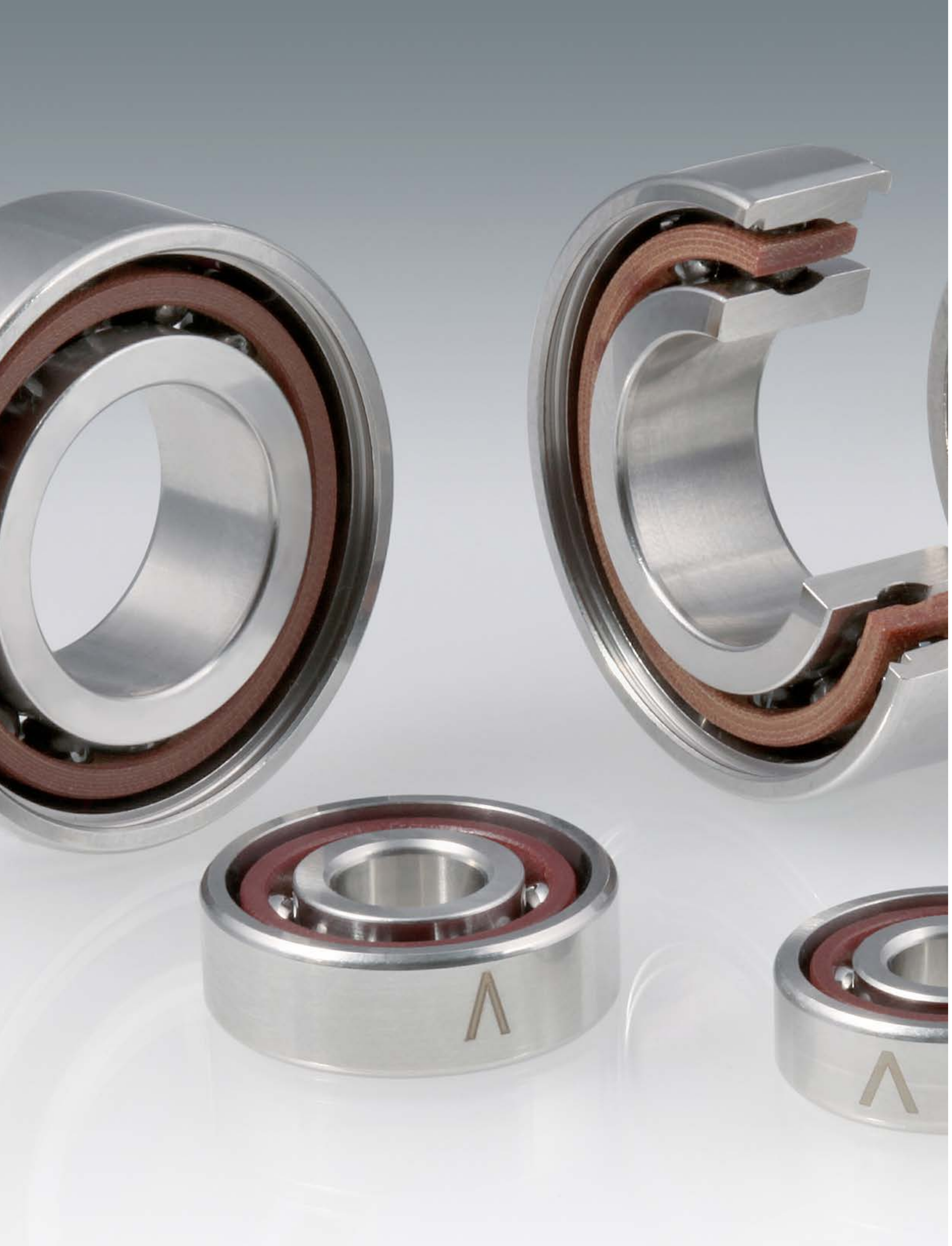
High Speed Spindle Bearings

HQW Precision GmbH
The Barden Corporation (UK) Ltd

Partners in Precision



Contents

High Speed Spindle Bearings

HQW Precision and The Barden Corporation (BUK) are Partners in Precision, leading the market in super-precision bearings. Working together we provide customers worldwide with the highest quality precision bearing products and services.

Barden (BUK) brings more than seven decades of expertise and well-established practices to the partnership. HQW Precision was founded in 2010 and brings state-of-the-art facilities and a fresh, modern outlook. Jointly, we are able to share best practice to deliver high-end bearings and assemblies, tailormade 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.

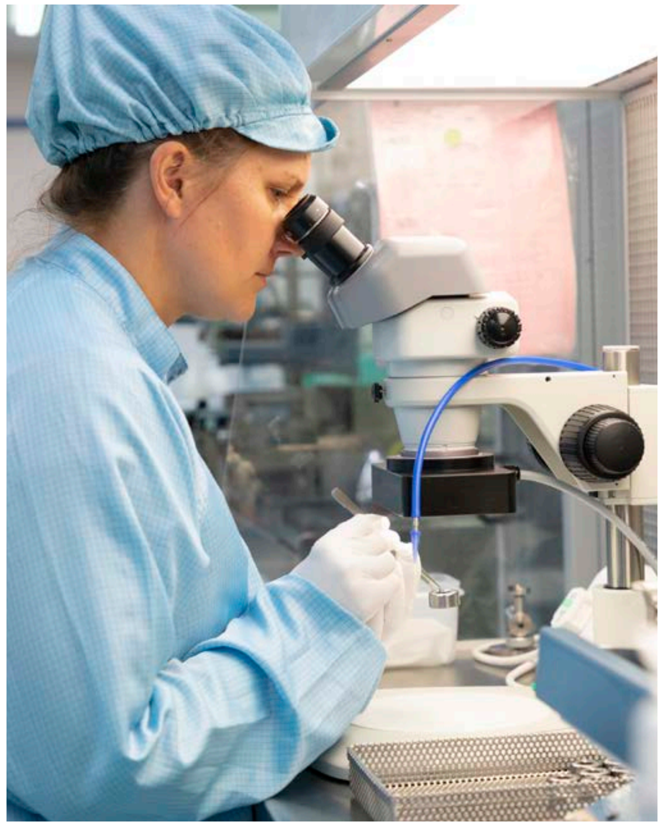
HQW Precision plant, Kürnach, Germany

Barden UK plant, Plymouth, United Kingdom

Our Spindle Bearings

We specialise in the production of spindle ball bearings which are manufactured to the highest tolerance standards. Our product range covers bearings from 3mm inner diameter up to 120mm outer diameter. The bearings are specially designed to offer an exceptionally long lifetime, extreme corrosion resistance where required and are suitable for the highest operating speeds.

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 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 ISO P4S as standard and up to P2 where required.

Customers are assured of exceptional high-quality and precision as there is full traceability of our product when needed; from initial enquiry, through the design process and manufacturing. 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 9001:2015 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.

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:

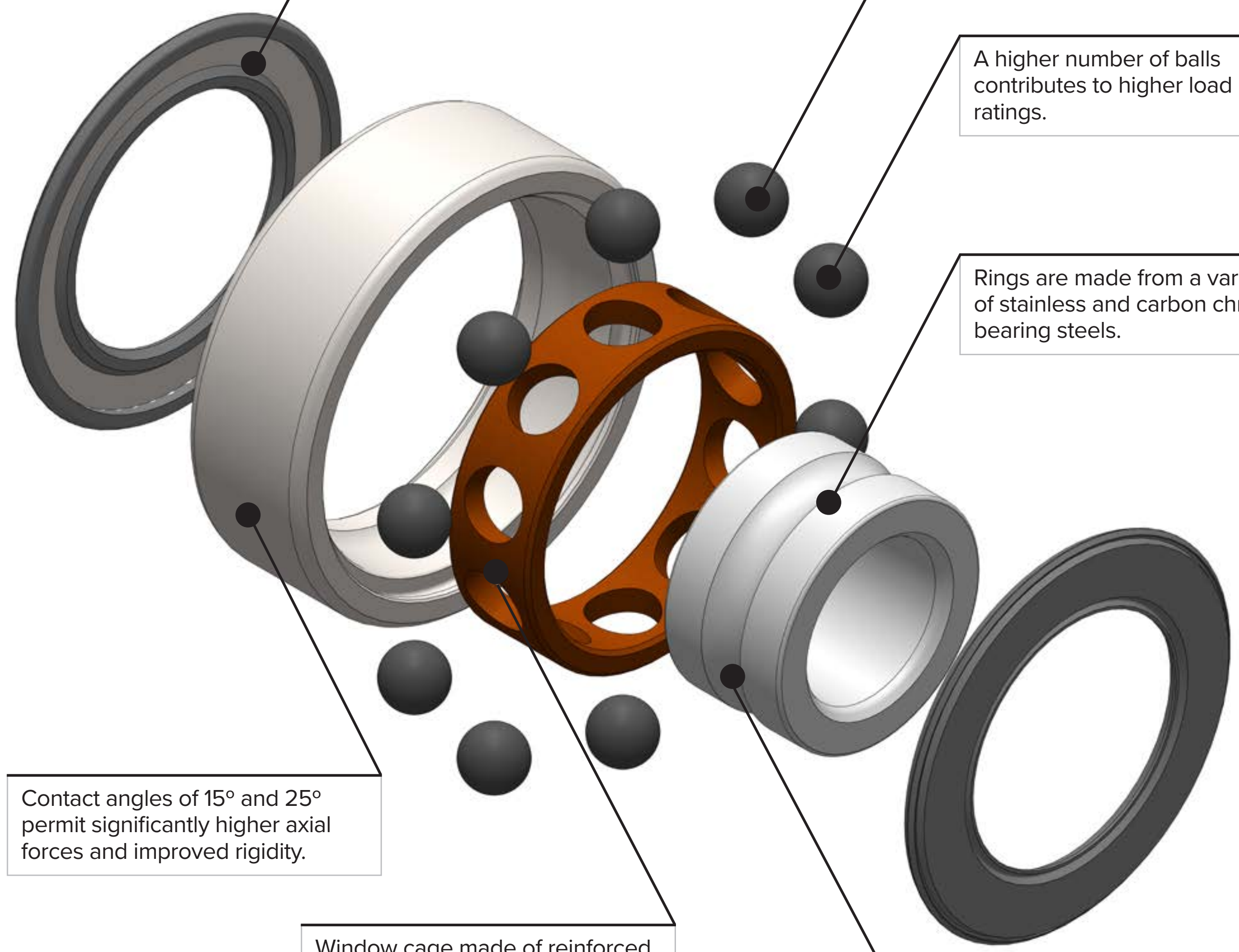
- Bearing damage analysis.
- Grease analysis.
- Dimensional check.
- Friction measurement.

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 window cage to maximise the bearing's speed, and they have exceptional high running accuracy.

The 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, offering maintenance-free and reliable performance.

Modern grinding motor spindles reach speeds of up to 180,000 rpm. Running accuracy and quietness 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

Stainless steel X65Cr13 and bearing steels 100Cr6 (SAE 52100) are standard materials used in this application. They have good load carrying capacity, fatigue resistance and stability.

The high-performance stainless-steel material SV30 (X30CrMoN15-1, AMS 5898) 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.

Designation			Material Composition							
Material	DIN	HQW	Cr	C	Si	Mn	P	S	Mo	N
X30CrMoN15-1	1.4108	SV30	14.0-16.0	0.25-0.35	-	-	-	-	0.85-1.10	0.30-0.40
X65Cr13	1.4037	S	12.50-14.50	0.43-0.50	≤1.00	≤1.00	≤0.040	≤0.030	-	-
100Cr6	1.3505	-	1.35-1.60	0.93-1.05	0.15-0.35	0.25-0.45	≤0.025	≤0.025	-	-

Material Composition

Advantages of SV30

- Longer lifetime in comparison to conventional materials.
- Exceptional corrosion resistance.
- Improved mechanical properties due to very fine structure.
- Low noise.
- Standard temperature resistance to 150°C; with special heat treatment up to 400°C.
- High chemical resistance.
- Excellent emergency running capabilities when used in conjunction with ceramic balls.

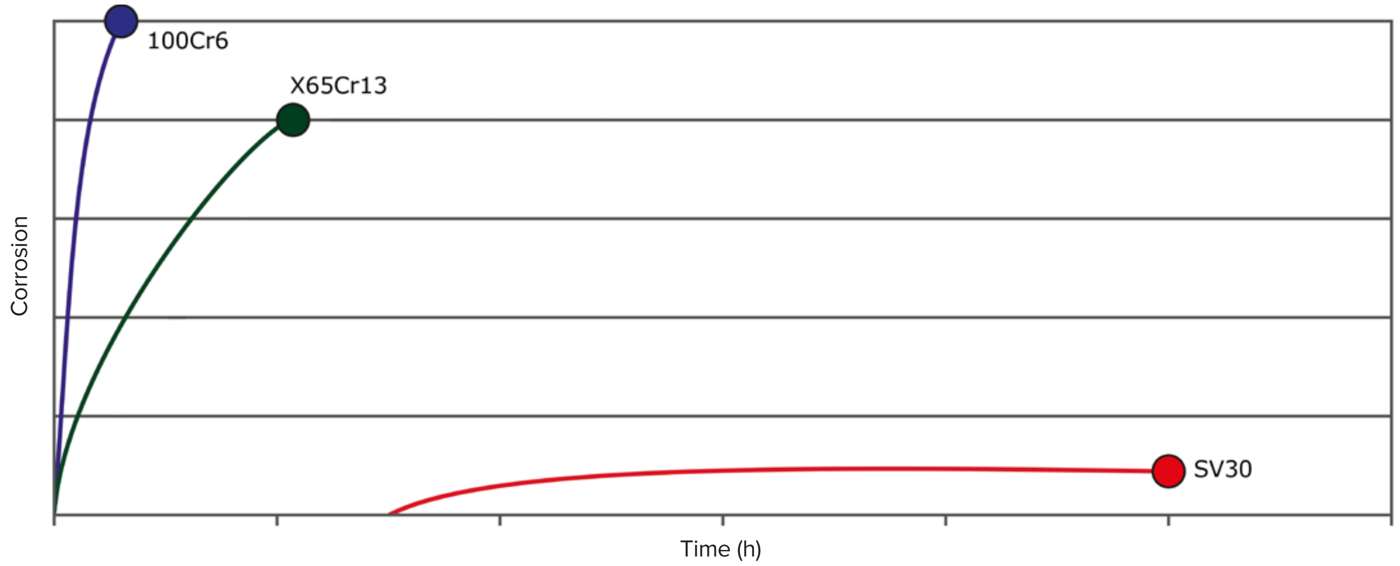
Corrosion Resistance

Corrosion can be described as the degradation of material surface through reaction with an oxidising substance. In engineering applications, corrosion is most commonly presented as the formation of metal oxides from exposure to air and water from the environment.

In most spindle bearing applications corrosion resistance is not an essential characteristic of the bearing material, with 100Cr6 used extensively. However some applications are required to work in aggressive environments where corrosion resistance is essential.

In controlled salt-spray tests (according to DIN EN ISO 9227:2012), our SV30 bearings have proven to give superior corrosion protection compared to those manufactured from stainless steels such as X65Cr13 and 100Cr6. During testing, the concentration of the salt solution, the temperature, the pressure, and the pH value were all maintained at a constant level. Thanks to its higher chrome content, X65Cr13 stainless steel will corrode at a much slower pace than 100Cr6.

The graph below shows the degree of corrosion over time for three materials, and SV30's high corrosion resistance is clearly seen on the test rings.



Corrosion over time

100Cr6
after 50h

X65Cr13
after 200h

SV30
after 1000h

If the application demands a particularly low corrosion rate we recommend the use of SV30 steel, which showed only slight signs of corrosion after 1,000 hours of salt spray testing.

Balls

For 100Cr6 bearings the standard ball material is the same as that used for the raceways, whereas for SV30 bearings the balls are made from X65Cr13 as standard. However, for particularly arduous applications many of our bearings are fitted with ceramic balls made from silicon nitride (Si_3N_4). Only balls of grade 3 and 5 are used for our spindle bearings as these classes comply with the highest tolerances in terms of size, roundness and roughness.

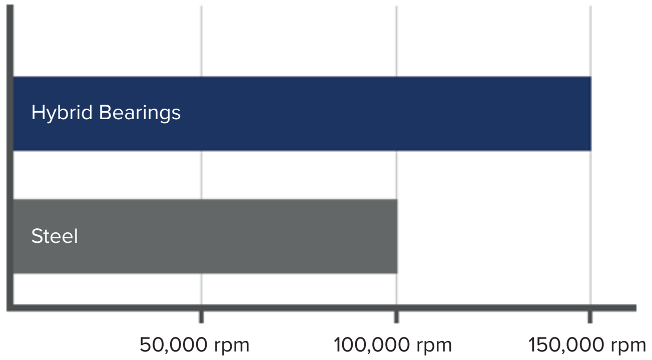
Hybrid Bearings

Hybrid spindle bearings are used to meet the requirements of particularly demanding applications. The inner ring and outer ring are made of either 100Cr6 or highly wear-resistant SV30 steel, while the balls are ceramic (silicon nitride).

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. This is because ceramic balls are 60% lighter than steel balls and because their surface finish is almost perfectly smooth.
- High running speeds. Ceramic hybrid bearings run at significantly lower operating temperatures, 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 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)

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 them coming into contact, 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 window 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
	TA TB	Machine-made single-piece window cage made of fabric reinforced phenolic resin. (A = outer ring guided, B = inner ring guided)	■ Standard cage type. ■ Oil impregnation possible. ■ Suitable for spindle ball bearings with high accuracy. ■ Very high speeds. ■ High strength. ■ Good low lubricant running characteristics.
	TA	Machine-made single-piece window cage made of fabric reinforced phenolic resin. (Outer ring guided only)	■ As standard TA cage, plus: ■ Bore grooves to reduce friction and improve lubricant circulation. ■ Typical cage design for 7000, 7200 series from bore size 5 (25mm) and above.
	TxA TxB	Machine-made single-piece window cage made of high-performance plastic (PEEK, Polyamide-imide, etc.). (A = outer ring guided, B = inner ring guided, x = material)	■ For spindle bearings with very high speeds. ■ High strength. ■ Best low lubricant running characteristics. ■ Also suitable for high temperature applications (operating temperature of polyamide-imide (such as Torlon®) up to 260°C).
	TxAF	Machine-made single-piece window cage made of high-performance plastic (PEEK, Polyamide-imide etc.) with a pitch for better guidance in outer ring and higher speeds. (A = outer ring guided, x = material)	■ For spindle bearings with very high speeds. ■ High strength. ■ Best low lubricant running characteristics. ■ Also suitable for high temperature applications (operating temperature of Polyamide-imide (such as Torlon®) up to 260°C).

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 a hydrodynamic 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.

Lubricant 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.

More than 300 different greases and oils are available for this purpose.

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 bearing grease 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.

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·dm = 2,200,000).
- Greasing, sealing and packaging in a clean room Class 7.

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.

