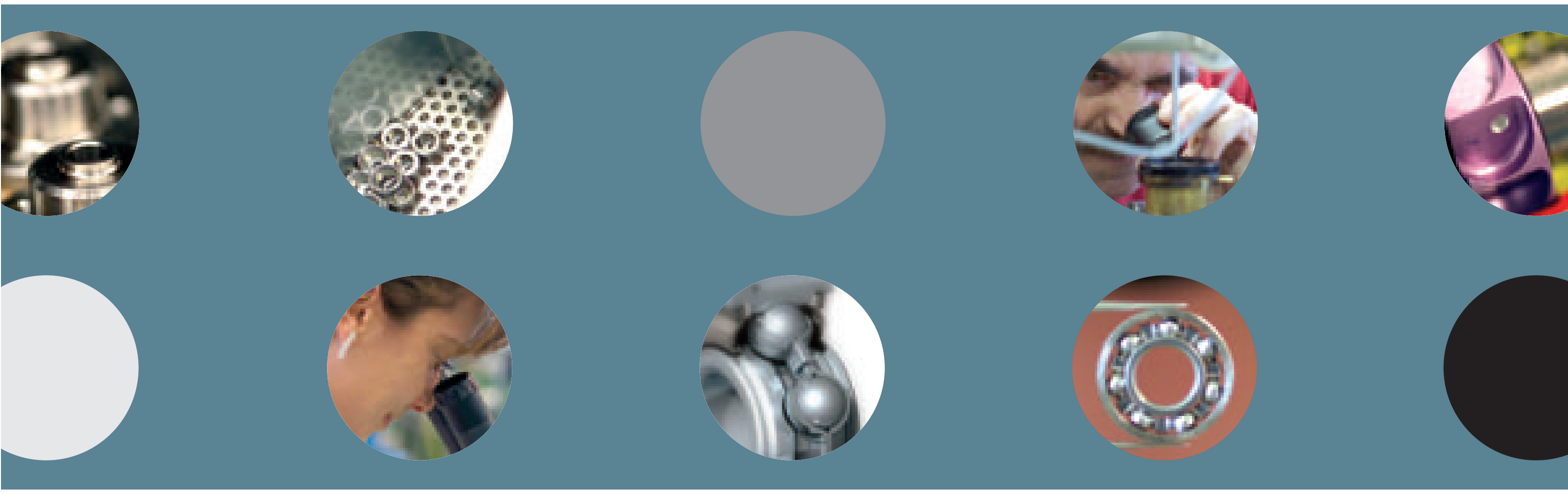
RMB bearings

myonic
more than a bearing



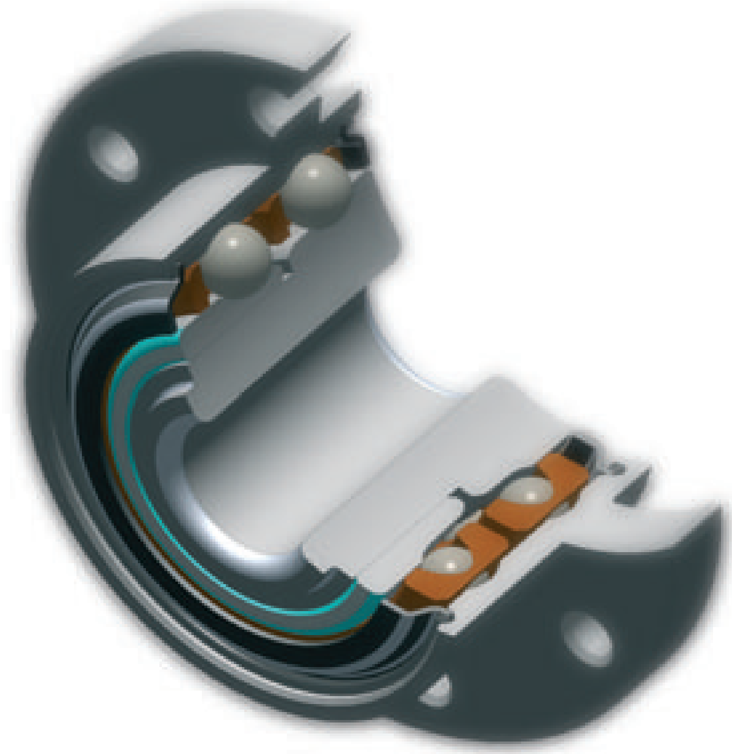
Standard catalog

myonic GmbH
Leutkirch
Steinbeisstraße

myonic GmbH
Leutkirch
Nadlerstraße

myonic s.r.o.
Roznov
Czech Republic

Index



myonic
more than a bearing

We started out small and have developed into a major market leader

Radial deep-groove ball bearing
Single-row, radial, deep-groove ball bearing with a flange

Radial deep-groove ball bearing
Single-row, radial, deep-groove ball bearing with an extended inner ring

Original size UL 103X

The early '30's was a difficult time for the Swiss watch industry, but the watch manufacturer "La Champagne SA" in Biel/Bienne recognized the increasingly important role electricity would play in people's daily lives.
All electrical appliances have one thing in common – they need miniature ball bearings in order to function.
So in 1932 the company successfully became involved with small components and created a spin-off company named RMB [Roulement Minature Bienne].
In 1969 a RMB miniature ball bearing was on the first manned moon landing – also a "big step" for RMB.
In 1971 RMB acquired "MKL-Miniature-Kugellager GmbH Leutkirch." Together they gained significant market share.
By 1979 RMB produced an annual quantity of 2 million ball bearings and by 1986 approached the 3 million mark.
In 1994 RMB established an assembly plant in Roznov, Czech Republic, the "Silicon Valley" of Eastern Europe.
Since December 2001, under the name of "myonic", RMB has developed into one of the world's leading suppliers in the design, engineering, manufacturing and assembly of high-precision ball bearings and system solutions.
Therefore, the company coined the phrase,
"myonic – more than a bearing"

myonic numbering system for bearings

Basic reference	Material	Features	Duplexed bearings	Ball cages	Precision grade	Radial play
