0.95 – 1.20					0.40 – 0.65	
AMS5898	X30CrMoN15-1	14.50 – 16.00	0.28 – 0.34	0.30 – 0.80	0.30 – 0.60	<0.02	<0.01	0.95 – 1.10	0.35 – 0.44

Material composition

Hybrid Bearings

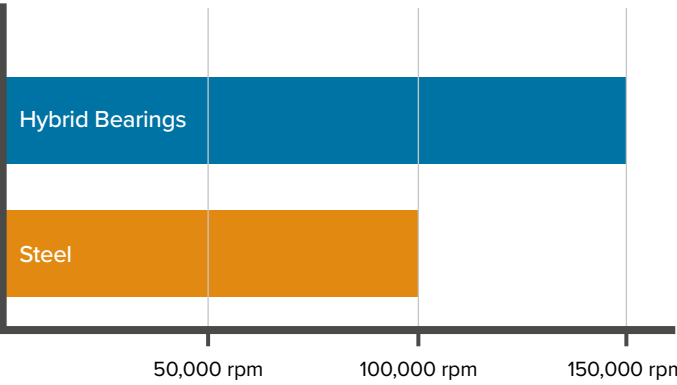
For carbon chrome bearings the standard ball material is the same as that used for the raceways, whereas for AMS5898 bearings the balls are made from stainless steel as standard. However, for particularly arduous applications many of our bearings are fitted with ceramic balls made from silicon nitride (Si₃N₄). Only balls of grades 3 and 5 are used for our spindle bearings as these classes comply with the tightest tolerances in terms of size, roundness and roughness.

Hybrid Bearings

Hybrid spindle bearings are used to meet the requirements of particularly demanding applications. The inner ring and outer ring are made of either carbon chrome or highly fatigue resistant AMS5898 steel, while the balls are ceramic (Si₃N₄).

- Ceramic balls used in place of steel balls can radically improve bearing performance in several ways:
- Low vibration and noise. Vibration levels can be up to seven times lower than conventional steel ball bearings due to the almost perfectly smooth finish and exceptional geometry of ceramic balls.
 - High running speeds. Ceramic hybrid bearings run at significantly lower operating temperatures with reduced internal loading due to a 60% lower ball mass than steel, allowing running speeds to increase by up to 50% (as shown opposite).
 - Low wear and long operating life. Bearings with ceramic balls have been proven to last up to five times longer than conventional steel ball bearings. The inherent properties of silicon nitride mean the balls drastically reduce the predominant cause of surface wear in conventional bearings. Lower operating temperatures also help extend lubricant life and they provide excellent performance where there is insufficient lubrication.
 - Systems equipped with ceramic hybrids show higher rigidity and a higher natural frequency making them less sensitive to vibration.

Please consult our bearing specialists for more information on how hybrid bearings can improve application performance.



Limiting speed for hybrid spindle bearings (illustrative)

ZSB Series Spindle Bearings



Barden ZSB angular contact series bearings can provide increased speed capability due to lower torque and temperature characteristics while offering improved stiffness and extended grease life.

As operating speeds increase, existing standard bearing designs are pushed to their limits and beyond. To address these challenges ZSB bearings use a smaller ball, in comparison to the bearing cross section, than their standard counterparts. This smaller ball, coupled with optimised internal geometry, reduces the influence of centrifugal effects, and allows the ZSB range bearings to operate at speeds up to 40% higher than large ball variants with no loss of accuracy.

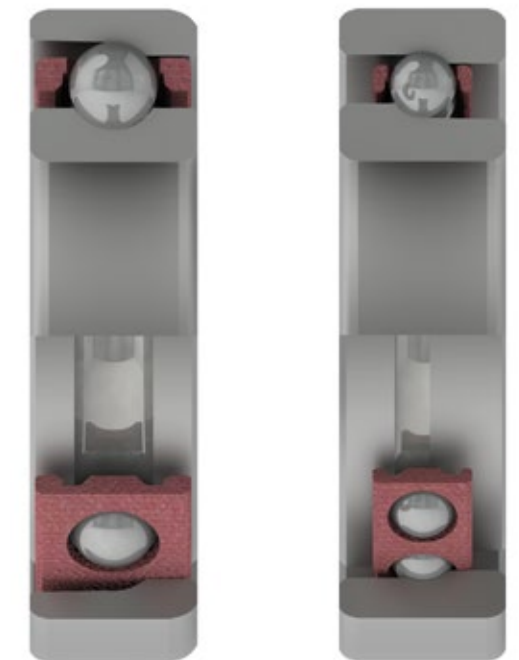
With a reduction in ball diameter comes an increase in ball complement. The increased ball complement means greater bearing stiffness, translating into greater machining accuracy and enhanced workpiece finish characteristics.

Operating speeds can be enhanced further when the ZSB design bearings are supplied with the optional ceramic (Si_3N_4) balls are used in place of steel balls. The ceramic material used to produce these balls has a density 60% lower than steel further reducing the effects of ball loading at high speeds, improving dynamic operating conditions.

ZSB series bearings are available either in open configuration for oil lubrication or fitted with closures and grease lubricated. Closures act to keep contaminants out and prolong lubricant life, thus reducing the risk of bearing failure.

Design Features

- Small ball design allows a greater number of balls for increased bearing stiffness.
- The land diameters of the inner and outer rings are relieved to provide:
 - Optimum exposure, and flow through, characteristics for air/oil lube systems.
 - Increased internal volume for lubricant in shielded/ sealed bearings.
- Ceramic (Silicon Nitride Si_3N_4) balls available as an option.
- Closures –available as an option.
 - Interchangeable with standard series bearings.
 - Factory controlled and filtered grease ensures clean, proper amount of lubrication.
- Available with 15° or 25° contact angles.



Comparison of ball diameter as proportion of cross section for H and ZSB style bearings

Benefits of Using ZSB Small Ball Bearings

- Increased bearing stiffness allows enhanced workpiece finish and greater machining accuracy.
- Up to 40% or more increase in operating speeds possible.
- Lower bearing friction means cooler running temperatures.
- Grease life increased due to lower temperatures.
- Closures keep contaminants out, lubricants in, reducing risk of bearing failure.
- Bearing grease life prolonged, which increases production capacity, reduces downtime.
- The ceramic ball option offers further reductions in torque and increased stiffness as well as increased speedability.
- Direct dimensional interchangeability of ZSB Series with other standard angular contact bearings.

Cages

Proper selection of cage design and materials is essential to the successful performance of a precision ball bearing. The basic purpose of a cage is to maintain uniform ball spacing, to prevent the balls contacting, thus ensuring an even load distribution within the bearing. They can also be designed to reduce torque and minimise heat build-up.

Our spindle bearings have a halo cage made of fabric reinforced phenolic as standard. If required, cages can also be produced from high-performance plastics such as PEEK or Polyamide-imide (such as Torlon®). These materials are used on account of their low weight, their corrosion resistance and low friction, which results in reduced wear and less heat generation. This enables the bearings to operate at higher speeds while prolonging grease service life.

Cage Types	Short Designation	Cage Type	Features
	H	Machined one-piece, outer ring guided, halo cage produced from fabric reinforced phenolic resin.	■ Standard cage type ■ Oil impregnation possible ■ Suitable for spindle ball bearings with high accuracy ■ Very high speeds ■ High strength ■ Good low lubricant running characteristics
	HEH	Machined one-piece, outer ring guided, halo cage produced from fabric reinforced phenolic resin.	■ As standard H cage, plus: ■ Bore grooves to reduce friction and improve lubricant circulation ■ Typical cage design for bearings of bore size 05 (25mm) and above

Cage types

Lubrication

Good lubrication is critical to the performance of anti-friction bearings. Increased speeds, higher temperatures, improved accuracy and reliability requirements result in the need for closer attention to lubricant selection. Lubricant type and quantity have a marked effect on functional properties and service life of each application.

The main task of a lubricant is to form an elastohydrodynamic lubricating film between the rolling element and the raceway, thereby preventing direct contact between the friction surfaces of the individual components.

A good lubricating film:

- Reduces friction
- Minimises wear
- Protects against corrosion
- Dissipates heat from the bearing
- Acts as barrier to contaminants



Lubrication Selection

The lubricant type is typically selected according to the operating conditions and limitations of the application while taking into account specific customer requirements. The most significant factors in selecting a lubricant are:

- Viscosity of the lubricant at operating temperature
- Maximum and minimum allowable operating temperatures
- Operating speed
- Required friction values

Lubricants are available in two basic forms:

- Oils (fluid lubricants)
- Greases – solid to semi-solid products consisting of an oil and a thickening agent

Barden have over 300 different oils and greases available, please consult us for any specific requirements.



Grease Lubrication

Grease lubrication is characterised as oil, bound by a thickener, which is continuously dispensed to the contact point during the lifetime. The primary advantage of grease over oil is that bearings can be pre-lubricated with grease, eliminating the need for an external lubrication system.

Our sealed spindle bearings are lubricated with a high-performance grease for the entire lifetime, and attainable running speeds are generally lower compared with oil lubrication.

The standard grease used in our spindle bearings is based on synthetic oil and polyurea thickener as standard. The grease exhibits optimal performance during tests at speed factors of two million n-dm (speed x PCD of balls). Bearing run-in occurs much faster and the starting torque is greatly reduced.

Grease lubrication also requires less maintenance and has less stringent sealing requirements than oil systems. Grease tends to remain in proximity to bearing components, metering its oil content to operating surfaces as needed.

Other considerations to grease selection include:

- **Speedability**
- **Temperature**
- **Consistency (stiffness)**
- **Bleeding**

Factory pre-lubrication of bearings is highly recommended, since the correct quantity of applied lubricant can be as important as the correct type of lubricant. This is especially true of greases, where an excess can cause high torque, overheating and — if the speed is high enough — rapid bearing failure. Based on our vast experience in this field, we have established standard quantities of lubricants that are suitable for most applications.

In grease lubricated bearings life is often not determined by the internal design, fitting and specification of the bearing but by the grease itself. It is important for this reason to ensure appropriate running conditions to optimise useful grease life.

In addition, we can offer special finishing of the spindle bearing itself or its individual components. This could include, for example, vacuum impregnation of the cage, special coating of the rings and film greasing.

Advantages of Sealed Spindle Bearings with Grease Lubrication

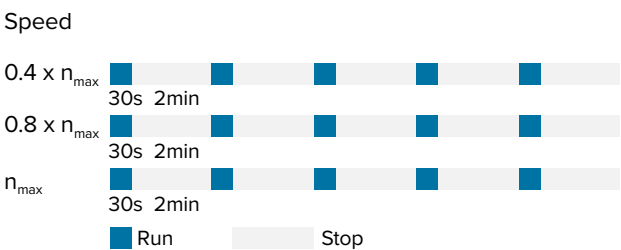
- **Lifetime lubrication**
- **Maintenance-free**
- **No external lubrication system required**
- **Optimal grease quantity**
- **Use of a high-performance lubricant (speed factor $n \cdot dm = 2,200,000$)**
- **Greasing, sealing and packaging in a clean room Class 7**

Grease Distribution

Before operating under load, spindle bearings with lifetime lubrication first need to be run in to distribute the grease evenly. This distribution process should be carried out at intervals with pauses at rest, allowing the bearing temperature to stabilise and prevent overheating and degradation of the grease.

The procedure for grease distribution is as follows: Three process steps with increasing speeds ($0.4 \times n_{max}$; $0.8 \times n_{max}$; n_{max}) in relation to the maximum speed of the application, and five intervals composed of one 30-second run and a two-minute stop. It is recommended to monitor the temperature and continue the last iteration with max. speed, longer run procedures and shorter stops until a steady temperature is reached.

Run In Intervals



Grease distribution

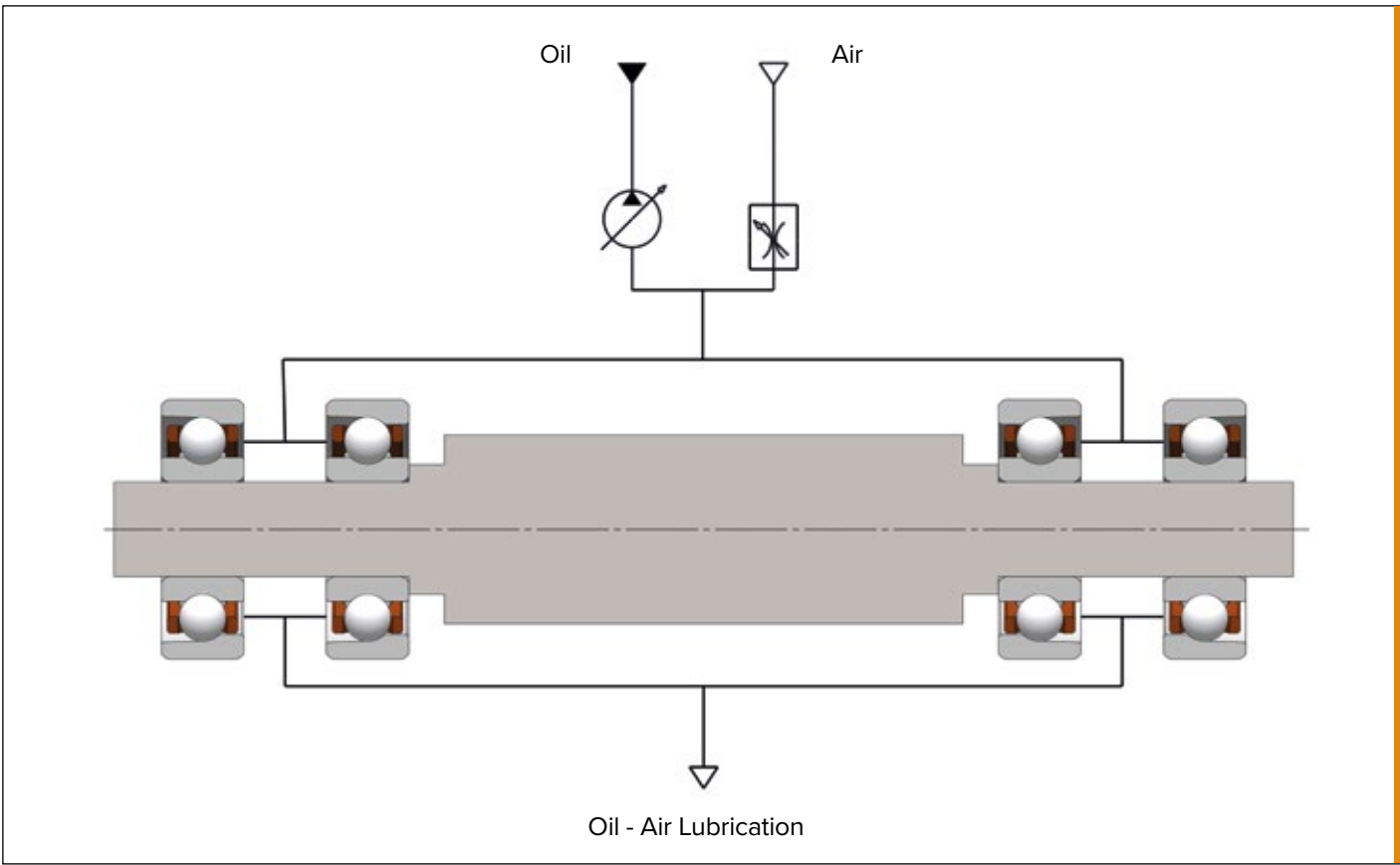
Oil Lubrication

Oil lubrication can offer advantages when compared with grease lubrication, particularly in the case of spindle bearings rotating at high speed.

Our open spindle bearings are supplied oil lubricated as standard. In contrast to grease lubricated bearings, oil lubricated bearings must be lubricated regularly with exactly the right amount of lubricant in order to achieve the expected bearing life. The optimisation of relubrication intervals and lubricant quantity can have a significant cost-saving effect for the end user. If regular relubrication of the bearings is necessary, an external oil-air lubrication system can be integrated into the system.

Oil-Air lubrication or oil minimum quantity lubrication (MQL) is often used in modern machine tool spindles

and is shown in the diagram below. In this process, an oil film is formed in front of the spindle and conveyed to the bearing. It enables exceptionally high speeds to be achieved and dissipates heat from the bearing. Ideally each bearing has its own oil-air supply.



Oil minimum quantity lubrication (MQL)



Design of Spindle Bearings

Open Design

Open spindle bearings make optimum use of the internal space by allowing large balls and a halo cage. This results in maximum load carrying capacities and therefore maximum bearing life. This open design is recommended for oil lubrication. Contamination should be prevented from entering the bearing and continuous relubrication should be used.

Sealed Design

Seals exclude contamination, contain lubricants, and protect the bearing from internal damage during handling.

Our sealed spindle bearings typically have non-contact seals on both sides, which ensure good protection against contaminants, such as dust, which could damage the internal workings of the bearing. This design also limits lubricant leakage from the bearing. They are recommended for applications where lifetime grease lubrication is required or where air flow through the bearing is present.

Since the seals are non-contact there is no negative effect on friction or speed ratings. Our standard seals are made from NBR with steel reinforcement. For extreme environments the flouroelastomer FKM is available, offering high chemical resistance and operating temperatures up to 230°C

In some instances it is necessary to reduce the ball diameter in order to provide space for the seals, an outcome of which can be a moderate increase in speed. Further advantages of the sealed design include ease of handling and trouble-free installation, making it particularly suitable where bearings are being replaced.



Open design

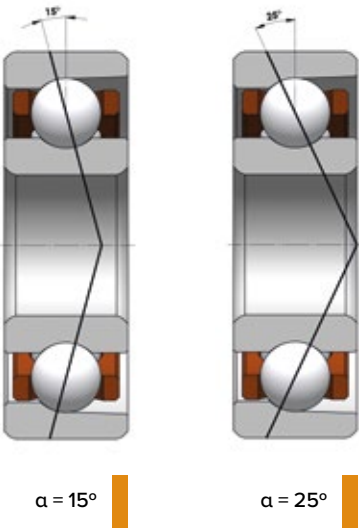


Sealed design

Contact Angle

Contact angle is the nominal angle between the ball-to-race contact line and a plane through the ball centres, perpendicular to the bearing axis. Load is transmitted from the shaft to the inner ring and then via the contact angle through the balls to the outer ring and subsequently the housing. To ensure an even load on all bearings within a set, they should all have the same contact angle.

Angular contact bearings are assembled to a constant contact angle by varying the radial clearance. Our spindle bearings are available with a contact angle of 15° or 25°. The larger the angle, the higher the axial capacity and rigidity as axial forces can be absorbed. Conversely, bearings with a smaller contact angle have better radial capacity and rigidity and are able to operate at higher speed. Non-standard contact angles are available on request.



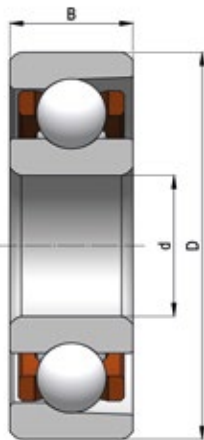
$\alpha = 15^\circ$

$\alpha = 25^\circ$

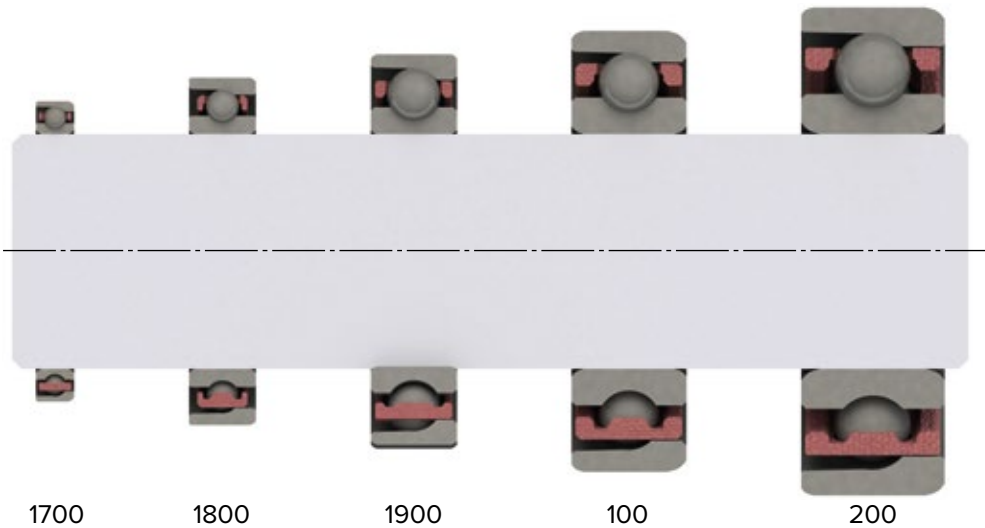
Dimension Series

Our spindle bearings range from 3mm inner diameter to 180mm outer diameter, and the following tables indicate the dimensions, the dynamic and static load rating and the limiting speed for the various designs of bearing. The diagram opposite shows the envelope dimensions which are referred to by the abbreviations d, D and B.

The envelope dimensions of our bearings are in line with ISO standards. These fall into different series where for the same given bore diameter and range of cross sections are available, in general smaller cross section offer higher speeds but lower load carrying capacity and vice-versa.



Dimension abbreviations



Comparison shown for 25mm bore diameter bearings



Miniature Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
17M3	Open	S30X17M3HY971	3	6	2	15	215	60	405000	326000	2	3.4	6	4	4.6	13	7	5.9	24
		C30X17M3HY971	3	6	2	15	215	52	585000	405000	2	3.8	6	4	5.1	13	7	6.6	23
		S30X17M3HY972	3	6	2	25	207	57	338000	270000	2	7.0	6	4	9.0	12	7	11.1	21
		C30X17M3HY972	3	6	2	25	207	50	495000	349000	2	8.0	6	4	10.3	12	7	12.6	21
18M3	Open	S30X18M3HY971	3	7	2	15	300	85	360000	290000	2	3.6	6	5	5.2	16	9	6.8	30
		C30X18M3HY971	3	7	2	15	300	75	520000	360000	2	4.0	6	5	5.8	16	9	7.5	30
		S30X18M3HY972	3	7	2	25	289	82	300000	240000	2	7.5	6	5	10.3	15	9	12.8	27
		C30X18M3HY972	3	7	2	25	289	72	440000	310000	2	8.5	6	5	11.8	15	9	14.6	27
19M3	Open	S30X19M3HY971	3	8	3	15	324	98	328000	265000	2	3.8	6	5	5.5	16	10	7.5	34
		C30X19M3HY971	3	8	3	15	324	86	474000	328000	2	4.3	6	5	6.2	16	10	8.4	33
		S30X19M3HY972	3	8	3	25	311	94	274000	219000	2	8.0	6	5	11.1	15	10	14.3	30
		C30X19M3HY972	3	8	3	25	311	82	401000	283000	2	9.1	6	5	12.6	15	10	16.2	30
30M3	Open	S30X30M3HY971	3	9	5	15	491	145	322000	259000	3	4.4	9	8	6.7	26	15	9.0	52
		C30X30M3HY971	3	9	5	15	491	127	465000	322000	3	5.0	9	8	7.6	26	15	10.1	51
		S30X30M3HY972	3	9	5	25	477	140	268000	215000	3	9.2	9	8	13.1	24	15	16.6	45
		C30X30M3HY972	3	9	5	25	477	122	393000	277000	3	10.5	9	8	14.9	24	15	18.8	45
	Sealed	S30X30M3HVVY971	3	9	5	15	491	145	322000	259000	3	4.4	9	8	6.7	26	15	9.0	52
		C30X30M3HVVY971	3	9	5	15	491	127	465000	322000	3	5.0	9	8	7.6	26	15	10.1	51
		S30X30M3HVVY972	3	9	5	25	477	140	268000	215000	3	9.2	9	8	13.1	24	15	16.6	45
		C30X30M3HVVY972	3	9	5	25	477	122	393000	277000	3	10.5	9	8	14.9	24	15	18.8	45
2M3	Open	S30X2M3HY971	3	10	4	15	507	156	273000	220000	3	4.4	9	8	6.8	26	16	9.3	56
		C30X2M3HY971	3	10	4	15	507	136	394000	273000	3	5.0	9	8	7.6	26	16	10.4	55
		S30X2M3HY972	3	10	4	25	488	150	228000	182000	3	9.2	9	8	13.1	24	15	16.6	45
		C30X2M3HY972	3	10	4	25	488	131	334000	235000	3	10.5	9	8	14.9	23	15	18.9	45
	Sealed	S30X2M3HVVY971	3	10	4	15	507	156	273000	220000	3	4.4	9	8	6.8	26	16	9.3	56
		C30X2M3HVVY971	3	10	4	15	507	136	394000	273000	3	5.0	9	8	7.6	26	16	10.4	55
		S30X2M3HVVY972	3	10	4	25	488	150	228000	182000	3	9.2	9	8	13.1	24	15	16.6	45
		C30X2M3HVVY972	3	10	4	25	488	131	334000	235000	3	10.5	9	8	14.9	23	15	18.9	45

* Limiting speeds are provided as a guide only with the attainable speed depending on many factors specific to individual installations.
** Axial rigidity values are calculated as a solidly preloaded pair of bearings under the stated preload level.