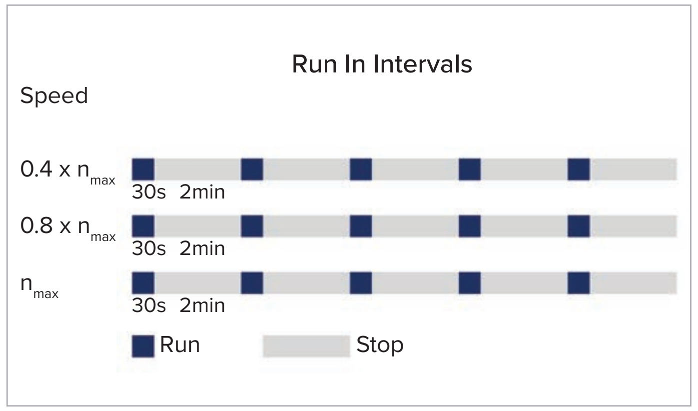
In grease lubricated bearings life is often not determined by the internal design, fitting and specification of the bearing but by the grease itself. It is important for this reason to ensure appropriate running conditions to optimise useful grease life.

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 dispersion greasing.

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, so that the oil can flow back into the track.

The procedure for grease distribution is as follows: Three process steps with increasing speeds (0 .4 x n_{max}; 0 .8 x 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.



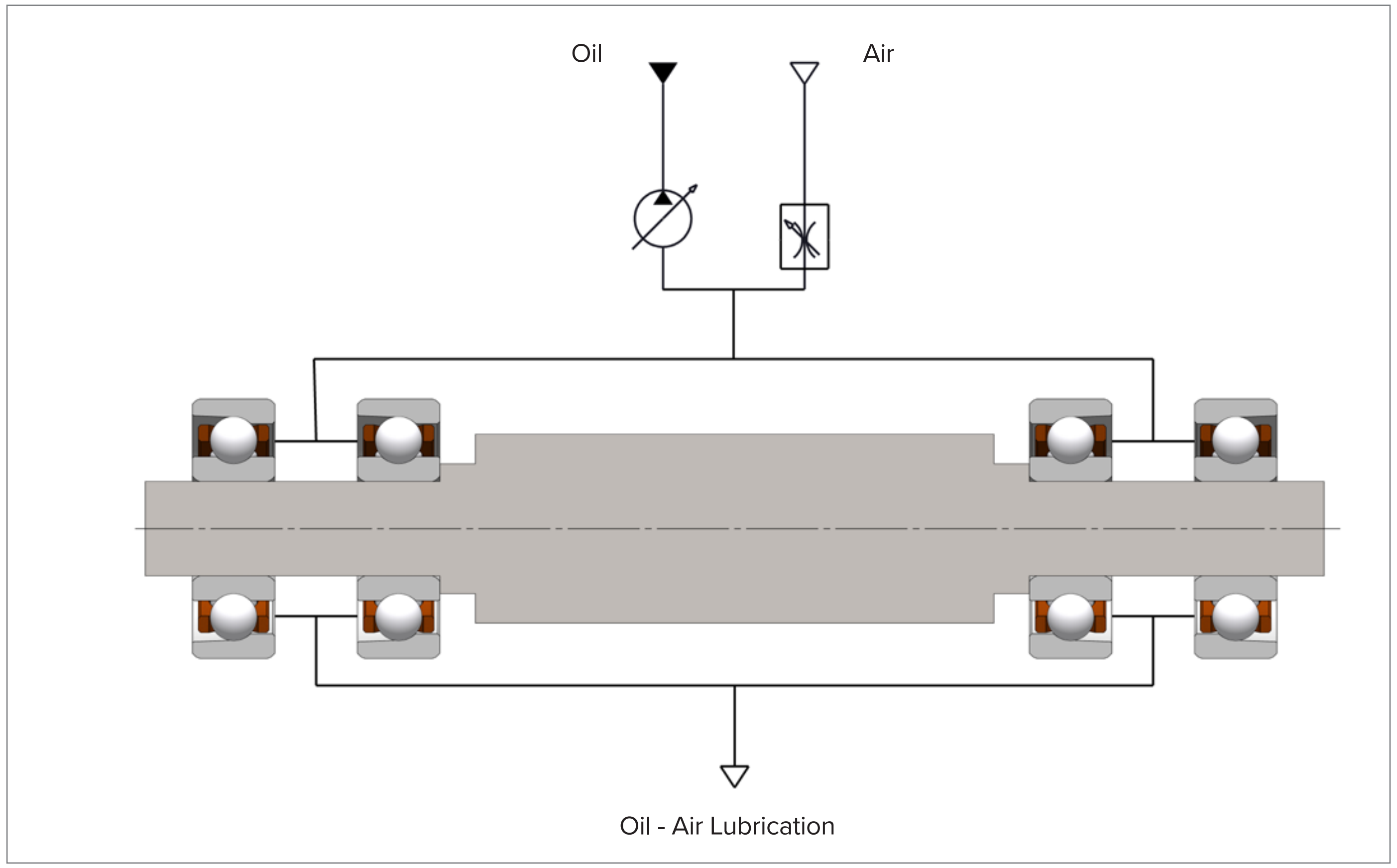
Grease Distribution

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 lifetime lubrication, if loss lubrication is intended, the bearing must be lubricated regularly with exactly the right amount of lubricant in order to achieve the expected bearing life. The relubrication interval may vary widely - from a continuous supply to every two years for example. 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.



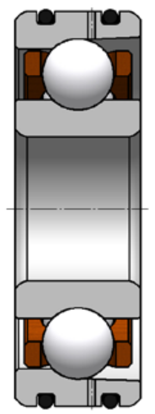
Oil minimum quantity lubrication (MQL)

Direct Lubrication

For high speed spindle applications, many bearing types can be supplied with radial lubrication holes to position oil in close proximity to the ball to raceway contact zones.

The number and size of the lubricating holes can be varied to suit the application, and these holes are connected by a radial oil distribution groove. O-rings on either side of the distribution groove prevent losses, ensuring the correct quantity of oil is delivered to the correct area.

Please contact our engineers for further detaills and availability.



Direct lubrication

Design of Spindle Bearings

Open Design

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

Open Design

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.

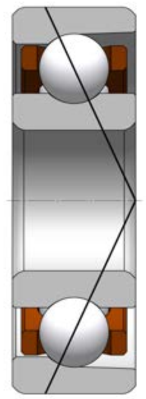
Since the seals are non-contact there is no negative effect on friction or speed ratings. Our seals are made of fluoroelastomer as standard, which can withstand peak temperatures of 230°C, and the material possesses a very high resistance to grease and mineral oil.

Smaller balls are typical in a sealed design allowing for higher speeds. Further advantages of the sealed design include ease of handling and trouble-free installation, making it particularly suitable where bearings are being replaced.

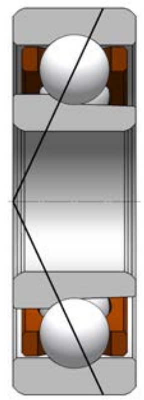
Sealed Design

Special Design - ACI

As a general rule, spindle bearings have an open shoulder on the outer ring (ACO). However, for some special applications the open shoulder can be positioned on the inner ring (ACI) (e.g. dismountable bearings). Our engineers are happy to discuss specific requirements.



ACO



ACI

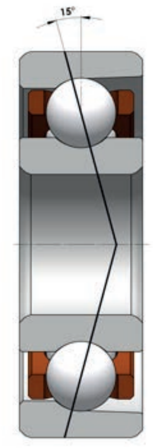
Nomenclature

Ball Material	-	100Cr6 (for 100Cr6 rings)
	-	X65Cr13 (for X30CrMoN15-1 rings)
	HYQ	Si_3N_4
Ring Material	-	100Cr6
	SV	X30CrMoN15-1
		See page 8
Series		Dimensions according to ISO 15
Contact Angle α	C	15°
	AC	25°
Internal Geometry	d	Deviating inner ring ø (e.g. d3)
	D	Deviating outer ring ø (e.g. D7
	W	Deviating width (e.g. W4)
Seal	-	Without seal
	2VZ	Both sides, non-contact FPM (fluoroelastomer)
Version	ACO	One shoulder on outer ring
	ACI	One shoulder on inner ring
Cage	TA TB	Outer ring guided, phenolic resin Inner ring guided, phenolic resin
		See page 11
Accuracy	P4S	According to DIN 620 See page 64-66
Specific Calibration	X	See page 67
Type of Pairing	U	Universal
	DB	Back-to-back arrangement
	DF	Face-to-face arrangement
	DT	Tandem arrangement
		Bearing Sets - 2UL, 3UL, 2DT... Bearings are packed as sets with aligned bore and outer diameter
Preload	L	Light
	M	Medium
	S	Heavy
Lubrication		All bearings are supplied with high performance lubricants, either grease (sealed bearings) or oil (open bearings). See pages 12-14

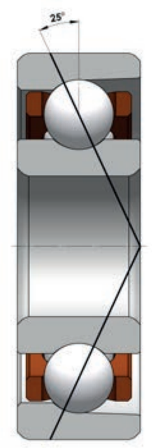
Contact Angle

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 via contact angle (α) to the inner ring, then via the balls to the outer ring. To ensure an even load on all bearings within a system, 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. Deviating contact angles are available on request.



α = 15°

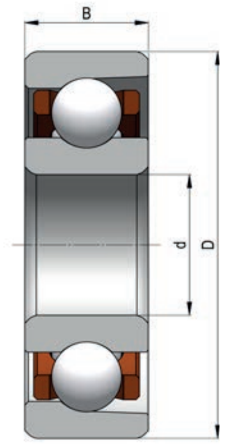


α = 25°

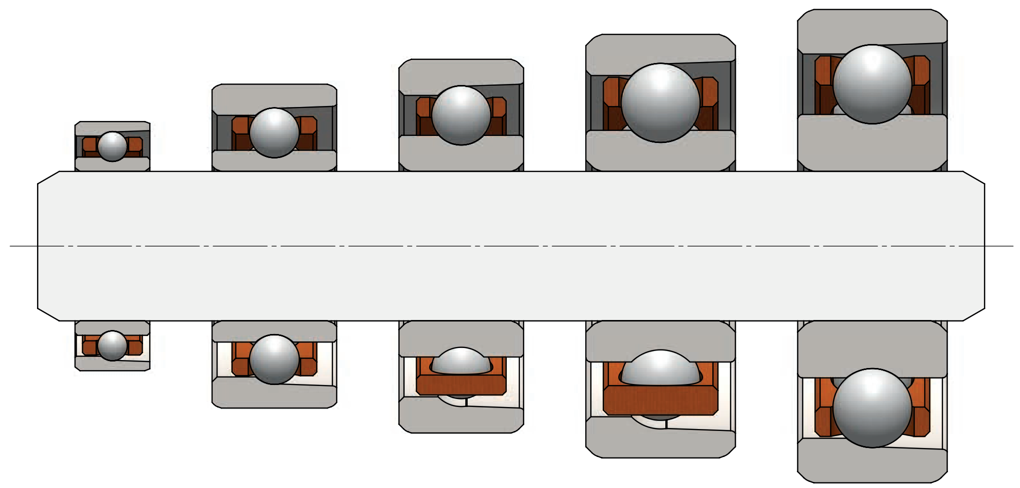
Dimension Series

The nomenclature diagram opposite shows how the spindle bearing part number is derived from the bearing's components, tolerance classes and design. Our spindle bearings range from 3mm inner diameter to 120mm 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 areas which are referred to by the abbreviations d, D and B.

Most bore diameter sizes have a number of progressively increasing series of outside diameters, width and ball size. The diagram below shows the different dimension series with a fixed bore diameter of 6mm. These series are termed 776, 786, 796, 706 and 726 and are shown in the product tables.



Dimension abbreviations



Dimension series for 6mm fixed bore

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}								
			Bore Diameter	Outside Diameter	Standard Width		Dynamic	Static			Light (L)			Medium (M)			Heavy (S)		
			d	D	B	α	C	C_0	Oil	Grease	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}
			[mm]	[mm]	[mm]	[°]	[N]	[N]	[min^{-1}]	[min^{-1}]	[N]	[N/µm]	[N]	[N]	[N/µm]	[N]	[N]	[N/µm]	[N]
773	open	SV773 C TA	3	6	2	15	215	60	405000	326000	2	0.8	3	4	1.3	10	7	1.7	21
773	open	HYQ SV773 C TA	3	6	2	15	215	42	585000	405000	2	1.0	3	4	1.4	10	7	1.9	21
773	open	SV773 AC TA	3	6	2	25	206	57	338000	270000	2	1.8	2	4	2.7	9	7	3.4	18
773	open	HYQ SV773 AC TA	3	6	2	25	206	40	495000	349000	2	2.1	2	4	3.0	9	7	3.8	18
783	open	SV783 C TA	3	7	2	15	295	86	360000	290000	2	1.0	4	5	1.5	14	9	2.0	30
783	open	HYQ SV783 C TA	3	7	2	15	295	60	520000	360000	2	1.1	4	5	1.7	14	9	2.2	30
783	open	SV783 AC TA	3	7	2	25	285	82	300000	240000	2	2.2	4	5	3.2	12	9	4.1	25
783	open	HYQ SV783 AC TA	3	7	2	25	285	57	440000	310000	2	2.5	4	5	3.6	12	9	4.6	25
793	open	SV793 C TA	3	8	3	15	320	99	328000	265000	2	1.1	4	5	1.7	15	10	2.2	32
793	open	HYQ SV793 C TA	3	8	3	15	320	69	474000	328000	2	1.2	4	5	1.9	15	10	2.4	32
793	open	SV793 AC TA	3	8	3	25	310	95	274000	219000	2	2.4	4	5	3.5	13	10	4.5	27
793	open	HYQ SV793 AC TA	3	8	3	25	310	66	401000	283000	2	2.7	4	5	3.9	13	10	5.0	27
703	open	SV703 C TA	3	9	5	15	490	146	322000	259000	3	1.3	7	8	2.0	24	15	2.6	50
703	open	HYQ SV703 C TA	3	9	5	15	490	102	465000	322000	3	1.4	7	8	2.2	24	15	2.9	50
703	open	SV703 AC TA	3	9	5	25	475	141	268000	215000	3	2.8	6	8	4.1	20	15	5.2	42
703	open	HYQ SV703 AC TA	3	9	5	25	475	99	393000	277000	3	3.1	6	8	4.6	20	15	5.8	42
703	sealed	SV703 C 2VZ TA	3	9	5	15	490	146	322000	259000	3	1.3	7	8	2.0	24	15	2.6	50
703	sealed	HYQ SV703 C 2VZ TA	3	9	5	15	490	102	465000	322000	3	1.4	7	8	2.2	24	15	2.9	50
703	sealed	SV703 AC 2VZ TA	3	9	5	25	475	141	268000	215000	3	2.8	6	8	4.1	20	15	5.2	42
703	sealed	HYQ SV703 AC 2VZ TA	3	9	5	25	475	99	393000	277000	3	3.1	6	8	4.6	20	15	5.8	42
723	open	SV723 C TA	3	10	4	15	505	157	273000	220000	3	1.3	7	8	2.0	24	16	2.6	50
723	open	HYQ SV723 C TA	3	10	4	15	505	110	394000	273000	3	1.5	7	8	2.2	24	16	2.9	50
723	open	SV723 AC TA	3	10	4	25	485	151	228000	182000	3	2.8	6	8	4.1	21	15	5.2	43
723	open	HYQ SV723 AC TA	3	10	4	25	485	106	334000	235000	3	3.1	6	8	4.6	21	15	5.9	43
723	sealed	SV723 C 2VZ TA	3	10	4	15	505	157	273000	220000	3	1.3	7	8	2.0	24	16	2.6	50
723	sealed	HYQ SV723 C 2VZ TA	3	10	4	15	505	110	394000	273000	3	1.5	7	8	2.2	24	16	2.9	50
723	sealed	SV723 AC 2VZ TA	3	10	4	25	485	151	228000	182000	3	2.8	6	8	4.1	21	15	5.2	43
723	sealed	HYQ SV723 AC 2VZ TA	3	10	4	25	485	106	334000	235000	3	3.1	6	8	4.6	21	15	5.9	43
774	open	SV774 C TA	4	7	2	15	231	71	331000	267000	2	0.9	3	4	1.4	11	7	1.8	23
774	open	HYQ SV774 C TA	4	7	2	15	231	50	478000	331000	2	1.0	3	4	1.6	11	7	2.0	23
774	open	SV774 AC TA	4	7	2	25	221	68	276000	221000	2	2.0	3	4	2.9	9	7	3.7	19
774	open	HYQ SV774 AC TA	4	7	2	25	221	47	404000	285000	2	2.3	3	4	3.3	9	7	4.2	19
784	open	SV784 C TA	4	9	2.5	15	345	112	296000	238000	2	1.2	5	6	1.8	16	11	2.4	34
784	open	HYQ SV784 C TA	4	9	2.5	15	345	79	427000	296000	2	1.4	5	6	2.0	16	11	2.7	34
784	open	SV784 AC TA	4	9	2.5	25	330	107	246000	197000	2	2.6	4	5	3.8	14	10	4.9	29
784	open	HYQ SV784 AC TA	4	9	2.5	25	330	75	361000	255000	2	2.9	4	5	4.3	14	10	5.5	29