UL 3006	X			-48	-A5P	-6/10
ULKZ 4008	X	.1c			-A7P	–
RKF 310	X	.1v			-P5P	-11/20
R 6190	X			-237HG	-P4P	-2/5
ULKU 8012	X			-48	-A9P	-2/10
RA 4012	X			-257HP	-A7P	
R 5160			.9d/1000			-16/20
Types listed Example :UL=type 3006=basic size of bearing bore and O.D in 1/32 of an inch or in millimeters for metric series.	X=AISI 440 C Stainless steel. No suffix is required for chrome steel AISI 52100 > page 6, 7	.1= 1 closure only. .1c= 1 closure, flanged side .1v= 1 closure only, side opposite flange > page 8	Type of Mounting / Preload .9f= face to face. .9d= back to back. .9t= tandem 1000= preload of 10[N] > page 9	Type and material. Standard cage is not mentioned in the reference. > page 10, 11	Dimensional and functional accuracy are according to ABEC or ISO Grades > page 12, 13	Lower/upper limits expressed in microns Standard radial play of 6/15 [μm] is not included in the reference. > page 14

Contact angle	Quietness	Torque	Coding of bores and outside dia	Special instruction	Lubrication
		-10/75D	-S2	-J...	-L23
					-G48
	-10/174				-G48/20
			-SB4/0C		G18/…mg
				-J...	-L96
-20/25°					-L23
			-S4/BB	-J...	-L23
Lower/upper limit > page 14	10 ≙ Limit 174≙ meassuring instrument	10 ≙ limit [µNm] 75 ≙ axial load [cN] D≙ starting torque > page 15, 16	Coding by dimensional groups. > page 17	Letter J followed by a number refers to an internal document and covers any requirement that cannot be expressed by the preceding suffixes.	Lubrification code L = oil G = grease Example: -G48/20 = grease G48, dispersion 20% -G18/…mg = grease G18, dose…mg. > page 18

C E R T I F I C A T E

DQS GmbH

Deutsche Gesellschaft zur Zertifizierung von Managementsystemen

hereby certifies that the company

myonic Group

Steinbeisstrasse 4
D-88299 Leutkirch
Germany

for the scope

Development, production and sales of miniature ball bearings and micro precision systems

has implemented and maintains a

Quality Management System.