Miniature Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
17M4	Open	S30X17M4HY971	4	7	2	15	232	71	331000	267000	2	3.6	6	4	4.8	13	7	6.2	23
		C30X17M4HY971	4	7	2	15	232	62	478000	331000	2	4.1	6	4	5.4	13	7	7.0	23
		S30X17M4HY972	4	7	2	25	221	68	276000	221000	2	7.5	6	4	9.7	12	7	11.9	21
		C30X17M4HY972	4	7	2	25	221	59	404000	285000	2	8.6	6	4	11.0	12	7	13.5	21
18M4	Open	S30X18M4HY971	4	9	2.5	15	347	112	296000	238000	2	4.0	6	6	6.3	19	11	8.3	37
		C30X18M4HY971	4	9	2.5	15	347	98	427000	296000	2	4.6	6	6	7.1	19	11	9.2	36
		S30X18M4HY972	4	9	2.5	25	332	107	246000	197000	2	8.5	6	5	11.8	15	10	15.2	30
		C30X18M4HY972	4	9	2.5	25	332	93	361000	255000	2	9.7	6	5	13.4	15	10	17.2	29
	Sealed	S30X19M4HY971	4	11	4	15	850	285	242000	195000	5	6.3	16	13	9.5	43	26	13.2	92
		C30X19M4HY971	4	11	4	15	850	248	349000	242000	5	7.1	15	13	10.7	42	26	14.7	90
		S30X19M4HY972	4	11	4	25	823	275	202000	161000	5	13.1	14	13	18.5	38	25	23.6	75
		C30X19M4HY972	4	11	4	25	823	240	295000	208000	5	14.9	14	13	21.0	38	23	26.0	69
19M4	Sealed	S30X19M4HVVY971	4	11	4	15	778	247	254000	205000	4	5.4	12	12	8.6	40	24	12.0	85
		C30X19M4HVVY971	4	11	4	15	778	216	367000	254000	4	6.1	12	12	9.6	39	24	13.3	83
		S30X19M4HVVY972	4	11	4	25	754	239	212000	170000	4	11.2	12	12	16.6	36	23	21.3	70
		C30X19M4HVVY972	4	11	4	25	754	209	310000	219000	4	12.8	12	12	18.9	35	25	24.9	75
10M4	Open	S30X10M4HY971	4	12	4	15	1223	434	233000	188000	7	8.1	23	19	13.1	70	37	18.6	147
		C30X10M4HY971	4	12	4	15	1223	378	336000	233000	7	9.0	23	19	14.5	68	36	20.1	139
		S30X10M4HY972	4	12	4	25	1192	422	194000	156000	6	14.7	18	18	22.4	55	36	29.8	114
		C30X10M4HY972	4	12	4	25	1192	368	285000	201000	6	16.7	18	18	25.3	55	36	33.5	113
	Sealed	S30X10M4HVVY971	4	12	4	15	852	285	240000	194000	5	6.3	16	13	9.5	43	26	13.2	92
		C30X10M4HVVY971	4	12	4	15	852	249	347000	240000	5	7.1	15	13	10.7	42	26	14.7	90
		S30X10M4HVVY972	4	12	4	25	824	276	200000	160000	5	13.1	14	13	18.5	38	25	23.6	75
		C30X10M4HVVY972	4	12	4	25	824	240	293000	207000	5	14.9	14	13	21.0	38	25	26.8	75
2M4	Open	S30X2M4HY971	4	13	5	15	1342	522	212000	171000	7	7.5	22	21	12.3	72	41	17.1	151
		C30X2M4HY971	4	13	5	15	1342	455	306000	212000	7	8.5	22	21	13.7	71	41	18.9	148
		S30X2M4HY972	4	13	5	25	1295	505	177000	142000	7	15.3	20	20	22.5	60	39	29.1	120
		C30X2M4HY972	4	13	5	25	1295	440	259000	183000	7	17.4	20	20	25.5	59	39	33.0	119
	Sealed	S30X2M4HVVY971	4	13	5	15	1342	522	212000	171000	7	7.5	22	21	12.3	72	41	17.1	151
		C30X2M4HVVY971	4	13	5	15	1342	455	306000	212000	7	8.5	22	21	13.7	71	41	18.9	148
		S30X2M4HVVY972	4	13	5	25	1295	505	177000	142000	7	15.3	20	20	22.5	60	39	29.1	120
		C30X2M4HVVY972	4	13	5	25	1295	440	259000	183000	7	17.4	20	20	25.5	59	39	33.0	119

* Limiting speeds are provided as a guide only with the attainable speed depending on many factors specific to individual installations.
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Miniature Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
17M5	Open	S30X17M5HY971	5	8	2	15	273	96	280000	225000	2	4.2	6	5	6.2	16	9	8.0	30
		C30X17M5HY971	5	8	2	15	273	84	404000	280000	2	4.8	6	5	7.0	16	9	9.0	30
		S30X17M5HY972	5	8	2	25	259	92	233000	187000	2	8.9	6	4	11.4	12	8	14.7	24
		C30X17M5HY972	5	8	2	25	259	80	342000	241000	2	10.2	6	4	13.0	12	8	16.7	24
18M5	Open	S30X18M5HY971	5	11	3	15	634	230	225000	182000	4	6.0	12	10	8.9	33	19	12.0	66
		C30X18M5HY971	5	11	3	15	634	201	325000	225000	4	6.8	12	10	10.0	32	19	13.3	64
		S30X18M5HY972	5	11	3	25	606	220	188000	150000	4	12.5	12	10	17.4	29	19	22.2	57
		C30X18M5HY972	5	11	3	25	606	192	275000	194000	4	14.3	12	10	19.8	29	19	25.2	57
38M5	Sealed	S30X38M5HVVY971	5	11	5	15	633	226	237000	191000	4	6.0	12	10	8.9	33	19	12.0	66
		C30X38M5HVVY971	5	11	5	15	633	197	343000	237000	4	6.8	12	10	10.0	32	19	13.3	64
		S30X38M5HVVY972	5	11	5	25	607	217	198000	158000	4	12.5	12	10	17.4	29	19	22.2	57
		C30X38M5HVVY972	5	11	5	25	607	189	290000	204000	4	14.3	12	10	19.8	29	19	25.2	57
19M5	Open	S30X19M5HY971	5	13	4	15	937	343	198000	160000	6	7.3	19	18	11.7	61	36	16.4	130
		C30X19M5HY971	5	13	4	15	937	299	286000	198000	6	8.2	18	18	13.1	60	36	18.2	127
		S30X19M5HY972	5	13	4	25	898	329	165000	132000	6	14.9	17	17	21.8	50	34	28.4	103
		C30X19M5HY972	5	13	4	25	898	287	242000	171000	6	17.0	17	17	24.8	50	34	32.2	103
	Sealed	S30X19M5HVVY971	5	13	4	15	937	343	198000	160000	6	7.3	19	18	11.7	61	36	16.4	130
		C30X19M5HVVY971	5	13	4	15	937	299	286000	198000	6	8.2	18	18	13.1	60	36	18.2	127
		S30X19M5HVVY972	5	13	4	25	898	329	165000	132000	6	14.9	17	17	21.8	50	34	28.4	103
		C30X19M5HVVY972	5	13	4	25	898	287	242000	171000	6	17.0	17	17	24.8	50	34	32.2	103
10M5	Open	S30X10M5HY971	5	14	5	15	1468	613	194000	156000	8	8.5	25	22	13.4	75	44	18.8	161
		C30X10M5HY971	5	14	5	15	1468	535	280000	194000	8	9.6	25	22	14.9	74	44	20.8	158
		S30X10M5HY972	5	14	5	25	1410	591	162000	130000	7	16.5	20	21	24.6	63	42	32.2	129
		C30X10M5HY972	5	14	5	25	1410	516	237000	167000	7	18.8	20	21	28.0	62	42	36.5	128
	Sealed	S30X10M5HVVY971	5	14	5	15	1468	613	194000	156000	8	8.5	25	22	13.4	75	44	18.8	161
		C30X10M5HVVY971	5	14	5	15	1468	535	280000	194000	8	9.6	25	22	14.9	74	44	20.8	158
		S30X10M5HVVY972	5	14	5	25	1410	591	162000	130000	7	16.5	20	21	24.6	63	42	32.2	129
		C30X10M5HVVY972	5	14	5	25	1410	516	237000	167000	7	18.8	20	21	28.0	62	42	36.5	128
34-5	Open	S30X34-5HY971	5	16	5	15	1766	801	167000	135000	9	9.9	28	27	16.2	93	55	23.1	205
		C30X34-5HY971	5	16	5	15	1766	699	241000	167000	9	11.1	28	27	18.1	91	55	25.5	200
		S30X34-5HY972	5	16	5	25	1689	770	139000	112000	9	20.0	26	26	29.6	78	55	39.7	170
		C30X34-5HY972	5	16	5	25	1689	672	204000	144000	9	22.8	26	26	33.6	77	55	44.9	168
	Sealed	S30X34-5HVVY971	5	16	5	15	1766	801	167000	135000	9	9.9	28	27	16.2	93	55	23.1	205
		C30X34-5HVVY971	5	16	5	15	1766	699	241000	167000	9	11.1	28	27	18.1	91	55	25.5	200
		S30X34-5HVVY972	5	16	5	25	1689	770	139000	112000	9	20.0	26	26	29.6	78	55	39.7	170
		C30X34-5HVVY972	5	16	5	25	1689	672	204000	144000	9	22.8	26	26	33.6	77	55	44.9	168

* Limiting speeds are provided as a guide only with the attainable speed depending on many factors specific to individual installations.
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Miniature Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
27M6	Open	S30X27M6HY971	6	10	3	15	383	144	225000	182000	2	4.4	6	6	7.0	19	12	9.5	41
		C30X27M6HY971	6	10	3	15	383	126	325000	225000	2	5.0	6	6	7.8	19	12	10.6	40
		S30X27M6HY972	6	10	3	25	364	137	188000	150000	2	9.3	6	6	13.8	18	11	17.3	33
		C30X27M6HY972	6	10	3	25	364	120	275000	194000	2	10.7	6	6	15.7	18	11	19.6	33
18M6	Open	S30X18M6HY971	6	13	3.5	15	1180	535	186000	150000	6	8.1	19	18	13.2	62	36	18.7	134
		C30X18M6HY971	6	13	3.5	15	1180	467	269000	186000	6	9.1	19	18	14.7	61	36	20.7	131
		S30X18M6HY972	6	13	3.5	25	1123	513	155000	124000	6	16.2	18	17	23.9	51	34	31.4	105
		C30X18M6HY972	6	13	3.5	25	1123	447	227000	160000	6	18.5	17	17	27.1	51	34	35.4	104
	Sealed	S30X18M6HVVY971	6	13	3.5	15	937	343	198000	160000	5	6.7	15	15	10.8	50	29	14.7	102
		C30X18M6HVVY971	6	13	3.5	15	937	299	286000	198000	5	7.6	15	15	12.1	49	29	16.4	100
		S30X18M6HVVY972	6	13	3.5	25	898	329	165000	132000	5	14.0	14	14	20.3	41	27	26.0	81
		C30X18M6HVVY972	6	13	3.5	25	898	287	242000	171000	5	16.0	14	14	23.1	41	27	29.5	81
28M6	Sealed	S30X28M6HVVY971	6	13	5	15	937	343	198000	160000	5	6.7	15	15	10.8	50	29	14.7	102
		C30X28M6HVVY971	6	13	5	15	937	299	286000	198000	5	7.6	15	15	12.1	49	29	16.4	100
		S30X28M6HVVY972	6	13	5	25	898	329	165000	132000	5	14.0	14	14	20.3	41	27	26.0	81
		C30X28M6HVVY972	6	13	5	25	898	287	242000	171000	5	16.0	14	14	23.1	41	27	29.5	81
19M6	Open	S30X19M6HY971	6	15	5	15	1475	644	172000	139000	8	8.5	25	23	13.6	79	45	19.0	165
		C30X19M6HY971	6	15	5	15	1475	562	248000	172000	8	9.6	25	23	15.2	77	45	21.0	161
		S30X19M6HY972	6	15	5	25	1408	619	143000	115000	7	16.5	20	21	24.6	63	42	32.2	129
		C30X19M6HY972	6	15	5	25	1408	540	210000	148000	7	18.8	20	21	28.0	62	42	36.5	128
	Sealed	S30X19M6HVVY971	6	15	5	15	1475	644	172000	139000	8	8.5	25	23	13.6	79	45	19.0	165
		C30X19M6HVVY971	6	15	5	15	1475	562	248000	172000	8	9.6	25	23	15.2	77	45	21.0	161
		S30X19M6HVVY972	6	15	5	25	1408	619	143000	115000	7	16.5	20	21	24.6	63	42	32.2	129
		C30X19M6HVVY972	6	15	5	25	1408	540	210000	148000	7	18.8	20	21	28.0	62	42	36.5	128
10M6	Open	S30X10M6HY971	6	17	6	15	2556	1086	157000	127000	13	12.9	43	39	21.7	142	80	31.8	317
		C30X10M6HY971	6	17	6	15	2556	948	227000	157000	13	14.4	42	39	24.1	139	80	34.9	309
		S30X10M6HY972	6	17	6	25	2477	1051	131000	105000	13	25.1	38	38	37.8	116	75	50.0	238
		C30X10M6HY972	6	17	6	25	2477	917	192000	135000	13	28.6	38	38	42.8	115	75	56.3	235
	Sealed	S30X10M6HVVY971	6	17	6	15	2509	1046	169000	136000	13	12.9	43	38	21.4	138	75	30.7	295
		C30X10M6HVVY971	6	17	6	15	2509	912	243000	169000	13	14.4	42	38	23.7	135	75	33.7	288
		S30X10M6HVVY972	6	17	6	25	2440	1015	141000	113000	13	25.1	38	37	37.4	113	75	50.0	238
		C30X10M6HVVY972	6	17	6	25	2440	885	206000	145000	13	28.6	38	37	42.3	112	75	56.3	235

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Miniature Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
2M6	Open	S30X2M6HY971	6	19	6	15	2720	1219	139000	112000	14	13.7	45	41	22.7	147	85	33.2	331
		C30X2M6HY971	6	19	6	15	2720	1064	200000	139000	14	15.4	45	41	25.2	144	85	36.5	323
		S30X2M6HY972	6	19	6	25	2620	1174	116000	93000	14	27.0	41	40	40.2	122	80	53.3	252
		C30X2M6HY972	6	19	6	25	2620	1024	170000	120000	14	30.8	41	40	45.6	121	80	60.0	249
	Sealed	S30X2M6HVVY971	6	19	6	15	1959	940	139000	112000	10	12.4	33	30	21.0	109	60	30.2	237
		C30X2M6HVVY971	6	19	6	15	1959	820	201000	139000	10	13.9	32	30	23.2	107	60	33.2	231
		S30X2M6HVVY972	6	19	6	25	1871	899	116000	93000	10	24.2	29	29	36.4	89	60	49.0	191
		C30X2M6HVVY972	6	19	6	25	1871	785	170000	120000	10	27.6	29	30	41.7	91	60	55.2	188
27M7	Open	S30X27M7HY971	7	11	3	15	438	185	200000	162000	3	5.9	9	7	8.4	22	14	11.5	48
		C30X27M7HY971	7	11	3	15	438	161	289000	200000	3	6.7	9	7	9.5	22	14	12.9	47
		S30X27M7HY972	7	11	3	25	415	175	167000	134000	3	12.4	9	7	16.8	20	13	21.1	39
		C30X27M7HY972	7	11	3	25	396	143	245000	173000	3	13.6	9	7	18.3	20	13	23.0	39
18M7	Open	S30X18M7HY971	7	14	3.5	15	1062	428	177000	143000	6	8.1	18	16	12.3	53	32	17.0	112
		C30X18M7HY971	7	14	3.5	15	1062	373	255000	177000	6	9.2	18	16	13.8	52	32	18.9	110
		S30X18M7HY972	7	14	3.5	25	1015	409	148000	118000	6	16.8	17	16	23.9	47	32	31.1	96
		C30X18M7HY972	7	14	3.5	25	1015	357	216000	152000	6	19.2	17	16	27.2	47	32	35.2	96
28M7	Sealed	S30X28M7HVVY971	7	14	5	15	1062	428	177000	143000	6	8.1	18	16	12.3	53	32	17.0	112
		C30X28M7HVVY971	7	14	5	15	1062	373	255000	177000	6	9.2	18	16	13.8	52	32	18.9	110
		S30X28M7HVVY972	7	14	5	25	1015	409	148000	118000	6	16.8	17	16	23.9	47	31	30.7	93
		C30X28M7HVVY972	7	14	5	25	1015	357	216000	152000	6	19.2	17	16	27.2	47	31	34.8	93
19M7	Open	S30X19M7HY971	7	17	5	15	2489	1046	154000	124000	13	12.5	42	38	20.8	137	75	29.6	292
		C30X19M7HY971	7	17	5	15	2489	913	223000	154000	13	14.0	42	38	23.0	134	60	29.0	222
		S30X19M7HY972	7	17	5	25	2410	1011	129000	103000	12	23.9	35	36	36.2	109	75	48.7	237
		C30X19M7HY972	7	17	5	25	2410	882	189000	133000	12	27.2	35	36	41.0	109	75	54.9	234
	Sealed	S30X19M7HVVY971	7	17	5	15	1881	911	153000	123000	10	10.9	32	29	17.6	100	60	25.3	223
		C30X19M7HVVY971	7	17	5	15	1881	795	221000	153000	10	12.3	31	29	19.6	98	60	28.0	218
		S30X19M7HVVY972	7	17	5	25	1792	874	128000	102000	9	21.3	26	27	31.9	81	55	42.1	169
		C30X19M7HVVY972	7	17	5	25	1792	762	187000	132000	9	24.3	26	27	36.2	80	55	47.6	168

* Limiting speeds are provided as a guide only with the attainable speed depending on many factors specific to individual installations.
** Axial rigidity values are calculated as a solidly preloaded pair of bearings under the stated preload level.



Miniature Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
10M7	Open	S30X10M7HY971	7	19	6	15	2720	1219	139000	112000	14	13.7	45	41	22.7	147	85	33.2	331
		C30X10M7HY971	7	19	6	15	2720	1064	200000	139000	14	15.4	45	41	25.2	144	85	36.5	323
		S30X10M7HY972	7	19	6	25	2620	1174	116000	93000	14	27.0	41	40	40.2	122	80	53.3	252
		C30X10M7HY972	7	19	6	25	2620	1024	170000	120000	14	30.8	41	40	45.6	121	80	60.0	249
	Sealed	S30X10M7HVVY971	7	19	6	15	1959	940	139000	112000	10	12.4	33	30	21.0	109	60	30.2	237
		C30X10M7HVVY971	7	19	6	15	1959	820	201000	139000	10	13.9	32	30	23.2	107	60	33.2	231
		S30X10M7HVVY972	7	19	6	25	1871	899	116000	93000	10	24.2	29	29	36.4	89	60	49.0	191
		C30X10M7HVVY972	7	19	6	25	1871	785	170000	120000	10	27.6	29	29	41.2	88	60	55.2	188
37	Open	S30X37HY971	7	22	7	15	3638	1586	120000	97000	19	14.8	61	55	24.3	194	110	34.6	420
		C30X37HY971	7	22	7	15	3638	1384	174000	120000	19	16.7	60	55	26.9	190	110	38.1	410
		S30X37HY972	7	22	7	25	3517	1531	100000	80000	18	28.9	53	55	43.9	167	110	58.0	344
		C30X37HY972	7	22	7	25	3517	1336	147000	104000	18	32.9	52	55	49.8	165	110	65.4	340
	Sealed	S30X37HVVY971	7	22	7	15	2833	1330	125000	101000	15	14.6	49	43	24.1	156	85	34.5	335
		C30X37HVVY971	7	22	7	15	2833	1161	181000	125000	15	16.3	49	43	26.7	153	85	37.9	327
		S30X37HVVY972	7	22	7	25	2718	1277	105000	84000	14	27.6	41	41	41.6	125	85	56.1	270
		C30X37HVVY972	7	22	7	25	2718	1114	153000	108000	14	31.4	41	41	47.1	124	85	63.1	267
17M8	Open	S30X17M8HY971	8	12	2.5	15	468	213	180000	145000	3	6.4	9	7	9.1	22	14	12.3	47
		C30X17M8HY971	8	12	2.5	15	468	186	260000	180000	3	7.3	9	7	10.2	22	14	13.8	46
		S30X17M8HY972	8	12	2.5	25	442	202	150000	120000	3	13.5	9	7	18.2	20	14	23.5	42
		C30X17M8HY972	8	12	2.5	25	442	177	220000	155000	3	15.4	9	7	20.8	20	14	26.7	41
18M8	Open	S30X18M8HY971	8	16	4	15	1836	833	150000	121000	10	11.8	33	28	19.3	102	55	27.6	217
		C30X18M8HY971	8	16	4	15	1836	727	217000	150000	10	13.2	33	28	21.4	100	55	30.3	212
		S30X18M8HY972	8	16	4	25	1758	799	125000	100000	9	21.9	27	27	33.4	83	55	44.7	175
		C30X18M8HY972	8	16	4	25	1758	697	184000	130000	9	25.0	26	27	37.8	82	55	50.3	173
	Sealed	S30X18M8HVVY971	8	16	4	15	1379	736	155000	125000	7	10.0	22	21	16.3	72	42	23.0	155
		C30X18M8HVVY971	8	16	4	15	1379	642	224000	155000	7	11.3	22	21	18.2	71	42	25.4	151
		S30X18M8HVVY972	8	16	4	25	1305	696	129000	104000	7	20.3	20	20	29.9	60	39	38.8	120
		C30X18M8HVVY972	8	16	4	25	1305	608	189000	134000	7	23.2	20	20	33.9	59	39	43.9	119

* Limiting speeds are provided as a guide only with the attainable speed depending on many factors specific to individual installations.
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Miniature Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
19M8	Open	S30X19M8HY971	8	19	6	15	2720	1219	139000	112000	14	13.7	45	41	22.7	147	85	33.2	331
		C30X19M8HY971	8	19	6	15	2720	1064	200000	139000	14	15.4	45	41	25.2	144	85	36.5	323
		S30X19M8HY972	8	19	6	25	2620	1174	116000	93000	14	27.0	41	40	40.2	122	80	53.3	252
		C30X19M8HY972	8	19	6	25	2620	1024	170000	120000	14	30.8	41	40	45.6	121	80	60.0	249
	Sealed	S30X19M8HVVY971	8	19	6	15	1959	940	139000	112000	10	12.4	33	30	21.0	109	60	30.2	237
		C30X19M8HVVY971	8	19	6	15	1959	820	201000	139000	10	13.9	32	30	23.2	107	60	33.2	231
		S30X19M8HVVY972	8	19	6	25	1871	899	116000	93000	10	24.2	29	29	36.4	89	60	49.0	191
		C30X19M8HVVY972	8	19	6	25	1871	785	170000	120000	10	27.6	29	29	41.2	88	60	55.2	188
38	Open	S30X38HY971	8	22	7	15	3638	1586	120000	97000	19	14.8	61	55	24.3	194	110	34.6	420
		C30X38HY971	8	22	7	15	3638	1384	174000	120000	18	16.3	57	55	26.9	190	110	38.1	410
		S30X38HY972	8	22	7	25	3517	1531	100000	80000	18	28.9	53	55	43.9	167	110	58.0	344
		C30X38HY972	8	22	7	25	3517	1336	147000	104000	18	32.9	52	55	49.8	165	110	65.4	340
	Sealed	S30X38HVVY971	8	22	7	15	2833	1330	125000	101000	15	14.6	49	43	24.1	156	85	34.5	335
		C30X38HVVY971	8	22	7	15	2833	1161	181000	125000	15	16.3	49	43	26.7	153	85	37.9	327
		S30X38HVVY972	8	22	7	25	2718	1277	105000	84000	14	27.6	41	41	41.6	125	85	56.1	270
		C30X38HVVY972	8	22	7	25	2718	1114	153000	108000	14	31.4	41	41	47.1	124	85	63.1	267
2M8	Open	S30X2M8HY971	8	24	8	15	4386	1814	113000	91000	22	14.7	70	70	24.9	245	135	34.7	507
		C30X2M8HY971	8	24	8	15	4386	1583	163000	113000	22	16.5	69	65	26.7	221	135	38.3	495
		S30X2M8HY972	8	24	8	25	4267	1760	94000	75000	22	29.6	64	65	44.3	195	130	58.2	403
		C30X2M8HY972	8	24	8	25	4267	1536	138000	97000	22	33.7	64	65	50.2	194	130	65.8	399
	Sealed	S30X2M8HVVY971	8	24	8	15	3656	1605	117000	95000	19	14.8	61	55	24.3	194	110	34.6	420
		C30X2M8HVVY971	8	24	8	15	3656	1401	169000	117000	19	16.7	60	55	26.9	190	110	38.1	410
		S30X2M8HVVY972	8	24	8	25	3530	1548	98000	78000	18	28.9	53	55	43.9	167	110	58.0	344
		C30X2M8HVVY972	8	24	8	25	3530	1351	143000	101000	18	32.9	52	55	49.8	165	110	65.4	340
17M9	Open	S30X17M9HY971	9	14	3	15	793	367	157000	127000	4	7.6	12	12	11.9	39	24	16.3	82
		C30X17M9HY971	9	14	3	15	793	320	227000	157000	4	8.6	12	12	13.4	38	24	18.2	80
		S30X17M9HY972	9	14	3	25	751	349	131000	105000	4	16.0	12	12	23.6	35	23	30.1	69
		C30X17M9HY972	9	14	3	25	751	304	192000	135000	4	18.3	11	12	26.9	35	23	34.2	68