Other sizes available on request

*Ask our application engineers for more information

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}								
			Bore Diameter	Outside Diameter	Standard Width		Dynamic	Static			Light (L)			Medium (M)			Heavy (S)		
			d	D	B	α	C	C_0	Oil	Grease	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}
			[mm]	[mm]	[mm]	[°]	[N]	[N]	[min⁻¹]	[min⁻¹]	[N]	[N/μm]	[N]	[N]	[N/μm]	[N]	[N]	[N/μm]	[N]
794	open	SV794 C TA	4	11	4	15	850	285	242000	195000	5	1.9	13	13	2.8	42	26	3.8	85
		HYQ SV794 C TA	4	11	4	15	850	200	349000	242000	5	2.1	13	13	3.2	42	26	4.2	85
		SV794 AC TA	4	11	4	25	820	275	202000	161000	5	4.0	11	13	5.8	36	25	7.5	70
		HYQ SV794 AC TA	4	11	4	25	820	194	295000	208000	5	4.5	11	13	6.6	36	25	8.4	70
	sealed	SV794 C 2VZ TA	4	11	4	15	775	249	254000	205000	4	1.7	11	12	2.5	38	24	3.4	80
		HYQ SV794 C 2VZ TA	4	11	4	15	775	174	367000	254000	4	1.9	11	12	2.8	38	24	3.8	80
		SV794 AC 2VZ TA	4	11	4	25	750	241	212000	170000	4	3.6	10	12	5.2	33	23	6.7	65
		HYQ SV794 AC 2VZ TA	4	11	4	25	750	168	310000	219000	4	4.0	10	12	5.9	33	23	7.5	65
704	open	SV704 C TA	4	12	4	15	1220	435	233000	188000	7	2.3	20	19	3.6	65	37	4.9	140
		HYQ SV704 C TA	4	12	4	15	1220	305	336000	233000	7	2.5	20	19	4.0	65	37	5.4	140
		SV704 AC TA	4	12	4	25	1190	425	194000	156000	6	4.7	17	18	7.0	50	36	9.1	110
		HYQ SV704 AC TA	4	12	4	25	1190	295	285000	201000	6	5.3	17	18	7.9	50	36	10.2	110
	sealed	SV704 C 2VZ TA	4	12	4	15	850	285	240000	194000	5	1.9	13	13	2.8	42	26	3.8	85
		HYQ SV704 C 2VZ TA	4	12	4	15	850	201	347000	240000	5	2.1	13	13	3.2	42	26	4.2	85
		SV704 AC 2VZ TA	4	12	4	25	820	275	200000	160000	5	4.0	11	13	5.8	36	25	7.5	70
		HYQ SV704 AC 2VZ TA	4	12	4	25	820	194	293000	207000	5	4.5	11	13	6.6	36	25	8.4	70
724	open	SV724 C TA	4	13	5	15	1340	525	212000	171000	7	2.3	21	21	3.5	65	41	4.7	140
		HYQ SV724 C TA	4	13	5	15	1340	365	306000	212000	7	2.6	21	21	3.9	65	41	5.2	140
		SV724 AC TA	4	13	5	25	1290	505	177000	142000	7	4.8	18	20	7.1	55	39	9.1	110
		HYQ SV724 AC TA	4	13	5	25	1290	355	259000	183000	7	5.4	18	20	8.0	55	39	10.2	110
	sealed	SV724 C 2VZ TA	4	13	5	15	1340	525	212000	171000	7	2.3	21	21	3.5	65	41	4.7	140
		HYQ SV724 C 2VZ TA	4	13	5	15	1340	365	306000	212000	7	2.6	21	21	3.9	65	41	5.2	140
		SV724 AC 2VZ TA	4	13	5	25	1290	505	177000	142000	7	4.8	18	20	7.1	55	39	9.1	110
		HYQ SV724 AC 2VZ TA	4	13	5	25	1290	355	259000	183000	7	5.4	18	20	8.0	55	39	10.2	110
775	open	SV775 C TA	5	8	2	15	273	97	280000	225000	2	1.2	4	5	1.8	12	9	2.3	27
		HYQ SV775 C TA	5	8	2	15	273	67	404000	280000	2	1.3	4	5	2.0	12	9	2.6	27
		SV775 AC TA	5	8	2	25	255	92	233000	187000	2	2.5	3	4	3.7	11	8	4.7	22
		HYQ SV775 AC TA	5	8	2	25	255	64	342000	241000	2	2.8	3	4	4.1	11	8	5.2	22
785	open	SV785 C TA	5	11	3	15	630	232	225000	182000	4	1.7	9	10	2.6	30	19	3.5	65
		HYQ SV785 C TA	5	11	3	15	630	162	325000	225000	4	1.9	9	10	2.9	30	19	3.9	65
		SV785 AC TA	5	11	3	25	605	222	188000	150000	4	3.7	8	10	5.4	26	19	7.0	50
		HYQ SV785 AC TA	5	11	3	25	605	155	275000	194000	4	4.2	8	10	6.1	26	19	7.8	50
	sealed	SV785 C 2VZ TA	5	11	5	15	630	228	237000	191000	4	1.7	9	10	2.6	30	19	3.5	65
		HYQ SV785 C 2VZ TA	5	11	5	15	630	159	343000	237000	4	1.9	9	10	2.9	30	19	3.9	65
		SV785 AC 2VZ TA	5	11	5	25	605	218	198000	158000	4	3.7	8	10	5.4	26	19	7.0	50
		HYQ SV785 AC 2VZ TA	5	11	5	25	605	153	290000	204000	4	4.2	8	10	6.1	26	19	7.8	50

Other sizes available on request

*Ask our appplication engineers for more information

Spindle Bearings - Product Tables

Basic Part Number			Dimensions: Bore Diameter d [mm]	Dimensions: Outside Diameter D [mm]	Dimensions: Standard Width B [mm]	Contact Angle α [°]	Load Rating: Dynamic C [N]	Load Rating: Static C_0 [N]		*Limiting Speed: Oil [min^{-1}]	*Limiting Speed: Grease [min^{-1}]	Light (L) F_{va} [N]	Light (L) c_a [N/µm]	Light (L) K_{aE} [N]	Medium (M) F_{va} [N]	Medium (M) c_a [N/µm]	Medium (M) K_{aE} [N]	Heavy (S) F_{va} [N]	Heavy (S) c_a [N/µm]	Heavy (S) K_{aE} [N]
795	open	SV795 C TA	5	13	4	15	1180	525		198000	160000	6	2.5	18	18	3.8	60	36	5.1	130
795	open	HYQ SV795 C TA	5	13	4	15	1180	365		286000	198000	6	2.8	18	18	4.2	60	36	5.7	130
795	open	SV795 AC TA	5	13	4	25	1120	505		165000	132000	6	5.2	16	17	7.6	50	34	9.8	100
795	open	HYQ SV795 AC TA	5	13	4	25	1120	350		242000	171000	6	5.8	16	17	8.5	50	34	10.9	100
795	sealed	SV795 C 2VZ TA	5	13	4	15	1180	525		198000	160000	6	2.5	18	18	3.8	60	36	5.1	130
795	sealed	HYQ SV795 C 2VZ TA	5	13	4	15	1180	365		286000	198000	6	2.8	18	18	4.2	60	36	5.7	130
795	sealed	SV795 AC 2VZ TA	5	13	4	25	1120	505		165000	132000	6	5.2	16	17	7.6	50	34	9.8	100
795	sealed	HYQ SV795 AC 2VZ TA	5	13	4	25	1120	350		242000	171000	6	5.8	16	17	8.5	50	34	10.9	100
705	open	SV705 C TA	5	14	5	15	1460	615		194000	156000	8	2.5	22	22	3.9	70	44	5.3	160
705	open	HYQ SV705 C TA	5	14	5	15	1460	430		280000	194000	8	2.8	22	22	4.4	70	44	5.8	160
705	open	SV705 AC TA	5	14	5	25	1400	595		162000	130000	7	5.4	20	21	7.9	60	42	10.2	120
705	open	HYQ SV705 AC TA	5	14	5	25	1400	415		237000	167000	7	6.0	20	21	8.9	60	42	11.4	120
705	sealed	SV705 C 2VZ TA	5	14	5	15	1460	615		194000	156000	8	2.5	22	22	3.9	70	44	5.3	160
705	sealed	HYQ SV705 C 2VZ TA	5	14	5	15	1460	430		280000	194000	8	2.8	22	22	4.4	70	44	5.8	160
705	sealed	SV705 AC 2VZ TA	5	14	5	25	1400	595		162000	130000	7	5.4	20	21	7.9	60	42	10.2	120
705	sealed	HYQ SV705 AC 2VZ TA	5	14	5	25	1400	415		237000	167000	7	6.0	20	21	8.9	60	42	11.4	120
725	open	SV725 C TA	5	16	5	15	1760	805		167000	135000	9	3.0	27	27	4.7	90	55	6.3	190
725	open	HYQ SV725 C TA	5	16	5	15	1760	565		241000	167000	9	3.4	27	27	5.2	90	55	7.0	190
725	open	SV725 AC TA	5	16	5	25	1680	775		139000	112000	9	6.4	24	26	9.4	75	55	12.0	150
725	open	HYQ SV725 AC TA	5	16	5	25	1680	540		204000	144000	9	7.1	24	26	10.5	75	55	13.5	150
725	sealed	SV725 C 2VZ TA	5	16	5	15	1760	805		167000	135000	9	3.0	27	27	4.7	90	55	6.3	190
725	sealed	HYQ SV725 C 2VZ TA	5	16	5	15	1760	565		241000	167000	9	3.4	27	27	5.2	90	55	7.0	190
725	sealed	SV725 AC 2VZ TA	5	16	5	25	1680	775		139000	112000	9	6.4	24	26	9.4	75	55	12.0	150
725	sealed	HYQ SV725 AC 2VZ TA	5	16	5	25	1680	540		204000	144000	9	7.1	24	26	10.5	75	55	13.5	150
776	open	SV776 C TA	6	10	3	15	380	145		225000	182000	2	1.4	5	6	2.1	18	12	2.7	38
776	open	HYQ SV776 C TA	6	10	3	15	380	102		325000	225000	2	1.5	5	6	2.3	18	12	3.0	38
776	open	SV776 AC TA	6	10	3	25	360	138		188000	150000	2	3.0	5	6	4.3	15	11	5.5	32
776	open	HYQ SV776 AC TA	6	10	3	25	360	97		275000	194000	2	3.3	5	6	4.8	15	11	6.2	32
786	open	SV786 C TA	6	13	3.5	15	1170	535		186000	150000	6	2.5	18	18	3.8	60	36	5.1	130
786	open	HYQ SV786 C TA	6	13	3.5	15	1170	375		269000	186000	6	2.7	18	18	4.2	60	36	5.7	130
786	open	SV786 AC TA	6	13	3.5	25	1120	515		155000	124000	6	5.2	16	17	7.6	50	34	9.8	100
786	open	HYQ SV786 AC TA	6	13	3.5	25	1120	360		227000	160000	6	5.8	16	17	8.5	50	34	10.9	100
786	sealed	SV786 C 2VZ TA	6	13	5	15	935	345		198000	160000	5	2.1	14	15	3.1	46	29	4.2	95
786	sealed	HYQ SV786 C 2VZ TA	6	13	5	15	935	240		286000	198000	5	2.3	14	15	3.5	46	29	4.6	95
786	sealed	SV786 AC 2VZ TA	6	13	5	25	895	330		165000	132000	5	4.4	12	14	6.5	39	27	8.3	80
786	sealed	HYQ SV786 AC 2VZ TA	6	13	5	25	895	230		242000	171000	5	5.0	12	14	7.2	39	27	9.3	80

Preload F_{va} / Axial Rigidity c_a / Unloading Force K_{aE}

Other sizes available on request

*Ask our appplication engineers for more information

Spindle Bearings - Product Tables

Series	Type	Basic Part Number	Dimensions			Contact Angle	Load Rating			*Limiting Speed		Preload F_{va} / Axial Rigidity c_a / Unloading Force K_{aE}								
			Bore Diameter	Outside Diameter	Standard Width		Dynamic	Static				Light (L)			Medium (M)			Heavy (S)		
			d	D	B	α	C	C_0		Oil	Grease	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}
			[mm]	[mm]	[mm]	[°]	[N]	[N]		[min⁻¹]	[min⁻¹]	[N]	[N/µm]	[N]	[N]	[N/µm]	[N]	[N]	[N/µm]	[N]
786	sealed	SV786 C W3.5 2VZ TA	6	13	3.5	15	730	305		224000	176000	4	2.1	11	11	3.1	36	22	4.2	75
		HYQ SV786 C W3.5 2VZ TA	6	13	3.5	15	730	214		320000	213000	4	2.3	11	11	3.5	36	22	4.7	75
		SV786 AC W3.5 2VZ TA	6	13	3.5	25	695	290		187000	150000	4	4.4	10	11	6.4	30	21	8.2	60
		HYQ SV786 AC W3.5 2VZ TA	6	13	3.5	25	695	204		272000	187000	4	4.9	10	11	7.2	30	21	9.2	60
796	open	SV796 C TA	6	15	5	15	1470	645		172000	139000	8	2.6	23	23	3.9	75	45	5.3	160
		HYQ SV796 C TA	6	15	5	15	1470	450		248000	172000	8	2.9	23	23	4.4	75	45	5.8	160
		SV796 AC TA	6	15	5	25	1400	620		143000	115000	7	5.4	20	21	7.9	60	42	10.2	120
		HYQ SV796 AC TA	6	15	5	25	1400	435		210000	148000	7	6.0	20	21	8.9	60	42	11.4	120
	sealed	SV796 C 2VZ TA	6	15	5	15	1470	645		172000	139000	8	2.6	23	23	3.9	75	45	5.3	160
		HYQ SV796 C 2VZ TA	6	15	5	15	1470	450		248000	172000	8	2.9	23	23	4.4	75	45	5.8	160
		SV796 AC 2VZ TA	6	15	5	25	1400	620		143000	115000	7	5.4	20	21	7.9	60	42	10.2	120
		HYQ SV796 AC 2VZ TA	6	15	5	25	1400	435		210000	148000	7	6.0	20	21	8.9	60	42	11.4	120
706	open	SV706 C TA	6	17	6	15	2550	1090		157000	127000	13	3.8	41	39	6.1	130	80	8.3	300
		HYQ SV706 C TA	6	17	6	15	2550	765		227000	157000	13	4.3	41	39	6.7	130	80	9.1	300
		SV706 AC TA	6	17	6	25	2470	1050		131000	105000	13	8.0	36	38	11.8	110	75	15.3	230
		HYQ SV706 AC TA	6	17	6	25	2470	740		192000	135000	13	9.0	36	38	13.2	110	75	17.1	230
	sealed	SV706 C 2VZ TA	6	17	6	15	2500	1050		169000	136000	13	3.8	40	38	6.0	130	75	8.2	290
		HYQ SV706 C 2VZ TA	6	17	6	15	2500	735		243000	169000	13	4.3	40	38	6.7	130	75	9.0	290
		SV706 AC 2VZ TA	6	17	6	25	2440	1020		141000	113000	13	7.9	35	37	11.8	110	75	15.2	230
		HYQ SV706 AC 2VZ TA	6	17	6	25	2440	715		206000	145000	13	8.9	35	37	13.2	110	75	17.0	230
726	open	SV726 C TA	6	19	6	15	2710	1220		139000	112000	14	4.1	43	41	6.4	140	85	8.8	310
		HYQ SV726 C TA	6	19	6	15	2710	860		200000	139000	14	4.6	43	41	7.1	140	85	9.7	310
		SV726 AC TA	6	19	6	25	2620	1180		116000	93000	14	8.6	38	40	12.7	110	80	16.4	240
		HYQ SV726 AC TA	6	19	6	25	2620	825		170000	120000	14	9.6	38	40	14.2	110	80	18.3	240
	sealed	SV726 C 2VZ TA	6	19	6	15	1950	945		163000	128000	10	3.7	31	30	5.8	100	60	8.0	230
		HYQ SV726 C 2VZ TA	6	19	6	15	1950	660		232000	155000	10	4.1	31	30	6.5	100	60	8.8	230
		SV726 AC 2VZ TA	6	19	6	25	1870	905		136000	109000	10	7.6	27	29	9.4	85	60	14.7	170
		HYQ SV726 AC 2VZ TA	6	19	6	25	1870	630		197000	136000	10	8.6	27	29	12.7	85	60	16.4	170
777	open	SV777 C TA	7	11	3	15	435	186		200000	162000	3	1.7	6	7	2.5	20	14	3.3	44
		HYQ SV777 C TA	7	11	3	15	435	130		289000	200000	3	1.9	6	7	2.8	20	14	3.7	44
		SV777 AC TA	7	11	3	25	410	176		167000	134000	3	3.6	5	7	5.2	17	13	6.7	36
		HYQ SV777 AC TA	7	11	3	25	410	123		245000	173000	3	3.8	5	7	5.6	17	13	7.1	36
787	open	SV787 C TA	7	14	3.5	15	1060	430		177000	143000	6	2.4	16	16	3.7	50	32	4.9	110
		HYQ SV787 C TA	7	14	3.5	15	1060	300		255000	177000	6	2.7	16	16	4.1	50	32	5.4	110
		SV787 AC TA	7	14	3.5	25	1010	410		148000	118000	6	5.2	14	16	7.6	44	31	9.7	90
		HYQ SV787 AC TA	7	14	3.5	25	1010	285		216000	152000	6	5.8	14	16	8.5	44	31	10.9	90
	sealed	SV787 C 2VZ TA	7	14	5	15	1060	430		177000	143000	6	2.4	16	16	3.7	50	32	4.9	110
		HYQ SV787 C 2VZ TA	7	14	5	15	1060	300		255000	177000	6	2.7	16	16	4.1	50	32	5.4	110
		SV787 AC 2VZ TA	7	14	5	25	1010	410		148000	118000	6	5.2	14	16	7.6	44	31	9.7	90
		HYQ SV787 AC 2VZ TA	7	14	5	25	1010	285		216000	152000	6	5.8	14	16	8.5	44	31	10.9	90

Other sizes available on request

*Ask our appplication engineers for more information

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}								
			Bore Diameter	Outside Diameter	Standard Width		Dynamic	Static			Light (L)			Medium (M)			Heavy (S)		
			d	D	B	α	C	C_0	Oil	Grease	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}
			[mm]	[mm]	[mm]	[°]	[N]	[N]	[min⁻¹]	[min⁻¹]	[N]	[N/μm]	[N]	[N]	[N/μm]	[N]	[N]	[N/μm]	[N]
797	open	SV797 C TA	7	17	5	15	2480	1050	154000	124000	13	3.7	40	38	5.8	130	75	7.9	280
		HYQ SV797 C TA	7	17	5	15	2480	735	223000	154000	13	4.1	40	38	6.5	130	75	8.8	280
		SV797 AC TA	7	17	5	25	2400	1010	129000	103000	12	7.7	35	36	11.5	100	75	14.8	220
		HYQ SV797 AC TA	7	17	5	25	2400	710	189000	133000	12	8.7	35	36	12.8	100	75	16.6	220
	sealed	SV797 C 2VZ TA	7	17	5	15	1880	915	178000	140000	10	3.3	29	29	5.1	95	60	6.8	200
		HYQ SV797 C 2VZ TA	7	17	5	15	1880	640	255000	170000	10	3.7	29	29	5.6	95	60	7.6	200
		SV797 AC 2VZ TA	7	17	5	25	1790	880	149000	119000	9	6.9	26	27	10.2	80	55	13.1	160
		HYQ SV797 AC 2VZ TA	7	17	5	25	1790	615	217000	149000	9	7.8	26	27	11.4	80	55	14.7	160
707	open	SV707 C TA	7	19	6	15	2710	1220	139000	112000	14	4.1	43	41	6.4	140	85	8.8	310
		HYQ SV707 C TA	7	19	6	15	2710	860	200000	139000	14	4.6	43	41	7.1	140	85	9.7	310
		SV707 AC TA	7	19	6	25	2620	1180	116000	93000	14	8.6	38	40	12.7	110	80	16.4	240
		HYQ SV707 AC TA	7	19	6	25	2620	825	170000	120000	14	9.6	38	40	14.2	110	80	18.3	240
	sealed	SV707 C 2VZ TA	7	19	6	15	1950	945	163000	128000	10	3.7	31	30	5.8	100	60	8.0	230
		HYQ SV707 C 2VZ TA	7	19	6	15	1950	660	232000	155000	10	4.1	31	30	6.5	100	60	8.8	230
		SV707 AC 2VZ TA	7	19	6	25	1870	905	136000	109000	10	7.6	27	29	11.3	85	60	14.7	170
		HYQ SV707 AC 2VZ TA	7	19	6	25	1870	630	197000	136000	10	8.6	27	29	12.7	85	60	16.4	170
727	open	SV727 C TA	7	22	7	15	3630	1590	120000	97000	19	4.4	55	55	6.9	190	110	9.4	410
		HYQ SV727 C TA	7	22	7	15	3630	1110	174000	120000	19	5.0	55	55	7.7	190	110	10.4	410
		SV727 AC TA	7	22	7	25	3510	1540	100000	80000	18	9.3	50	55	13.7	150	110	17.7	320
		HYQ SV727 AC TA	7	22	7	25	3510	1080	147000	104000	18	10.4	50	55	15.4	150	110	19.8	320
	sealed	SV727 C 2VZ TA	7	22	7	15	2830	1340	146000	115000	15	4.3	46	43	6.7	150	85	9.2	330
		HYQ SV727 C 2VZ TA	7	22	7	15	2830	935	209000	139000	15	4.8	46	43	7.5	150	85	10.1	330
		SV727 AC 2VZ TA	7	22	7	25	2710	1280	122000	98000	14	8.8	39	41	13.1	120	85	17.0	250
		HYQ SV727 AC 2VZ TA	7	22	7	25	2710	900	177000	122000	14	9.9	39	41	14.6	120	85	18.9	250
778	open	SV778 C TA	8	12	2.5	15	465	215	180000	145000	3	1.9	7	7	2.8	22	14	3.7	46
		HYQ SV778 C TA	8	12	2.5	15	465	150	260000	180000	3	2.1	7	7	3.1	22	14	4.1	46
		SV778 AC TA	8	12	2.5	25	440	204	150000	120000	3	4.0	6	7	5.8	19	14	7.4	39
		HYQ SV778 AC TA	8	12	2.5	25	440	142	220000	155000	3	4.5	6	7	6.5	19	14	8.3	39
788	open	SV788 C TA	8	16	4	15	1830	840	150000	121000	10	3.4	30	28	5.4	95	55	7.3	210
		HYQ SV788 C TA	8	16	4	15	1830	585	217000	150000	10	3.8	30	28	6.0	95	55	8.1	210
		SV788 AC TA	8	16	4	25	1750	805	125000	100000	9	7.0	25	27	10.4	80	55	13.5	160
		HYQ SV788 AC TA	8	16	4	25	1750	560	184000	130000	9	7.9	25	27	11.7	80	55	15.1	160
	closed	SV788 C W4 2VZ TA	8	16	4	15	1380	740	181000	142000	7	7.2	20	21	10.6	60	42	13.8	130
		HYQ SV788 C W4 2VZ TA	8	16	4	15	1380	515	258000	172000	7	8.1	20	21	11.9	60	42	15.4	130
		SV788 AC W4 2VZ TA	8	16	4	25	1300	700	151000	121000	7	6.5	18	20	9.5	55	39	12.2	110
		HYQ SV788 AC W4 2VZ TA	8	16	4	25	1300	490	219000	151000	7	7.3	18	20	10.6	55	39	13.7	110