An audit, documented in a report, has verified that this quality management system fulfills the requirements of the following standard:

DIN EN ISO 9001 : 2000
December 2000 edition

This certificate is valid until	2007-03-31
Certificate Registration No.:	276602 QM
Frankfurt am Main, Berlin	2004-04-01

Ass. iur. M. Drechsel — Dipl.-Ing. S. Heinloth

MANAGING DIRECTORS

D-60433 Frankfurt am Main, August-Schanz-Straße 21
D-10787 Berlin, Burggrafenstraße 6

Cleanliness is essential for proper performance of bearings but is particularly important for miniature bearings.

myonic achieves this cleanliness by:

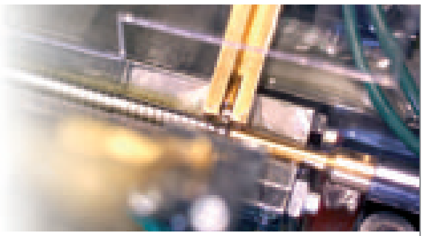
- Complete temperature and humidity control and air filtration of all production departments.
- Ultrasonic cleaning of all components after each stage of manufacture.
- Cleaning of all component parts by our special methods, just prior to assembly.
- The assembly of bearings in class 10,000 clean rooms under class 100 laminar flow benches.
- Strict observation of clean room procedures for all personnel working therein.
- The cleaning of assembled product by processes specially designed and perfected by myonic for miniature bearings.
- The use of special filtered lubricants.
- The packing of finished bearings in clean pouches or tubes, hermetically sealed.

These examples give an indication of the effort myonic make to supply their customers with bearings to the highest degree of cleanliness. Our customers also need to maintain this attention to detail. This may be achieved by observing the following points:

- All mating parts must be manufactured to correct tolerances as recommended in this catalog.
- The surface finishes of these parts must be satisfactory for the application in question and all components must be free of burrs, corrosion, etc.
- Any cleaning prior to final assembly should be done outside of the assembly area, with special attention paid to ensure the cleaned parts do not become contaminated during the transport process to the assembly area.
- The bearings should be assembled in a space arranged for this purpose and separate from other departments. It should, if possible, conform to clean room standards, with a dust free atmosphere and temperature and humidity control. Machining should not be done in the same room.
- The personnel employed in the assembly of miniature bearings should be subject to special rules of cleanliness. It is normal practice to equip them with coveralls or gowns and headdress of special non-fibrous material. It should be strictly forbidden to smoke, eat, wear makeup, etc. within the confines of the clean room.
- Bearings should remain in their protective packaging until just prior to assembly. If the package contains several bearings, it should be opened in such a way that only one bearing may be taken out at a time.
- Bearings should be handled with tweezers or other special tools. One should never touch high precision miniature bearings with fingers unprotected by rubber or plastic finger cots or gloves.

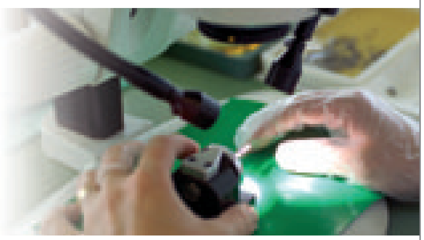
Naturally, the more demanding the end application, the more stringently the guidelines above need to be enforced.