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Miniature Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
18M9	Open	S30X18M9HY971	9	17	4	15	1959	941	139000	112000	10	12.4	33	30	21.0	109	60	30.2	237
		C30X18M9HY971	9	17	4	15	1959	821	200000	139000	10	13.9	32	30	23.2	107	60	33.2	231
		S30X18M9HY972	9	17	4	25	1870	900	116000	93000	10	24.2	29	29	36.4	89	60	49.0	191
		C30X18M9HY972	9	17	4	25	1870	785	170000	120000	10	27.6	29	29	41.2	88	60	55.2	188
	Sealed	S30X18M9HVVY971	9	17	4	15	1429	796	143000	115000	8	11.0	25	22	17.4	75	43	24.1	158
		C30X18M9HVVY971	9	17	4	15	1429	695	206000	143000	8	12.4	25	22	19.4	74	43	26.7	154
		S30X18M9HVVY972	9	17	4	25	1351	739	119000	95000	7	21.3	20	21	31.9	63	41	41.3	126
		C30X18M9HVVY972	9	17	4	25	1351	645	174000	123000	7	24.3	20	21	36.2	62	41	46.8	125
19M9	Open	S30X19M9HY971	9	20	6	15	2928	1395	126000	101000	15	14.9	49	44	24.7	157	90	35.8	349
		C30X19M9HY971	9	20	6	15	2928	1218	181000	126000	15	16.8	48	44	27.4	154	90	39.4	341
		S30X19M9HY972	9	20	6	25	2809	1339	105000	84000	14	28.7	41	42	43.4	127	85	57.8	267
		C30X19M9HY972	9	20	6	25	2809	1169	154000	108000	14	32.7	41	42	49.2	126	85	65.1	264
	Sealed	S30X19M9HVVY971	9	20	6	15	2184	1141	128000	103000	11	14.2	36	33	23.9	119	70	35.5	276
		C30X19M9HVVY971	9	20	6	15	2184	995	184000	128000	11	15.9	35	33	26.5	117	70	39.0	269
		S30X19M9HVVY972	9	20	6	25	2081	1089	107000	85000	11	27.9	32	32	41.8	98	65	55.9	205
		C30X19M9HVVY972	9	20	6	25	2081	950	156000	110000	11	31.8	32	32	47.4	97	65	62.9	203
10M9	Open	S30X10M9HY971	9	24	7	15	3942	1809	114000	92000	20	16.1	64	60	26.7	212	120	38.1	457
		C30X10M9HY971	9	24	7	15	3942	1578	164000	114000	19	17.7	60	60	29.7	207	120	42.0	447
		S30X10M9HY972	9	24	7	25	3801	1743	95000	76000	19	31.5	56	60	48.4	182	115	62.9	359
		C30X10M9HY972	9	24	7	25	3801	1521	139000	98000	19	35.9	55	60	54.9	180	115	70.9	355
	Sealed	S30X10M9HVVY971	9	24	7	15	3942	1809	114000	92000	20	16.1	64	60	26.7	212	120	38.1	457
		C30X10M9HVVY971	9	24	7	15	3675	1421	164000	114000	20	17.0	64	60	28.1	210	120	39.9	452
		S30X10M9HVVY972	9	24	7	25	3801	1743	95000	76000	19	31.5	56	60	48.4	182	115	62.9	359
		C30X10M9HVVY972	9	24	7	25	3801	1521	139000	98000	19	35.9	55	60	54.9	180	115	70.9	355
39	Open	S30X39HY971	9	26	8	15	5238	2407	100000	81000	27	18.2	86	80	29.8	277	160	42.2	597
		C30X39HY971	9	26	8	15	5238	2100	145000	100000	27	20.5	85	80	33.2	272	160	46.6	584
		S30X39HY972	9	26	8	25	5064	2324	84000	67000	26	36.3	76	80	55.0	240	155	71.4	479
		C30X39HY972	9	26	8	25	5064	2028	123000	87000	26	41.4	76	80	62.4	239	155	80.7	475
	Sealed	S30X39HVVY971	9	26	8	15	3985	1877	104000	84000	20	16.1	64	60	26.7	212	120	38.1	457
		C30X39HVVY971	9	26	8	15	3985	1638	150000	104000	20	18.1	63	60	29.7	207	120	42.0	447
		S30X39HVVY972	9	26	8	25	3828	1803	87000	69000	20	32.1	59	60	48.5	182	115	62.9	359
		C30X39HVVY972	9	26	8	25	3828	1574	127000	90000	20	36.6	58	60	55.0	180	115	71.0	355

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width	α [°]	Dynamic Radial	Static Radial	Oil [min ⁻¹]	Grease [min ⁻¹]	Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]		C [N]	C ₀ [N]			F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
1700	Open	S30X1700H	10	15	3	15	816	397	144000	116000	5	8.6	15	13	12.8	42	25	17.2	85
		C30X1700H	10	15	3	15	816	346	208000	144000	5	9.7	15	13	14.3	41	25	19.1	84
		S30X2700H	10	15	3	25	772	376	120000	96000	4	16.6	12	12	24.6	35	24	31.7	72
		C30X2700H	10	15	3	25	772	328	176000	124000	4	19.0	11	12	28.0	35	24	36.1	71
1800	Open	S30X1800H	10	19	5	15	2069	1057	126000	102000	10	13.0	33	30	21.9	108	60	31.4	234
		C30X1800H	10	19	5	15	2069	922	182000	126000	10	14.6	32	30	24.2	106	60	34.6	229
		S30X2800H	10	19	5	25	1970	1009	105000	84000	8	23.6	23	24	35.6	73	60	51.6	190
		C30X2800H	10	19	5	25	1970	880	154000	109000	8	26.9	23	24	40.4	72	60	58.1	187
	Sealed	S30X1800HVV	10	19	5	15	1577	888	129000	104000	8	13.0	26	24	21.9	86	48	31.4	187
		C30X1800HVV	10	19	5	15	1577	775	186000	129000	8	14.6	26	24	24.3	85	48	34.6	183
		S30X2800HVV	10	19	5	25	1495	844	108000	86000	8	25.6	24	23	38.2	70	45	50.2	142
		C30X2800HVV	10	19	5	25	1495	737	158000	111000	8	29.2	23	23	43.3	69	45	56.6	140
1900	Open	ZSB1900JY965	10	22	6	15	1546	774	159000	104000	5	8.5	15	15	13.4	48	30	18.3	103
		S30X1900HY971	10	22	6	15	3030	1517	113000	91000	16	15.8	52	46	26.1	167	95	38.3	375
		CZSB1900JY965	10	22	6	15	1546	689	205000	134000	4	8.8	12	12	13.6	38	24	18.4	79
		C30X1900HY971	10	22	6	15	3030	1324	163000	113000	16	17.7	52	46	28.9	163	95	42.0	366
		ZSB2900JY965	10	22	6	25	1471	736	143000	93000	7	20.2	20	21	30.0	62	42	39.0	127
		S30X2900HY971	10	22	6	25	2897	1452	94000	75000	15	30.1	44	46	46.1	141	90	60.7	285
		CZSB2900JY965	10	22	6	25	1471	656	185000	120000	6	21.7	17	18	32.0	53	36	41.5	108
		C30X2900HY971	10	22	6	25	2897	1267	138000	97000	15	34.2	44	44	51.3	133	90	68.4	282
	Sealed	S30X1900HVVY971	10	22	6	15	2169	1170	116000	93000	11	14.2	36	33	23.9	119	65	34.1	254
		C30X1900HVVY971	10	22	6	15	2169	1021	167000	116000	11	15.9	35	33	26.5	117	65	37.4	248
		S30X2900HVVY971	10	22	6	25	2062	1115	97000	77000	11	27.9	32	31	41.3	94	65	55.9	205
		C30X2900HVVY971	10	22	6	25	2062	973	142000	100000	11	31.8	32	31	46.8	94	65	62.9	203
100	Open	ZSB100JY965	10	26	8	15	2749	1421	140000	91000	11	12.9	34	33	20.4	108	65	28.1	229
		S30X100HY971	10	26	8	15	5238	2407	100000	81000	27	18.2	86	80	29.8	277	160	42.2	597
		CZSB100JY965	10	26	8	15	2749	1265	182000	119000	8	12.8	24	24	19.9	76	48	26.9	159
		C30X100HY971	10	26	8	15	5238	2100	145000	100000	27	20.5	85	80	33.2	272	160	46.6	584
		ZSB2100JY965	10	26	8	25	2624	1356	127000	82000	17	31.5	49	50	47.0	152	100	61.5	312
		S30X2100HY971	10	26	8	25	5064	2324	84000	67000	26	36.3	76	80	55.0	240	155	71.4	479
		CZSB2100JY965	10	26	8	25	2624	1207	164000	107000	12	31.6	35	36	46.7	106	70	60.5	216
		C30X2100HY971	10	26	8	25	5064	2028	123000	87000	26	41.4	76	80	62.4	239	155	80.7	475
	Sealed	S30X100HVVY971	10	26	8	15	3985	1877	104000	84000	20	16.1	64	60	26.7	212	120	38.1	457
		C30X100HVVY971	10	26	8	15	3985	1638	150000	104000	20	18.1	63	60	29.7	207	120	42.0	447
		S30X2100HVVY971	10	26	8	25	3828	1803	87000	69000	20	32.1	59	60	48.5	182	115	62.9	359
		C30X2100HVVY971	10	26	8	25	3828	1574	127000	90000	20	36.6	58	60	55.0	180	115	71.0	355

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width	α [°]	Dynamic Radial	Static Radial	Oil [min ⁻¹]	Grease [min ⁻¹]	Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]		C [N]	C ₀ [N]			F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
200	Open	S30X200HY971	10	30	9	15	4777	2599	87000	70000	32	22.9	104	95	38.3	342	190	55.1	742
		C30X200HY971	10	30	9	15	6260	2852	124000	86000	32	25.2	103	95	41.6	334	190	59.3	721
		S30X2200HY971	10	30	9	25	6011	3139	72000	57000	31	43.7	91	95	66.9	289	185	87.7	583
		C30X2200HY971	10	30	9	25	6011	2739	105000	74000	31	49.8	91	95	75.7	287	185	98.8	576
	Sealed	S30X200HVVY971	10	30	9	15	6260	3268	86000	69000	32	22.5	104	95	37.5	341	190	53.9	740
		C30X200HVVY971	10	30	9	15	6260	2852	124000	86000	32	25.2	103	95	41.6	334	190	59.3	721
		S30X2200HVVY971	10	30	9	25	6011	3139	72000	57000	31	43.7	91	95	66.9	289	185	87.7	583
		C30X2200HVVY971	10	30	9	25	6011	2739	105000	74000	31	49.8	91	95	75.7	287	185	98.8	576
1701	Open	S30X1701H	12	18	3	15	879	481	120000	97000	5	9.5	15	14	14.5	45	27	19.4	91
		C30X1701H	12	18	3	15	879	420	174000	120000	5	10.7	15	14	16.2	44	27	21.7	90
		S30X2701H	12	18	3	25	829	455	100000	80000	5	20.0	14	13	28.1	38	25	35.7	74
		C30X2701H	12	18	3	25	829	397	147000	104000	5	22.8	14	13	32.0	38	25	40.6	74
1801	Open	S30X1801H	12	21	5	15	2267	1278	110000	88000	12	15.4	39	24	21.2	83	70	36.7	273
		C30X1801H	12	21	5	15	2267	1115	158000	110000	12	17.3	39	34	27.9	120	70	40.3	267
		S30X2801H	12	21	5	25	2152	1216	91000	73000	11	29.2	32	34	44.8	104	65	58.3	205
		C30X2801H	12	21	5	25	2152	1061	134000	94000	11	33.3	32	33	50.2	100	65	65.7	202
	1801	S30X1801HVV	12	21	5	15	1608	978	110000	89000	8	13.5	26	24	22.6	86	48	32.4	186
		C30X1801HVV	12	21	5	15	1608	853	159000	110000	8	15.2	26	24	25.1	84	48	35.6	181
		S30X2801HVV	12	21	5	25	1520	928	92000	74000	8	26.7	23	23	39.8	70	46	52.6	144
		C30X2801HVV	12	21	5	25	1520	810	135000	95000	8	30.4	23	23	45.0	69	46	59.3	143
1901	Open	ZSB1901JY965	12	24	6	15	1682	915	141000	92000	5	9.3	15	15	14.5	48	30	19.8	101
		S30X1901HY971	12	24	6	15	3385	1834	105000	85000	17	17.8	55	55	31.0	200	105	43.6	411
		CZSB1901JY965	12	24	6	15	1682	815	182000	119000	4	9.6	12	12	14.8	37	24	19.9	78
		C30X1901HY971	12	24	6	15	3385	1600	152000	105000	17	20.0	55	55	34.4	195	105	47.9	401
		ZSB2901JY965	12	24	6	25	1596	869	127000	83000	8	23.2	23	24	34.5	71	48	44.9	145
		S30X2901HY971	12	24	6	25	3228	1752	88000	70000	17	35.0	50	49	52.3	149	100	69.9	316
		CZSB2901JY965	12	24	6	25	1596	774	164000	107000	7	25.1	20	21	37.1	62	42	48.1	126
		C30X2901HY971	12	24	6	25	3228	1529	128000	91000	17	39.9	50	49	59.2	148	100	78.8	312
	1901	S30X1901HVVY971	12	24	6	15	2474	1465	108000	87000	13	17.2	42	38	28.4	136	75	40.5	291
		C30X1901HVVY971	12	24	6	15	2474	1279	156000	108000	13	19.3	42	38	31.5	133	75	44.5	283
		S30X2901HVVY971	12	24	6	25	2347	1395	90000	72000	12	32.8	35	36	49.7	109	75	66.9	236
		C30X2901HVVY971	12	24	6	25	2347	1217	132000	93000	12	37.4	35	36	56.3	108	75	75.4	233

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width	α [°]	Dynamic Radial	Static Radial	Oil [min ⁻¹]	Grease [min ⁻¹]	Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]		C [N]	C ₀ [N]			F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
101	Open	ZSB101JY965	12	28	8	15	2868	1564	126000	82000	11	13.4	34	33	21.2	107	65	29.2	227
		CZSB101JY965	12	28	8	15	2868	1393	164000	107000	8	13.4	24	24	20.7	75	48	27.9	158
		S30X101HY971	12	28	8	15	5673	2773	90000	73000	29	19.9	92	90	33.2	313	175	46.3	653
		C30X101HY971	12	28	8	15	5673	2419	130000	90000	29	22.4	91	90	36.9	307	175	51.1	638
		ZSB2101JY965	12	28	8	25	2731	1490	114000	74000	18	33.6	52	50	50.2	161	105	65.6	330
		CZSB2101JY965	12	28	8	25	2731	1326	148000	96000	12	33.0	35	36	48.8	106	70	63.2	215
		S30X2101HY971	12	28	8	25	5459	2667	75000	60000	28	39.6	82	85	59.8	255	165	77.6	509
		C30X2101HY971	12	28	8	25	5459	2327	110000	78000	28	45.2	81	85	67.8	253	165	87.7	504
	Sealed	S30X101HVVY971	12	28	8	15	4778	2589	88000	71000	24	20.2	77	75	34.1	263	145	47.7	548
		C30X101HVVY971	12	28	8	15	4778	2260	126000	88000	24	22.8	76	75	37.9	258	145	52.6	535
		S30X2101HVVY971	12	28	8	25	4563	2476	73000	59000	23	39.9	67	70	60.4	211	140	79.6	435
		C30X2101HVVY971	12	28	8	25	4563	2161	107000	76000	23	45.5	67	70	68.6	209	140	89.9	431
201	Open	S30X201HY971	12	32	10	15	9356	4927	82000	66000	47	28.1	156	145	48.8	540	285	70.2	1154
		C30X201HY971	12	32	10	15	9356	4300	118000	82000	47	31.5	154	145	53.9	528	285	77.0	1124
		S30X2201HY971	12	32	10	25	9051	4761	68000	55000	46	53.7	136	140	82.6	432	275	109.5	883
		C30X2201HY971	12	32	10	25	9051	4155	100000	70000	46	61.0	135	140	93.3	428	275	123.1	872
	Sealed	S30X201HVVY971	12	32	10	15	5714	2857	84000	68000	29	19.9	92	90	33.2	313	175	46.3	653
		C30X201HVVY971	12	32	10	15	5714	2493	121000	84000	29	22.4	91	90	36.9	307	175	51.1	638
		S30X2201HVVY971	12	32	10	25	5481	2741	70000	56000	28	39.6	82	85	59.8	255	165	77.6	509
		C30X2201HVVY971	12	32	10	25	5481	2392	102000	72000	28	45.2	81	85	67.8	253	165	87.7	504
1702	Open	S30X1702H	15	21	4	15	980	616	100000	81000	5	10.9	15	15	16.9	48	30	23.0	100
		C30X1702H	15	21	4	15	980	538	145000	100000	5	12.3	15	15	19.0	47	30	25.7	99
		S30X2702H	15	21	4	25	923	583	84000	67000	5	23.1	14	14	33.2	41	28	42.8	83
		C30X2702H	15	21	4	25	923	509	123000	87000	5	26.4	14	14	37.9	41	28	48.7	82
1802	Open	S30X1802H	15	24	5	15	2534	1599	95000	77000	13	17.8	42	38	29.3	135	75	41.6	288
		C30X1802H	15	24	5	15	2534	1395	138000	95000	13	20.0	41	38	32.5	132	75	45.9	281
		S30X2802H	15	24	5	25	2399	1519	80000	64000	12	34.1	35	36	51.6	109	75	69.3	235
		C30X2802H	15	24	5	25	2399	1325	117000	82000	12	38.9	35	36	58.5	108	75	78.2	233
	Sealed	S30X1802HVV	15	24	5	15	2534	1599	95000	77000	13	17.8	42	38	29.3	135	75	41.6	288
		C30X1802HVV	15	24	5	15	2534	1395	138000	95000	13	20.0	41	38	32.5	132	75	45.9	281
		S30X2802HVV	15	24	5	25	2399	1519	80000	64000	12	34.1	35	36	51.6	109	75	69.3	235
		C30X2802HVV	15	24	5	25	2399	1325	117000	82000	12	38.9	35	36	58.5	108	75	78.2	233

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width	α [°]	Dynamic Radial	Static Radial	Oil [min ⁻¹]	Grease [min ⁻¹]	Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]		C [N]	C ₀ [N]			F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
1902	Open	ZSB1902JY965	15	28	7	15	2311	1335	118000	77000	7	11.4	21	21	17.8	67	42	24.2	141
		S30X1902HY971	15	28	7	15	4530	2390	88000	71000	24	19.3	77	75	32.7	266	145	45.9	553
		CZSB1902JY965	15	28	7	15	2311	1189	153000	100000	6	12.1	18	18	18.7	56	36	25.1	118
		C30X1902HY971	15	28	7	15	4778	2260	126000	88000	24	22.8	76	75	37.9	258	145	52.6	535
		ZSB2902JY965	15	28	7	25	2192	1267	107000	70000	11	28.3	32	33	42.1	97	65	54.7	199
		S30X2902HY971	15	28	7	25	4326	2286	73000	59000	23	38.0	67	70	57.6	212	140	75.9	437
		CZSB2902JY965	15	28	7	25	2192	1128	138000	90000	10	31.1	29	30	45.9	88	60	59.4	179
		C30X2902HY971	15	28	7	25	4326	1995	107000	76000	23	43.3	67	70	65.3	210	140	85.7	432
	Sealed	S30X1902HVVY971	15	28	7	15	4530	2390	88000	71000	24	19.3	77	75	32.7	266	145	45.9	553
		C30X1902HVVY971	15	28	7	15	4530	2086	126000	88000	24	21.7	76	75	36.3	260	145	50.6	540
		S30X2902HVVY971	15	28	7	25	4326	2286	73000	59000	23	38.0	67	70	57.6	212	140	75.9	437
		C30X2902HVVY971	15	28	7	25	4326	1995	107000	76000	23	43.3	67	70	65.3	210	140	85.7	432
102	Open	ZSB102JY965	15	32	9	15	4297	2407	108000	70000	17	16.7	52	50	26.4	165	100	36.3	351
		CZSB102JY965	15	32	9	15	4297	2143	140000	91000	12	16.5	36	36	25.4	113	70	34.3	236
		S30X102HY971	15	32	9	15	6410	3477	77000	62000	32	22.8	101	100	38.1	345	195	53.1	722
		C30X102HY971	15	32	9	15	6410	3034	111000	77000	32	25.7	100	100	42.4	339	195	58.7	706
		ZSB2102JY965	15	32	9	25	4098	2294	97000	63000	27	41.4	78	80	61.8	241	160	80.7	494
		CZSB2102JY965	15	32	9	25	4098	2042	126000	82000	19	41.5	55	55	61.3	167	110	79.3	341
		S30X2102HY971	15	32	9	25	6131	3329	64000	52000	31	45.8	90	95	69.2	285	185	89.8	569
		C30X2102HY971	15	32	9	25	6131	2905	94000	66000	31	52.2	90	95	78.5	283	185	101.5	564
	Sealed	S30X102HVVY971	15	32	9	15	5238	3079	79000	64000	27	23.1	86	80	37.9	279	160	53.7	601
		C30X102HVVY971	15	32	9	15	5238	2687	114000	79000	27	26.0	85	80	42.1	273	160	59.3	587
		S30X2102HVVY971	15	32	9	25	4988	2938	66000	53000	25	45.1	73	70	66.0	210	150	89.1	464
		C30X2102HVVY971	15	32	9	25	4988	2564	97000	68000	25	51.4	73	75	77.0	224	150	100.7	460
	Open	S30X202HY971	15	35	11	15	9706	5021	72000	58000	49	26.6	159	150	44.9	537	295	63.8	1142
		C30X202HY971	15	35	11	15	9706	4381	104000	72000	49	29.9	156	150	49.8	526	295	70.2	1115
		S30X2202HY971	15	35	11	25	9366	4841	60000	48000	47	51.7	138	145	79.2	441	285	104.0	895
		C30X2202HY971	15	35	11	25	9366	4225	88000	62000	47	58.9	137	145	89.7	437	285	117.3	886
	Sealed	S30X202HVVY971	15	35	11	15	6411	3546	72000	58000	33	23.1	104	100	38.1	345	195	53.1	722
		C30X202HVVY971	15	35	11	15	6411	3095	104000	72000	33	26.1	103	100	42.4	339	195	58.7	706
		S30X2202HVVY971	15	35	11	25	6121	3391	60000	48000	31	45.8	90	95	69.2	285	185	89.8	569
		C30X2202HVVY971	15	35	11	25	6121	2959	88000	62000	31	52.2	90	95	78.5	283	185	101.5	564

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width	α [°]	Dynamic Radial	Static Radial	Oil [min ⁻¹]	Grease [min ⁻¹]	Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]		C [N]	C ₀ [N]			F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
1703	Open	S30X1703H	17	23	4	15	1006	674	90000	73000	5	11.4	15	15	17.7	47	30	23.9	100
		C30X1703H	17	23	4	15	1006	588	130000	90000	5	12.9	15	15	19.9	47	30	26.8	98
		S30X2703H	17	23	4	25	947	637	75000	60000	5	24.3	14	15	35.8	44	29	45.5	86
		C30X2703H	17	23	4	25	947	556	110000	78000	5	27.8	14	15	40.8	44	29	51.8	85
1803	Open	S30X1803H	17	26	5	15	2589	1725	86000	70000	13	18.4	42	39	30.6	138	80	44.3	308
		C30X1803H	17	26	5	15	2589	1506	125000	86000	13	20.6	41	39	33.9	136	80	48.7	300
		S30X2803H	17	26	5	25	2447	1637	72000	58000	13	36.5	38	37	54.0	112	75	71.7	235
		C30X2803H	17	26	5	25	2447	1428	106000	74000	13	41.5	38	37	61.2	111	75	80.9	232
	Sealed	S30X1803HVV	17	26	5	15	2589	1725	86000	70000	13	18.4	42	39	30.6	138	80	44.3	308
		C30X1803HVV	17	26	5	15	2589	1506	125000	86000	13	20.6	41	39	33.9	136	80	48.7	300
		S30X2803HVV	17	26	5	25	2447	1637	72000	58000	13	36.5	38	37	54.0	112	75	71.7	235
		C30X2803HVV	17	26	5	25	2447	1428	106000	74000	13	41.5	38	37	61.2	111	75	80.9	232
1903	Open	ZSB1903JY965	17	30	7	15	2470	1526	108000	71000	7	12.2	21	21	19.0	66	42	25.8	140
		S30X1903HY971	17	30	7	15	4994	2896	77000	62000	25	21.5	80	75	35.4	261	150	50.3	564
		CZSB1903JY965	17	30	7	15	2470	1359	140000	91000	7	13.8	21	21	21.3	66	42	28.7	138
		C30X1903HY971	17	30	7	15	4994	2527	111000	77000	25	24.2	79	75	39.4	256	150	55.5	551
		ZSB2903JY965	17	30	7	25	2340	1447	98000	64000	12	31.5	35	36	46.8	106	70	60.8	217
		S30X2903HY971	17	30	7	25	4752	2762	64000	51000	24	42.5	70	75	65.0	226	145	84.4	450
		CZSB2903JY965	17	30	7	25	2340	1289	126000	82000	10	33.6	29	30	49.5	88	60	64.0	179
		C30X2903HY971	17	30	7	25	4752	2410	94000	66000	24	48.5	70	75	73.7	224	145	95.3	445
	Sealed	S30X1903HVVY971	17	30	7	15	3790	2428	79000	64000	19	21.0	61	60	36.0	215	115	50.4	444
		C30X1903HVVY971	17	30	7	15	3790	2119	114000	79000	19	23.6	61	60	39.9	210	115	55.5	433
		S30X2903HVVY971	17	30	7	25	3591	2308	66000	53000	18	40.8	53	55	62.1	167	110	82.1	345
		C30X2903HVVY971	17	30	7	25	3591	2014	96000	68000	18	46.5	53	55	70.4	165	110	92.6	341
103	Open	ZSB103JY965	17	35	10	15	4462	2632	97000	63000	17	17.4	52	50	27.4	165	100	37.5	349
		CZSB103JY965	17	35	10	15	4462	2343	126000	82000	12	17.2	36	36	26.4	112	70	35.5	235
		S30X103HY971	17	35	10	15	6730	3864	70000	56000	34	24.5	107	105	40.5	362	205	56.5	757
		C30X103HY971	17	35	10	15	6730	3372	100000	70000	34	27.6	106	105	45.1	355	205	62.4	740
		ZSB2103JY965	17	35	10	25	4246	2504	88000	57000	28	43.7	81	80	65.2	250	165	85.1	512
		CZSB2103JY965	17	35	10	25	4246	2229	114000	74000	19	43.3	55	55	63.9	167	110	82.6	340
		S30X2103HY971	17	35	10	25	6418	3691	58000	47000	33	49.1	96	100	73.9	299	195	95.9	600
		C30X2103HY971	17	35	10	25	6418	3221	85000	60000	33	56.0	96	100	83.9	297	195	108.4	594
	Sealed	S30X103HVVY971	17	35	10	15	6730	3864	70000	56000	34	24.5	107	105	40.5	362	205	56.5	757
		C30X103HVVY971	17	35	10	15	6730	3372	100000	70000	34	27.6	106	105	45.1	355	205	62.4	740
		S30X2103HVVY971	17	35	10	25	6418	3691	58000	47000	33	49.1	96	100	73.9	299	195	95.9	600
		C30X2103HVVY971	17	35	10	25	6418	3221	85000	60000	33	56.0	96	100	83.9	297	195	108.4	594