Other sizes available on request

*Ask our application engineers for more information

Series	Type	Basic Part Number	Dimensions: Bore Diameter d [mm]	Dimensions: Outside Diameter D [mm]	Dimensions: Standard Width B [mm]	Contact Angle α [°]	Load Rating: Dynamic C [N]	Load Rating: Static C_0 [N]	*Limiting Speed: Oil [min^{-1}]	*Limiting Speed: Grease [min^{-1}]	Light (L) F_{va} [N]	Light (L) c_a [N/µm]	Light (L) K_{aE} [N]	Medium (M) F_{va} [N]	Medium (M) c_a [N/µm]	Medium (M) K_{aE} [N]	Heavy (S) F_{va} [N]	Heavy (S) c_a [N/µm]	Heavy (S) K_{aE} [N]
798	open	SV798 C TA	8	19	6	15	2710	1220	139000	112000	14	4.1	43	41	6.4	140	85	8.8	310
		HYQ SV798 C TA	8	19	6	15	2710	860	200000	139000	14	4.6	43	41	7.1	140	85	9.7	310
		SV798 AC TA	8	19	6	25	2620	1180	116000	93000	14	8.6	38	40	12.7	110	80	16.4	240
		HYQ SV798 AC TA	8	19	6	25	2620	825	170000	120000	14	9.6	38	40	14.2	110	80	18.3	240
	sealed	SV798 C 2VZ TA	8	19	6	15	1950	945	163000	128000	10	3.7	31	30	5.8	100	60	8.0	230
		HYQ SV798 C 2VZ TA	8	19	6	15	1950	660	232000	155000	10	4.1	31	30	6.5	100	60	8.8	230
		SV798 AC 2VZ TA	8	19	6	25	1870	905	136000	109000	10	7.6	27	29	11.3	85	60	14.7	170
		HYQ SV798 AC 2VZ TA	8	19	6	25	1870	630	197000	136000	10	8.6	27	29	12.7	85	60	16.4	170
708	open	SV708 C TA	8	22	7	15	3630	1590	120000	97000	19	4.4	55	55	6.9	190	110	9.4	410
		HYQ SV708 C TA	8	22	7	15	3630	1110	174000	120000	19	5.0	55	55	7.7	190	110	10.4	410
		SV708 AC TA	8	22	7	25	3510	1540	100000	80000	18	9.3	50	55	13.7	150	110	17.7	320
		HYQ SV708 AC TA	8	22	7	25	3510	1080	147000	104000	18	10.4	50	55	15.4	150	110	19.8	320
	sealed	SV708 C 2VZ TA	8	22	7	15	2830	1340	146000	115000	15	4.3	46	43	6.7	150	85	9.2	330
		HYQ SV708 C 2VZ TA	8	22	7	15	2830	935	209000	139000	15	4.8	46	43	7.5	150	85	10.1	330
		SV708 AC 2VZ TA	8	22	7	25	2710	1280	122000	98000	14	8.8	39	41	13.1	120	85	17.0	250
		HYQ SV708 AC 2VZ TA	8	22	7	25	2710	900	177000	122000	14	9.9	39	41	14.6	120	85	18.9	250
728	open	SV728 C TA	8	24	8	15	4380	1820	113000	91000	22	4.5	65	70	7.0	220	135	9.4	490
		HYQ SV728 C TA	8	24	8	15	4380	1280	163000	113000	22	5.0	65	70	7.8	220	135	10.4	490
		SV728 AC TA	8	24	8	25	4260	1770	94000	75000	22	9.5	60	65	14.0	190	130	18.1	390
		HYQ SV728 AC TA	8	24	8	25	4260	1240	138000	97000	22	10.7	60	65	15.7	190	130	20.2	390
	sealed	SV728 C 2VZ TA	8	24	8	15	3650	1610	137000	108000	19	4.5	55	55	6.9	190	110	9.4	410
		HYQ SV728 C 2VZ TA	8	24	8	15	3650	1130	195000	130000	19	5.0	55	55	7.7	190	110	10.4	410
		SV728 AC 2VZ TA	8	24	8	25	3530	1560	114000	91000	18	9.3	50	55	13.8	160	110	17.8	330
		HYQ SV728 AC 2VZ TA	8	24	8	25	3530	1090	166000	114000	18	10.5	50	55	15.4	160	110	19.9	330
779	open	SV779 C TA	9	14	3	15	790	370	157000	127000	4	2.4	11	12	3.6	38	24	4.8	80
		HYQ SV779 C TA	9	14	3	15	790	255	227000	157000	4	2.7	11	12	4.0	38	24	5.3	80
		SV779 AC TA	9	14	3	25	750	350	131000	105000	4	5.1	10	12	7.5	32	23	9.6	65
		HYQ SV779 AC TA	9	14	3	25	750	246	192000	135000	4	5.8	10	12	8.4	32	23	10.7	65
789	open	SV789 C TA	9	17	4	15	1950	945	139000	112000	10	3.7	31	30	5.8	100	60	8.0	230
		HYQ SV789 C TA	9	17	4	15	1950	660	200000	139000	10	4.1	31	30	6.5	100	60	8.8	230
		SV789 AC TA	9	17	4	25	1870	905	116000	93000	10	7.6	27	29	11.3	85	60	14.7	170
		HYQ SV789 AC TA	9	17	4	25	1870	635	170000	120000	10	8.6	27	29	12.7	85	60	16.4	170
	sealed	SV789 C 2VZ TA	9	17	4	15	1420	800	167000	131000	8	3.3	22	22	5.0	70	43	6.7	150
		HYQ SV789 C 2VZ TA	9	17	4	15	1420	560	238000	159000	8	3.6	22	22	5.6	70	43	7.5	150
		SV789 AC 2VZ TA	9	17	4	25	1350	745	139000	111000	7	6.9	19	21	10.1	60	41	13.0	120
		HYQ SV789 AC 2VZ TA	9	17	4	25	1350	520	202000	139000	7	7.7	19	21	11.3	60	41	14.5	120

Preload F_{va} / Axial Rigidity c_a / Unloading Force K_{aE}

Other sizes available on request

*Ask our application engineers for more information

Spindle Bearings - Product Tables

Series	Type	Basic Part Number	Dimensions: Bore Diameter d [mm]	Dimensions: Outside Diameter D [mm]	Dimensions: Standard Width B [mm]	Contact Angle α [°]	Load Rating: Dynamic C [N]	Load Rating: Static C_0 [N]	*Limiting Speed: Oil [min^{-1}]	*Limiting Speed: Grease [min^{-1}]	Light (L) F_{va} [N]	Light (L) c_a [N/µm]	Light (L) K_{aE} [N]	Medium (M) F_{va} [N]	Medium (M) c_a [N/µm]	Medium (M) K_{aE} [N]	Heavy (S) F_{va} [N]	Heavy (S) c_a [N/µm]	Heavy (S) K_{aE} [N]
799	open	SV799 C TA	9	20	6	15	2920	1400	126000	101000	15	4.5	47	44	7.0	150	90	9.6	330
		HYQ SV799 C TA	9	20	6	15	2920	985	181000	126000	15	5.0	47	44	7.8	150	90	10.5	330
		SV799 AC TA	9	20	6	25	2800	1350	105000	84000	14	9.3	41	42	13.8	120	85	17.8	260
		HYQ SV799 AC TA	9	20	6	25	2800	945	154000	108000	14	10.5	41	42	15.4	120	85	19.9	260
	sealed	SV799 C 2VZ TA	9	20	6	15	2180	1150	149000	117000	11	4.3	35	33	6.7	110	70	9.2	250
		HYQ SV799 C 2VZ TA	9	20	6	15	2180	805	213000	142000	11	4.8	35	33	7.5	110	70	10.1	250
		SV799 AC 2VZ TA	9	20	6	25	2080	1090	124000	99000	11	8.9	30	32	13.1	95	65	17.0	190
		HYQ SV799 AC 2VZ TA	9	20	6	25	2080	765	181000	124000	11	9.9	30	32	14.7	95	65	19.0	190
709	open	SV709 C TA	9	24	7	15	3940	1820	114000	92000	20	4.9	60	60	7.6	200	120	10.3	450
		HYQ SV709 C TA	9	24	7	15	3940	1270	164000	114000	20	5.5	60	60	8.5	200	120	11.4	450
		SV709 AC TA	9	24	7	25	3800	1750	95000	76000	19	10.2	55	60	15.1	170	115	19.5	350
		HYQ SV709 AC TA	9	24	7	25	3800	1230	139000	98000	19	11.5	55	60	16.9	170	115	21.8	350
	sealed	SV709 C 2VZ TA	9	24	7	15	3940	1820	114000	92000	20	4.9	60	60	7.6	200	120	10.3	450
		HYQ SV709 C 2VZ TA	9	24	7	15	3940	1270	164000	114000	20	5.5	60	60	8.5	200	120	11.4	450
		SV709 AC 2VZ TA	9	24	7	25	3800	1750	95000	76000	19	10.2	55	60	15.1	170	115	19.5	350
		HYQ SV709 AC 2VZ TA	9	24	7	25	3800	1230	139000	98000	19	11.5	55	60	16.9	170	115	21.8	350
729	open	SV729 C TA	9	26	8	15	5230	2420	100000	81000	27	5.5	80	80	8.6	270	160	11.6	580
		HYQ SV729 C TA	9	26	8	15	5230	1690	145000	100000	27	6.2	80	80	9.5	270	160	12.8	580
		SV729 AC TA	9	26	8	25	5060	2340	84000	67000	26	11.7	70	80	17.2	220	155	22.2	460
		HYQ SV729 AC TA	9	26	8	25	5060	1640	123000	87000	26	13.2	70	80	19.3	220	155	24.8	460
	sealed	SV729 C 2VZ TA	9	26	8	15	3980	1890	121000	95000	20	4.9	60	60	7.7	210	120	10.4	450
		HYQ SV729 C 2VZ TA	9	26	8	15	3980	1320	173000	115000	20	5.5	60	60	8.5	210	120	11.5	450
		SV729 AC 2VZ TA	9	26	8	25	3820	1810	101000	81000	20	10.3	55	60	15.1	170	115	19.6	350
		HYQ SV729 AC 2VZ TA	9	26	8	25	3820	1270	147000	101000	20	11.5	55	60	17.0	170	115	21.9	350
7700	open	SV7700 C TA	10	15	3	15	815	400	144000	116000	5	2.5	12	13	3.8	39	25	5.0	80
		HYQ SV7700 C TA	10	15	3	15	815	280	208000	144000	5	2.8	12	13	4.2	39	25	5.6	80
		SV7700 AC TA	10	15	3	25	770	375	120000	96000	4	5.4	11	12	7.9	33	24	10.0	65
		HYQ SV7700 AC TA	10	15	3	25	770	265	176000	124000	4	6.1	11	12	8.8	33	24	11.3	65
7800	open	SV7800 C TA	10	19	5	15	2070	1050	126000	102000	11	4.0	33	32	6.3	110	65	8.6	240
		HYQ SV7800 C TA	10	19	5	15	2070	740	182000	126000	11	4.5	33	32	7.0	110	65	9.5	240
		SV7800 AC TA	10	19	5	25	1970	1010	105000	84000	10	8.2	28	30	12.2	90	60	15.8	180
		HYQ SV7800 AC TA	10	19	5	25	1970	705	154000	109000	10	9.3	28	30	13.7	90	60	17.7	180
	sealed	SV7800 C 2VZ TA	10	19	5	15	1570	895	150000	118000	8	3.9	25	24	6.2	80	48	8.4	180
		HYQ SV7800 C 2VZ TA	10	19	5	15	1570	625	215000	143000	8	4.4	25	24	6.8	80	48	9.2	180
		SV7800 AC 2VZ TA	10	19	5	25	1490	850	125000	100000	8	8.1	21	23	12.0	65	45	15.5	140
		HYQ SV7800 AC 2VZ TA	10	19	5	25	1490	595	183000	125000	8	9.1	21	23	13.4	65	45	17.3	140

Preload F_{va} / Axial Rigidity c_a / Unloading Force K_{aE}

Other sizes available on request

*Ask our application engineers for more information

Basic Part Number			Dimensions			Contact Angle	Load Rating		*Limiting Speed		Preload F_{va} / Axial Rigidity c_a / Unloading Force K_{aE}								
			Bore Diameter	Outside Diameter	Standard Width		Dynamic	Static			Light (L)			Medium (M)			Heavy (S)		
			d	D	B	α	C	C_0	Oil	Grease	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}
			[mm]	[mm]	[mm]	[°]	[N]	[N]	[min^{-1}]	[min^{-1}]	[N]	[N/µm]	[N]	[N]	[N/µm]	[N]	[N]	[N/µm]	[N]
7900	open	SV7900 C TA	10	22	6	15	3030	1530	113000	91000	16	4.7	49	46	7.3	160	95	10.0	350
		HYQ SV7900 C TA	10	22	6	15	3030	1070	163000	113000	16	5.2	49	46	8.1	160	95	11.0	350
		SV7900 AC TA	10	22	6	25	2890	1460	94000	75000	15	9.6	42	44	14.2	130	90	18.4	270
		HYQ SV7900 AC TA	10	22	6	25	2890	1020	138000	97000	15	10.8	42	44	15.9	130	90	20.6	270
	sealed	SV7900 C 2VZ TA	10	22	6	15	2160	1180	135000	106000	11	4.3	35	33	6.7	110	65	9.1	250
		HYQ SV7900 C 2VZ TA	10	22	6	15	2160	825	193000	129000	11	4.8	35	33	7.4	110	65	10.1	250
		SV7900 AC 2VZ TA	10	22	6	25	2060	1120	113000	90000	11	8.8	30	31	13.1	90	65	16.9	190
		HYQ SV7900 AC 2VZ TA	10	22	6	25	2060	780	164000	113000	11	9.9	30	31	14.6	90	65	18.9	190
7000	open	SV7000 C TA	10	26	8	15	5230	2420	100000	81000	27	5.5	80	80	8.6	270	160	11.6	580
		HYQ SV7000 C TA	10	26	8	15	5230	1690	145000	100000	27	6.2	80	80	9.5	270	160	12.8	580
		SV7000 AC TA	10	26	8	25	5060	2340	84000	67000	26	11.7	70	80	17.2	220	155	22.2	460
		HYQ SV7000 AC TA	10	26	8	25	5060	1640	123000	87000	26	13.2	70	80	19.3	220	155	24.8	460
	sealed	SV7000 C 2VZ TA	10	26	8	15	3980	1890	104000	84000	20	4.9	60	60	7.7	210	120	10.4	450
		HYQ SV7000 C 2VZ TA	10	26	8	15	3980	1320	150000	104000	20	5.5	60	60	8.5	210	120	11.5	450
		SV7000 AC 2VZ TA	10	26	8	25	3820	1810	87000	69000	20	10.3	55	60	15.1	170	115	19.6	350
		HYQ SV7000 AC 2VZ TA	10	26	8	25	3820	1270	127000	90000	20	11.5	55	60	17.0	170	115	21.9	350
7200	open	SV7200 C TA	10	30	9	15	6250	3290	86000	69000	32	6.8	100	95	10.6	330	190	14.4	720
		HYQ SV7200 C TA	10	30	9	15	6250	2300	124000	86000	32	7.5	100	95	11.7	330	190	15.9	720
		SV7200 AC TA	10	30	9	25	6010	3160	72000	57000	31	14.0	85	95	20.7	270	185	26.8	560
		HYQ SV7200 AC TA	10	30	9	25	6010	2210	105000	74000	31	15.7	85	95	23.2	270	185	30.0	560
	sealed	SV7200 C 2VZ TA	10	30	9	15	6250	3290	86000	69000	32	6.8	100	95	10.6	330	190	14.4	720
		HYQ SV7200 C 2VZ TA	10	30	9	15	6250	2300	124000	86000	32	7.5	100	95	11.7	330	190	15.9	720
		SV7200 AC 2VZ TA	10	30	9	25	6010	3160	72000	57000	31	14.0	85	95	20.7	270	185	26.8	560
		HYQ SV7200 AC 2VZ TA	10	30	9	25	6010	2210	105000	74000	31	15.7	85	95	23.2	270	185	30.0	560
7701	open	SV7701 C TA	12	18	3	15	875	485	120000	97000	5	2.9	13	14	4.3	41	27	5.7	85
		HYQ SV7701 C TA	12	18	3	15	875	335	174000	120000	5	3.2	13	14	4.8	41	27	6.3	85
		SV7701 AC TA	12	18	3	25	825	455	100000	80000	5	6.2	11	13	9.0	36	25	11.4	70
		HYQ SV7701 AC TA	12	18	3	25	825	320	147000	104000	5	6.9	11	13	10.1	36	25	12.8	70
7801	open	SV7801 C TA	12	21	5	15	2260	1280	110000	88000	12	4.5	36	34	7.1	120	70	9.7	260
		HYQ SV7801 C TA	12	21	5	15	2260	900	158000	110000	12	5.1	36	34	7.9	120	70	10.7	260
		SV7801 AC TA	12	21	5	25	2150	1220	91000	73000	11	9.4	31	33	13.9	95	65	18.0	200
		HYQ SV7801 AC TA	12	21	5	25	2150	855	134000	94000	11	10.6	31	33	15.6	95	65	20.1	200
	sealed	SV7801 C 2VZ TA	12	21	5	15	1600	985	129000	101000	8	4.1	25	24	6.4	85	48	8.8	180
		HYQ SV7801 C 2VZ TA	12	21	5	15	1600	690	183000	122000	8	4.6	25	24	7.1	85	48	9.6	180
		SV7801 AC 2VZ TA	12	21	5	25	1520	935	107000	86000	8	8.5	22	23	12.6	65	46	16.2	140
		HYQ SV7801 AC 2VZ TA	12	21	5	25	1520	655	156000	107000	8	9.5	22	23	14.1	65	46	18.2	140

Other sizes available on request

*Ask our application engineers for more information

Basic Part Number			Dimensions			Contact Angle	Load Rating			*Limiting Speed		Preload F_{va} / Axial Rigidity c_a / Unloading Force K_{aE}								
			Bore Diameter	Outside Diameter	Standard Width		Dynamic	Static				Light (L)			Medium (M)			Heavy (S)		
			d	D	B	α	C	C_0		Oil	Grease	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}
			[mm]	[mm]	[mm]	[°]	[N]	[N]		[min⁻¹]	[min⁻¹]	[N]	[N/µm]	[N]	[N]	[N/µm]	[N]	[N]	[N/µm]	[N]
7901	open	SV7901 C TA	12	24	6	15	3380	1850		105000	85000	17	5.4	50	55	8.5	180	105	11.5	390
		HYQ SV7901 C TA	12	24	6	15	3380	1290		152000	105000	17	6.0	50	55	9.4	180	105	12.7	390
		SV7901 AC TA	12	24	6	25	3220	1760		88000	70000	17	11.1	47	49	16.5	140	100	21.3	300
		HYQ SV7901 AC TA	12	24	6	25	3220	1230		128000	91000	17	12.5	47	49	19.8	140	100	23.8	300
	sealed	SV7901 C 2VZ TA	12	24	6	15	2470	1470		126000	99000	13	5.1	39	38	8.0	130	75	10.9	280
		HYQ SV7901 C 2VZ TA	12	24	6	15	2470	1030		180000	120000	13	5.7	39	38	8.9	130	75	12.0	280
		SV7901 AC 2VZ TA	12	24	6	25	2340	1400		105000	84000	12	10.6	34	36	15.6	100	75	20.2	220
		HYQ SV7901 AC 2VZ TA	12	24	6	25	2340	980		153000	105000	12	11.9	34	36	17.5	100	75	22.6	220
7001	open	SV7001 C TA	12	28	8	15	5670	2790		90000	73000	29	6.1	85	90	9.4	18	175	12.7	630
		HYQ SV7001 C TA	12	28	8	15	5670	1950		130000	90000	29	6.8	85	90	10.4	18	175	14.0	630
		SV7001 AC TA	12	28	8	25	5450	2690		75000	60000	28	12.8	75	85	18.8	240	165	24.2	500
		HYQ SV7001 AC TA	12	28	8	25	5450	1880		110000	78000	28	14.4	75	85	21.1	240	165	27.1	500
	sealed	SV7001 C 2VZ TA	12	28	8	15	4770	2610		102000	80000	24	6.2	75	75	9.6	250	145	13.0	540
		HYQ SV7001 C 2VZ TA	12	28	8	15	4770	1820		146000	97000	24	6.9	75	75	10.7	250	145	14.4	540
		SV7001 AC 2VZ TA	12	28	8	25	4560	2490		85000	68000	23	13.0	65	70	19.1	200	140	24.6	420
		HYQ SV7001 AC 2VZ TA	12	28	8	25	4560	1740		124000	85000	23	14.6	65	70	21.4	200	140	27.6	420
7201	open	SV7201 C TA	12	32	10	15	9350	4970		82000	66000	47	8.4	150	145	13.3	470	285	18.3	1130
		HYQ SV7201 C TA	12	32	10	15	9350	3470		118000	82000	47	9.3	150	145	14.7	470	285	20.1	1130
		SV7201 AC TA	12	32	10	25	9050	4800		68000	55000	46	17.2	130	140	25.6	410	275	33.3	870
		HYQ SV7201 AC TA	12	32	10	25	9050	3360		100000	70000	46	19.3	130	140	28.6	410	275	37.1	870
	sealed	SV7201 C 2VZ TA	12	32	10	15	5710	2880		84000	68000	29	6.1	90	90	9.4	290	175	12.7	630
		HYQ SV7201 C 2VZ TA	12	32	10	15	5710	2010		121000	84000	29	6.8	90	90	10.5	290	175	14.0	630
		SV7201 AC 2VZ TA	12	32	10	25	5480	2760		70000	56000	28	12.8	75	85	18.9	240	165	24.3	500
		HYQ SV7201 AC 2VZ TA	12	32	10	25	5480	1930		102000	72000	28	14.4	75	85	21.2	240	165	27.2	500
7702	open	SV7702 C TA	15	21	4	15	975	620		100000	81000	5	3.4	14	15	5.2	46	30	6.8	95
		HYQ SV7702 C TA	15	21	4	15	975	435		145000	100000	5	3.9	14	15	5.8	46	30	7.5	95
		SV7702 AC TA	15	21	4	25	920	585		84000	67000	5	7.4	13	14	10.8	40	28	13.7	80
		HYQ SV7702 AC TA	15	21	4	25	920	410		123000	87000	5	8.3	13	14	12.1	40	28	15.4	80
7802	open	SV7802 C TA	15	24	5	15	2530	1610		95000	77000	13	5.4	40	38	8.4	130	80	11.4	290
		HYQ SV7802 C TA	15	24	5	15	2530	1120		138000	95000	13	6.0	40	38	9.3	130	80	12.5	290
		SV7802 AC TA	15	24	5	25	2390	1530		80000	64000	12	11.1	34	36	16.4	100	75	21.1	220
		HYQ SV7802 AC TA	15	24	5	25	2390	1070		117000	82000	12	12.4	34	36	18.3	100	75	23.6	220
	sealed	SV7802 C 2VZ TA	15	24	5	15	2530	1610		95000	77000	13	5.4	40	38	8.4	130	80	11.4	290
		HYQ SV7802 C 2VZ TA	15	24	5	15	2530	1120		138000	95000	13	6.0	40	38	9.3	130	80	12.5	290
		SV7802 AC 2VZ TA	15	24	5	25	2390	1530		80000	64000	12	11.1	34	36	16.4	100	75	21.1	220
		HYQ SV7802 AC 2VZ TA	15	24	5	25	2390	1070		117000	82000	12	12.4	34	36	18.3	100	75	23.6	220

Other sizes available on request

*Ask our application engineers for more information

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}								
			Bore Diameter	Outside Diameter	Standard Width		Dynamic	Static				Light (L)			Medium (M)			Heavy (S)		
			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]
7902	open	SV7902 C TA	15	28	7	15	4770	2610		102000	80000	24	6.2	75	75	9.6	250	145	13.0	540
7902	open	HYQ SV7902 C TA	15	28	7	15	4770	1820		146000	97000	24	6.9	75	75	10.7	250	145	14.4	540
7902	open	SV7902 AC TA	15	28	7	25	4560	2490		85000	68000	23	13.0	65	70	19.1	200	140	24.6	420
7902	open	HYQ SV7902 AC TA	15	28	7	25	4560	1740		124000	85000	23	14.6	65	70	21.4	200	140	27.6	420
7902	sealed	SV7902 C 2VZ TA	15	28	7	15	4770	2610		102000	80000	24	6.2	75	75	9.6	250	145	13.0	540
7902	sealed	HYQ SV7902 C 2VZ TA	15	28	7	15	4770	1820		146000	97000	24	6.9	75	75	10.7	250	145	14.4	540
7902	sealed	SV7902 AC 2VZ TA	15	28	7	25	4560	2490		85000	68000	23	13.0	65	70	19.1	200	140	24.6	420
7902	sealed	HYQ SV7902 AC 2VZ TA	15	28	7	25	4560	1740		124000	85000	23	14.6	65	70	21.4	200	140	27.6	420
7002	open	SV7002 C TA	15	32	9	15	6400	3500		77000	62000	32	7.1	100	100	10.9	330	195	14.7	710
7002	open	HYQ SV7002 C TA	15	32	9	15	6400	2450		111000	77000	32	7.9	100	100	12.1	330	195	16.2	710
7002	open	SV7002 AC TA	15	32	9	25	6130	3350		64000	52000	31	15.1	85	95	21.9	270	185	28.1	560
7002	open	HYQ SV7002 AC TA	15	32	9	25	6130	2350		94000	66000	31	16.7	85	95	24.5	270	185	31.5	560
7002	sealed	SV7002 C 2VZ TA	15	32	9	15	5230	3100		92000	73000	27	7.0	80	80	10.9	270	160	14.7	580
7002	sealed	HYQ SV7002 C 2VZ TA	15	32	9	15	5230	2170		132000	88000	27	7.8	80	80	12.1	270	160	16.2	580
7002	sealed	SV7002 AC 2VZ TA	15	32	9	25	4980	2960		77000	62000	25	14.7	70	75	21.6	220	150	27.9	460
7002	sealed	HYQ SV7002 AC 2VZ TA	15	32	9	25	4980	2070		112000	77000	25	16.5	70	75	24.2	220	150	31.2	460
7202	open	SV7202 C TA	15	35	11	15	9700	5060		72000	58000	49	8.0	150	150	12.6	510	295	17.1	1120
7202	open	HYQ SV7202 C TA	15	35	11	15	9700	3540		104000	72000	49	9.0	150	150	14.0	510	295	18.9	1120
7202	open	SV7202 AC TA	15	35	11	25	9360	4880		60000	48000	47	16.8	130	145	24.8	420	285	32.0	880
7202	open	HYQ SV7202 AC TA	15	35	11	25	9360	3410		88000	62000	47	18.8	130	145	27.8	420	285	35.8	880
7202	sealed	SV7202 C 2VZ TA	15	35	11	15	6410	3570		85000	67000	33	7.1	100	100	10.9	330	195	14.7	710
7202	sealed	HYQ SV7202 C 2VZ TA	15	35	11	15	6410	2490		122000	81000	33	7.9	100	100	12.1	330	195	16.2	710
7202	sealed	SV7202 AC 2VZ TA	15	35	11	25	6120	3410		71000	57000	31	14.9	85	95	21.9	270	185	28.1	560
7202	sealed	HYQ SV7202 AC 2VZ TA	15	35	11	25	6120	2380		103000	71000	31	16.7	85	95	24.5	270	185	31.5	560
7703	open	SV7703 C TA	17	23	4	15	1000	675		90000	73000	5	3.6	14	15	5.5	47	30	7.2	95
7703	open	HYQ SV7703 C TA	17	23	4	15	1000	475		130000	90000	5	4.1	14	15	6.1	47	30	8.0	95
7703	open	SV7703 AC TA	17	23	4	25	945	640		75000	60000	5	7.9	13	15	11.4	41	29	14.6	80
7703	open	HYQ SV7703 AC TA	17	23	4	25	945	445		110000	78000	5	8.8	13	15	12.9	41	29	16.4	80
7803	open	SV7803 C TA	17	26	5	15	2580	1740		86000	70000	13	5.6	41	39	8.7	130	80	11.8	290
7803	open	HYQ SV7803 C TA	17	26	5	15	2580	1210		125000	86000	13	6.2	41	39	9.7	130	80	13.1	290
7803	open	SV7803 AC TA	17	26	5	25	2440	1650		72000	58000	13	11.6	35	37	17.1	110	75	22.1	220
7803	open	HYQ SV7803 AC TA	17	26	5	25	2440	1150		106000	74000	13	13.0	35	37	19.2	110	75	24.7	220
7803	sealed	SV7803 C 2VZ TA	17	26	5	15	2580	1740		86000	70000	13	5.6	41	39	8.7	130	80	11.8	290
7803	sealed	HYQ SV7803 C 2VZ TA	17	26	5	15	2580	1210		125000	86000	13	6.2	41	39	9.7	130	80	13.1	290
7803	sealed	SV7803 AC 2VZ TA	17	26	5	25	2440	1650		72000	58000	13	11.6	35	37	17.1	110	75	22.1	220
7803	sealed	HYQ SV7803 AC 2VZ TA	17	26	5	25	2440	1150		106000	74000	13	13.0	35	37	19.2	110	75	24.7	220

Other sizes available on request

*Ask our application engineers for more information

Series	Type	Basic Part Number	Bore Diameter d [mm]	Outside Diameter D [mm]	Standard Width B [mm]	Contact Angle α [°]	Load Rating Dynamic C [N]	Load Rating Static C_0 [N]	*Limiting Speed Oil [min^{-1}]	*Limiting Speed Grease [min^{-1}]	Light (L) F_{va} [N]	Light (L) c_a [N/μm]	Light (L) K_{aE} [N]	Medium (M) F_{va} [N]	Medium (M) c_a [N/μm]	Medium (M) K_{aE} [N]	Heavy (S) F_{va} [N]	Heavy (S) c_a [N/μm]	Heavy (S) K_{aE} [N]
7903	open	SV7903 C TA	17	30	7	15	4990	2920	77000	62000	25	6.6	75	75	10.2	260	150	13.8	560
		HYQ SV7903 C TA	17	30	7	15	4990	2040	111000	77000	25	7.4	75	75	11.4	260	150	15.3	560
		SV7903 AC TA	17	30	7	25	4750	2780	64000	51000	24	13.8	65	75	20.3	210	145	26.2	440
		HYQ SV7903 AC TA	17	30	7	25	4750	1950	94000	66000	24	15.5	65	75	22.8	210	145	29.3	440
	sealed	SV7903 C 2VZ TA	17	30	7	15	3780	2440	92000	72000	19	6.4	60	60	10.0	200	115	13.6	430
		HYQ SV7903 C 2VZ TA	17	30	7	15	3780	1710	131000	87000	19	7.1	60	60	11.1	200	115	15.0	430
		SV7903 AC 2VZ TA	17	30	7	25	3590	2320	77000	61000	18	13.2	50	55	19.6	160	110	25.3	330
		HYQ SV7903 AC 2VZ TA	17	30	7	25	3590	1620	111000	77000	18	14.9	50	55	21.9	160	110	28.3	330
7003	open	SV7003 C TA	17	35	10	15	6730	3890	70000	56000	34	7.5	100	105	11.6	340	205	15.6	740
		HYQ SV7003 C TA	17	35	10	15	6730	2720	100000	70000	34	8.4	100	105	12.9	340	205	17.3	740
		SV7003 AC TA	17	35	10	25	6410	3720	58000	47000	33	15.8	90	100	23.3	280	195	30.0	590
		HYQ SV7003 AC TA	17	35	10	25	6410	2600	85000	60000	33	17.8	90	100	26.1	280	195	33.6	590
	sealed	SV7003 C 2VZ TA	17	35	10	15	6730	3890	70000	56000	34	7.5	100	105	11.6	340	205	15.6	740
		HYQ SV7003 C 2VZ TA	17	35	10	15	6730	2720	100000	70000	34	8.4	100	105	12.9	340	205	17.3	740
		SV7003 AC 2VZ TA	17	35	10	25	6410	3720	58000	47000	33	15.8	90	100	23.3	280	195	30.0	590
		HYQ SV7003 AC 2VZ TA	17	35	10	25	6410	2600	85000	60000	33	17.8	90	100	26.1	280	195	33.6	590
7203	open	SV7203 C TA	17	40	12	15	11140	6450	63000	50000	60	9.5	170	170	14.9	590	335	20.2	1280
		HYQ SV7203 C TA	17	40	12	15	11140	4510	90000	63000	60	10.6	170	170	16.5	590	335	22.2	1280
		SV7203 AC TA	17	40	12	25	10680	6190	52000	42000	55	19.8	150	165	29.2	480	325	37.8	1000
		HYQ SV7203 AC TA	17	40	12	25	10680	4330	76000	54000	55	22.2	150	165	32.7	480	325	42.2	1000
	sealed	SV7203 C 2VZ TA	17	40	12	15	9180	5490	74000	58000	46	8.9	140	140	13.9	480	280	18.9	1050
		HYQ SV7203 C 2VZ TA	17	40	12	15	9180	3840	106000	71000	46	10.0	140	140	15.5	480	280	20.8	1050
		SV7203 AC 2VZ TA	17	40	12	25	8770	5250	62000	50000	44	18.6	120	135	27.4	390	265	35.4	820
		HYQ SV7203 AC 2VZ TA	17	40	12	25	8770	3670	90000	62000	44	20.9	120	135	30.7	390	265	39.6	820
7704	open	SV7704 C TA	20	27	4	15	1030	765	77000	62000	6	3.9	15	16	5.9	48	31	7.7	100
		HYQ SV7704 C TA	20	27	4	15	1030	535	111000	77000	6	4.4	15	16	6.6	48	31	8.6	100
		SV7704 AC TA	20	27	4	25	970	720	64000	52000	5	8.5	13	15	12.4	42	30	15.7	85
		HYQ SV7704 AC TA	20	27	4	25	970	505	94000	66000	5	9.6	13	15	13.9	42	30	17.7	85
7804	open	SV7804 C TA	20	32	7	15	4020	2820	70000	56000	21	7.0	60	65	11.0	210	125	14.9	460
		HYQ SV7804 C TA	20	32	7	15	4020	1970	100000	70000	21	7.8	60	65	12.2	210	125	16.4	460
		SV7804 AC TA	20	32	7	25	3800	2670	58000	47000	19	14.6	55	60	21.5	170	115	27.8	350
		HYQ SV7804 AC TA	20	32	7	25	3800	1870	85000	60000	19	16.4	55	60	24.1	170	115	31.1	350
	sealed	SV7804 C 2VZ TA	20	32	7	15	4020	2820	81000	64000	21	7.0	60	65	11.0	210	125	14.9	460
		HYQ SV7804 C 2VZ TA	20	32	7	15	4020	1970	116000	77000	21	7.8	60	65	12.2	210	125	16.4	460
		SV7804 AC 2VZ TA	20	32	7	25	3800	2670	68000	54000	19	14.6	55	60	21.5	170	115	27.8	350
		HYQ SV7804 AC 2VZ TA	20	32	7	25	3800	1870	99000	68000	19	16.4	55	60	24.1	170	115	31.1	350