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
203	Open	S30X203HY971	17	40	12	15	11144	6399	63000	50000	60	32.2	195	170	52.4	605	335	74.4	1288
		C30X203HY971	17	40	12	15	11144	5584	90000	63000	60	36.2	192	170	58.2	593	335	81.9	1257
		S30X2203HY971	17	40	12	25	10688	6141	52000	42000	55	61.6	161	165	93.1	500	325	122.3	1018
		C30X2203HY971	17	40	12	25	10688	5359	76000	54000	55	70.1	161	165	105.5	496	325	137.9	1007
	Sealed	S30X203HVVY971	17	40	12	15	9189	5443	64000	51000	46	29.3	148	140	49.0	497	280	70.0	1074
		C30X203HVVY971	17	40	12	15	9189	4750	92000	64000	46	32.9	146	140	54.4	486	280	77.1	1048
		S30X2203HVVY971	17	40	12	25	8779	5208	53000	43000	44	57.2	129	135	87.2	409	265	114.3	828
		C30X2203HVVY971	17	40	12	25	8779	4545	78000	55000	44	65.2	128	135	98.8	406	265	128.9	819
1704	Open	S30X1704H	20	27	4	15	1036	761	77000	62000	6	13.0	18	16	19.3	50	31	25.7	102
		C30X1704H	20	27	4	15	1036	664	111000	77000	6	14.8	18	16	21.8	50	31	28.8	101
		S30X2704H	20	27	4	25	974	718	64000	52000	5	26.1	14	15	38.3	44	30	49.3	89
		C30X2704H	20	27	4	25	974	627	94000	66000	5	29.8	14	15	43.7	43	30	56.1	88
1804	Open	S30X1804H	20	32	7	15	4022	2798	70000	56000	21	23.5	68	65	39.7	232	125	55.7	480
		C30X1804H	20	32	7	15	4022	2442	100000	70000	21	26.4	67	65	44.1	227	125	61.3	469
		S30X2804H	20	32	7	25	3803	2655	58000	47000	19	44.9	56	60	69.0	182	115	89.6	359
		C30X2804H	20	32	7	25	3803	2317	85000	60000	19	51.1	55	60	78.3	180	115	101.2	355
	Sealed	S30X1804HVV	20	32	7	15	4022	2798	70000	56000	21	23.5	68	65	39.7	232	125	55.7	480
		C30X1804HVV	20	32	7	15	4022	2442	100000	70000	21	26.4	67	65	44.1	227	125	61.3	469
		S30X2804HVV	20	32	7	25	3803	2655	58000	47000	19	44.9	56	60	69.0	182	115	89.6	359
		C30X2804HVV	20	32	7	25	3803	2317	85000	60000	19	51.1	55	60	78.3	180	115	101.2	355
1904	Open	ZSB1904JY965	20	37	9	15	3340	2237	89000	58000	10	15.5	30	30	24.0	95	60	32.5	200
		S30X1904HY971	20	37	9	15	7013	4247	64000	51000	36	26.1	113	110	42.9	378	215	59.8	792
		CZSB1904JY965	20	37	9	15	3340	1992	115000	75000	9	16.8	27	27	25.7	84	50	34.6	175
		C30X1904HY971	20	37	9	15	7013	3706	92000	64000	36	29.4	112	110	47.9	371	215	66.2	774
		ZSB2904JY965	20	37	9	25	3161	2120	81000	53000	16	38.8	46	48	57.6	141	95	74.7	289
		S30X2904HY971	20	37	9	25	6672	4049	53000	43000	34	51.9	99	105	78.5	314	205	102.0	630
		CZSB2904JY965	20	37	9	25	3161	1887	104000	68000	14	42.1	40	42	62.1	123	80	80.1	250
		C30X2904HY971	20	37	9	25	6672	3533	78000	55000	34	59.2	99	105	89.2	312	205	115.3	624
	Sealed	S30X1904HVVY971	20	37	9	15	5589	3663	65000	52000	28	25.2	89	85	41.6	294	170	58.9	634
		C30X1904HVVY971	20	37	9	15	5589	3196	94000	65000	28	28.4	88	85	46.3	289	170	65.0	619
		S30X2904HVVY971	20	37	9	25	5298	3483	54000	44000	27	50.3	79	80	75.1	240	160	98.6	494
		C30X2904HVVY971	20	37	9	25	5298	3039	79000	56000	27	57.3	78	80	85.3	238	160	111.5	489

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
104	Open	ZSB104JY965	20	42	12	15	6454	4020	82000	53000	25	21.8	76	75	34.3	242	150	47.0	511
		CZSB104JY965	20	42	12	15	6454	3579	106000	69000	18	21.7	54	50	33.4	168	105	44.9	352
		S30X104HY971	20	42	12	15	11789	7097	59000	47000	60	33.7	193	180	56.1	639	355	79.7	1362
		C30X104HY971	20	42	12	15	11789	6193	84000	59000	60	37.9	191	180	62.3	626	355	87.7	1329
		ZSB2104JY965	20	42	12	25	6142	3826	74000	48000	40	54.4	116	120	81.0	356	240	105.7	729
		CZSB2104JY965	20	42	12	25	6142	3406	96000	62000	28	54.5	81	80	80.4	246	165	103.8	500
		S30X2104HY971	20	42	12	25	11281	6799	49000	39000	60	66.9	176	170	98.9	514	340	130.6	1063
		C30X2104HY971	20	42	12	25	11281	5933	71000	50000	60	76.2	175	170	112.1	511	340	147.4	1052
	Sealed	S30X104HVVY971	20	42	12	15	10286	6107	60000	49000	55	31.6	177	155	51.0	546	310	72.6	1179
		C30X104HVVY971	20	42	12	15	10286	5329	87000	60000	55	35.5	175	155	56.7	535	310	80.1	1151
		S30X2104HVVY971	20	42	12	25	9833	5845	50000	40000	50	60.6	146	150	91.4	453	295	119.8	919
		C30X2104HVVY971	20	42	12	25	9833	5100	74000	52000	50	69.1	146	150	103.7	450	295	135.2	909
204	Open	204H	20	47	14	15	15819	9075	54000	44000	80	36.2	259	240	60.5	857	475	86.1	1834
		C204H	20	47	14	15	15819	7920	78000	54000	80	40.6	255	240	67.1	839	475	94.8	1789
		2204H	20	47	14	25	15219	8730	45000	36000	80	71.6	235	230	106.6	698	460	141.0	1443
		C2204H	20	47	14	25	15219	7619	66000	47000	80	81.5	234	230	120.8	692	460	159.0	1427
1705	Open	S30X1705H	25	32	4	15	1069	876	64000	51000	6	14.1	18	16	20.8	50	32	28.0	105
		C30X1705H	25	32	4	15	1069	765	92000	64000	6	16.0	18	16	23.4	49	32	31.4	103
		S30X2705H	25	32	4	25	1005	826	53000	43000	6	30.1	17	16	42.5	46	31	54.0	91
		C30X2705H	25	32	4	25	1005	721	78000	55000	6	34.4	17	16	48.5	46	31	61.5	91
1805	Open	S30X1805H	25	37	7	15	5037	3793	59000	47000	26	27.5	83	80	46.2	282	155	64.7	588
		C30X1805H	25	37	7	15	5037	3310	84000	59000	26	31.0	82	80	51.3	276	155	71.3	574
		S30X2805H	25	37	7	25	4758	3596	49000	39000	24	53.4	70	75	81.7	226	145	106.2	451
		C30X2805H	25	37	7	25	4758	3138	71000	50000	24	60.9	70	75	92.7	225	145	119.9	446
	Sealed	S30X1805HVV	25	37	7	15	4463	3511	60000	48000	23	27.4	74	70	45.6	246	135	63.7	511
		C30X1805HVV	25	37	7	15	4463	3064	86000	60000	23	30.8	73	70	50.7	241	135	70.3	499
		S30X2805HVV	25	37	7	25	4211	3325	50000	40000	22	53.8	64	65	80.5	196	130	106.1	404
		C30X2805HVV	25	37	7	25	4211	2902	73000	51000	22	61.3	64	65	91.4	195	130	119.8	400
1905	Open	1905H	25	42	9	15	10208	7722	54000	35000	36	27.2	111	85	39.1	277	175	54.7	608
		C1905H	25	42	9	15	10208	6874	70000	46000	36	30.5	110	85	43.6	273	175	60.5	597
		ZSB1905JY965	25	42	9	15	3667	2749	76000	50000	11	17.9	33	33	27.8	104	65	37.5	218
		CZSB1905JY965	25	42	9	15	3667	2447	98000	64000	10	19.5	30	30	29.9	93	60	40.1	194
		2905H	25	42	9	25	9681	7362	49000	32000	60	67.5	175	155	96.0	464	310	125.9	956
		C2905H	25	42	9	25	9681	6554	63000	41000	60	76.5	175	155	108.3	461	310	141.5	947
		ZSB2905JY965	25	42	9	25	3464	2601	69000	45000	17	44.7	49	50	66.1	150	100	85.6	305
		CZSB2905JY965	25	42	9	25	3464	2315	89000	58000	15	48.6	43	45	71.5	131	90	92.2	267

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
105	Open	105H	25	47	12	15	11379	8058	51000	33000	50	28.2	157	130	42.9	437	265	60.5	956
		C105H	25	47	12	15	11379	7174	66000	43000	50	31.6	155	130	47.6	430	265	66.7	936
		ZSB105JY965	25	47	12	15	6856	4639	70000	46000	27	24.1	82	80	37.8	260	160	51.7	550
		CZSB105JY965	25	47	12	15	6856	4130	91000	60000	19	23.8	56	55	36.5	177	110	49.0	370
		2105H	25	47	12	25	10808	7692	46000	30000	80	68.1	235	200	96.1	603	400	126.6	1245
		C2105H	25	47	12	25	10808	6848	59000	39000	80	77.1	234	265	129.8	793	400	142.1	1233
		ZSB2105JY965	25	47	12	25	6506	4404	64000	41000	42	59.5	122	125	88.5	373	250	115.3	764
		CZSB2105JY965	25	47	12	25	6506	3921	82000	54000	30	60.0	86	90	88.5	263	180	114.3	536
205	Open	205H	25	52	15	15	15026	10163	42000	28000	65	28.2	201	175	43.0	578	355	60.1	1252
		C205H	25	52	15	15	15026	9048	55000	36000	65	31.6	199	175	47.9	570	355	66.4	1228
		2205H	25	52	15	25	14303	9738	38000	25000	110	70.3	322	265	97.4	793	355	108.9	1074
		C2205H	25	52	15	25	14303	8669	50000	32000	110	79.6	320	265	109.9	788	355	122.8	1066
1706	Open	S30X1706H	30	37	4	15	1139	1043	54000	44000	6	15.6	18	17	23.4	53	34	31.5	111
		C30X1706H	30	37	4	15	1139	910	78000	54000	6	17.7	18	17	26.5	52	34	35.3	109
		S30X2706H	30	37	4	25	1070	982	45000	36000	6	33.5	17	16	47.2	46	32	60.5	94
		C30X2706H	30	37	4	25	1070	857	66000	47000	6	38.3	17	16	53.9	46	32	69.0	94
1806	Open	S30X1806H	30	42	7	15	5524	4654	51000	41000	28	31.5	89	85	52.2	296	170	74.1	638
		C30X1806H	30	42	7	15	5524	4062	73000	51000	28	35.5	88	85	58.1	290	170	81.7	623
		S30X2806H	30	42	7	25	5208	4406	42000	34000	26	61.8	76	80	93.7	240	160	123.2	495
		C30X2806H	30	42	7	25	5208	3844	62000	44000	26	70.5	76	80	106.4	239	160	139.2	490
	Sealed	S30X1806HVV	30	42	7	15	4526	4079	51000	41000	23	28.1	72	70	46.0	239	140	64.8	514
		C30X1806HVV	30	42	7	15	4526	3559	74000	51000	23	31.7	71	70	51.3	235	140	71.6	502
		S30X2806HVV	30	42	7	25	4257	3858	43000	34000	22	56.3	64	65	83.7	194	130	109.6	398
		C30X2806HVV	30	42	7	25	4257	3366	62000	44000	22	64.2	64	65	95.1	193	130	124.0	395
1906	Open	1906H	30	47	9	15	10819	8983	47000	31000	44	31.6	137	110	46.9	363	220	64.9	773
		C1906H	30	47	9	15	10819	7997	61000	40000	44	35.5	135	110	52.2	358	220	71.8	759
		ZSB1906JY965	30	47	9	15	3953	3263	66000	43000	12	20.4	36	36	31.5	113	70	42.5	237
		CZSB1906JY965	30	47	9	15	3953	2905	86000	56000	10	21.5	30	30	32.8	92	60	43.8	192
		2906H	30	47	9	25	10229	8544	43000	28000	70	77.0	205	175	108.1	524	355	142.7	1095
		C2906H	30	47	9	25	10229	7606	55000	36000	70	87.2	204	175	122.0	521	355	160.4	1085
		ZSB2906JY965	30	47	9	25	3729	3084	60000	39000	19	51.4	55	55	75.9	167	110	98.3	341
		CZSB2906JY965	30	47	9	25	3729	2745	77000	50000	16	54.9	46	48	80.8	140	95	104.0	284

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
106	Open	106H	30	55	13	15	14686	11160	42000	28000	65	33.5	203	175	51.6	588	355	72.6	1278
		C106H	30	55	13	15	14686	9935	55000	36000	65	37.6	201	175	57.4	578	355	80.1	1252
		ZSB106JY965	30	55	13	15	7613	5783	60000	39000	29	27.9	87	85	43.5	277	170	59.2	585
		CZSB106JY965	30	55	13	15	7613	5149	78000	51000	20	27.3	59	60	41.7	185	120	55.8	386
		2106H	30	55	13	25	13928	10641	38000	25000	110	82.8	323	265	115.1	799	530	151.6	1648
		C2106H	30	55	13	25	13928	9473	50000	32000	110	93.7	322	200	108.3	599	530	170.2	1632
		ZSB2106JY965	30	55	13	25	7207	5480	54000	35000	47	70.1	136	140	104.1	417	280	135.4	852
		CZSB2106JY965	30	55	13	25	7207	4879	70000	46000	33	70.3	95	95	103.5	289	195	133.5	587
206	Open	206H	30	62	16	15	24582	16674	36000	23000	65	31.1	198	285	58.4	957	575	81.9	2068
		C206H	30	62	16	15	24582	14844	46000	30000	65	35.0	197	285	64.9	941	575	90.3	2026
		2206H	30	62	16	25	23533	16014	32000	21000	175	92.9	513	440	131.3	1327	885	173.3	2754
		C2206H	30	62	16	25	23533	14257	41000	27000	175	105.2	511	440	148.0	1318	885	194.6	2727
1807	Open	1807H	35	47	7	15	5935	6052	37000	30000	30	34.6	95	90	56.8	312	180	80.4	672
		C1807H	35	47	7	15	5935	5388	64000	44000	30	38.7	94	90	62.9	306	180	88.3	657
		2807H	35	47	7	25	5590	5722	37000	30000	28	68.1	82	85	102.6	255	170	134.7	525
		C2807H	35	47	7	25	5590	5094	54000	38000	28	77.1	81	85	115.7	253	170	151.3	520
1907	Open	1907H	35	55	10	15	14182	12473	40000	26000	50	35.3	154	130	52.8	424	265	73.3	919
		C1907H	35	55	10	15	14182	11104	52000	34000	50	39.7	152	130	58.9	418	265	81.2	902
		ZSB1907JY965	35	55	10	15	5845	4877	57000	37000	18	24.6	54	50	37.9	169	105	51.1	355
		CZSB1907JY965	35	55	10	15	5845	4342	73000	48000	15	25.9	44	45	39.5	138	90	52.7	288
		2907H	35	55	10	25	13399	11859	36000	24000	85	88.7	248	220	125.9	657	440	164.9	1351
		C2907H	35	55	10	25	13399	10557	47000	31000	85	100.5	247	220	142.2	653	440	185.5	1339
		ZSB2907JY965	35	55	10	25	5518	4611	51000	33000	28	61.4	81	80	90.8	246	165	117.5	502
		CZSB2907JY965	35	55	10	25	5518	4105	66000	43000	24	66.1	69	70	97.3	210	140	125.2	426
107	Open	107H	35	62	14	15	18551	14825	38000	25000	85	39.7	266	220	60.0	736	440	83.7	1573
		C107H	35	62	14	15	18551	13198	49000	32000	85	44.5	263	220	66.8	724	440	92.4	1542
		ZSB107JY965	35	62	14	15	9788	7502	52000	34000	38	31.2	114	110	48.6	363	225	66.2	767
		CZSB107JY965	35	62	14	15	9788	6679	68000	44000	27	30.9	80	80	47.3	250	160	63.2	522
		2107H	35	62	14	25	17586	14131	34000	22000	130	94.6	381	355	137.7	1070	710	181.5	2209
		C2107H	35	62	14	25	17586	12581	44000	29000	130	107.1	379	355	155.3	1063	710	203.7	2187
		ZSB2107JY965	35	62	14	25	9268	7111	47000	31000	60	77.6	173	180	115.3	532	360	149.9	1087
		CZSB2107JY965	35	62	14	25	9268	6330	61000	40000	42	77.8	121	125	114.6	367	250	147.7	747

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
207	Open	207H	35	72	17	15	29793	21701	31000	20000	110	41.1	340	355	68.1	1190	710	95.1	2547
		C207H	35	72	17	15	29793	19320	40000	26000	110	46.1	337	355	75.7	1171	710	104.9	2495
		2207H	35	72	17	25	28437	20796	28000	18000	220	108.9	645	530	151.3	1595	1065	199.5	3305
		C2207H	35	72	17	25	28437	18514	36000	23000	220	123.3	643	530	170.6	1584	1065	224.0	3274
1808	Open	1808H	40	52	7	15	6308	7009	33000	27000	32	38.4	101	95	62.5	327	190	88.2	703
		C1808H	40	52	7	15	6308	6240	57000	40000	32	43.0	100	95	69.3	321	190	97.0	687
		2808H	40	52	7	25	5936	6620	33000	27000	30	76.0	87	90	113.9	269	180	149.3	554
		C2808H	40	52	7	25	5936	5894	48000	34000	30	86.1	87	90	128.5	268	180	167.8	549
1908	Open	1908H	40	62	12	15	17540	15777	36000	23000	65	40.1	200	175	61.0	573	355	84.8	1238
		C1908H	40	62	12	15	17540	14045	46000	30000	65	45.1	198	175	68.0	565	355	93.8	1215
		ZSB1908JY965	40	62	12	15	7797	6456	50000	33000	24	27.3	72	70	42.1	226	140	56.8	473
		CZSB1908JY965	40	62	12	15	7797	5747	65000	42000	21	29.3	62	60	44.8	194	125	59.7	404
		2908H	40	62	12	25	16573	15000	32000	21000	110	100.6	321	285	142.9	852	575	188.0	1768
		C2908H	40	62	12	25	16573	13354	42000	27000	110	114.0	320	285	161.3	847	575	211.3	1752
		ZSB2908JY965	40	62	12	25	7364	6107	45000	30000	37	68.0	107	110	100.6	325	220	130.1	663
		CZSB2908JY965	40	62	12	25	7364	5437	58000	38000	32	73.4	92	95	108.1	279	190	139.1	568
108	Open	108H	40	68	15	15	19851	17244	34000	22000	110	47.5	347	265	70.0	891	530	97.8	1907
		C108H	40	68	15	15	19851	15352	44000	29000	110	53.3	343	265	77.8	876	530	107.9	1869
		ZSB108JY965	40	68	15	15	10474	8669	47000	31000	41	34.7	123	120	54.1	391	245	73.5	823
		CZSB108JY965	40	68	15	15	10474	7718	61000	40000	29	34.4	86	85	52.5	268	170	70.1	558
		2108H	40	68	15	25	18775	16407	30000	20000	155	109.2	454	400	155.8	1206	800	205.2	2488
		C2108H	40	68	15	25	18775	14606	39000	26000	155	123.6	453	400	175.6	1197	800	230.3	2464
		ZSB2108JY965	40	68	15	25	9904	8208	43000	28000	60	86.3	185	190	128.1	566	380	166.3	1157
		CZSB2108JY965	40	68	15	25	9904	7307	55000	36000	45	86.7	129	135	127.5	393	270	164.2	799
208	Open	208H	40	80	18	15	33701	25239	27000	18000	130	44.5	403	420	74.0	1412	845	103.7	3043
		C208H	40	80	18	15	33701	22470	36000	23000	130	50.0	399	420	82.3	1389	845	114.4	2981
		2208H	40	80	18	25	32123	24162	25000	16000	265	118.8	778	665	167.8	2008	1330	221.3	4146
		C2208H	40	80	18	25	32123	21510	32000	21000	265	134.4	775	665	189.1	1994	1330	248.3	4105
1809	Open	1809H	45	58	7	15	6506	7755	30000	24000	33	41.0	104	95	65.5	324	195	93.3	716
		C1809H	45	58	7	15	6506	6904	51000	35000	33	45.9	103	95	72.7	318	195	102.7	701
		2809H	45	58	7	25	6118	7319	30000	24000	31	81.5	90	90	120.4	268	180	157.5	551
		C2809H	45	58	7	25	6118	6516	43000	31000	31	92.3	90	90	135.9	267	180	177.2	547

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
1909	Open	1909H	45	68	12	15	18382	17801	32000	21000	85	47.5	264	220	71.5	728	440	99.1	1553
		C1909H	45	68	12	15	18382	15848	42000	27000	85	53.3	261	220	79.6	717	440	109.5	1523
		ZSB1909JY965	45	68	12	15	8434	7585	45000	30000	26	30.9	77	75	47.5	243	155	63.9	510
		CZSB1909JY965	45	68	12	15	8434	6753	58000	38000	22	32.8	65	65	49.9	202	130	66.3	420
		2909H	45	68	12	25	17340	16900	29000	19000	130	113.9	380	330	160.8	988	665	211.6	2049
		C2909H	45	68	12	25	17340	15045	38000	25000	130	129.0	378	330	181.5	982	665	237.8	2030
		ZSB2909JY965	45	68	12	25	7958	7169	41000	27000	40	77.0	115	120	113.7	351	240	146.9	715
		CZSB2909JY965	45	68	12	25	7958	6382	53000	34000	35	83.5	100	105	122.7	305	210	157.9	620
109	Open	109H	45	75	16	15	26782	22946	31000	20000	130	50.7	406	355	78.6	1192	710	109.8	2552
		C109H	45	75	16	15	26782	20428	40000	26000	130	56.9	402	355	87.4	1173	710	121.1	2500
		ZSB109JY965	45	75	16	15	12095	10405	42000	28000	47	38.1	141	140	59.2	447	280	80.4	941
		CZSB109JY965	45	75	16	15	12095	9263	55000	36000	33	37.6	97	95	57.4	304	195	76.5	633
		2109H	45	75	16	25	25372	21860	28000	18000	220	125.4	646	555	177.5	1675	1110	234.0	3456
		C2109H	45	75	16	25	25372	19461	36000	23000	220	142.0	643	555	200.1	1663	1110	262.6	3422
		ZSB2109JY965	45	75	16	25	11432	9847	38000	25000	70	95.1	214	220	141.0	654	440	183.0	1336
		CZSB2109JY965	45	75	16	25	11432	8766	50000	32000	50	95.5	149	155	140.5	454	310	180.8	923
209	Open	209H	45	85	19	15	35377	28064	25000	17000	175	52.7	549	440	79.0	1475	885	110.5	3175
		C209H	45	85	19	15	35377	24984	33000	21000	175	59.1	543	440	87.8	1451	885	121.9	3111
		2209H	45	85	19	25	33632	26812	23000	15000	285	128.3	837	710	180.8	2143	1420	238.4	4423
		C2209H	45	85	19	25	33632	23870	30000	19000	285	145.2	833	710	203.8	2128	1420	267.5	4380
1810	Open	1810H	50	65	7	15	8190	9956	27000	21000	41	45.8	129	120	73.7	408	245	104.6	897
		C1810H	50	65	7	15	8190	8864	46000	32000	41	51.3	127	120	81.7	401	245	115.1	878
		2810H	50	65	7	25	7703	9398	27000	21000	39	91.7	113	115	136.2	343	230	178.2	704
		C2810H	50	65	7	25	7703	8367	39000	27000	39	103.9	113	115	153.8	341	230	200.4	698
1910	Open	1910H	50	72	12	15	19210	19771	30000	20000	85	50.1	263	240	78.1	794	485	108.9	1712
		C1910H	50	72	12	15	19210	17601	39000	25000	85	56.3	260	240	87.0	782	485	120.3	1679
		ZSB1910JY965	50	72	12	15	8675	8179	42000	27000	26	32.2	77	75	49.4	243	155	66.4	507
		CZSB1910JY965	50	72	12	15	8675	7281	54000	35000	23	34.7	68	65	52.8	211	135	70.3	439
		2910H	50	72	12	25	18103	18751	27000	18000	155	128.6	453	355	174.9	1062	710	229.4	2185
		C2910H	50	72	12	25	18103	16694	35000	23000	155	145.7	452	355	197.4	1056	710	257.8	2165
		ZSB2910JY965	50	72	12	25	8181	7725	38000	25000	41	81.1	118	120	119.7	360	245	154.6	732
		CZSB2910JY965	50	72	12	25	8181	6878	49000	32000	36	88.1	103	105	129.4	314	215	166.4	637