Preload F_{va} / Axial Rigidity c_a / Unloading Force K_{aE}

Other sizes available on request

*Ask our application engineers for more information

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}								
			Bore Diameter	Outside Diameter	Standard Width		Dynamic	Static			Light (L)			Medium (M)			Heavy (S)		
			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]
7904	open	SV7904 C TA	20	37	9	15	7010	4280	64000	51000	36	8.0	110	110	12.3	350	215	16.5	770
7904	open	HYQ SV7904 C TA	20	37	9	15	7010	2990	92000	64000	36	8.9	110	110	13.7	350	215	18.3	770
7904	open	SV7904 AC TA	20	37	9	25	6670	4080	53000	43000	34	16.8	95	105	24.7	290	205	31.8	610
7904	open	HYQ SV7904 AC TA	20	37	9	25	6670	2850	78000	55000	34	18.9	95	105	27.7	290	205	35.6	610
7904	sealed	SV7904 C 2VZ TA	20	37	9	15	5580	3690	76000	60000	28	7.8	85	85	12.0	280	170	16.2	620
7904	sealed	HYQ SV7904 C 2VZ TA	20	37	9	15	5580	2580	108000	72000	28	8.7	85	85	13.4	280	170	17.9	620
7904	sealed	SV7904 AC 2VZ TA	20	37	9	25	5290	3510	63000	51000	27	16.3	75	80	23.9	230	160	30.8	480
7904	sealed	HYQ SV7904 AC 2VZ TA	20	37	9	25	5290	2450	92000	63000	27	18.3	75	80	26.8	230	160	34.5	480
7004	open	SV7004 C TA	20	42	12	15	11780	7150	59000	47000	60	10.2	180	180	15.9	620	355	21.6	1350
7004	open	HYQ SV7004 C TA	20	42	12	15	11780	5010	84000	59000	60	11.4	180	180	17.7	620	355	23.8	1350
7004	open	SV7004 AC TA	20	42	12	25	11280	6850	49000	39000	60	21.2	160	170	31.4	510	340	40.5	1050
7004	open	HYQ SV7004 AC TA	20	42	12	25	11280	4800	71000	50000	60	23.9	160	170	35.1	510	340	45.3	1050
7004	sealed	SV7004 C 2VZ TA	20	42	12	15	10280	6160	70000	55000	55	9.4	160	155	14.6	490	310	19.8	1170
7004	sealed	HYQ SV7004 C 2VZ TA	20	42	12	15	10280	4310	100000	67000	55	10.5	160	155	16.2	490	310	21.9	1170
7004	sealed	SV7004 AC 2VZ TA	20	42	12	25	9830	5890	59000	47000	50	19.6	140	150	28.9	440	295	37.3	910
7004	sealed	HYQ SV7004 AC 2VZ TA	20	42	12	25	9830	4120	85000	59000	50	22.0	140	150	32.4	440	295	41.7	910
7204	open	SV7204 C TA	20	47	14	15	15810	9150	54000	44000	80	11.0	250	240	17.2	840	475	23.3	1830
7204	open	HYQ SV7204 C TA	20	47	14	15	15810	6400	78000	54000	80	12.2	250	240	19.0	840	475	25.7	1830
7204	open	SV7204 AC TA	20	47	14	25	15210	8800	45000	36000	80	22.8	220	230	33.7	690	460	43.6	1430
7204	open	HYQ SV7204 AC TA	20	47	14	25	15210	6160	66000	47000	80	25.6	220	230	37.8	690	460	48.7	1430
7204	sealed	SV7204 C 2VZ TA	20	47	14	15	12710	7170	67000	53000	65	9.6	200	195	15.0	670	385	20.3	1450
7204	sealed	HYQ SV7204 C 2VZ TA	20	47	14	15	12710	5020	95000	64000	65	10.7	200	195	16.6	670	385	22.3	1450
7204	sealed	SV7204 AC 2VZ TA	20	47	14	25	12200	6890	56000	45000	65	20.0	170	185	29.6	550	370	38.2	1140
7204	sealed	HYQ SV7204 AC 2VZ TA	20	47	14	25	12200	4820	81000	56000	65	22.5	170	185	33.1	550	370	42.7	1140
7705	open	SV7705 C TA	25	32	4	15	1060	880	64000	51000	6	4.3	15	16	6.4	49	32	8.4	100
7705	open	HYQ SV7705 C TA	25	32	4	15	1060	615	92000	64000	6	4.8	15	16	7.2	49	32	9.4	100
7705	open	SV7705 AC TA	25	32	4	25	1004	830	53000	43000	6	9.3	14	16	13.6	43	31	17.3	85
7705	open	HYQ SV7705 AC TA	25	32	4	25	1004	580	78000	55000	6	10.5	14	16	15.3	43	31	19.4	85
7805	open	SV7805 C TA	25	37	7	15	5030	3820	59000	47000	26	8.3	80	80	12.9	260	155	17.5	570
7805	open	HYQ SV7805 C TA	25	37	7	15	5030	2670	84000	59000	26	9.3	80	80	14.4	260	155	19.3	570
7805	open	SV7805 AC TA	25	37	7	25	4750	3620	49000	39000	24	17.3	65	75	25.5	210	145	32.9	440
7805	open	HYQ SV7805 AC TA	25	37	7	25	4750	2530	71000	50000	24	19.5	65	75	28.6	210	145	36.8	440
7805	sealed	SV7805 C 2VZ TA	25	37	7	15	4460	3540	70000	55000	23	8.3	70	70	12.9	230	135	17.4	500
7805	sealed	HYQ SV7805 C 2VZ TA	25	37	7	15	4460	2470	99000	66000	23	9.2	70	70	14.3	230	135	19.2	500
7805	sealed	SV7805 AC 2VZ TA	25	37	7	25	4210	3350	58000	47000	22	17.2	60	65	25.4	190	130	32.7	390
7805	sealed	HYQ SV7805 AC 2VZ TA	25	37	7	25	4210	2340	84000	58000	22	19.3	60	65	28.5	190	130	36.6	390

Other sizes available on request

*Ask our appplication engineers for more information

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}								
			Bore Diameter	Outside Diameter	Standard Width		Dynamic	Static			Light (L)			Medium (M)			Heavy (S)		
			d	D	B	α	C	C_0	Oil	Grease	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}
			[mm]	[mm]	[mm]	[°]	[N]	[N]	[min^{-1}]	[min^{-1}]	[N]	[N/µm]	[N]	[N]	[N/µm]	[N]	[N]	[N/µm]	[N]
7905	open	SV7905 C TA	25	42	9	15	7500	5040	54000	44000	38	8.9	110	115	13.6	380	225	18.3	820
		HYQ SV7905 C TA	25	42	9	15	7500	3520	78000	54000	38	9.9	110	115	15.2	380	225	20.2	820
		SV7905 AC TA	25	42	9	25	7110	4790	45000	36000	36	18.7	100	110	27.4	310	215	35.2	650
		HYQ SV7905 AC TA	25	42	9	25	7110	3350	66000	47000	36	21.0	100	110	30.8	310	215	39.4	650
	sealed	SV7905 C 2VZ TA	25	42	9	15	6070	4480	65000	51000	31	8.9	95	95	13.7	310	185	18.4	670
		HYQ SV7905 C 2VZ TA	25	42	9	15	6070	3140	92000	62000	31	9.9	95	95	15.2	310	185	20.4	670
		SV7905 AC 2VZ TA	25	42	9	25	5740	4250	54000	43000	29	18.6	80	90	27.4	250	175	35.2	520
		HYQ SV7905 AC 2VZ TA	25	42	9	25	5740	2970	78000	54000	29	20.9	80	90	30.7	250	175	39.4	520
7005	open	7005 C TA	25	47	12	15	10150	5800	50000	41000	55	9.0	150	105	11.8	330	305	18.6	1110
		7005 AC TA	25	47	12	25	9690	5530	42000	34000	49	19.1	140	100	24.3	280	295	36.0	880
		HYQ 7005 C TA	25	47	12	15	10150	4110	73000	50000	55	10.1	150	105	13.1	320	305	20.5	1090
		HYQ 7005 AC TA	25	47	12	25	9690	3920	62000	44000	49	21.3	140	100	27.1	280	295	40.1	880
	sealed	SV7005 C 2VZ TA	25	47	12	15	10700	7110	60000	47000	55	22.2	150	165	32.7	480	325	42.1	990
		HYQ SV7005 C 2VZ TA	25	47	12	15	11260	5210	85000	57000	60	11.9	150	170	18.3	480	340	24.7	990
		SV7005 AC 2VZ TA	25	47	12	25	10715	7100	50000	40000	55	22.2	150	165	32.7	480	325	42.2	990
		HYQ SV7005 AC 2VZ TA	25	47	12	25	10715	4970	73000	50000	55	24.9	150	165	36.7	480	325	47.2	990
7205	open	7205 C TA	25	52	15	15	13530	7310	47000	38000	70	9.6	210	140	12.5	440	410	19.8	1480
		7205 AC TA	25	52	15	25	12970	7000	39000	32000	65	20.2	180	130	25.8	380	390	38.2	1190
		HYQ 7205 C TA	25	52	15	15	13530	5180	68000	47000	70	10.7	210	140	13.9	430	410	21.8	1450
		HYQ7205 AC TA	25	52	15	25	12970	4960	58000	41000	65	22.7	180	130	28.8	380	390	42.6	1180
	sealed	SV7205 C 2VZ TA	25	52	15	15	14290	8920	58000	46000	75	11.1	220	215	17.3	750	430	23.4	1620
		HYQ SV7205 C 2VZ TA	25	52	15	15	14290	6240	82000	55000	75	12.4	220	215	19.2	750	430	25.8	1620
		SV7205 AC 2VZ TA	25	52	15	25	13650	8540	48000	39000	70	23.2	190	205	34.3	610	410	44.2	1270
		HYQ SV7205 AC 2VZ TA	25	52	15	25	13650	5970	70000	48000	70	26.1	190	205	38.4	610	410	49.4	1270
7706	open	SV7706 C TA	30	37	4	15	1130	1050	54000	44000	6	4.9	16	17	7.3	50	34	9.5	110
		HYQ SV7706 C TA	30	37	4	15	1130	735	78000	54000	6	5.5	16	17	8.2	50	34	10.6	110
		SV7706 AC TA	30	37	4	25	1060	990	45000	36000	6	10.6	15	16	15.4	46	32	19.6	90
		HYQ SV7706 AC TA	30	37	4	25	1060	690	66000	47000	6	11.9	15	16	17.3	46	32	22.0	90
7806	open	SV7806 C TA	30	42	7	15	5520	4690	51000	41000	28	9.7	85	85	15.0	280	170	20.2	620
		HYQ SV7806 C TA	30	42	7	15	5520	3280	73000	51000	28	10.8	85	85	16.6	280	170	22.3	620
		SV7806 AC TA	30	42	7	25	5200	4440	42000	34000	26	20.1	75	80	29.6	230	160	38.2	480
		HYQ SV7806 AC TA	30	42	7	25	5200	3110	62000	44000	26	22.6	75	80	33.2	230	160	42.7	480
	sealed	SV7806 C 2VZ TA	30	42	7	15	4520	4110	59000	47000	23	8.7	70	70	13.3	230	140	17.9	490
		HYQ SV7806 C 2VZ TA	30	42	7	15	4520	2880	85000	57000	23	9.7	70	70	14.8	230	140	19.8	490
		SV7806 AC 2VZ TA	30	42	7	25	4250	3890	50000	40000	22	18.2	60	65	26.7	190	130	34.3	390
		HYQ SV7806 AC 2VZ TA	30	42	7	25	4250	2720	72000	50000	22	20.4	60	65	29.9	190	130	38.4	390

Other sizes available on request

*Ask our appplication engineers for more information

Basic Part Number			Dimensions: Bore Diameter d [mm]	Dimensions: Outside Diameter D [mm]	Dimensions: Standard Width B [mm]	Contact Angle α [°]	Load Rating: Dynamic C [N]	Load Rating: Static C_0 [N]	*Limiting Speed: Oil [min^{-1}]	*Limiting Speed: Grease [min^{-1}]	Light (L) F_{va} [N]	Light (L) c_a [N/µm]	Light (L) K_{aE} [N]	Medium (M) F_{va} [N]	Medium (M) c_a [N/µm]	Medium (M) K_{aE} [N]	Heavy (S) F_{va} [N]	Heavy (S) c_a [N/µm]	Heavy (S) K_{aE} [N]
7906	open	7906 C TA	30	47	9	15	9800	6460	47000	38000	50	10.6	150	100	13.8	310	295	21.7	1060
		7906 AC TA	30	47	9	25	9310	6140	39000	32000	47	22.4	130	95	28.4	270	280	42.1	850
		HYQ 7906 C TA	30	47	9	15	9800	4580	68000	47000	50	11.8	150	100	15.3	310	295	23.9	1040
		HYQ 7906 AC TA	30	47	9	25	9310	4350	58000	41000	47	25.0	130	95	31.8	270	280	47.0	840
	sealed	SV7906 C 2VZ TA	30	47	9	15	6490	5280	56000	44000	33	9.9	100	100	15.3	330	195	20.5	710
		HYQ SV7906 C 2VZ TA	30	47	9	15	6490	3690	80000	54000	33	11.1	100	100	17.0	330	195	22.7	710
		SV7906 AC 2VZ TA	30	47	9	25	6120	5000	47000	38000	31	20.9	85	95	30.6	270	185	39.4	560
		HYQ SV7906 AC 2VZ TA	30	47	9	25	6120	3500	68000	47000	31	23.4	85	95	34.4	270	185	44.1	560
7006	open	7006 C TA	30	55	13	15	13170	8010	43000	35000	70	10.7	200	135	14.0	430	400	22.1	1430
		7006 AC TA	30	55	13	25	12550	7630	36000	29000	65	22.7	180	130	28.9	360	380	42.8	1140
		HYQ 7006 C TA	30	55	13	15	13170	5680	62000	43000	70	12.0	200	135	15.6	420	400	24.4	1400
		HYQ 7006 AC TA	30	55	13	25	12550	5410	52000	37000	65	25.4	180	130	32.3	360	380	47.7	1140
	sealed	SV7006 C 2VZ TA	30	55	13	15	13890	10200	50000	40000	70	12.8	220	210	20.0	730	420	27.0	1570
		HYQ SV7006 C 2VZ TA	30	55	13	15	13890	7140	72000	48000	70	14.3	220	210	22.1	730	420	29.8	1570
		SV7006 AC 2VZ TA	30	55	13	25	13190	9710	42000	34000	70	26.7	190	200	39.4	590	400	50.8	1220
		HYQ SV7006 AC 2VZ TA	30	55	13	25	13190	6790	61000	42000	70	30.0	190	200	44.2	590	400	56.9	1220
7206	open	7206 C TA	30	62	16	15	21560	11990	40000	32000	110	12.2	330	220	15.9	700	650	25.0	2340
		7206 AC TA	30	62	16	25	20730	11510	33000	27000	105	25.8	300	210	32.8	610	625	48.7	1890
		HYQ 7206 C TA	30	62	16	15	21560	8500	57000	40000	110	13.5	330	220	17.6	690	650	27.6	2300
		HYQ 7206 AC TA	30	62	16	25	20730	8160	48000	34000	105	28.9	300	210	36.7	600	625	54.3	1880
7807	open	SV7807 C TA	35	47	7	15	5930	5570	44000	36000	30	10.9	90	90	16.9	300	180	25.1	540
		HYQ SV7807 C TA	35	47	7	15	5930	3900	64000	44000	30	12.2	90	90	18.7	300	180	25.1	540
		SV7807 AC TA	35	47	7	25	5580	5270	37000	30000	28	22.8	80	85	33.6	250	170	43.2	510
		HYQ SV7807 AC TA	35	47	7	25	5580	3690	54000	38000	28	25.6	80	85	37.6	250	170	48.3	510
	sealed	SV7807 C 2VZ TA	35	47	7	15	4930	5010	52000	41000	25	10.0	75	75	15.4	240	150	20.6	530
		HYQ SV7807 C 2VZ TA	35	47	7	15	4930	3510	74000	50000	25	11.2	75	75	17.1	240	150	22.8	530
		SV7807 AC 2VZ TA	35	47	7	25	4640	4730	44000	35000	24	21.1	65	70	31.0	200	140	39.7	420
		HYQ SV7807 AC 2VZ TA	35	47	7	25	4640	3310	63000	44000	24	23.7	65	70	34.7	200	140	44.5	420
7907	open	7907 C TA	35	55	10	15	12900	8950	40000	33000	65	12.5	200	130	16.3	410	390	25.6	1390
		7907 AC TA	35	55	10	25	12250	8510	34000	27000	65	26.5	170	125	33.7	350	370	49.9	1110
		HYQ 7907 C TA	35	55	10	15	12900	6340	58000	40000	65	14.0	190	130	18.1	410	390	28.3	1360
		HYQ 7907 AC TA	35	55	10	25	12250	6030	49000	35000	65	29.7	170	125	37.7	350	370	55.7	1100
	sealed	SV7907 C 2VZ TA	35	55	10	15	8470	6890	47000	37000	43	10.9	130	130	16.7	420	255	22.3	910
		HYQ SV7907 C 2VZ TA	35	55	10	15	8470	4820	67000	45000	43	12.2	130	130	18.6	420	255	24.7	910
		SV7907 AC 2VZ TA	35	55	10	25	7990	6520	39000	32000	40	23.0	110	120	33.8	350	240	43.3	720
		HYQ SV7907 AC 2VZ TA	35	55	10	25	7990	4570	57000	39000	40	25.9	110	120	37.9	350	240	48.5	720