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Spindle Bearings - Product Tables

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			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
110	Open	110H	50	80	16	15	28617	26311	28000	18000	155	58.4	486	375	85.9	1253	755	120.1	2697
		C110H	50	80	16	15	28617	23423	36000	24000	155	65.5	481	375	95.6	1233	755	132.6	2644
		ZSB110JY965	50	80	16	15	12518	11327	39000	26000	49	40.5	147	145	62.9	465	290	85.3	978
		CZSB110JY965	50	80	16	15	12518	10084	51000	33000	34	39.9	100	100	60.7	313	200	80.9	651
		2110H	50	80	16	25	27065	25031	25000	17000	220	135.2	644	575	193.5	1730	1155	255.0	3582
		C2110H	50	80	16	25	27065	22284	33000	22000	220	153.1	641	575	218.2	1718	1155	286.3	3548
		ZSB2110JY965	50	80	16	25	11822	10712	35000	23000	75	101.2	222	230	150.0	680	460	194.5	1388
		CZSB2110JY965	50	80	16	25	11822	9536	46000	30000	50	101.5	155	160	149.3	471	320	192.1	957
210	Open	210H	50	90	20	15	41726	34451	24000	16000	175	55.7	543	555	91.9	1865	1110	128.4	3992
		C210H	50	90	20	15	41726	30670	31000	20000	175	62.6	537	555	102.2	1835	1110	141.6	3911
		2210H	50	90	20	25	39660	32911	21000	14000	355	148.3	1043	885	209.1	2673	1775	276.1	5535
		C2210H	50	90	20	25	39660	29299	28000	18000	355	167.8	1038	885	235.6	2654	1775	309.8	5480
1811	Open	1811H	55	72	9	15	11169	13404	24000	19000	55	51.6	173	165	83.8	562	335	118.8	1228
		C1811H	55	72	9	15	11169	11933	41000	29000	55	57.8	171	165	93.0	553	335	130.7	1202
		2811H	55	72	9	25	10510	12659	24000	19000	50	101.6	145	155	153.7	462	315	202.3	965
		C2811H	55	72	9	25	10510	11270	35000	25000	50	115.2	145	155	173.5	459	315	227.5	957
1911	Open	1911H	55	80	13	15	23243	24391	27000	18000	130	60.8	406	310	88.6	1029	620	123.1	2197
		C1911H	55	80	13	15	23243	21714	35000	23000	130	68.2	402	310	98.6	1014	620	136.0	2154
		ZSB1911JY965	55	80	13	15	9196	9331	38000	25000	28	35.7	83	80	54.7	260	165	73.4	544
		CZSB1911JY965	55	80	13	15	9196	8307	49000	32000	24	38.1	71	70	57.8	220	140	76.7	456
		2911H	55	80	13	25	21904	23134	24000	16000	200	145.2	586	485	202.0	1456	975	266.1	3016
		C2911H	55	80	13	25	21904	20595	32000	21000	200	164.5	583	485	227.9	1447	975	298.9	2988
		ZSB2911JY965	55	80	13	25	8665	8807	34000	22000	44	90.0	126	130	132.7	386	260	171.3	785
		CZSB2911JY965	55	80	13	25	8665	7841	44000	29000	38	97.2	109	110	142.7	331	225	183.3	671
111	Open	111H	55	90	18	15	36630	33451	25000	17000	220	67.1	694	530	98.9	1785	1065	138.7	3843
		C111H	55	90	18	15	36630	29780	33000	22000	220	75.2	686	530	109.9	1756	1065	152.9	3765
		ZSB111JY965	55	90	18	15	16772	14997	35000	23000	65	45.3	198	195	70.3	626	395	95.3	1318
		CZSB111JY965	55	90	18	15	16772	13351	46000	30000	46	44.6	136	135	68.0	423	275	90.6	881
		2111H	55	90	18	25	34677	31849	23000	15000	310	154.0	909	800	219.8	2414	1600	289.7	4981
		C2111H	55	90	18	25	34677	28354	30000	19000	310	174.4	905	800	247.7	2397	1600	325.1	4932
		ZSB2111JY965	55	90	18	25	15851	14193	32000	21000	100	112.8	297	305	167.1	909	615	216.8	1857
		CZSB2111JY965	55	90	18	25	15851	12635	41000	27000	70	113.0	206	215	166.2	628	430	213.8	1276

* Limiting speeds are provided as a guide only with the attainable speed depending on many factors specific to individual installations.
** Axial rigidity values are calculated as a solidly preloaded pair of bearings under the stated preload level.



Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
211	Open	211H	55	100	21	15	51656	43357	21000	14000	220	62.5	682	710	103.9	2388	1420	145.3	5113
		C211H	55	100	21	15	51656	38599	28000	18000	220	70.2	675	710	115.5	2349	1420	160.2	5009
		2211H	55	100	21	25	49126	41436	19000	13000	440	165.6	1292	1110	234.4	3351	2220	309.1	6918
		C2211H	55	100	21	25	49126	36889	25000	16000	440	187.4	1286	1110	264.2	3328	2220	346.8	6850
1812	Open	1812H	60	78	10	15	11587	14747	22000	18000	55	54.2	172	170	89.0	576	345	125.8	1256
		1812H	60	78	10	15	11587	14747	22000	18000	55	54.2	172	170	89.0	576	345	125.8	1256
		C1812H	60	78	10	15	11587	13128	38000	27000	55	60.9	170	170	98.9	567	345	138.6	1230
		C1812H	60	78	10	15	11587	13128	38000	27000	55	60.9	170	170	98.9	567	345	138.6	1230
		2812H	60	78	10	25	10898	13920	22000	18000	50	107.5	145	160	164.2	476	325	215.8	993
		2812H	60	78	10	25	10898	13920	22000	18000	50	107.5	145	160	164.2	476	325	215.8	993
		C2812H	60	78	10	25	10898	12392	32000	23000	50	121.9	145	160	185.4	473	325	242.9	985
		C2812H	60	78	10	25	10898	12392	32000	23000	50	121.9	145	160	185.4	473	325	242.9	985
1912	Open	1912H	60	85	13	15	24170	26832	25000	17000	130	63.8	404	330	95.4	1094	665	132.9	2353
		C1912H	60	85	13	15	24170	23888	33000	21000	130	71.7	400	330	106.2	1077	665	146.9	2307
		ZSB1912JY965	60	85	13	15	9553	10198	35000	23000	29	38.1	86	85	58.3	269	170	78.0	562
		CZSB1912JY965	60	85	13	15	9553	9079	46000	30000	25	40.8	73	75	61.8	228	150	81.9	473
		2912H	60	85	13	25	22760	25428	23000	15000	220	158.6	644	530	220.1	1592	1065	289.8	3295
		C2912H	60	85	13	25	22760	22637	30000	19000	220	179.5	642	530	248.2	1581	1065	325.5	3264
		ZSB2912JY965	60	85	13	25	8998	9622	32000	21000	45	95.7	129	135	141.0	394	270	181.8	801
		CZSB2912JY965	60	85	13	25	8998	8566	41000	27000	40	104.4	115	120	153.2	348	240	196.8	706
112	Open	112H	60	95	18	15	37637	35977	24000	16000	220	69.4	692	575	105.9	1941	1155	148.6	4179
		C112H	60	95	18	15	37637	32029	31000	20000	220	77.8	684	575	117.7	1909	1155	163.8	4093
		ZSB112JY965	60	95	18	15	17402	16297	33000	22000	65	47.9	204	200	74.3	644	405	100.6	1353
		CZSB112JY965	60	95	18	15	17402	14508	43000	28000	48	47.5	141	140	72.3	441	285	96.2	917
		2112H	60	95	18	25	35581	34216	21000	14000	330	163.4	968	845	232.5	2549	1690	306.4	5260
		C2112H	60	95	18	25	35581	30461	28000	18000	330	185.0	964	845	262.1	2531	1690	343.9	5209
		ZSB2112JY965	60	95	18	25	16435	15413	30000	20000	105	119.9	309	320	177.6	944	640	230.3	1927
		CZSB2112JY965	60	95	18	25	16435	13722	39000	25000	75	120.3	215	225	176.9	654	450	227.5	1328
212	Open	212H	60	110	22	15	62487	53363	20000	13000	285	70.8	886	885	116.0	2979	1775	162.4	6400
		C212H	60	110	22	15	62487	47507	25000	17000	285	79.5	877	885	128.9	2930	1775	179.1	6269
		2212H	60	110	22	25	59445	51010	18000	12000	575	187.8	1690	1420	264.0	4293	2845	348.7	8884
		C2212H	60	110	22	25	59445	45412	23000	15000	575	212.5	1683	1420	297.5	4262	2845	391.2	8794
1813	Open	1813H	65	85	10	15	14991	18821	20000	16000	70	59.5	218	220	98.4	746	445	138.8	1621
		C1813H	65	85	10	15	14991	16756	35000	24000	70	66.8	216	220	109.3	734	445	152.9	1587
		2813H	65	85	10	25	14105	17774	20000	16000	70	122.0	203	210	182.3	625	420	238.3	1284
		C2813H	65	85	10	25	14105	15824	30000	21000	70	138.4	203	210	205.9	622	420	268.1	1273

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
1913	Open	1913H	65	90	13	15	24411	28197	24000	16000	155	70.3	486	400	106.4	1343	800	148.6	2875
		C1913H	65	90	13	15	24411	25102	31000	20000	155	78.8	481	400	118.3	1322	800	163.9	2817
		ZSB1913JY965	65	90	13	15	9891	11067	33000	22000	30	40.4	89	90	61.8	278	180	82.7	579
		CZSB1913JY965	65	90	13	15	9891	9853	43000	28000	26	43.4	76	75	65.7	237	155	87.0	491
		2913H	65	90	13	25	22970	26703	21000	14000	240	167.8	704	620	239.5	1870	1245	316.1	3875
		C2913H	65	90	13	25	22970	23772	28000	18000	240	190.0	701	620	270.0	1857	1245	354.8	3837
		ZSB2913JY965	65	90	13	25	9312	10438	30000	20000	47	102.1	135	140	150.4	411	280	193.8	836
		CZSB2913JY965	65	90	13	25	9312	9293	39000	25000	41	110.7	117	120	162.4	357	245	208.4	723
113	Open	113H	65	100	18	15	38568	38493	22000	15000	220	71.6	689	575	109.1	1932	1155	152.7	4154
		C113H	65	100	18	15	38568	34269	29000	19000	220	80.3	682	575	121.2	1900	1155	168.4	4070
		ZSB113JY965	65	100	18	15	17997	17599	31000	20000	70	50.6	209	210	78.3	661	420	105.9	1388
		CZSB113JY965	65	100	18	15	17997	15667	40000	26000	49	50.0	144	145	76.0	449	290	101.0	934
		2113H	65	100	18	25	36420	36574	20000	13000	355	173.7	1042	885	244.7	2669	1775	322.8	5523
		C2113H	65	100	18	25	36420	32560	26000	17000	355	196.6	1037	885	275.8	2650	1775	362.3	5469
		ZSB2113JY965	65	100	18	25	16987	16635	28000	18000	110	127.1	320	330	188.1	978	665	243.7	1997
		CZSB2113JY965	65	100	18	25	16987	14810	36000	24000	75	127.1	221	230	186.7	671	460	239.9	1362
213	Open	213H	65	120	23	15	74240	64329	18000	12000	440	86.2	1387	1110	129.8	3749	2220	181.7	8033
		C213H	65	120	23	15	74240	57269	23000	15000	440	96.6	1371	1110	144.1	3686	2220	200.2	7868
		2213H	65	120	23	25	70653	61511	16000	11000	665	203.2	1953	1690	288.6	5106	3380	380.7	10544
		C2213H	65	120	23	25	70653	54760	21000	14000	665	230.0	1944	1690	325.2	5070	3380	427.1	10439
1814	Open	1814H	70	90	10	15	15318	20060	19000	15000	75	63.3	234	225	102.5	761	455	144.4	1651
		C1814H	70	90	10	15	15318	17858	33000	23000	75	71.1	232	225	113.9	748	455	159.1	1617
		2814H	70	90	10	25	14407	18936	19000	15000	70	126.6	203	215	190.6	640	430	249.0	1312
		C2814H	70	90	10	25	14407	16857	28000	20000	70	143.6	202	215	215.3	636	430	280.2	1302
1914	Open	1914H	70	100	16	15	32837	36952	22000	14000	200	76.9	626	485	113.0	1616	975	157.6	3472
		C1914H	70	100	16	15	32837	32897	28000	18000	200	86.2	619	485	125.7	1591	975	174.1	3403
		ZSB1914JY965	70	100	16	15	13978	15006	30000	20000	42	44.7	124	125	68.4	389	250	91.5	812
		CZSB1914JY965	70	100	16	15	13978	13359	39000	26000	37	48.3	109	110	73.1	338	220	96.9	701
		2914H	70	100	16	25	30927	35029	20000	13000	310	183.9	908	775	259.0	2332	1555	341.3	4824
		C2914H	70	100	16	25	30927	31184	25000	17000	310	208.3	905	775	292.1	2316	1555	383.2	4778
		ZSB2914JY965	70	100	16	25	13171	14164	27000	18000	65	113.6	192	200	167.4	587	400	215.8	1193
		CZSB2914JY965	70	100	16	25	13171	12610	35000	23000	55	122.7	166	170	180.1	505	345	231.2	1023

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
114	Open	114H	70	110	16	15	47732	47152	21000	14000	285	79.0	895	710	118.0	2385	1420	164.7	5104
		C114H	70	110	16	15	47732	41978	27000	17000	285	88.6	886	710	131.1	2346	1420	181.7	5001
		ZSB114JY965	70	110	16	15	21347	20955	28000	19000	80	54.2	248	245	83.9	783	495	113.4	1645
		CZSB114JY965	70	110	16	15	21347	18655	37000	24000	55	53.6	171	170	81.4	532	345	108.1	1104
		2114H	70	110	16	25	45111	44833	19000	12000	465	192.0	1366	1155	270.4	3490	2310	356.8	7208
		C2114H	70	110	16	25	45111	39913	24000	16000	465	217.3	1360	1155	304.8	3465	2310	400.3	7136
		ZSB2114JY965	70	110	16	25	20153	19811	26000	17000	130	135.9	378	390	201.2	1154	785	260.7	2355
		CZSB2114JY965	70	110	16	25	20153	17637	33000	22000	90	136.5	264	275	200.6	802	550	257.8	1627
214	Open	214H	70	125	24	15	77427	70024	17000	11000	440	89.7	1381	1155	137.2	3891	2310	191.8	8332
		C214H	70	125	24	15	77427	62339	22000	15000	440	100.6	1366	1155	152.4	3827	2310	211.5	8162
		2214H	70	125	24	25	73574	66866	15000	10000	710	217.5	2085	1820	309.8	5500	3645	409.0	11374
		C2214H	70	125	24	25	73574	59528	20000	13000	710	246.1	2076	1820	349.2	5461	3645	458.9	11261
1815	Open	1815H	75	95	10	15	15903	21857	18000	15000	75	66.4	233	235	109.2	792	475	153.6	1717
		C1815H	75	95	10	15	15903	19458	31000	22000	75	74.5	231	235	121.3	779	475	169.3	1681
		2815H	75	95	10	25	14953	20624	18000	15000	70	133.3	203	220	202.1	653	445	264.9	1355
		C2815H	75	95	10	25	14953	18361	26000	19000	70	151.2	202	220	228.4	650	445	298.2	1345
1915	Open	1915H	75	105	16	15	34168	40401	20000	13000	220	83.8	689	530	122.9	1767	1065	171.5	3795
		C1915H	75	105	16	15	34168	35967	26000	17000	220	94.0	682	530	136.7	1739	1065	189.3	3720
		ZSB1915JY965	75	105	16	15	14299	15925	29000	19000	43	46.7	127	125	71.4	398	255	95.4	830
		CZSB1915JY965	75	105	16	15	14299	14177	37000	24000	38	50.4	111	110	76.4	347	225	101.1	718
		2915H	75	105	16	25	32164	38272	18000	12000	310	193.6	907	800	275.5	2403	1600	362.1	4951
		C2915H	75	105	16	25	32164	34072	24000	16000	310	219.2	903	800	310.7	2387	1600	406.7	4905
		ZSB2915JY965	75	105	16	25	13469	15026	26000	17000	65	118.3	195	200	174.2	595	405	224.5	1209
		CZSB2915JY965	75	105	16	25	13469	13377	33000	22000	55	127.9	169	175	187.7	513	350	240.8	1040
115	Open	115H	75	115	20	15	50686	52998	19000	13000	310	87.0	973	755	128.4	2526	1510	179.1	5402
		C115H	75	115	20	15	50686	47182	25000	17000	310	97.6	962	755	142.8	2486	1510	197.6	5294
		ZSB115JY965	75	115	20	15	22073	22546	27000	18000	85	57.3	257	255	88.5	810	515	119.5	1700
		CZSB115JY965	75	115	20	15	22073	20072	35000	23000	60	56.6	176	180	85.9	549	360	114.0	1140
		2115H	75	115	20	25	47858	50350	18000	12000	485	208.5	1423	1200	292.8	3617	2400	385.6	7462
		C2115H	75	115	20	25	47858	44825	23000	15000	485	236.0	1417	1200	330.1	3592	2400	432.9	7389
		ZSB2115JY965	75	115	20	25	20827	21307	24000	16000	135	143.9	392	405	212.8	1198	815	275.6	2443
		CZSB2115JY965	75	115	20	25	20827	18968	32000	21000	95	144.2	272	285	211.8	828	570	272.1	1679

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
215	Open	215H	75	130	25	15	83755	80463	16000	11000	440	96.6	1371	1155	146.7	3849	2310	204.2	8221
		C215H	75	130	25	15	83755	71633	21000	14000	440	108.4	1357	1155	163.2	3788	2310	225.5	8059
		2215H	75	130	25	25	79481	76756	15000	10000	710	235.5	2079	1820	334.6	5474	3645	440.4	11300
		C2215H	75	130	25	25	79481	68333	19000	13000	710	266.6	2071	1820	377.3	5437	3645	494.5	11193
1816	Open	C1816H	80	100	10	15	16194	20560	29000	20000	80	78.8	246	240	125.9	794	485	175.4	1712
		2816H	80	100	10	25	15223	21785	17000	14000	75	141.1	217	225	210.3	668	455	275.5	1384
		C2816H	80	100	10	25	15223	19395	25000	18000	75	160.1	217	225	237.7	664	455	310.2	1373
		1916H	80	110	16	15	34572	42299	19000	13000	220	85.7	688	555	128.1	1852	1110	178.4	3957
1916	Open	C1916H	80	110	16	15	34572	37656	25000	17000	220	96.1	680	555	142.5	1823	1110	197.0	3879
		ZSB1916JY965	80	110	16	15	14607	16843	27000	18000	44	48.6	130	130	74.3	407	260	99.2	847
		CZSB1916JY965	80	110	16	15	14607	14995	35000	23000	39	52.6	114	115	79.6	355	230	105.3	736
		2916H	80	110	16	25	32525	39879	18000	12000	330	202.8	966	845	287.9	2540	1690	378.6	5234
		C2916H	80	110	16	25	32525	35502	23000	15000	330	229.7	962	845	324.8	2523	1690	425.2	5185
		ZSB2916JY965	80	110	16	25	13755	15887	24000	16000	65	122.9	198	205	181.0	603	410	233.1	1226
		CZSB2916JY965	80	110	16	25	13755	14144	32000	21000	60	133.1	172	180	195.1	521	360	250.3	1057
		116H	80	125	22	15	63148	66496	18000	12000	400	98.7	1257	975	145.8	3268	1955	203.7	7011
116	Open	C116H	80	125	22	15	63148	59198	23000	15000	400	110.6	1243	975	162.1	3216	1955	224.8	6870
		ZSB116JY965	80	125	22	15	26309	27219	25000	16000	100	62.7	308	305	97.0	970	615	130.9	2035
		CZSB116JY965	80	125	22	15	26309	24232	32000	21000	70	62.0	212	215	94.1	659	430	125.0	1367
		2116H	80	125	22	25	59667	63213	16000	11000	620	235.4	1820	1555	332.4	4691	3110	438.1	9681
		C2116H	80	125	22	25	59667	56275	21000	14000	620	266.4	1812	1555	374.7	4658	3110	491.6	9586
		ZSB2116JY965	80	125	22	25	24829	25726	23000	15000	160	157.4	467	485	232.8	1426	970	301.3	2908
		CZSB2116JY965	80	125	22	25	24829	22903	29000	19000	110	157.7	324	335	231.6	984	675	297.5	1996
		216H	80	140	26	15	90270	84116	15000	10000	530	98.4	1664	1375	149.7	4632	2755	209.5	9939
216	Open	C216H	80	140	26	15	90270	74885	20000	13000	530	110.3	1646	1375	166.3	4556	2755	230.9	9736
		2216H	80	140	26	25	85700	80267	14000	9000	885	241.3	2601	2175	338.5	6574	4355	446.9	13593
		C2216H	80	140	26	25	85700	71458	18000	12000	885	273.1	2590	2175	381.5	6527	4355	501.4	13457
		1816H	85	110	13	15	16194	23095	17000	14000	80	70.2	249	240	113.3	807	485	159.1	1747
1817	Open	1817H	85	110	13	15	23959	32065	16000	13000	115	77.7	358	355	127.1	1198	715	178.5	2588
		C1817H	85	110	13	15	23959	28546	27000	19000	115	87.1	354	355	141.1	1179	715	196.7	2535
		2817H	85	110	13	25	22541	30279	16000	13000	110	157.0	319	335	235.5	996	675	308.3	2058
		C2817H	85	110	13	25	22541	26956	23000	16000	110	178.1	318	335	266.1	990	675	347.1	2041

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
1917	Open	1917H	85	120	18	15	44186	52674	18000	12000	285	93.6	892	710	139.4	2372	1420	194.2	5070
		C1917H	85	120	18	15	44186	46894	23000	15000	285	105.0	883	710	155.0	2334	1420	214.3	4969
		ZSB1917JY965	85	120	18	15	19386	21619	25000	17000	55	53.2	175	175	81.3	546	350	108.7	1139
		CZSB1917JY965	85	120	18	15	19386	19247	32000	21000	50	57.0	150	150	86.2	465	305	114.2	963
		2917H	85	120	18	25	41605	49911	16000	11000	440	223.6	1289	1110	316.0	3341	2220	416.0	6890
		C2917H	85	120	18	25	41605	44434	21000	14000	440	253.2	1284	1110	356.4	3319	2220	467.0	6824
		ZSB2917JY965	85	120	18	25	18266	20405	23000	15000	90	134.1	264	275	197.4	805	550	254.4	1636
		CZSB2917JY965	85	120	18	25	18266	18166	29000	19000	80	145.1	229	240	212.9	696	480	273.2	1410
117	Open	117H	85	130	22	15	64655	70513	17000	11000	400	101.5	1253	1020	152.9	3418	2045	213.5	7330
		C117H	85	130	22	15	64655	62774	22000	15000	400	113.9	1240	1020	170.0	3363	2045	235.6	7183
		ZSB117JY965	85	130	22	15	26606	28253	24000	16000	100	64.2	310	310	99.2	978	620	133.8	2051
		CZSB117JY965	85	130	22	15	26606	25152	31000	20000	70	63.6	214	215	96.5	667	435	128.0	1385
		2117H	85	130	22	25	61041	66984	16000	10000	665	249.1	1953	1645	350.0	4964	3290	461.4	10246
		C2117H	85	130	22	25	61041	59633	20000	13000	665	281.9	1944	1645	394.5	4929	3290	517.8	10145
		ZSB2117JY965	85	130	22	25	25098	26694	22000	14000	160	161.0	469	485	238.1	1434	975	308.0	2924
		CZSB2117JY965	85	130	22	25	25098	23764	28000	18000	110	161.5	327	340	237.1	992	680	304.5	2013
217	Open	217H	85	150	28	15	101151	98022	14000	9000	665	113.1	2099	1645	168.9	5557	3290	236.4	11910
		C217H	85	150	28	15	101151	87264	18000	12000	665	126.7	2075	1645	187.5	5465	3290	260.6	11665
		2217H	85	150	28	25	95967	93490	13000	9000	1065	272.0	3133	2620	382.1	7931	5245	504.8	16406
		C2217H	85	150	28	25	95967	83230	17000	11000	1065	307.7	3119	2620	430.5	7873	5245	566.2	16239
1818	Open	1818H	90	115	13	15	24546	34069	15000	12000	120	81.7	373	365	132.6	1229	735	186.0	2652
		C1818H	90	115	13	15	24546	30330	26000	18000	120	91.6	370	365	147.3	1209	735	205.1	2598
		2818H	90	115	13	25	23087	32161	15000	12000	115	165.4	333	345	246.5	1024	690	321.7	2100
		C2818H	90	115	13	25	23087	28631	22000	16000	115	187.5	332	345	278.6	1019	690	362.2	2084
1918	Open	1918H	90	125	18	15	44834	55189	17000	11000	310	99.2	973	755	146.4	2527	1510	204.2	5404
		C1918H	90	125	18	15	44834	49132	22000	15000	310	111.2	962	755	162.8	2487	1510	225.3	5296
		ZSB1918JY965	90	125	18	15	19875	22922	24000	16000	60	55.4	177	180	84.5	554	360	112.9	1155
		CZSB1918JY965	90	125	18	15	19875	20407	31000	20000	50	59.4	152	155	89.8	473	310	118.8	980
		2918H	90	125	18	25	42195	52267	16000	10000	440	229.3	1288	1155	328.7	3477	2310	432.7	7169
		C2918H	90	125	18	25	42195	46531	20000	13000	440	259.6	1283	1155	370.7	3453	2310	485.8	7101
		ZSB2918JY965	90	125	18	25	18722	21628	22000	14000	95	140.5	273	285	206.8	831	570	266.4	1688
		CZSB2918JY965	90	125	18	25	18722	19255	28000	18000	80	151.7	235	245	222.4	713	490	285.3	1444