Preload F_{va} / Axial Rigidity c_a / Unloading Force K_{aE}

Other sizes available on request

*Ask our appplication engineers for more information

Spindle Bearings - Product Tables

Basic Part Number			Dimensions: Bore Diameter d [mm]	Dimensions: Outside Diameter D [mm]	Dimensions: Standard Width B [mm]	Contact Angle α [°]	Load Rating: Dynamic C [N]	Load Rating: Static C_0 [N]	*Limiting Speed: Oil [min^{-1}]	*Limiting Speed: Grease [min^{-1}]	Light (L) F_{va} [N]	Light (L) c_a [N/µm]	Light (L) K_{aE} [N]	Medium (M) F_{va} [N]	Medium (M) c_a [N/µm]	Medium (M) K_{aE} [N]	Heavy (S) F_{va} [N]	Heavy (S) c_a [N/µm]	Heavy (S) K_{aE} [N]
7007	open	7007 C TA	35	62	14	15	16650	10660	38000	30000	85	12.6	250	170	16.4	540	500	25.8	1800
		7007 AC TA	35	62	14	25	15860	10160	31000	25000	80	26.6	220	160	33.8	460	480	50.1	1440
		HYQ 7007 C TA	35	62	14	15	16650	7560	54000	38000	85	14.0	250	170	18.2	530	500	28.4	1770
		HYQ 7007 AC TA	35	62	14	25	15860	7210	46000	32000	80	29.8	220	160	37.9	460	480	55.9	1430
7207	open	7207 C TA	35	72	17	15	30480	19490	34000	28000	155	17.1	470	305	22.3	980	915	35.0	3270
		7207 AC TA	35	72	17	25	29230	18670	29000	23000	150	36.4	420	295	46.3	850	880	68.5	2660
		HYQ 7207 C TA	35	72	17	15	30480	13820	49000	34000	155	19.1	460	305	24.8	970	915	38.7	3210
		HYQ 7207 AC TA	35	72	17	25	29230	13240	42000	29000	150	40.8	420	295	51.8	850	880	76.5	2640
7808	open	SV7808 C TA	40	52	7	15	6300	6450	40000	32000	32	12.1	95	95	18.7	320	190	25.2	690
		HYQ SV7808 C TA	40	52	7	15	6300	4520	57000	40000	32	13.6	95	95	20.8	320	190	27.8	690
		SV7808 AC TA	40	52	7	25	5930	6100	33000	27000	30	25.4	85	90	37.4	260	180	48.1	540
		HYQ SV7808 AC TA	40	52	7	25	5930	4270	48000	34000	30	28.6	85	90	41.9	260	180	53.8	540
	sealed	SV7808 C 2VZ TA	40	52	7	15	5190	5750	40000	32000	26	11.0	80	80	16.9	260	160	22.6	550
		HYQ SV7808 C 2VZ TA	40	52	7	15	5190	4020	58000	40000	26	11.3	80	80	18.8	260	160	25.0	550
		SV7808 AC 2VZ TA	40	52	7	25	4880	5430	33000	27000	25	23.3	70	75	34.2	210	150	43.8	440
		HYQ SV7808 AC 2VZ TA	40	52	7	25	4880	3800	49000	34000	25	26.2	70	75	38.3	210	150	49.1	440
7908	open	7908 C TA	50	62	12	15	15760	11560	33000	26000	80	15.5	200	160	18.1	510	475	28.4	1690
		7908 AC TA	50	62	12	25	14940	10970	27000	22000	75	29.5	210	150	37.5	430	450	55.4	1360
		HYQ 7908 C TA	50	62	12	15	15760	8190	47000	33000	80	15.5	240	160	20.1	500	475	31.4	1660
		HYQ 7908 AC TA	50	62	12	25	14940	7780	40000	28000	75	33.0	210	150	41.9	430	450	61.8	1350
7008	open	7008 C TA	40	68	15	15	17960	12400	34000	27000	90	14.0	270	180	18.2	580	540	28.6	1930
		7008 AC TA	40	68	15	25	17080	11800	28000	23000	90	29.6	240	175	37.7	500	515	55.8	1550
		HYQ 7008 C TA	40	68	15	15	17960	8790	49000	34000	90	15.6	270	180	20.3	570	540	31.6	1900
		HYQ 7008 AC TA	40	68	15	25	17080	8360	41000	29000	90	33.2	240	175	42.2	490	515	62.2	1540
7208	open	7208 C TA	40	80	18	15	29810	18170	30000	25000	150	15.0	460	300	19.6	970	895	30.8	3220
		7208 AC TA	40	80	18	25	28550	17390	25000	20000	145	31.9	410	290	40.6	830	860	60.1	2600
		HYQ 7208 C TA	40	80	18	15	29810	12880	44000	30000	150	16.8	460	300	21.8	950	895	34.0	3160
		HYQ 7208 AC TA	40	80	18	25	28550	12330	37000	26000	145	35.7	410	290	45.4	830	860	67.0	2590
7909	open	7909 C TA	45	68	12	15	16830	12800	32000	26000	85	15.2	260	170	19.8	540	510	30.9	1800
		7909 AC TA	45	68	12	25	15950	12150	27000	22000	80	32.2	230	160	40.9	460	480	60.5	1450
		HYQ 7909 C TA	45	68	12	15	16830	9070	47000	32000	85	16.9	250	170	22.0	530	510	34.2	1760
		HYQ 7909 AC TA	45	68	12	25	15950	8610	39000	28000	80	36.0	230	160	45.8	460	480	67.5	1440
7009	open	7009 C TA	45	75	16	15	24090	16510	30000	25000	125	15.7	370	245	20.5	780	725	32.2	2590
		7009 AC TA	45	75	16	25	22940	15720	25000	20000	115	33.4	330	230	42.4	670	690	62.8	2090
		HYQ 7009 C TA	45	75	16	15	24090	11700	44000	30000	125	17.5	370	245	22.8	770	725	35.5	2540
		HYQ 7009 AC TA	45	75	16	25	22940	11150	37000	26000	115	37.4	330	230	47.4	670	690	70.0	2070
7209	open	7209 C TA	45	85	19	15	31490	20170	28000	23000	160	16.1	480	315	21.1	1020	945	33.1	3390
		7209 AC TA	45	85	19	25	30080	19270	24000	19000	155	34.3	430	305	43.6	880	905	64.5	2740
		HYQ 7209 C TA	45	85	19	15	31490	14300	40000	28000	160	18.0	480	315	23.4	1010	945	36.5	3330
		HYQ 7209 AC TA	45	85	19	25	30080	13660	34000	24000	155	38.3	430	305	48.7	880	905	71.9	2720

Preload F_{va} / Axial Rigidity c_a / Unloading Force K_{aE}

Other sizes available on request

*Ask our appplication engineers for more information

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}								
			Bore Diameter	Outside Diameter	Standard Width		Dynamic	Static			Light (L)			Medium (M)			Heavy (S)		
			d	D	B	α	C	C_0	Oil	Grease	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}
			[mm]	[mm]	[mm]	[°]	[N]	[N]	[min^{-1}]	[min^{-1}]	[N]	[N/μm]	[N]	[N]	[N/μm]	[N]	[N]	[N/μm]	[N]
7910	open	7910 C TA	50	72	12	15	17690	14210	30000	24000	90	16.4	270	180	21.3	570	535	33.3	1880
		7910 AC TA	50	72	12	25	16750	13470	25000	20000	85	34.8	240	170	44.2	490	505	65.2	1520
		HYQ 7910 C TA	50	72	12	15	17690	10080	43000	30000	90	18.3	270	180	23.7	560	535	36.8	1850
		HYQ 7910 AC TA	50	72	12	25	16750	9550	37000	26000	85	38.9	240	170	49.4	440	505	72.8	1510
7010	open	7010 C TA	50	80	16	15	25910	18920	28000	23000	130	17.4	400	260	22.7	830	780	35.5	2770
		7010 AC TA	50	80	16	25	24620	18000	24000	19000	125	36.9	350	250	47.0	720	740	69.4	2240
		HYQ 7010 C TA	50	80	16	15	25910	13420	40000	28000	130	19.4	390	260	25.2	820	780	39.2	2720
		HYQ 7010 AC TA	50	80	16	25	24620	12760	34000	24000	125	41.4	350	250	52.5	710	740	77.5	2220
7210	open	7210 C TA	50	90	20	15	37160	24790	26000	21000	190	18.3	570	375	23.8	1200	1115	37.4	3990
		7210 AC TA	50	90	20	25	35490	23670	22000	18000	180	38.8	510	355	49.4	1040	1065	73.0	3230
		HYQ 7210 C TA	50	90	20	15	37160	17580	38000	26000	190	20.4	570	375	26.5	1190	1115	41.2	3920
		HYQ 7210 AC TA	50	90	20	25	35490	16780	32000	23000	180	43.5	510	355	55.2	1030	1065	81.5	3210
7911	open	7911 C TA	55	80	13	15	21400	17530	27000	22000	110	18.1	330	215	23.5	680	645	36.7	2270
		7911 AC TA	55	80	13	25	20260	16630	23000	18000	105	38.4	290	205	48.7	590	610	72.0	1830
		HYQ 7911 C TA	55	80	13	15	21400	12430	39000	27000	110	20.1	320	215	26.1	680	645	40.5	2230
		HYQ 7911 AC TA	55	80	13	25	20260	11790	33000	23000	105	42.9	290	205	54.5	590	610	80.3	1820
7011	open	7011 C TA	55	90	18	15	33030	24080	25000	20000	170	19.1	510	335	24.9	1060	995	39.0	3530
		7011A C TA	55	90	18	25	31420	22920	21000	17000	160	40.6	450	315	51.6	920	945	76.3	2850
		HYQ 7011 C TA	55	90	18	15	33030	17070	36000	25000	170	21.3	500	335	27.7	1050	995	43.0	3470
		HYQ 7011 AC TA	55	90	18	25	31420	16250	31000	22000	160	45.5	450	315	57.7	910	945	85.1	2830
7211	open	7211 C TA	55	100	21	15	45930	31230	24000	19000	230	20.4	710	460	26.6	1480	1380	41.6	4920
		7211 AC TA	55	100	21	25	43900	29830	20000	16000	220	43.3	630	440	55.1	1280	1320	81.5	3990
		HYQ 7211 C TA	55	100	21	15	45930	22140	34000	24000	230	22.7	700	460	29.5	1460	1380	45.9	4830
		HYQ 7211 AC TA	55	100	21	25	43900	21150	29000	20000	220	48.5	630	440	61.6	1280	1320	90.9	3970
7912	open	7912 C TA	60	85	13	15	22370	19280	25000	20000	115	19.4	340	225	25.2	710	675	39.2	2360
		7912 AC TA	60	85	13	25	21160	18270	21000	17000	110	41.1	300	215	52.2	610	640	77.1	1910
		HYQ 7912 C TA	60	85	13	15	22370	13670	36000	25000	115	21.6	340	225	28.0	700	675	43.3	2320
		HYQ 7912 AC TA	60	85	13	25	21160	12960	31000	22000	110	46.1	300	215	58.4	610	640	86.1	1900
7012	sealed	7012 C TA	60	95	18	15	32850	24440	24000	19000	165	19.1	500	330	24.8	1060	990	38.9	3510
		7012 AC TA	60	95	18	25	31210	23240	20000	16000	160	40.5	450	315	51.5	910	940	76.1	2830
		HYQ 7012 C TA	60	95	18	15	32850	17330	34000	24000	165	21.3	500	330	27.6	1040	990	42.9	3450
		HYQ 7012 AC TA	60	95	18	25	31210	16480	29000	20000	160	45.4	450	315	57.6	910	940	84.9	2810
7212	open	7212 C TA	60	110	22	15	55520	38410	22000	18000	280	22.5	850	560	29.3	1790	1670	45.8	5940
		7212 AC TA	60	110	22	25	53080	36700	18000	15000	270	47.8	760	535	60.8	1550	1595	89.8	4820
		HYQ 7212 C TA	60	110	22	15	55520	27230	31000	22000	280	25.1	850	560	32.5	1770	1670	50.6	5830
		HYQ 7212 AC TA	60	110	22	25	53080	26020	26000	19000	270	53.5	760	535	32.0	1690	1595	49.6	5550
7913	open	7913 C TA	65	90	13	15	23280	21040	24000	19000	120	20.6	350	235	26.8	740	700	41.7	2450
		7913 AC TA	65	90	13	25	22010	19920	20000	16000	115	43.8	310	225	55.7	640	665	82.1	1990
		HYQ 7913 C TA	65	90	13	15	23280	14920	34000	24000	120	23.0	350	235	29.8	730	700	46.1	2410
		HYQ 7913 AC TA	65	90	13	25	22010	14130	29000	20000	115	49.1	310	225	62.3	640	665	91.7	1970

Other sizes available on request

*Ask our appplication engineers for more information

Basic Part Number			Dimensions			Contact Angle	Load Rating			*Limiting Speed		Preload F_{va} / Axial Rigidity c_a / Unloading Force K_{aE}								
			Bore Diameter	Outside Diameter	Standard Width		Dynamic	Static				Light (L)			Medium (M)			Heavy (S)		
			d	D	B	α	C	C_0		Oil	Grease	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}	F_{va}	c_a	K_{aE}
			[mm]	[mm]	[mm]	[°]	[N]	[N]		[min⁻¹]	[min⁻¹]	[N]	[N/µm]	[N]	[N]	[N/µm]	[N]	[N]	[N/µm]	[N]
7013	open	7013 C TA	65	100	18	15	35150	27680		22000	18000	180	21.0	540	355	27.3	1130	1055	42.7	3740
		7013 AC TA	65	100	18	25	33360	26290		19000	15000	170	44.6	480	335	56.7	970	1005	83.7	3020
		HYQ 7013 C TA	65	100	18	15	35150	19630		32000	22000	180	23.4	530	355	30.3	1110	1055	47.1	3670
		HYQ 7013 AC TA	65	100	18	25	33360	18640		27000	19000	170	49.9	480	335	63.4	970	1005	93.4	3000
7213	open	7213 C TA	65	120	23	15	65910	46320		20000	16000	330	24.6	1010	660	32.0	2120	1980	50.0	7030
		7213 AC TA	65	120	23	25	63030	44280		17000	13000	320	52.3	910	635	66.4	1840	1895	98.1	5730
		HYQ 7213 C TA	65	120	23	15	35910	32850		29000	20000	330	27.4	1010	660	35.5	2100	1980	55.2	6910
		HYQ 7213 AC TA	65	120	23	25	63030	31390		24000	17000	320	58.5	900	635	74.3	1840	1895	109.5	5690
7914	open	7914 C TA	70	100	16	15	30340	26560		22000	18000	155	22.1	460	305	28.8	970	915	44.8	3200
		7914 AC TA	70	100	16	25	28710	25170		18000	15000	145	47.1	410	290	59.8	830	865	88.2	2590
		HYQ 7914 C TA	70	100	16	15	30340	18830		31000	22000	155	24.7	460	305	32.0	960	915	49.5	3150
		HYQ 7914 AC TA	70	100	16	25	28710	17850		26000	19000	145	52.7	410	290	66.9	830	865	98.5	2580
7014	open	7014 C TA	70	110	20	15	43330	33920		20000	17000	220	22.7	660	435	29.5	1390	1305	46.1	4610
		7014 AC TA	70	110	20	25	41150	32250		17000	14000	210	48.2	590	415	61.3	1200	1235	90.5	3730
		HYQ 7014 C TA	70	110	20	15	43330	24050		29000	20000	220	25.3	660	435	32.8	1370	1305	50.9	4530
		HYQ 7014 AC TA	70	110	20	25	41150	22860		25000	18000	210	54.0	590	415	68.6	1200	1235	101.0	3710
7915	open	7915 C TA	75	105	16	15	31700	29040		20000	17000	160	23.7	480	320	30.7	1010	955	47.8	3330
		7915 AC TA	75	105	16	25	29980	27500		17000	14000	150	50.4	430	300	64.0	870	900	94.3	2700
		HYQ 7915 C TA	75	105	16	15	31700	20590		29000	20000	160	26.4	480	320	34.2	1000	955	52.8	3280
		HYQ 7915 AC TA	75	105	16	25	29980	19500		25000	18000	150	56.4	430	300	71.6	870	900	105.3	2690
7015	open	7015 C TA	75	115	20	15	46220	38110		19000	16000	235	24.8	710	465	32.3	1480	1390	50.4	4890
		7015 AC TA	75	115	20	25	43850	36200		16000	13000	220	52.8	630	440	67.1	1280	1320	99.1	3970
		HYQ 7015 C TA	75	115	20	15	46220	27030		28000	19000	235	27.7	700	465	35.9	1460	1390	55.6	4810
		HYQ 7015 AC TA	75	115	20	25	43850	25670		24000	17000	220	59.1	630	440	75.1	1270	1320	110.6	3940
7916	open	7916 C TA	80	110	16	15	32200	30400		19000	16000	165	24.4	490	325	31.6	1020	970	49.2	3380
		7916 AC TA	80	110	16	25	30430	28780		16000	13000	155	51.9	430	305	65.9	880	915	97.1	2740
		HYQ 7916 C TA	80	110	16	15	32200	21550		28000	19000	165	27.2	490	325	35.2	1010	970	54.4	3320
		HYQ 7916 AC TA	80	110	16	25	30430	20400		24000	17000	155	58.1	430	305	73.7	880	915	108.5	2730

Other sizes available on request

*Ask our application engineers for more information

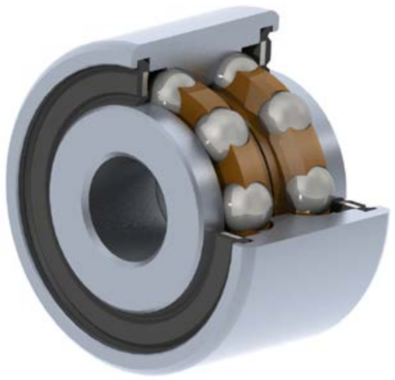
Ball Screw Support Bearings (ZKLN)

ZKLN bearings are double row, axial angular contact ball bearings with a pressure 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 X65Cr13 or X30CrMoN15-1 can be used depending on application requirements. Hybrid versions which include ceramic balls (Si_3N_4) 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.



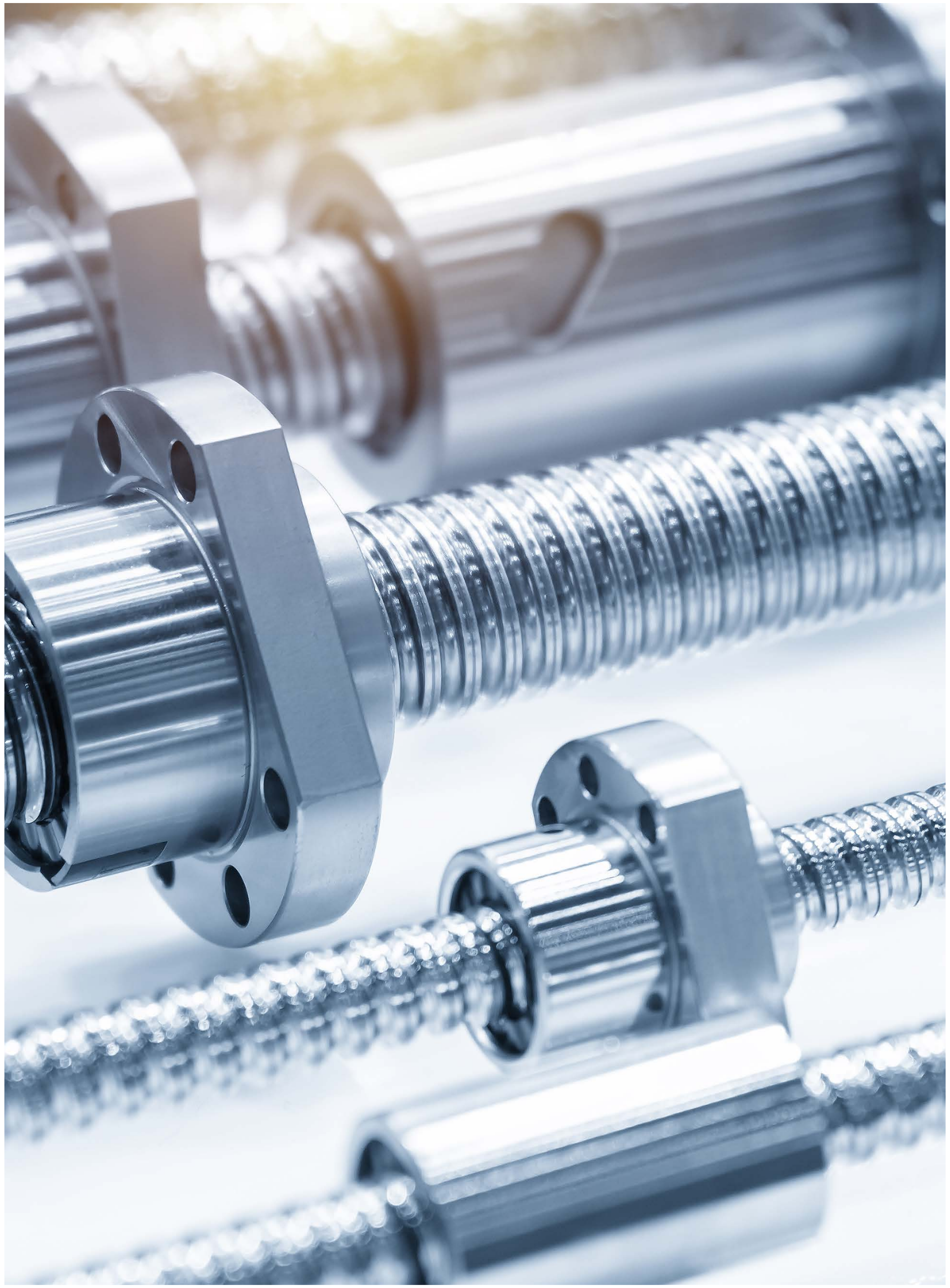
ZKLN Bearing

ZKLF Bearing

Available Size Range

	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.



Bearing Preload

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

Preloading:

- Eliminates radial and axial play.
- Increases system rigidity.
- Reduces non-repetitive run-out.
- Lessens the difference in contact angles between the balls and both inner and outer rings 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

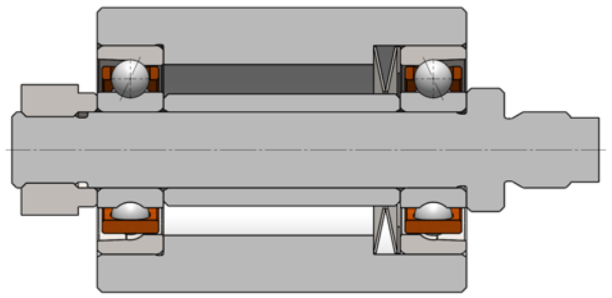
Springs are often the simplest method for bearing preload and should be considered first. They are typically coil springs, disc springs, wave and finger spring washers which load the non-rotating ring of the bearing, typically the outer ring. The selected ring must fit the shaft and/or housing under 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 against the preload force (e.g. tensile forces).