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
118	Open	118H	90	140	24	15	73638	78150	16000	11000	485	105.6	1527	1245	160.1	4204	2490	224.2	9009
		C118H	90	140	24	15	73638	69573	21000	14000	485	118.4	1510	1245	177.9	4135	2490	247.1	8824
		ZSB118JY965	90	140	24	15	34351	35338	22000	15000	130	69.2	400	400	107.0	1261	800	144.4	2646
		CZSB118JY965	90	140	24	15	34351	31460	29000	19000	90	68.6	276	280	104.0	860	560	138.1	1785
		2118H	90	140	24	25	69567	74280	15000	10000	755	251.9	2218	1910	357.2	5772	3825	471.5	11937
		C2118H	90	140	24	25	69567	66128	19000	12000	755	285.1	2208	1910	402.5	5731	3825	529.0	11818
		ZSB2118JY965	90	140	24	25	32434	33414	20000	13000	210	173.8	608	630	257.0	1857	1265	332.7	3788
		CZSB2118JY965	90	140	24	25	32434	29747	26000	17000	145	174.5	424	440	256.2	1289	885	329.1	2615
218	Open	218H	90	160	30	15	119439	113652	13000	9000	710	114.0	2228	1775	170.4	5952	3555	237.9	12752
		C218H	90	160	30	15	119439	101179	17000	11000	710	127.9	2203	1775	189.4	5856	3555	262.5	12495
		2218H	90	160	30	25	113473	108510	12000	8000	1110	273.2	3257	2800	386.5	8445	5600	509.3	17426
		C2218H	90	160	30	25	113473	96602	16000	10000	1110	309.3	3243	2800	435.7	8386	5600	571.7	17256
1819	Open	1819H	95	120	13	15	25109	36075	14000	12000	125	85.7	389	375	138.1	1260	750	192.9	2697
		C1819H	95	120	13	15	25109	32116	25000	17000	125	96.1	385	375	153.5	1240	750	212.8	2642
		2819H	95	120	13	25	23611	34044	14000	12000	115	171.1	333	350	256.2	1038	705	334.9	2143
		C2819H	95	120	13	25	23611	30308	21000	15000	115	194.0	332	350	289.5	1033	705	377.2	2127
1919	Open	1919H	95	130	18	15	45455	57698	16000	11000	310	101.4	971	775	151.3	2592	1555	211.1	5560
		C1919H	95	130	18	15	45455	51366	21000	14000	310	113.7	960	775	168.2	2550	1555	233.0	5449
		ZSB1919JY965	95	130	18	15	20346	24226	23000	15000	60	57.9	183	185	88.3	572	370	117.9	1192
		CZSB1919JY965	95	130	18	15	20346	21568	30000	19000	50	62.2	158	160	94.0	491	320	124.4	1017
		2919H	95	130	18	25	42762	54191	15000	10000	485	243.3	1422	1245	346.3	3753	2490	456.3	7743
		C2919H	95	130	18	25	42762	48244	19000	13000	485	275.5	1416	1245	390.5	3727	2490	512.1	7668
		ZSB2919JY965	95	130	18	25	19160	22853	21000	14000	95	146.3	278	290	215.3	848	580	277.2	1722
		CZSB2919JY965	95	130	18	25	19160	20345	27000	18000	80	158.2	240	250	231.8	730	500	297.3	1479
119	Open	119H	95	145	24	15	78085	87134	15000	10000	530	116.2	1667	1285	171.5	4313	2575	239.6	9250
		C119H	95	145	24	15	78085	77571	20000	13000	530	130.2	1649	1285	190.6	4243	2575	264.3	9063
		ZSB119JY965	95	145	24	15	35607	37974	21000	14000	135	73.2	415	415	113.0	1306	830	152.3	2738
		CZSB119JY965	95	145	24	15	35607	33806	28000	18000	95	72.4	285	290	109.7	886	580	145.4	1838
		2119H	95	145	24	25	73716	82768	14000	9000	800	274.2	2348	2000	386.6	6032	4000	509.4	12447
		C2119H	95	145	24	25	73716	73685	18000	12000	800	310.3	2338	2000	435.8	5990	4000	571.8	12325
		ZSB2119JY965	95	145	24	25	33606	35894	19000	13000	215	183.9	631	655	271.8	1927	1310	351.7	3927
		CZSB2119JY965	95	145	24	25	33606	31955	25000	16000	150	184.4	438	455	270.6	1332	915	347.6	2701

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width	α [°]	Dynamic Radial	Static Radial	Oil [min ⁻¹]	Grease [min ⁻¹]	Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]		C [N]	C ₀ [N]			F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
219	Open	219H	95	170	32	15	143955	137553	13000	8000	845	124.7	2647	2090	185.1	6984	4180	258.0	14928
		C219H	95	170	32	15	143955	122457	16000	11000	845	139.9	2618	2090	205.9	6873	4180	284.7	14630
		2219H	95	170	32	25	136935	131455	12000	8000	1330	300.0	3900	3290	421.0	9907	6580	554.2	20430
		C2219H	95	170	32	25	136935	117029	15000	10000	1330	339.6	3884	3290	474.7	9839	6580	622.2	20234
1920	Open	1920H	100	140	20	15	57346	71824	15000	10000	400	112.8	1255	975	166.5	3261	1955	232.3	6991
		C1920H	100	140	20	15	57346	63941	20000	13000	400	126.4	1241	975	185.1	3209	1955	256.4	6851
		ZSB1920JY965	100	140	20	15	23999	28311	22000	14000	70	61.2	216	215	93.4	674	435	124.6	1404
		CZSB1920JY965	100	140	20	15	23999	25204	28000	18000	60	65.6	185	185	99.1	573	375	131.0	1186
		2920H	100	140	20	25	53983	68038	14000	9000	620	269.4	1818	1555	380.1	4686	3110	500.7	9668
		C2920H	100	140	20	25	53983	60572	18000	12000	620	304.9	1811	1555	428.6	4654	3110	562.0	9574
		ZSB2920JY965	100	140	20	25	22606	26712	19000	13000	110	154.5	327	340	227.4	996	680	292.8	2024
		CZSB2920JY965	100	140	20	25	22606	23781	25000	16000	95	167.2	283	295	245.1	860	590	314.4	1743
120	Open	120H	100	150	24	15	79887	92015	15000	10000	575	123.5	1813	1375	181.4	4624	2755	253.7	9919
		C120H	100	150	24	15	79887	81917	19000	13000	575	138.4	1792	1375	201.6	4548	2755	279.8	9717
		ZSB120JY965	100	150	24	15	36062	39388	21000	14000	140	75.1	420	420	115.8	1323	845	156.0	2774
		CZSB120JY965	100	150	24	15	36062	35065	27000	18000	95	74.4	291	295	112.7	904	590	149.4	1875
		2120H	100	150	24	25	75369	87356	13000	9000	845	288.1	2480	2090	404.6	6303	4180	533.2	13005
		C2120H	100	150	24	25	75369	77769	17000	11000	845	326.1	2470	2090	456.1	6259	4180	598.4	12878
		ZSB2120JY965	100	150	24	25	34024	37218	19000	12000	220	188.3	636	660	278.3	1943	1325	359.9	3960
		CZSB2120JY965	100	150	24	25	34024	33134	24000	16000	155	189.1	444	465	277.5	1349	930	356.3	2735
220	Open	220H	100	180	34	15	152154	147585	12000	8000	975	133.1	3068	2400	197.8	8071	4800	276.5	17280
		C220H	100	180	34	15	152154	131388	16000	10000	975	149.1	3034	2400	219.8	7940	4800	304.9	16928
		2220H	100	180	34	25	144636	140969	11000	7000	1510	316.9	4434	3735	445.3	11274	7470	587.2	23271
		C2220H	100	180	34	25	144636	125499	14000	9000	1510	358.7	4415	3735	502.0	11194	7470	658.9	23041
1921	Open	1921H	105	145	20	15	59646	77830	15000	10000	400	117.8	1249	1020	176.9	3403	2045	246.6	7290
		C1921H	105	145	20	15	59646	69289	19000	13000	400	132.1	1236	1020	196.8	3349	2045	272.2	7145
		ZSB1921JY965	105	145	20	15	24594	29909	21000	14000	75	63.8	221	225	97.3	692	450	129.8	1440
		CZSB1921JY965	105	145	20	15	24594	26627	27000	18000	65	68.5	190	195	103.5	590	390	136.7	1222
		2921H	105	145	20	25	56127	73632	13000	9000	620	282.4	1815	1600	402.2	4814	3200	529.3	9924
		C2921H	105	145	20	25	56127	65552	17000	11000	620	319.7	1808	1600	453.6	4781	3200	594.3	9830
		ZSB2921JY965	105	145	20	25	23161	28213	19000	12000	115	161.3	336	350	237.2	1022	700	305.4	2076
		CZSB2921JY965	105	145	20	25	23161	25117	24000	16000	100	174.7	292	305	256.1	886	610	328.4	1795

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Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
1922	Open	1922H	110	150	20	15	60455	81071	14000	9000	420	122.7	1313	1065	183.9	3555	2135	256.4	7617
		C1922H	110	150	20	15	60455	72174	18000	12000	420	137.6	1299	1065	204.6	3499	2135	283.1	7466
		ZSB1922JY965	110	150	20	15	25168	31509	20000	13000	75	66.1	224	225	100.8	700	455	134.3	1456
		CZSB1922JY965	110	150	20	15	25168	28051	26000	17000	65	71.1	193	195	107.2	599	395	141.6	1238
		2922H	110	150	20	25	56869	75932	13000	9000	665	296.2	1949	1690	419.8	5088	3380	552.6	10493
		C2922H	110	150	20	25	56869	67599	17000	11000	665	335.4	1941	1690	473.3	5054	3380	620.4	10392
		ZSB2922JY965	110	150	20	25	23696	29717	18000	12000	120	168.0	344	360	247.0	1048	720	317.9	2128
		CZSB2922JY965	110	150	20	25	23696	26455	23000	15000	100	181.6	297	310	266.1	903	620	341.1	1829
122	Open	122H	110	170	28	15	114408	127811	13000	9000	665	128.9	2071	1730	194.9	5758	3465	271.3	12315
		C122H	110	170	28	15	114408	113785	17000	11000	665	144.6	2050	1730	216.9	5668	3465	299.6	12073
		ZSB122JY965	110	170	28	15	45963	50624	18000	12000	180	83.6	536	540	128.9	1689	1080	173.6	3538
		CZSB122JY965	110	170	28	15	45963	45068	24000	16000	125	82.7	370	375	125.3	1150	755	166.1	2384
		2122H	110	170	28	25	108134	121531	12000	8000	1065	313.4	3118	2665	441.0	8005	5335	579.9	16508
		C2122H	110	170	28	25	108134	108194	16000	10000	1065	354.9	3105	2665	497.5	7952	5335	651.4	16354
		ZSB2122JY965	110	170	28	25	43377	47847	17000	11000	280	209.7	812	845	309.9	2479	1690	400.7	5052
		CZSB2122JY965	110	170	28	25	43377	42596	22000	14000	195	210.7	567	590	309.2	1723	1185	396.9	3493
1924	Open	1924H	120	165	22	15	73488	98696	13000	9000	530	135.0	1660	1285	198.6	4285	2575	276.7	9174
		C1924H	120	165	22	15	73488	87865	17000	11000	530	151.4	1642	1285	220.9	4218	2575	305.5	8993
		ZSB1924JY965	120	165	22	15	29903	38115	18000	12000	90	72.5	268	270	110.4	837	545	147.0	1742
		CZSB1924JY965	120	165	22	15	29903	33932	23000	15000	75	77.9	231	235	117.5	716	470	155.1	1481
		2924H	120	165	22	25	69143	93053	12000	8000	800	319.9	2344	2000	450.4	6015	4000	592.4	12397
		C2924H	120	165	22	25	69143	82841	15000	10000	800	362.2	2334	2000	507.9	5974	4000	665.3	12280
		ZSB2924JY965	120	165	22	25	28155	35947	16000	11000	140	183.3	407	425	269.6	1239	850	346.8	2516
		CZSB2924JY965	120	165	22	25	28155	32002	21000	14000	120	198.8	355	370	291.2	1076	740	373.2	2180
124	Open	124H	120	180	28	15	116683	136147	12000	8000	755	139.8	2362	1865	207.2	6221	3735	288.6	13311
		C124H	120	180	28	15	116683	121205	16000	11000	755	156.7	2337	1865	230.4	6123	3735	318.6	13047
		ZSB124JY965	120	180	28	15	48178	55964	17000	11000	185	90.0	559	560	138.5	1759	1125	186.3	3682
		CZSB124JY965	120	180	28	15	48178	49822	22000	15000	130	89.3	387	395	135.0	1202	790	178.7	2490
		2124H	120	180	28	25	110153	129325	11000	8000	1110	328.2	3249	2755	460.3	8271	5515	605.1	17051
		C2124H	120	180	28	25	110153	115133	15000	10000	1110	371.7	3236	2755	519.3	8217	5515	679.7	16894
		ZSB2124JY965	120	180	28	25	45440	52866	16000	10000	295	226.5	852	885	334.5	2600	1775	432.3	5295
		CZSB2124JY965	120	180	28	25	45440	47064	20000	13000	205	227.3	593	620	333.4	1800	1240	427.8	3647

* Limiting speeds are provided as a guide only with the attainable speed depending on many factors specific to individual installations.
** Axial rigidity values are calculated as a solidly preloaded pair of bearings under the stated preload level.



Spindle Bearings - Product Tables

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}			Preload F _{va} / **Axial Rigidity c _a / Unloading Force K _{aE}		
			Bore Diameter	Outside Diameter	Standard Width		Dynamic Radial	Static Radial			Light (L)			Medium (M)			Heavy (H)		
			d [mm]	D [mm]	B [mm]	α [°]	C [N]	C ₀ [N]	Oil [min ⁻¹]	Grease [min ⁻¹]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]	F _{va} [N]	c _a [N/μm]	K _{aE} [N]
1926	Open	1926H	130	180	24	15	87169	117126	12000	8000	665	147.9	2089	1645	220.0	5520	3290	307.1	11810
		C1926H	130	180	24	15	87169	104272	16000	10000	665	165.8	2066	1645	244.6	5430	3290	338.8	11572
		ZSB1926JY965	130	180	24	15	34999	45349	17000	11000	105	78.4	312	315	119.4	974	635	158.9	2027
		CZSB1926JY965	130	180	24	15	34999	40372	22000	14000	90	84.3	269	275	127.1	834	550	167.6	1723
		2926H	130	180	24	25	82031	110915	11000	7000	1020	351.4	2993	2575	497.3	7766	5155	655.7	16042
		C2926H	130	180	24	25	82031	98743	14000	9000	1020	397.8	2980	2575	560.7	7712	5155	735.9	15885
		ZSB2926JY965	130	180	24	25	32953	42770	15000	10000	165	198.8	476	495	292.2	1448	995	375.8	2940
		CZSB2926JY965	130	180	24	25	32953	38077	20000	13000	145	215.6	415	435	315.7	1258	870	404.6	2548

* Limiting speeds are provided as a guide only with the attainable speed depending on many factors specific to individual installations.
** Axial rigidity values are calculated as a solidly preloaded pair of bearings under the stated preload level.



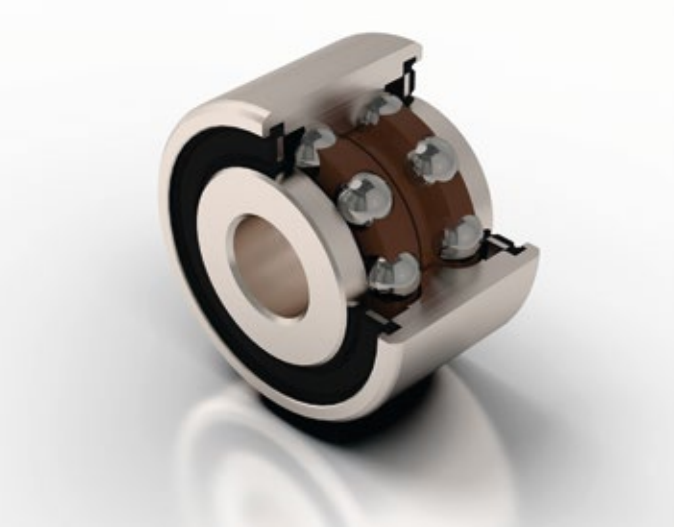
ZKLN Bearings

ZKLN bearings are double row, axial angular contact ball bearings with a contact angle of 60°. Their split inner ring design ensures the bearings are play-free with high axial stiffness and a defined preload following assembly. They also support radial forces.

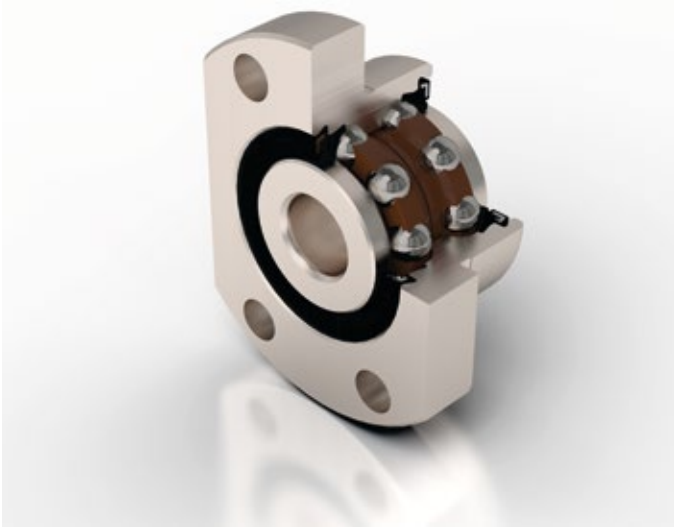
This bearing type is typically manufactured from chrome steel rings and steel balls, although other materials such as stainless steel or AMS5898 can be used depending on application requirements. Hybrid versions which include ceramic balls (Si₃N₄) are also available.

ZKLN bearings incorporate Phenolic cages as standard, although Polyamide-imide (such as Torlon®) or PEEK alternatives can be used. Full complement designs are also possible. Lubrication typically consists of a high load capacity grease which is generally sufficient for the entire service life of the bearing. In cases where relubrication is necessary, all ZKLN types are designed with a lubrication hole in the outer ring.

ZKLF bearings are also available, please contact us for more information.



ZKLN bearing



ZKLF bearing

	d (mm)	D (mm)	B (mm)
ZKLN0619	6	19	12
ZKLN0624	6	24	15
ZKLN0832	8	32	20
ZKLN1034	10	34	20
ZKLN1232	12	32	20
ZKLN1242	12	42	25

Other sizes and customised versions with deviating size or preload are available on request.

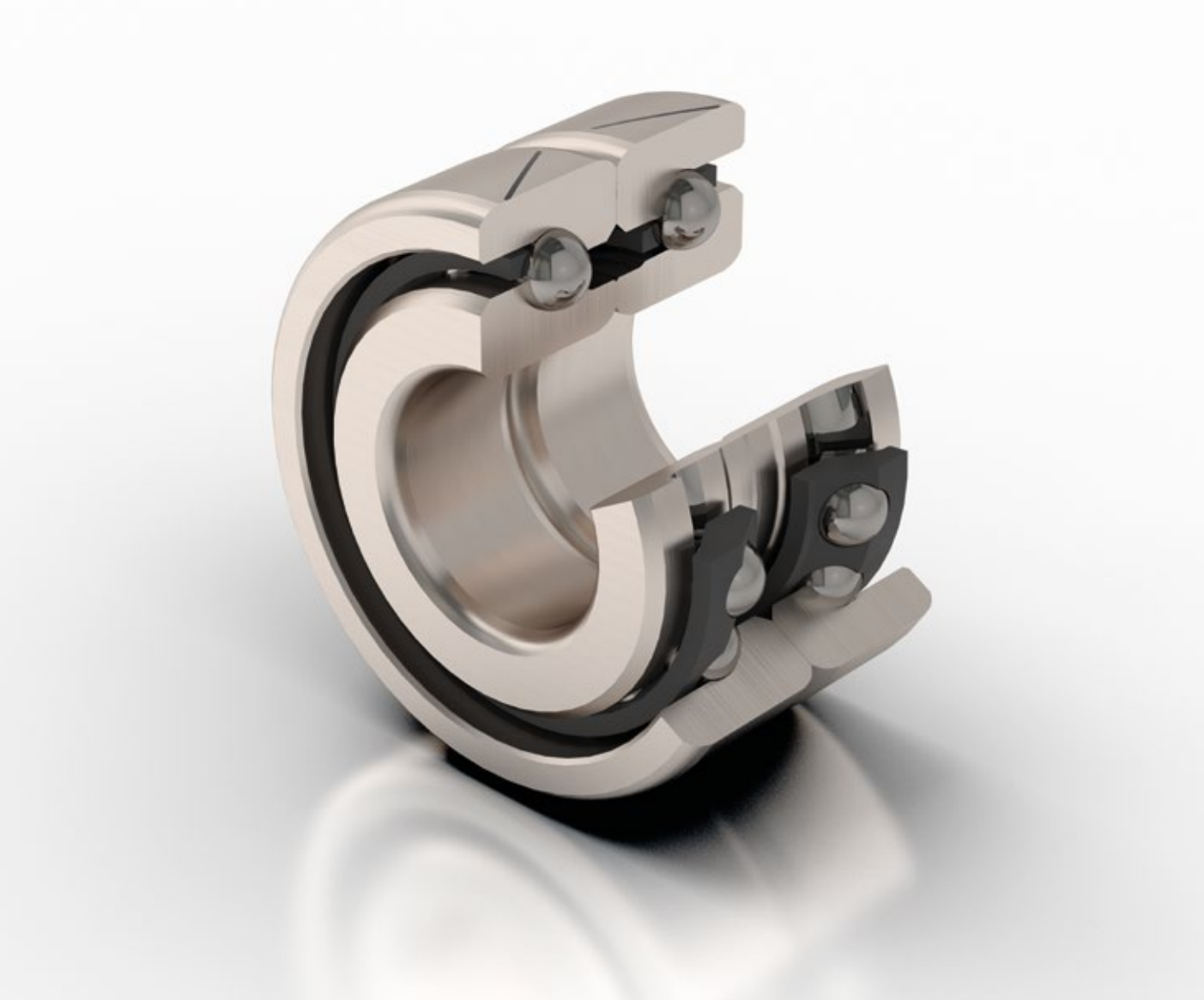
Ball Screw Support Bearings

Design & Applications

Barden Series ball screw support bearings are manufactured specifically for high performance ball screw applications, where high rigidity requirements preclude the use of standard angular contact bearings. The internal configuration has been designed to provide an optimum combination of high rigidity, low drag torque, exceptional control of axial runout, higher running speeds and longer life.

Series L non-separable angular contact bearings have cutaway shoulders on both the inner and outer rings. They can support very high thrust loads in one direction or combinations of radial and thrust loads, but not radial loading alone.

They are intended for special applications in machine tools, e.g., ball screw supports, cross slides, X-Y table positioners and transfer tables. They should not be used in place of standard angular contact spindle bearings. These bearings are available as single bearings or as standard duplex or quadruplex sets. In addition, we will supply custom combination sets to meet specialised application needs.



Ball Screw Support Bearings

Limiting Speeds

Limiting speeds shown in the data table are useful guidelines. Actual speed limits must be based on the application characteristics. Life requirements, heat transfer conditions, loading and lubrication methods are typical influential factors on the attainable speed.

Preloads

Standard values shown will be supplied unless otherwise specified. Barden recognises that some applications do not require the full axial stiffness (compliance) of the standard preload and will supply bearings with custom-ground preloads if required.

Seals

Ball screw support bearings can also be supplied with closures such as seals or shields, please discuss your requirements with your Barden sales engineer for details.

Cages

Y990 suffixed bearings have a moulded, glass fibre reinforced polyamide cage with spherical ball pockets. All metric ball screw support bearings come with the moulded polyamide cage, standard. Bearings with suffix Y991 feature a precision machined, land-piloted cage produced from reinforced phenolic material.

Mounting and Fitting

Normal fitting practice is line-to-line to loose for both shaft and housing fits, as shown in table. All bearing pairs and sets are match-marked on their outside diameter surfaces to indicate correct positioning of each bearing. Recommendations for shaft and housing shoulder diameters are based on maximum support of duplex-mounted bearings (see table). In circumstances with other mounting arrangements, consult Barden Product Engineering.

Life Calculations

Most ball screw support bearing applications are subject to duty-cycle loading with constantly changing feeds, speeds, and operating loads. These factors, in combination with the high preloads built into the bearings, make life calculations difficult. Consult Barden Product Engineering for information which can be used in specific cases.



Materials

All ball screw support bearings (rings and balls) are made from carbon chrome steel. Bearings are also available with rings produced from alternate materials such as corrosion resistant steel and balls from ceramic (Si_3N_4) for extreme environments.

Configurations

Standard configuration includes a cage; some sizes are also available in a full complement version (X205 suffix). Please consult Barden Engineering team.

Attainable Speeds

Limits given are for duplex pairs mounted with standard preload mounted sets with standard preload.

Duplexing

All bearings are supplied universally ground and can be mounted in pairs, DF (Face-to-Face), DB (Back-to-Back) or combinations of three, four or more bearings as required. Standard preloads for pairs are shown.

Tolerances

Standard precision class for Series L are ABEC 7, except for a tighter maximum raceway runout with side $2.5\mu\text{m}$ ($0.0001''$).

Lubricant:

Desired lubrication should be specified when ordering, based on torque, speed and temperature conditions of the application. Consult Barden for details.



Ball Screw Support Bearings

Basic Reference	Dimensions				*Limiting Speed		Preload Force	Abutment Diameters		**Axial Rigidity	***Drag Torque	Dynamic Thrust Capacity	Static Thrust Capacity
	Bore Diameter	Outside Diameter	Standard Width	Maximum Corner To Clear Shaft/ Housing	Oil [min ⁻¹]	Grease [min ⁻¹]	Standard F _{va} [N]	Min Shaft/Max Housing		c _a [N/μm]	[Nm]	C [kN]	C ₀ [kN]
	d [mm]	D [mm]	B [mm]	r [mm]				Shaft [mm]	Housing [mm]				
L2015JY990	15	35	11	0.6	12000	9000	1810	20.1	30.9	540	0.042	9.9	17.9
L2017JY990	17	40	12	0.6	10000	8000	2530	22.6	35.3	670	0.067	13.8	26.4
L2020JY990	20	47	14	1.0	9000	7000	3100	26.5	40.5	805	0.086	16.9	35.3
L2025JY990	25	52	15	1.0	8000	6000	3570	31.1	45.9	900	0.105	19.5	43.3
L2030JY990	30	62	16	1.0	7000	5000	4190	37.9	54.2	1050	0.128	22.9	55.8
L2035JY990	35	72	17	1.1	6000	4000	4870	44.6	62.4	1205	0.154	26.7	70.2
L2040JY990	40	80	18	1.1	5000	4000	6030	51.3	71.3	1380	0.209	33.0	91.3
L2045JY990	45	85	19	1.1	5000	3000	6130	55.0	75.0	1430	0.212	33.6	96.1
L2050JY990	50	90	20	1.1	4000	3000	6270	63.6	83.6	1530	0.214	34.4	106.1
L2060JY990	60	110	22	1.1	3000	3000	9020	73.6	98.9	1880	0.362	49.4	158.7
L2047JY990	20	47	15	1.0	9000	7000	2270	26.5	40.5	745	0.056	17.2	36.3
L2562JY990	25	62	15	1.0	7000	5000	3080	37.2	54.2	970	0.084	23.3	57.3
L3062JY990	30	62	15	1.0	7000	5000	3080	37.9	54.2	970	0.084	23.3	57.3
L3572JY990	35	72	15	1.1	6000	4000	3570	44.6	62.4	1115	0.101	27.1	72.1
L4072JY990	40	72	15	1.1	5000	4000	3350	47.9	64.2	1140	0.088	25.4	71.4
L4090JY990	40	90	20	1.5	5000	3000	5910	53.2	78.5	1400	0.219	44.8	120.8
L4575JY990	45	75	15	1.1	5000	4000	3390	52.0	68.0	1180	0.089	25.6	75.1
L45100JY990	45	100	20	1.5	4000	3000	6980	60.5	88.5	1575	0.277	52.9	149.9
L50100JY990	50	100	20	1.5	4000	3000	6980	61.5	88.5	1575	0.277	52.9	149.9
L55120JY990	55	120	20	1.5	3000	2000	7310	74.5	104.6	1750	0.284	55.4	175.3
L60120JY990	60	120	20	1.5	3000	2000	7310	75.5	104.6	1750	0.284	55.4	175.3

* Limiting speeds are provided as a guide only with the attainable speed depending on many factors specific to individual installations.
** For a pair of bearings under standard preload.
*** For a single bearing, lightly oiled, under preload only.

Bearing Preload

Preloading is the take up of internal clearance in a bearing by the application of a thrust load. Spindle bearings are matched and mounted with preload.

Preloading:

- Minimises axial and radial displacement under load.
- Increases system rigidity.
- Reduces non-repetitive run-out.
- Lessens the difference in contact angles between the balls and raceways at very high speeds.
- Prevents ball skidding under very high acceleration.
- Improves the rolling of the balls (spin/roll ratio).
- Ensures even loading of the balls.
- Enables faster speeds.

In most cases, two types of preload are sufficient – spring preload and rigid preload. In individual cases, hydraulic preload is used. This uses hydraulic pressure to set the preload during operation, depending on the speed of the bearing.

Spring Preload

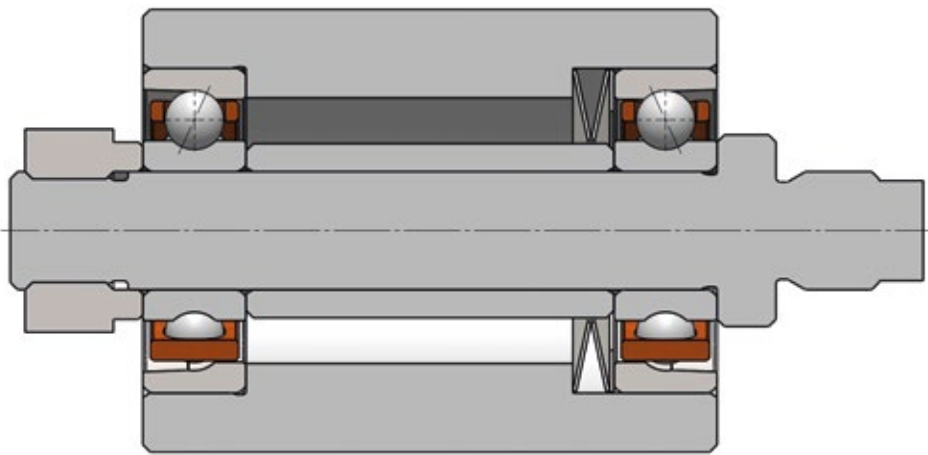
Springs are often the simplest method for bearing preload and should be considered first. They are typically coil springs, disc springs, wave and finger spring washers which load the non-rotating ring of the bearing, typically the outer ring. The selected ring must maintain a floating clearance fit with the shaft and/or housing under all operating conditions (temperatures, high centrifugal forces, etc).

The advantage of a spring preload, compared with a rigid preload, is that it provides a constant preload on account of its lower sensitivity to different thermal expansions. Ball or sliding bushes can be used to avoid misalignment from occurring at high speeds.

Properties:

- Resistant to different thermal expansions between shaft and housing.
- Suitable for the highest speeds.
- Continuous preload, even with changes of temperature or speed.
- Limited axial rigidity.

It should be noted that spring preloading cannot typically accommodate reversing thrust loads. Space must also be provided to accommodate both the springs and spring travel.



Spring preload

Rigid Preload with Paired/Duplexed Bearings

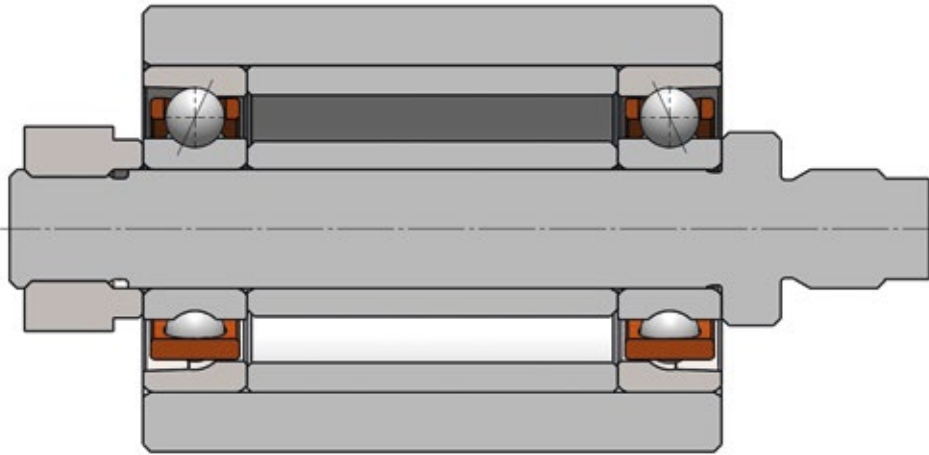
Matched pairs of bearings (duplex bearings) have a built-in means of preloading. The inner or outer ring faces of these bearings have been selectively relieved of a precise amount called the 'preload offset'. When the bearings are clamped together during installation, the offset faces meet, establishing a permanent preload in the bearing set.

The design of a rigid bearing arrangement is less complex than a spring preload, as there is no floating bearing to consider or any allowance made for the sliding movement of the bearing. Mounting of the bearing is also significantly easier. The preload can be determined using paired bearings and they must only be preloaded in sets.

Properties:

- Significantly higher rigidity in both axial directions compared with spring preload.
- Fewer design constraints as preload is already integrated in the system.
- Easier to assemble and mount.
- Lower maximum speeds due to higher sensitivity to thermal expansion.

The preload force should be determined depending on the desired performance. An excessive preload will lead to increased heating of the bearing, which makes it unsuitable for high speeds and will reduce the lifetime. An insufficient preload can lead to a slipping movement (sliding) between ball and raceway during operation, which also reduces the bearing life. A specific minimum bearing preload is thus required, and the preload classes L, M or H can be found in the spindle bearing tables.



Rigid preload

Speed Reduction with Rigid Bearing Arrangement

The high rigidity in these systems, compared with spring adjustment, means that it is not possible to compensate for expansion caused by temperature differences or centrifugal forces to the same extent. With the rigid bearing arrangement, maximum speeds can deviate from the values indicated in the table. Our bearing specialists are on hand to provide technical advice.

Axial Bearing Stiffness

The data tables reference the axial stiffness of the bearings when mounted as preloaded pairs under the defined preload levels.

Where a specific stiffness is required, axial, radial or moment the preload can be adjusted or internal design adapted. Consult our engineering team with your requirements.

Unloading Force

Unloading force is an important consideration in the design of the bearing. If high axial forces on the shaft are expected, it is important to check the ratio of axial force to unloading force. If the axial force exceeds the unloading force, this may lead to increased noise and vibration, and therefore a reduced lifetime.



Duplex Bearings

Duplexing is used to greatly increase radial and axial rigidity. Bearing pairs can be arranged back-to-back (DB) or face-to-face (DF) to withstand bi-directional thrust loads, or tandem (DT) to withstand heavy uni-directional thrust loads.

Back-to-back arrangement (DB):

When the bearings are mounted and the inner rings clamped together, the load lines (lines through points of ball contact) converge outside the bearings (forming an 'O'), resulting in increased moment rigidity. The axial force is absorbed in both directions.

This configuration is suited for most applications having good alignment of bearing housings and shafts. It is also preferable where high moment rigidity is required, and where the shaft runs warmer than the housing.

Face-to-face arrangement (DF):

When the bearings are mounted and the outer rings clamped together, the load lines converge toward the bore (forming an 'X'). The axial force is absorbed in both directions.

DF mounting is used in few applications — mainly where misalignment must be accommodated. This arrangement has less tilting rigidity and as such, speed capability is usually lower than a DB pair of identical preload.

Tandem arrangement (DT):

Abutting faces of DT pairs have equal offsets, creating parallel load lines. When mounted and preloaded by thrust forces, both bearings share the load equally.

DT pairs offer greater capacity without increasing bearing size, through load sharing — the axial load capacity is twice that of a single bearing. They can counter heavy thrust loads but only from one direction and they cannot take reversing loads as DB and DF pairs can. To combat this, DT pairs are usually opposed by another DT pair or a single bearing.

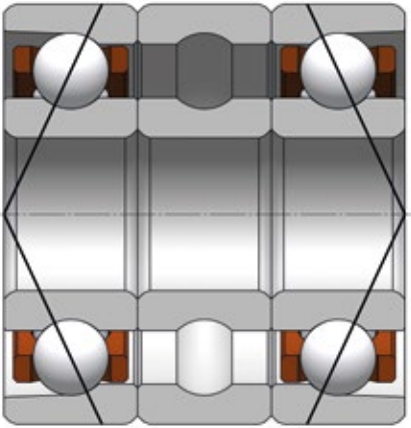
Universal design:

Universally preloaded bearings have equal face offsets on both sides of the bearings allowing them to be assembled in all configurations. Such bearings may be ordered as singles (DS) or in sets of two or more bearings. When ordered as universal sets this means the bore and outer diameter are in the same calibration group to ensure each bearing bears the same load.

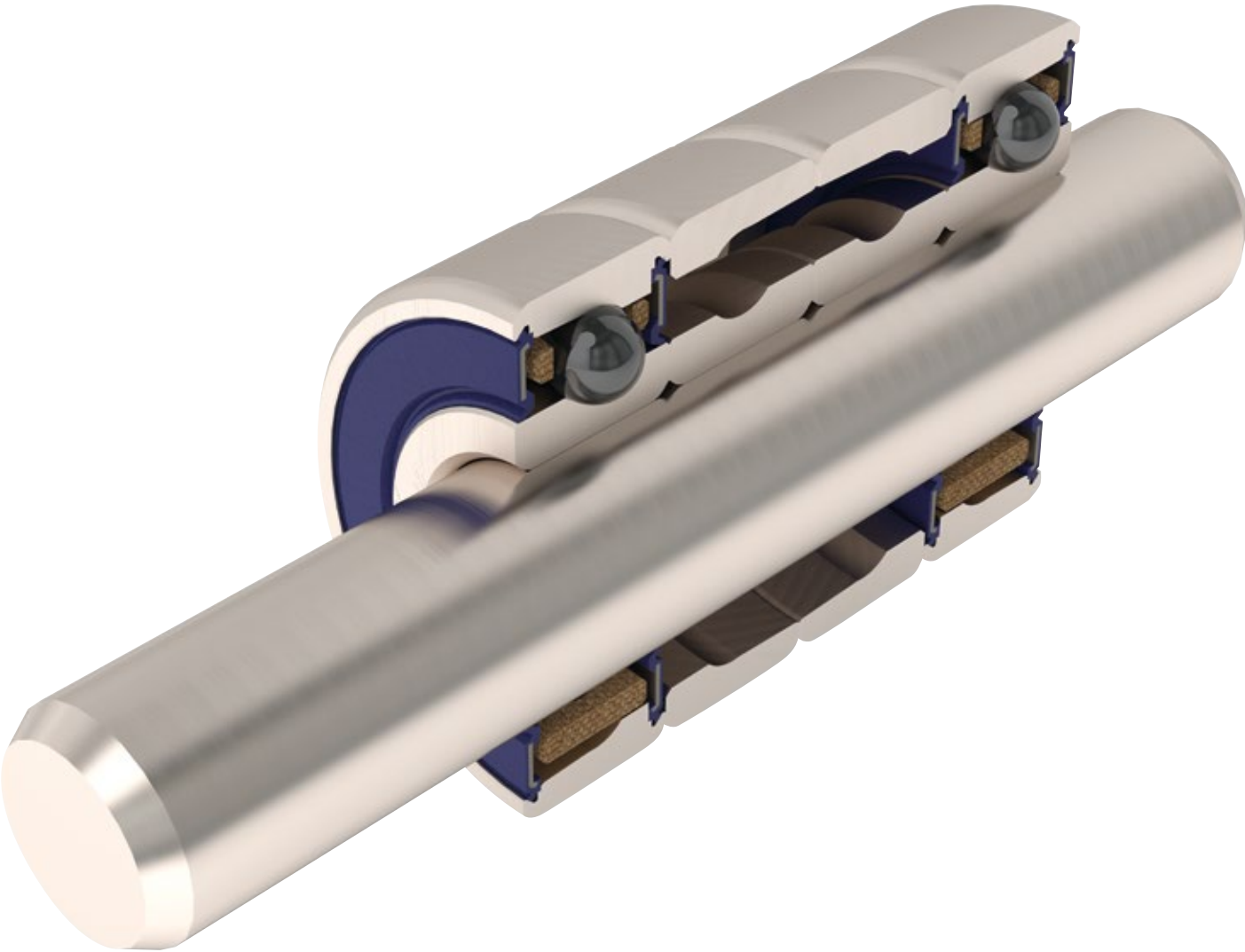
Spacers

All duplex pairs can be separated by equal-width spacers to increase moment rigidity. Spacers should ideally be machined as sets to ensure that inner and outer rings spacers are equal in length to preserve the factory preload levels. Care should be given to spacer parallelism and face runout to avoid any misalignment of the bearings when installed.

The diagram below shows two spindle bearings which are preloaded against each other with a defined force. In this instance two bearing inner and outer rings are used to provide a wide spacer. We also offer custom designed spacers and complete assemblies consisting of spindle bearings, spacers and shaft.



Bearing inner and outer ring as spacer



Preload with spacers



Calibration

To ensure optimum performance from matched sets of preload ground bearings, consideration is given to the potential differences between locating diameters within the bearing set.

In order to achieve a uniform fit of the bearing on the shaft, and in the housing, spindle bearings are calibrated on the bores and outside diameters, breaking down the overall tolerance further. As standard these diameters, and the bearing width, are identified with the deviation from nominal to the nearest micron. Bearings within a set are provided with bore and outside diameter codes matched within acceptable levels (It should be noted that the diameter codes between bearings in a set may not be identical and that the bore and outside diameter codes do not have to be the same).

Dimensions shown are deviation from nominal in µm's.

	Code	D			
		0/-2.5	-2.5/-5	-5/-7.5	-7.5/-10
d	0/-2.5	1	11	13	14
	-2.5/-5	2	21	23	24
	-5/-7.5	3	31	33	34
	-7.5/-10	4	41	43	44

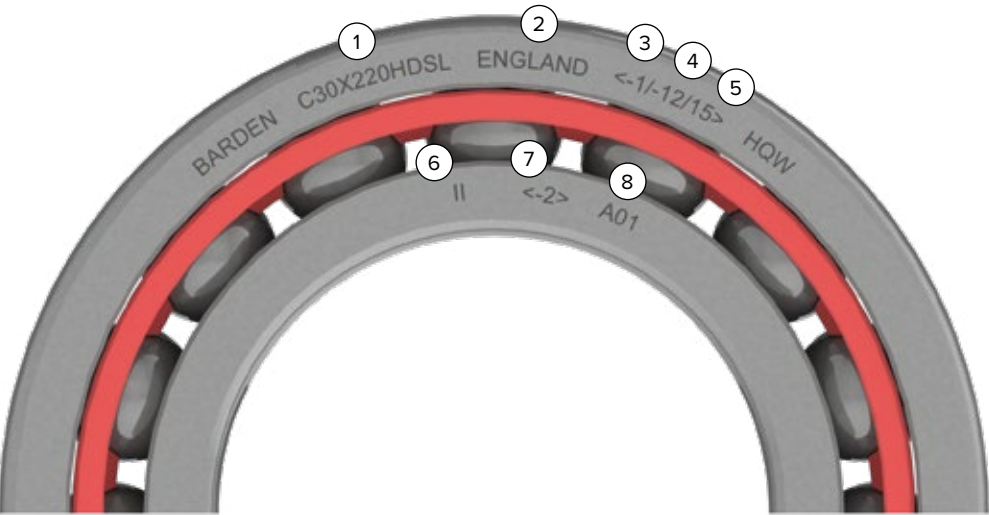
Example:

Code 11 (C11)
Bore: Ø 0/-2.5µm
OD: Ø 0/-2.5µm

Method of group classification:

Bore diameter: the smallest measured diameter determines the class.

Outside diameter: the largest measured diameter determines the class.



Key

- 1. Basic part number including preload level
- 2. Country of manufacture
- 3. Outer ring OD deviation from nominal
- 4. Width deviation from nominal
- 5. Nominal contact angle
- 6. High point of eccentricity
- 7. Bore diameter deviation from nominal
- 8. Date code

Precision Lock Nuts

Precision lock nuts are used for fastening of bearings on a shaft. They are also often used for fastening of gears, belt pulleys and other machine parts on shafts. Lock nuts must be secured using a retaining element in a groove of a shaft for example, or by a retaining element which directly integrates into the lock nut.

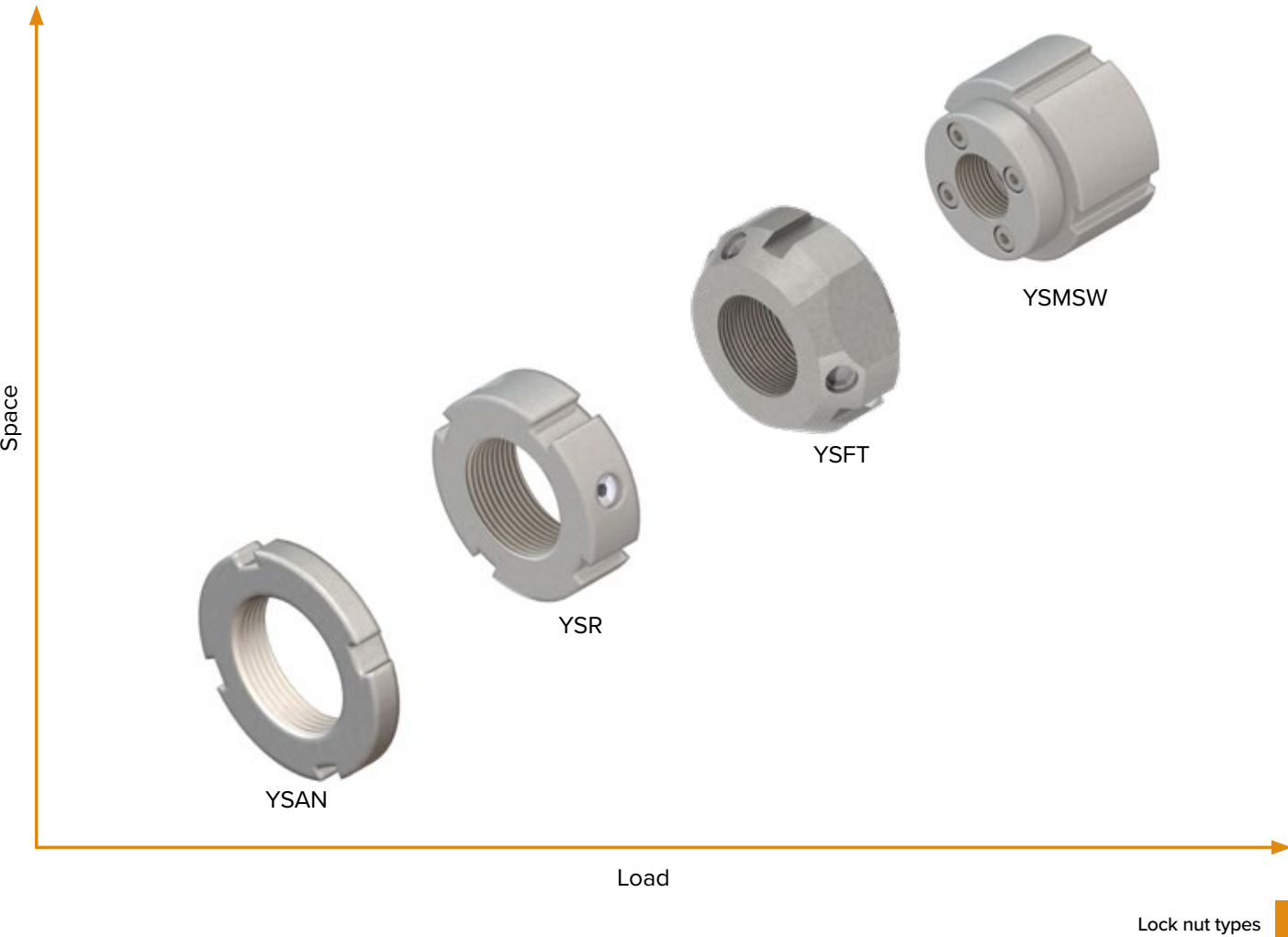
Lock nuts must display the following characteristics:

- Hardness: 28-32 HRc.
- Thread accuracy: ISO 4H.
- Run out: up to 0.005mm and up to 0.002mm on request.

Factors to consider in choosing a suitable lock nut:

- Free space (axial & radial)
- Size of axial load
- Turning direction of the shaft – continuous or changing
- Dynamic load on the installing place.
- Precision
- Frequency of mounting and demounting

The graph below shows the four main lock nut types and their load capabilities in relation to the space needed. Special designs are available on request.



Lock nut types



Precision Lock Nuts

YSAN Type

This lock nut type requires minimal space. It has no security pins therefore it is recommended to bond the lock nut using a suitable thread locking compound.



Available YSAN Types

Type	Thread	Thread Pitch	D	h	g	t	d	Max. Fastening Torque [Nm]	Max. Permissible Axial Force [kN]
YSAN M10 x 0.75P	M10	0.75	18	4	3	2	13.5	6	19
YSAN M12 x 1.0P	M12	1.0	22	4	3	2	17	8	29
YSAN M15 x 1.0P	M15	1.0	25	5	4	2	21	9	38
YSAN M17 x 1.0P	M17	1.0	28	5	4	2	24	12	43
YSAN M20 x 1.0P	M20	1.0	32	6	4	2	26	14	53
YSAN M25 x 1.5P	M25	1.5	38	7	5	2	32	16	96
YSAN M30 x 1.5P	M30	1.5	45	7	5	2	38	19	115
YSAN M35 x 1.5P	M35	1.5	52	8	5	2	44	22	138
YSAN M40 x 1.5P	M40	1.5	58	9	6	2.5	50	48	164
YSAN M45 x 1.5P	M45	1.5	65	10	6	2.5	56	54	190
YSAN M50 x 1.5P	M50	1.5	70	11	6	2.5	61	60	218

YSR Type

This lock nut has three security pins in a radial direction. It is used for medium loads and is not suitable for high precision applications since it can be difficult to adjust.