It should be noted that spring preloading cannot accept reversing thrust loads. Space must also be provided to accommodate both the springs and spring travel, and springs may tend to misalign the ring being loaded.

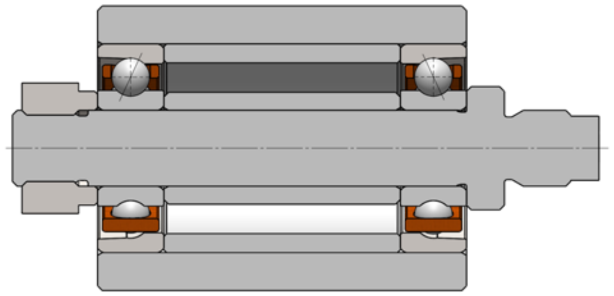


Spring preload

Rigid Preload with Paired 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 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 loose 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.



Rigid preload

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 S can be found in the spindle bearing tables.

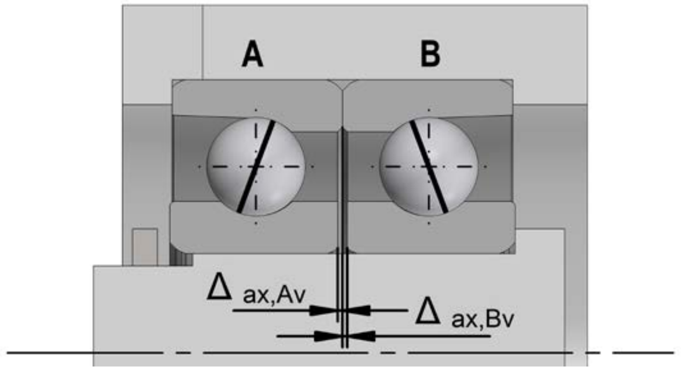
Speed Reduction with Rigid Bearing Arrangement

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.

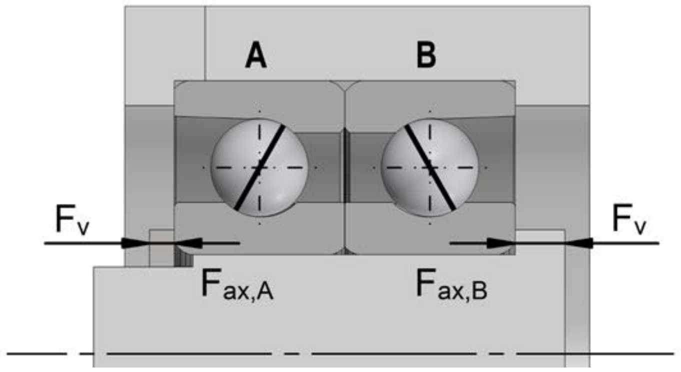
Unloading Force

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. Unloading force can be explained using the following example of a back-to-back arrangement.

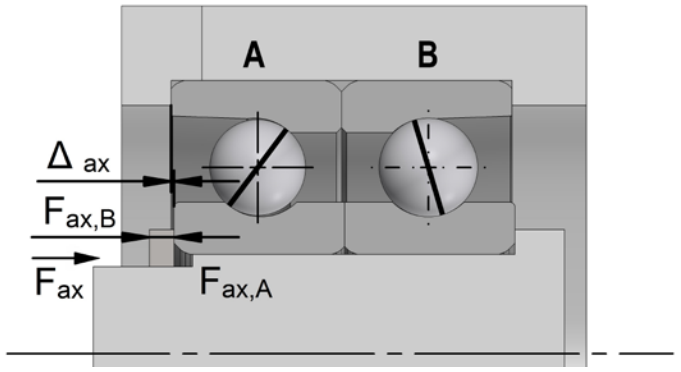
Step 1: Two spindle bearings are pressed on a shaft next to each other in back-to-back arrangement. Depending on the type and the desired preload of the spindle bearing, this results in a defined gap (Δ_{ax},A_v = $\Delta_{ax,Bv}$) between the two plane surfaces in a force-free state.



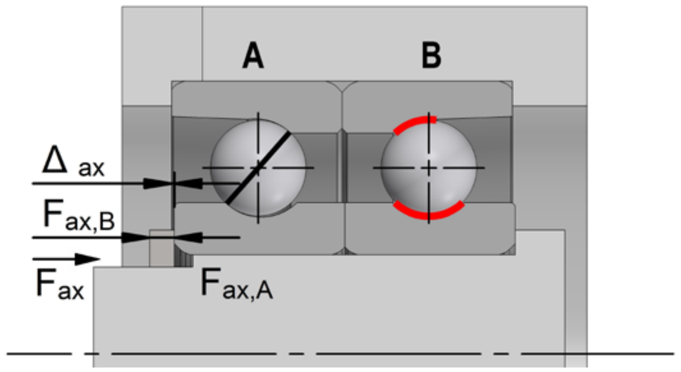
Step 2: Using a lock nut, the spindle bearings are preloaded against each other ($F_V = F_{ax,A} = F_{ax,B}$) with the preload force F_V (L, M or S), until the gap is closed. The operating contact angle is enlarged compared with the nominal contact angle due to the elastic deformation of the rings.



Step 3: As soon as an axial force F_{ax} puts pressure on the shaft, the shaft is moved in the direction of the axial force F_{ax} by δ_{ax}. As a result, the inner preload forces relocate, causing bearing A to absorb a higher force and reducing the force in bearing B. The contact angle will increase in bearing A and decrease in bearing B.



Step 4: If the axial force F_{ax} affecting the shaft exceeds the unloading force, the balls of bearing B become load free. Bearing A will absorb the complete force $F_{ax} = F_{ax,A}$. At high speeds, in particular, this may result in increased vibration and noise, and thus to a reduced lifetime.



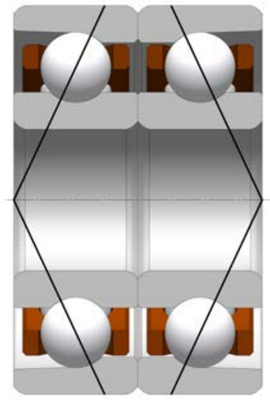
Duplex Bearings

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. Inner ring abutting faces of DB duplex bearings are relieved. 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.

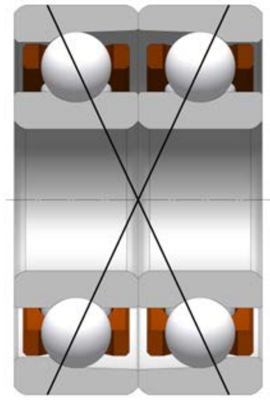


Back-to-Back Arrangement (DB)

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 outer ring abutting faces of DF duplex bearings are relieved. 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.

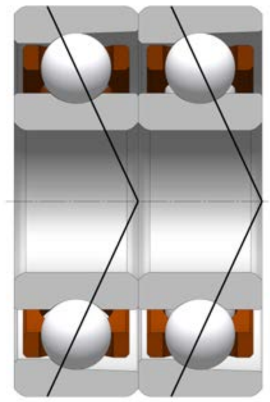


Face-to-Face Arrangement (DF)

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.



Tandem Arrangement (DT)

Universal design (U):

Universally preloaded bearings can be packed as sets 2UL, 3UL etc. 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. The width of the spacers should not be smaller than the width of the bearings, and inner and outer ring spacer widths (axial length) must be matched to within .0025mm to preserve preload and alignment. For paired bearings, both rings should be surface-ground in one processing step to ensure the same width.

The diagram below shows two spindle bearings which are preloaded against each other with a defined force. Two spacers provide a wide clamping surface. We also offer custom designed spacers and complete assemblies consisting of spindle bearings, spacers and shaft. Please ask our bearing specialists for more information.

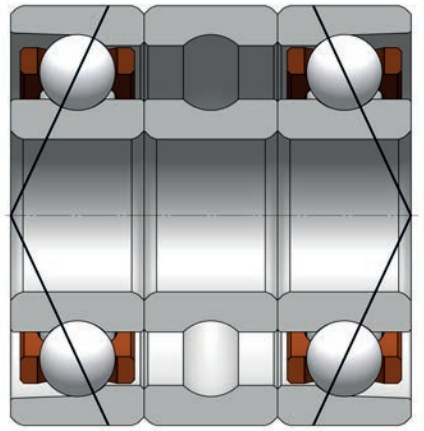
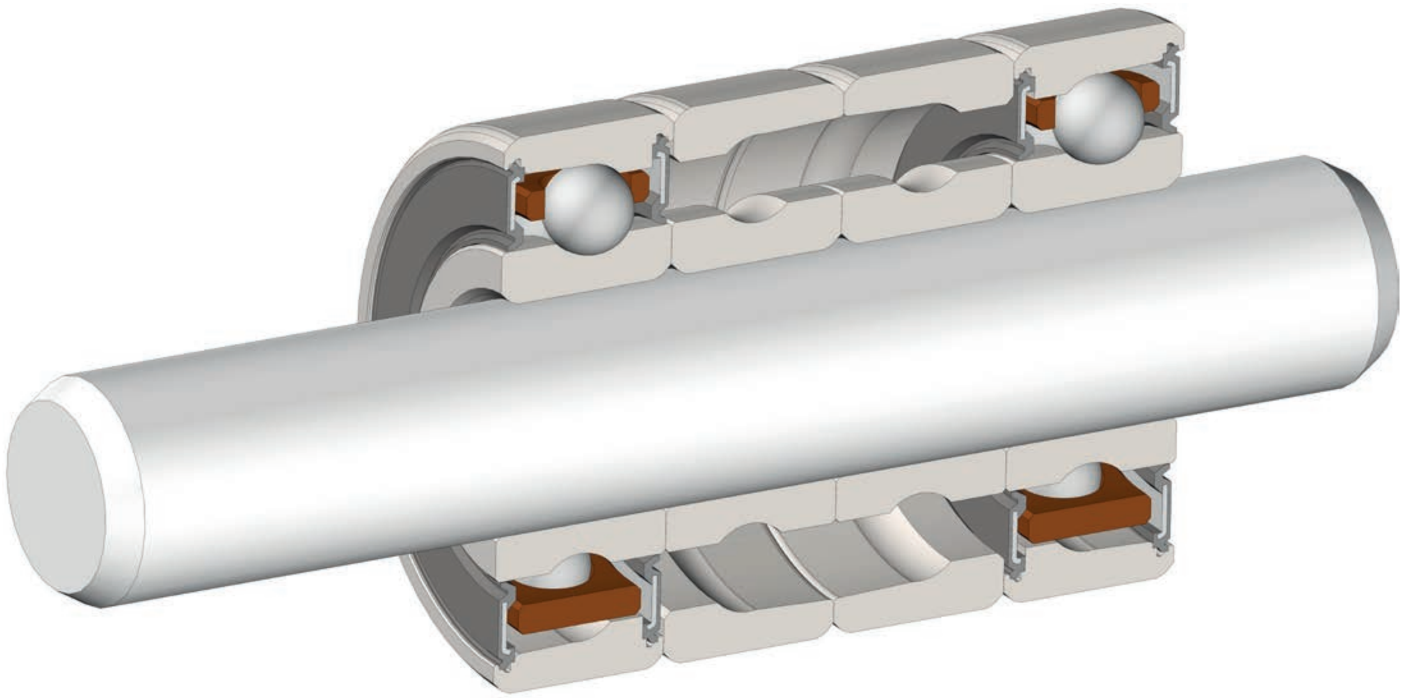


Figure 8 - Bearing Inner and Outer Ring as Spacer



Preload with spacers

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.

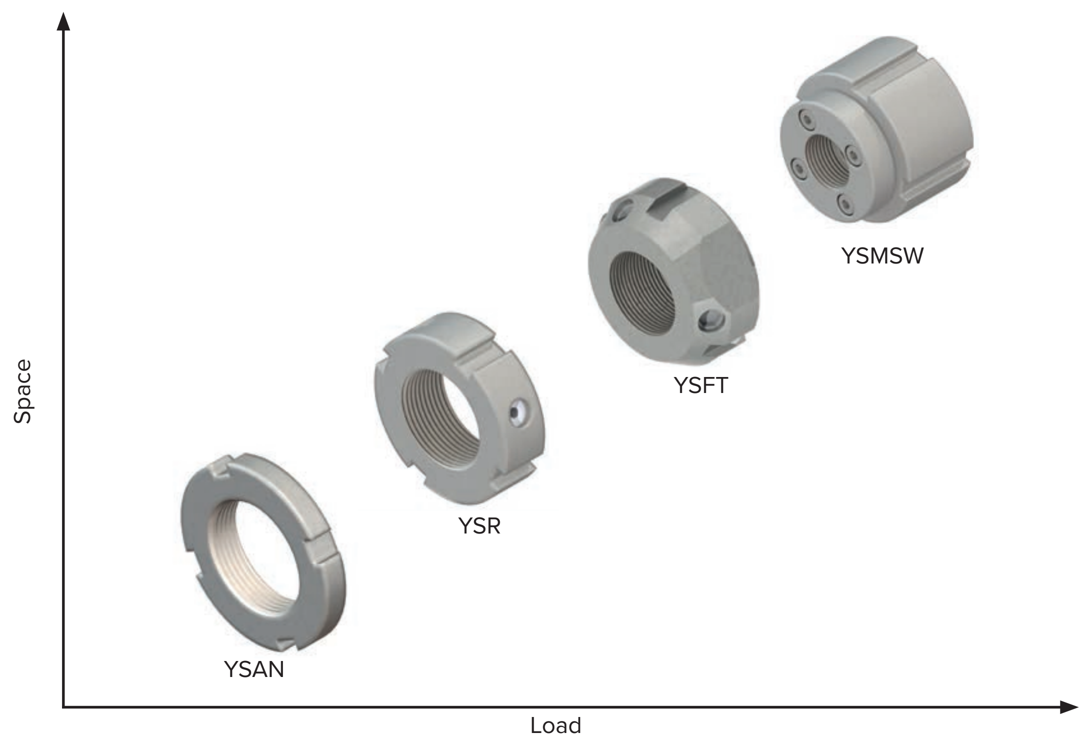
Lock nuts must display the following characteristics:

- 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.

Available YSAN Types

Type	Thread	Thread Pitch	D	h	g	t	d	Max. Fastening Torque [Nm]	Max. Permissable 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

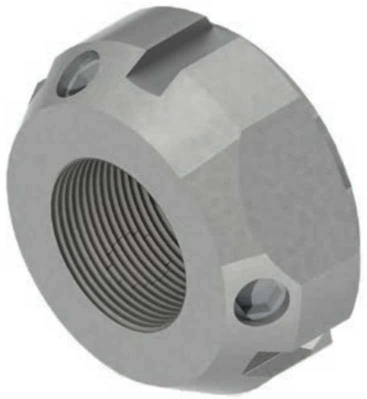
Type	Thread	Thread Pitch	D	h	g	t	d	n-m	Tightening Torque of Set Screw [Nm]	Fastening Torque [Nm]	Max. Permissable Axial Force [kN]
YSR M6 x 0.5	M6	0.5	16	8	3	2	11	2 - M4	3.5	3	11
YSR M8 x 0.75	M8	0.75	16	8	3	2	11	2 - M4	3.5	6	19
YSR M10 x 0.75	M10	0.75	18	8	3	2	13	2 - M4	3.5	6	24
YSR M10 x 1	M10	1.0	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. Permissable Axial Force [Nm]
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. Permissable Axial Force [Nm]
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 and classes P6 to P2 indicate increasing accuracy. 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 accuracy. 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.

Tolerance Table - Inner 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		Δ_{dmp} / Δ_{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
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	
	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	
	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	
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	
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	
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	
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	
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
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
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	

All figures in µm.

Tolerance Table - Outer Ring

Outer Ring Tolerances			D [mm] over	D [mm] incl.	P4 / ABEC7 max.	P4 / ABEC7 min.	P2 / ABEC9 max.	P2 / ABEC9 min.	P4S max.	P4S min.
Deviation of mean outside diameter in a single plane / Deviation of a single outside diameter		Δ_{Dmp} / Δ_{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
Variation of outside diameter in a single plane	Diameter series 7 / 8 / 9	V_{Dsp}	-	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	
	0 / 1	V_{Dsp}	-	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	
	2 / 3 / 4	V_{Dsp}	-	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	
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	
Radial runout of outer ring of assembled bearing		K_{ea}	-	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	
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	
Axial runout of outer ring of assembled bearing		S_{ea}	-	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	
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	
Deviation of a single outer ring width		Δ_{Cs} normal	-	18	Identical with Δ_{Bs} for inner ring of the same bearing					
			18	50						
			50	80						
			80	120						
Deviation of the total outer ring width for duplexed bearings		Δ_{Cs} modified [b]	-	120	Identical with Δ_{Bs} for inner ring of the same bearing					
Variation of outer ring width		V_{Cs}	-	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	

All figures in µm.

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.

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 with the tolerance being split into two groups. Bearings within a set will be provided such that all bores and all outside diameters are of the same code (however the bore code and OD code do not have to be the same).

It is also possible to request specific bore and OD codes, for example when repairing a spindle the shaft may be worn with a smaller bore diameter providing a better fit, or where machining tolerances cannot match those of the bearing. In these instances the diameters of the housings and shafts should be graded and suitable bearings selected for the desired fit.

The relevant group is indicated on the packaging of the bearing, according to the following code:

			D	
			0/-2.5	-2.5/-5
		Code	1	2
d	0/-2.5	1	11	12
d	-2.5/-5	2	21	22

Example:

Code 11

Bore: Ø 0/-2.5µ
OD: Ø 0/-2.5µ

Method of group classification:
Bore diameter: the smallest measured diameter determines the class.
Outside Diameter: the largest measured diameter determines the class.

Shaft Tolerances

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	Δ_{dmp} / Δ_{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
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
	Operating Conditions: 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
	Operating Conditions: 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
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	
	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	
	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	
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	
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	
Axial runout of the face in relation to the shaft			-	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	

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

Housing Tolerances

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	Δ_{Dmp} / Δ_{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
Deviation of the housing boreholes	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
	Operating conditions: 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
	Operating conditions: 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
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	
	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	
	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	
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	
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	
Axial runout of the face in relation to the housing borehole			-	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)

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 interchageable 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.
- The bearings with a multi-purpose design (UL, UM, US) are individually packed in foil and can be installed as required, e.g. with bearings from other batches. The load direction is indicated by arrow symbols on the outer ring.

Notes

HQW Precision GmbH
Wachtelberg 23
97273 Kürnach
Germany

Phone: +49 (0) 9367 98408-0
Email: info@hqw.gmbh
Web: www.hqw.gmbh

The Barden Corporation (UK) Ltd
Plymbridge Road, Estover
Plymouth PL6 7LH
United Kingdom

Phone: +44 (0) 1752 735555
Email: info@bardenbearings.co.uk
Web: www.bardenbearings.co.uk

HQW/BUK-SB-07/2020-EN