Available YSR Types

Type	Thread	Thread Pitch	D	h	g	t	d	n-m	Tightening Torque of Set Screw [Nm]	Fastening Torque [Nm]	Max. Permissible Axial Force [kN]
YSR M6 x 0.5	M6	0.5	16	8	3	2	11	2 - M4	3.5	3	11
YSR M8 x 0.75	M8	0.75	16	8	3	2	11	2 - M4	3.5	6	19
YSR M10 x 0.75	M10	0.75	18	8	3	2	13	2 - M4	3.5	6	24
YSR M10 x 1	M10	1.0	18	8	3	2	13	2 - M4	3.5	8	29
YSR M12 x 1	M12	1.0	20	8	3	2	16	2 - M4	3.5	9	35
YSR M12 x 1.25	M12	1.25	20	8	3	2	16	2 - M4	3.5	10	41
YSR M14 x 1.5	M14	1.5	25	8	3	2	21	2 - M4	3.5	10	56
YSR M15 x 1	M15	1.0	25	8	3	2	21	2 - M4	3.5	11	44
YSR M16 x 1.5	M16	1.5	28	10	4	2	23	2 - M5	4.5	11	68
YSR M17 x 1	M17	1.0	28	10	4	2	23	2 - M5	4.5	12	55
YSR M18 x 1.5	M18	1.5	30	10	4	2	25	2 - M5	4.5	13	76
YSR M20 x 1	M20	1.0	32	10	4	2	27	3 - M5	4.5	16	64
YSR M20 x 1.5	M20	1.5	32	10	4	2	27	3 - M5	4.5	14	85
YSR M22 x 1.5	M22	1.5	35	10	4	2	30	3 - M5	4.5	15	93
YSR M24 x 1.5	M24	1.5	38	12	5	2	33	3 - M6	8.0	16	108
YSR M25 x 1.5	M25	1.5	38	12	5	2	33	3 - M6	8.0	16	113
YSR M27 x 1.5	M27	1.5	42	12	5	2	37	3 - M6	8.0	17	122
YSR M30 x 1.5	M30	1.5	45	12	5	2	40	3 - M6	8.0	19	135
YSR M33 x 1.5	M33	1.5	52	12	5	2	45	3 - M6	8.0	21	149
YSR M35 x 1.5	M35	1.5	52	12	5	2	47	3 - M6	8.0	22	158
YSR M36 x 1.5	M36	1.5	55	14	6	2.5	49	3 - M6	8.0	24	172
YSR M39 x 1.5	M39	1.5	58	14	6	2.5	52	3 - M6	8.0	47	186
YSR M40 x 1.5	M40	1.5	58	14	6	2.5	52	3 - M6	8.0	48	191
YSR M42 x 1.5	M42	1.5	62	14	6	2.5	56	3 - M6	8.0	52	201
YSR M45 x 1.5	M45	1.5	65	14	6	2.5	59	3 - M6	8.0	54	215
YSR M48 x 1.5	M48	1.5	68	14	6	2.5	62	3 - M6	8.0	58	229
YSR M50 x 1.5	M50	1.5	70	14	6	2.5	64	3 - M8	18.0	60	239



Precision Lock Nuts

YSFT Type

YSFT Precision lock nuts are the most common type and incorporate 3 locking pins. With the locking pins adequately tightened (which has the same thread flank angle) high friction can be achieved on the thread so that loosening of the lock nut is almost impossible.

Evenly distributed pins around the circumference allow precise positioning and also compensates for light angular deviations.



Available YSFT Types

Type	Thread	Thread Pitch	D	h	g	t	d	n-m	Tightening Torque of Set Screw [Nm]	Fastening Torque [Nm]	Max. Permissible Axial Force [kN]
YSFT M10 x 0.75P	M10	0.75	28	14	4	2	23	3 - M5	4.5	6	32
YSFT M12 x 1.0P	M12	1.0	30	14	4	2	25	3 - M5	4.5	9	45
YSFT M15 x 1.0P	M15	1.0	33	16	4	2	28	3 - M5	4.5	10	60
YSFT M17 x 1.0P	M17	1.0	37	16	5	2	33	3 - M6	8	11	73
YSFT M20 x 1.0P	M20	1.0	40	18	5	2	35	3 - M6	8	13	86
YSFT M25 x 1.5P	M25	1.5	44	18	5	2	39	3 - M6	8	16	140
YSFT M30 x 1.5P	M30	1.5	49	20	5	2	44	3 - M6	8	19	168
YSFT M35 x 1.5P	M35	1.5	54	20	5	2	49	3 - M6	18	22	206
YSFT M40 x 1.5P	M40	1.5	65	22	6	2.5	59	3 - M6	18	48	235
YSFT M45 x 1.5P	M45	1.5	70	22	6	2.5	64	3 - M6	18	54	264
YSFT M50 x 1.5P	M50	1.5	75	22	7	3	68	3 - M6	18	60	314

YSFT precision lock nuts have the following advantages:

- Secures the lock nut without damaging to the shaft
- No keyseat in the shaft required
- No fatigue of pin material
- Reliable and secure
- Adjustable

YSMSW Type

This type of lock nut was initially developed for screw compressors due to the heavy loads found in the application. Nowadays it is widely used wherever high loads must be secured. Screws are included with these types.



Available YSMSW Types

Type	Thread	Thread Pitch	D	h	g	t	d	n-m	Tightening Torque of Set Screw [Nm]	Fastening Torque [Nm]	Max. Permissible Axial Force [kN]
YSMSW 20/28 M20 x 1.5	M20	1.5	42	28	6	2.5	38	4 - M4	3.5	14	134
YSMSW 20/40 M20 x 1.5	M20	1.5	52	40	7	3	42	4 - M4	3.5	14	168
YSMSW 25/28 M25 x 1.5	M25	1.5	47	28	7	3	43	4 - M4	3.5	16	168
YSMSW 25/40 M25 x 1.5	M25	1.5	62	40	8	3.5	47	4 - M4	3.5	16	209
YSMSW 30/28 M30 x 1.5	M30	1.5	52	28	7	3	48	4 - M4	3.5	19	201
YSMSW 30/44 M30 x 1.5	M30	1.5	68	44	8	3.5	52	4 - M4	3.5	19	267
YSMSW 35/28 M35 x 1.5	M35	1.5	60	28	8	3.5	53	4 - M4	3.5	22	235
YSMSW 35/44 M35 x 1.5	M35	1.5	73	44	8	3.5	60	4 - M4	3.5	22	312
YSMSW 40/28 M40 x 1.5	M40	1.5	65	28	8	3.5	58	6 - M4	3.5	48	268
YSMSW 40/44 M40 x 1.5	M40	1.5	75	44	8	3.5	62	6 - M4	3.5	48	356
YSMSW 45/28 M45 x 1.5	M45	1.5	70	28	8	3.5	63	6 - M4	3.5	54	302
YSMSW 45/44 M45 x 1.5	M45	1.5	90	44	10	4	70	6 - M4	3.5	54	400
YSMSW 50/32 M50 x 1.5	M50	1.5	90	32	8	3.5	68	6 - M4	3.5	60	362
YSMSW 50/46 M50 x 1.5	M50	1.5	75	46	10	4	75	6 - M4	3.5	60	458

Other sizes for the above ranges of precision lock nuts are available on request. Please contact our Application Engineers for more information.



Sizes, Tolerances and Geometric Accuracy

Our spindle bearings are manufactured in compliance with the current ISO (International Organization for Standardization) or ABEC (Annular Bearing Engineering Committee) standards.

Among the ISO standards, P0 corresponds to the standard accuracy precision with classes P6 through P2 indicating increasing precision. The ABEC classes for precision ball bearings define tolerances for major bearing dimensions and characteristics. ABEC1 corresponds with the lowest tolerance class and ABEC9 to the highest level of precision. The tables on the following pages represent tolerance values for both specifications and we produce spindle bearings to these tolerance classes as standard.

Internal Standards

While ISO/ABEC classes are useful, they are not all inclusive and they do not address many factors which affect performance and life (such as materials, ball complement, radial play or contact angle, cage design). To maintain a consistent level of precision in all aspects of its bearings, we apply internally developed standards to these factors. As part of these standards, all spindle bearings are 100% noise tested to ensure quiet operation.

Mounting and Fitting

The efficiency of our spindle bearings is determined largely by the precision of the mating parts and the accuracy of the fit will affect the performance of the bearing. Therefore, careful attention should be paid to the mounting and fitting.

Bearing seats on shafts and housings must be accurately machined and should match the bearing ring width to provide maximum seating surface. The ideal mounting for a precision bearing has a line-to-line fit, both on the shaft and in the housing. The appropriate fit may vary according to the specific operating requirements and mounting design and it may have moderate interference, moderate looseness or even a transitional nature.

For example, high speeds will result in increased centrifugal forces, leading to expansion of the inner ring which may result in it sliding on the shaft causing fretting, corrosion and vibration. To prevent this, a tighter fit should be selected. The fit can also be selected using tables “Shaft Tolerances” and “Housing Tolerances”.

To ensure a proper fit, assemble only clean, burr-free parts. Even small amounts of dirt on the shaft or housing can cause severe bearing misalignment problems.



Handling of Spindle Bearings

All our spindle bearings are manufactured, assembled and packaged in strictly controlled environments. If the full potential of these precision bearings is to be realised, then the same degree of care and attention must be used in installing them.

The first rule for handling bearings is to keep them clean. Consider every kind of foreign material — dust, moisture, fingerprints, solvents, lint, dirty grease — to be abrasive, corrosive or otherwise potentially damaging to the bearing precision.

We recommend following the guidelines below when handling our precision bearings, paying particular attention when installing or removing the bearings from shaft or housing assemblies.

- Ensure that the workplace is extremely clean and keep bearings in their original packaging until ready for use.
- Once unpacked, handle the bearings with clean, dry, talc-free gloves. Note that material incompatibility between the gloves and any cleaning solvents could result in contaminant films being transferred to the bearings during subsequent handling.
- Protect unwrapped bearings by keeping them covered at all times. Use a clean dry cover that will not shed fibrous or particulate contamination into the bearings.
- Avoid knocks and any impact to the bearings.
- Bearings should not be spun by hand or with an airline, as this can cause the balls to run over the retaining dam causing cuts and subsequent noise/reliability issues.

- Do not wash or treat the bearings. We take great care in cleaning our bearings and properly pre-lubricating them before packaging.
- Use only bearing-quality lubricants, and keep them clean during application, and covered between uses. For greased bearings, apply only the proper quantity of grease with a clean applicator. Ensure that all lubricants are within the recommended shelf life before application.
- Assemble using only clean, burr-free tools. Housing interiors and shaft seats should be thoroughly cleaned before fitting. Do not use tools that are painted or chrome plated as these can provide a source of particulate contamination.
- For high speed applications perform a grease distribution run.
- Bearing pairs in O, X or tandem arrangement (labelled with DB, DF or DT) are not interchangeable and may only be installed with the delivered spindle bearing of the corresponding type; labelling is carried out by means of arrow symbols on the outer diameter (<>, ><, >>, <<).
- The marking indicates the load direction of the outer ring.
- Bearings supplied as universal can be installed as required e.g. with bearings from other batches. The load direction is indicated by arrow symbols on the outer ring.

Inner Ring Tolerances

			d [mm]		P4 / ABEC7		P2 / ABEC9		P4S			
			over	incl.	max.	min.	max.	min.	max.	min.		
Deviation of mean bore diameter in a single plane / Deviation of a single bore diameter			$\Delta_{dmp} / \Delta_{ds}$	-	18	0	-4	0	-2.5	0	-4	
				18	30	0	-5	0	-2.5	0	-5	
				30	50	0	-6	0	-2.5	0	-6	
				50	80	0	-7	0	-4	0	-7	
				80	120	0	-8	0	-5	0	-8	
				120	180	0	-10	0	-7	0	-10	
Variation of bore diameter in a single plane	Diameter series 7/8/9	V_{dsp}	-	18	4		2.5		2.5			
			18	30	5		2.5		2.5			
			30	50	6		2.5		2.5			
			50	80	7		4		4			
			80	120	8		5		5			
			120	180	10		7		7			
	0/1	V_{dsp}	-	18	3		2.5		2.5			
			18	30	4		2.5		2.5			
			30	50	5		2.5		2.5			
			50	80	5		4		4			
			80	120	6		5		5			
			120	180	8		7		7			
	2/3/4	V_{dsp}	-	18	3		2.5		2.5			
			18	30	4		2.5		2.5			
			30	50	5		2.5		2.5			
			50	80	5		4		4			
			80	120	6		5		5			
			120	180	8		7		7			
	Variation of mean bore diameter			V_{dmp}	-	18	2		1.5		1.5	
					18	30	2.5		1.5		1.5	
30					50	3		1.5		1.5		
50					80	3.5		2		2		
80					120	4		2.5		2.5		
120					180	5		3.5		3.5		
Radial runout of inner ring of assembled bearing			K_{ia}	0.6	2.5	2.5		1.5		1.5		
				2.5	10	2.5		1.5		1.5		
				10	18	2.5		1.5		1.5		
				18	30	3		2.5		2.5		
				30	50	4		2.5		2.5		
				50	80	4		2.5		2.5		
				80	120	5		2.5		2.5		
				120	150	6		2.5		2.5		
				150	180	6		5		5		
Perpendicularity of inner ring face with respect to the bore			S_d	0.6	18	3		1.5		1.5		
				18	30	4		1.5		1.5		
				30	50	4		1.5		1.5		
				50	80	5		1.5		1.5		
				80	120	5		2.5		2.5		
				120	150	6		2.5		2.5		
				150	180	6		4		4		
Axial runout of inner ring of assembled bearing			S_{ia}	-	2.5	3		1.5		1.5		
				2.5	10	3		1.5		1.5		
				10	18	3		1.5		1.5		
				18	30	4		2.5		2.5		
				30	50	4		2.5		2.5		
				50	80	5		2.5		2.5		
				80	120	5		2.5		2.5		
				120	150	7		2.5		2.5		
				150	180	7		5		5		
Deviation of a single inner ring width			Δ_{Bs} normal	-	2.5	0	-40	0	-40	0	-40	
				2.5	10	0	-40	0	-40	0	-40	
				10	18	0	-80	0	-80	0	-80	
				18	30	0	-120	0	-120	0	-120	
				30	50	0	-120	0	-120	0	-120	
				50	80	0	-150	0	-150	0	-150	
				80	120	0	-200	0	-200	0	-200	
				120	180	0	-250	0	-250	0	-250	
Deviation of the total inner ring width for duplexed bearings			Δ_{Bs} modified ^a	-	2.5	0	-250	0	-250	0	-250	
				2.5	50	0	-250	0	-250	0	-250	
				50	80	0	-250	0	-250	0	-250	
				80	120	0	-380	0	-250	0	-250	
				120	180	0	-380	0	-250	0	-250	
Variation of inner ring width			V_{Bs}	-	2.5	2.5		1.5		1.5		
				2.5	10	2.5		1.5		1.5		
				10	30	2.5		1.5		1.5		
				30	50	3		1.5		1.5		
				50	80	4		1.5		1.5		
				80	120	4		2.5		2.5		
				120	150	5		2.5		2.5		
				150	180	5		4		4		

All figures in µm.

Outer Ring Tolerances

			d [mm]		P4 / ABEC7		P2 / ABEC9		P4S				
			over	incl.	max.	min.	max.	min.	max.	min.			
Deviation of mean outside diameter in a single plane / Deviation of a single outside diameter			$\Delta_{\text{dmp}} / \Delta_{\text{ds}}$	-	18	0	-4	0	-2.5	0	-4		
				18	30	0	-5	0	-4	0	-5		
				30	50	0	-6	0	-4	0	-6		
				50	80	0	-7	0	-4	0	-7		
				80	120	0	-8	0	-5	0	-8		
				120	150	0	-9	0	-5	0	-9		
				150	180	0	-10	0	-7	0	-10		
Variation of outside diameter in a single plane			V_{dsp}	Diameter series 7/8/9		-	18	4		2.5		2.5	
				18	30	5		4		4			
				30	50	6		4		4			
				50	80	7		4		4			
				80	120	8		5		5			
				120	150	9		5		5			
				150	180	10		7		7			
			V_{dsp}	0/1		-	18	3		2.5		2.5	
				18	30	4		4		4			
				30	50	5		4		4			
				50	80	5		4		4			
				80	120	6		5		5			
				120	150	7		5		5			
				150	180	8		7		7			
			V_{dsp}	2/3/4		-	18	3		2.5		2.5	
				18	30	4		4		4			
				30	50	5		4		4			
				50	80	5		4		4			
				80	120	6		5		5			
120	150	7			5		5						
150	180	8			7		7						
Variation of mean outside diameter			V_{dmp}	-	18	2		1.5		1.5			
				18	30	2.5		2		2			
				30	50	3		2		2			
				50	80	3.5		2		2			
				80	120	4		2.5		2.5			
				120	150	5		2.5		2.5			
				150	180	5		3.5		3.5			
Radial runout of outer ring of assembled bearing			K_{ta}	-	2.5	3		1.5		1.5			
				2.5	18	3		1.5		1.5			
				18	30	4		2.5		2.5			
				30	50	5		2.5		2.5			
				50	80	5		4		4			
				80	120	6		5		5			
				120	150	7		5		5			
Perpendicularity of outer ring outside surface with respect to the face			S_{d}	-	80	4		1.5		1.5			
				80	120	5		2.5		2.5			
				120	150	5		2.5		2.5			
Axial runout of outer ring of assembled bearing			S_{ta}	-	6	5		1.5		1.5			
				6	18	5		1.5		1.5			
				18	30	5		2.5		2.5			
				30	50	5		2.5		2.5			
				50	80	5		4		4			
				80	120	6		5		5			
				120	150	7		5		5			
Axial runout of outer ring flange back face of assembled bearing			S_{ea1}	-	18	7		3		3			
				18	50	7		4		4			
				50	80	7		6		6			
				80	120	8		7		7			
				120	150	10		7		7			
Deviation of a single outer ring width			ΔC_s normal	-	18	Identical with ΔB_s for inner ring of the same bearing							
				18	50								
				50	80								
				80	180								
Deviation of the total outer ring width for duplexed bearings			ΔC_s modified ^b	-	180	Identical with ΔB_s for inner ring of the same bearing							
Variation of outer ring width			VC_s	-	18	2.5		1.5		1.5			
				18	30	2.5		1.5		1.5			
				30	50	2.5		1.5		1.5			
				50	80	3		1.5		1.5			
				80	120	4		2.5		2.5			
				120	180	5		2.5		2.5			
				120	150	5		2.5		2.5			
				150	180	5		4		4			

Shaft Tolerances

				d [mm]		P4 / ABEC7		P2 / ABEC9		P4S	
				over	incl.	max.	min.	max.	min.	max.	min.
Deviation of mean bore diameter in a single plane / Deviation of a single outside diameter	$\Delta_{dmp} / \Delta_{ds}$			-	18	0	-4	0	-2.5	0	-4
				18	30	0	-5	0	-2.5	0	-5
				30	50	0	-6	0	-2.5	0	-6
				50	80	0	-7	0	-4	0	-7
				80	120	0	-8	0	-5	0	-8
				120	180	0	-10	0	-7	0	-10
Deviation of the shaft diameter	Operating Conditions	Clearance	Little load Medium speeds No vibration	-	18	-5	-9	-4	-7	-5	-9
				18	30	-6	-11	-4	-7	-6	-11
				30	50	-7	-13	-4	-7	-7	-13
				50	80	-8	-15	-5	-9	-8	-15
				80	120	-9	-17	-6	-11	-9	-17
				120	180	-11	-21	-8	-15	-11	-21
		Transfer	Medium load Medium speed Little vibration	-	18	0	-4	0	-2.5	0	-4
				18	30	0	-5	0	-2.5	0	-5
				30	50	0	-6	0	-2.5	0	-6
				50	80	0	-7	0	-4	0	-7
				80	120	0	-8	0	-5	0	-8
				120	180	0	-10	0	-7	0	-10
		Oversize	High load High speeds Large vibration	-	18	5	1	4	1	5	1
				18	30	6	1	4	1	6	1
				30	50	7	1	4	1	7	1
				50	80	8	1	5	1	8	1
				80	120	9	1	6	1	9	1
				120	180	11	1	8	1	11	1
Variation of the shaft diameter on a radial plane (roundness)	Diameter series 7/8/9		-	18	2		1.5		1.5		
			18	30	2.5		1.5		1.5		
			30	50	3		1.5		1.5		
			50	80	4		2		2		
			80	120	4		2.5		2.5		
			120	180	5		4		4		
	0/1		-	18	1.5		1.5		1.5		
			18	30	2		1.5		1.5		
			30	50	2.5		1.5		1.5		
			50	80	2.5		2		2		
			80	120	3		2.5		2.5		
			120	180	4		4		4		
	2/3/4		-	18	1.5		1.5		1.5		
			18	30	2		1.5		1.5		
			30	50	2.5		1.5		1.5		
			50	80	2.5		2		2		
			80	120	3		2.5		2.5		
			120	180	4		4		4		
Variation of the average shaft diameter (conicity)				-	18	1		0.8		0.8	
				18	30	1.5		0.8		0.8	
				30	50	1.5		0.8		0.8	
				50	80	2		1		1	
				80	120	2		1.5		1.5	
				120	180	2.5		2		2.5	
Concentricity of the shaft				-	2.5	1.5		0.8		0.8	
				2.5	10	1.5		0.8		0.8	
				10	18	1.5		0.8		0.8	
				18	30	1.5		1.5		1.5	
				30	50	2		1.5		1.5	
				50	80	2		1.5		1.5	
				80	120	2.5		1.5		1.5	
				120	150	3		1.5		1.5	
Axial runout of the face in relation to the shaft				150	180	3		2.5		2.5	
				-	18	1.5		0.8		0.8	
				18	30	2		0.8		0.8	
				30	50	2		0.8		0.8	
				50	80	2.5		0.8		0.8	
				80	120	2		1.5		1.5	
				120	150	3		1.5		1.5	
				150	180	3		2		2	

All figures in μm .
Axial securing of the outer ring is required (tight fit).

Housing Tolerances

				d [mm]		P4 / ABEC7		P2 / ABEC9		P4S	
				over	incl.	max.	min.	max.	min.	max.	min.
Deviation of mean outside diameter in a single plane / Deviation of a single outside diameter	$\Delta_{dmp} / \Delta_{ds}$			-	18	0	-4	0	-2.5	0	-4
				18	30	0	-5	0	-4	0	-5
				30	50	0	-6	0	-4	0	-6
				50	80	0	-7	0	-4	0	-7
				80	120	0	-8	0	-5	0	-8
				120	150	0	-9	0	-5	0	-9
				150	180	0	-10	0	-7	0	-10
Deviation of the housing diameter	Operating Conditions	Clearance	Little load Medium speeds No vibration	-	18	5	1	4	1	5	1
				18	30	6	1	5	1	6	1
				30	50	7	1	5	1	7	1
				50	80	8	1	5	1	8	1
				80	120	9	1	6	1	9	1
				120	150	10	1	6	1	10	1
				150	180	11	1	8	1	11	1
		Transfer	Medium load Medium speed Little vibration	-	18	0	-4	0	-3	0	-4
				18	30	0	-5	0	-4	0	-5
				30	50	0	-6	0	-4	0	-6
				50	80	0	-7	0	-4	0	-7
				80	120	0	-8	0	-4	0	-8
				120	150	0	-9	0	-5	0	-9
				150	180	0	-10	0	-7	0	-10
		Oversize	High load High speeds Large vibration	-	18	-5	-9	-4	-7	-5	-9
				18	30	-6	-11	-5	-9	-6	-11
				30	50	-7	-13	-5	-9	-7	-13
				50	80	-8	-15	-5	-9	-8	-15
				80	120	-9	-17	-6	-11	-9	-17
120	150			-10	-19	-6	-11	-10	-19		
150	180			-11	-21	-8	-15	-11	-21		
Variation of the housing borehole on a radial plane (roundness)	Diameter series 7/8/9			-	18	2		1.5		1.5	
				18	30	2.5		2		2	
				30	50	3		2		2	
				50	80	4		2		2	
				80	120	4		2.5		2.5	
				120	150	5		2.5		2.5	
				150	180	5		4		4	
	0/1			-	18	1.5		1.5		1.5	
				18	30	2		2		2	
				30	50	2.5		2		2	
				50	80	2.5		2		2	
				80	120	3		2.5		2.5	
				120	150	4		2.5		2.5	
				150	180	4		4		4	
	2/3/4			-	18	1.5		1.5		1.5	
				18	30	2		2		2	
				30	50	2.5		2		2	
				50	80	2.5		2		2	
				80	120	3		2.5		2.5	
120				150	4		2.5		2.5		
150				180	4		4		4		
Variation of the average housing borehole (conicity)				-	18	1		0.8		0.8	
				18	30	1.5		1		1	
				30	50	1.5		1		1	
				50	80	2		1		1	
				80	120	2		1.5		1.5	
				120	150	2.5		1.5		1.5	
				150	180	2.5		2		2	
Runout of the housing borehole (concentricity)				-	2.5	1.5		0.8		0.8	
				2.5	18	1.5		0.8		0.8	
				18	30	2		0.8		1.5	
				30	50	2.5		1.5		1.5	
				50	80	2.5		2		2	
				80	120	3		2.5		2.5	
				120	150	4		2.5		2.5	
Axial runout of the face in relation to the housing borehole				150	180	4		2.5		2.5	
				-	6	2.5		0.8		0.8	
				6	18	2.5		0.8		0.8	
				18	30	2.5		1.5		1.5	
				30	50	2.5		1.5		1.5	
				50	80	2.5		2		2	
				80	120	3		2.5		2.5	

All figures in μm .
Axial securing of the outer ring is required (tight fit).





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