The markets are changing and we continue to consistently evolve



High-precision component production

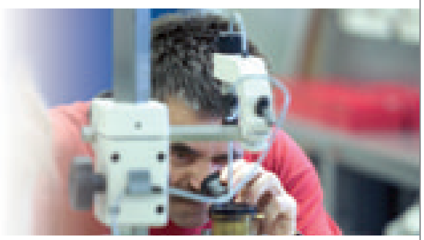
Myonic supports the customer at a very early product development stage with a highly qualified engineering team and the most modern equipment including laboratory, manufacturing and assembly. A dedicated and extremely flexible prototypemanufacturing cell provides short development cycles.
A consistently high quality is achieved by manufacturing critical components inhouse, and our semifinished component storage enables us to provide the highest flexibility and the shortest lead times in the market.



Clean-room assembly

The manufacturing area is located in a climate controlled environment, with the assembly in cleanrooms up to class 1000. We also offer our assembly competence as a service to a wide range of customers, with the keyword being: "Low cost assembly".

Myonic evolves continuously through the development of strategic partnerships with market leaders and is thus the innovation partner for system solutions that are on the edge of technology – with the slogan:
"myonic – more than a bearing"



Monitoring and measuring facilities

The RMB bearings have ring materials per list below.

At myonic, all raw material batches used to manufacture every ball bearing component are inspected by the material laboratory manned by metallurgical and chemical engineers. This includes materials for rings, balls, cages, shields and seals. Each batch is analyzed and classified by its grain structure, homogeneity and microscopic cleanliness.

To assure the best raw material, myonic uses vacuum degassed steel and in many cases, double induction melted vacuum degassed steel. These steels are able to meet the highest degree of cleanliness and homogeneity.

myonic uses many different steels able to meet customer specific needs. Please contact our sales and technical engineers for assistance in selecting the correct material for your customized application.

Standard-Material

X105CrMo17 - DIN 1.4125 - AISI 440C

This is the standard material used mainly where corrosion resistance is an issue. The heat treatment of this material ensures a good hardness of 61 HRC, together with a corrosion resistance property.

Material on request

X65Cr13 - DIN 1.4037

myonic introduced this stainless steel material many years ago, due to the particular microstructure of the grains. Tests at our internal R&D laboratory have shown that this material can, in many cases, ensure an improvement in the final noise level of the bearings, without any disadvantage in the corrosion resistance properties compared to the AISI 440 C.

Material on request

100Cr6 - DIN 1.3505 - AISI 52100

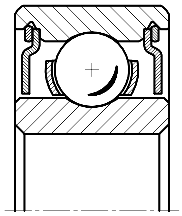
This chrome steel material, known also as bearing steel, is overall the most widely used material for manufacturing bearings of any size. Its composition corresponds to the AISI 52100 standard and assures a good uniform microstructure with a final hardness after heat treatment of 62 HRC. This material is standard for RMB thrust ball bearings.

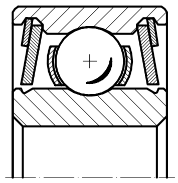
Material on request

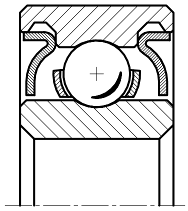
X30CrMoN15 1 - DIN 1.4108

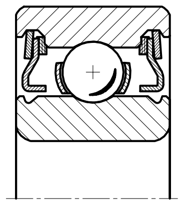
This stainless steel contains a significant amount of nitrogen, which generates, together with the available carbon, a grain structure, which contains homogeneously distributed microglobular carbonitrides. The chromium content ensures corrosion resistance. The special microstructure provides improved macro mechanical abilities, especially with respect to hot hardness, ductility, bending fatigue limit and breaking elongation.

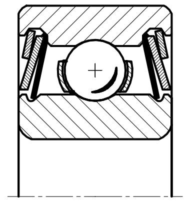
Please contact our application engineering department for suggestions on the most suitable steel for your application. For very demanding applications, our engineers will give you the right solution to your bearing application problems both by using standard myonic production steels or by employing exotic ones.


Standard shield type "V" et "Z"


Standard shield type "X"


Standard shield type "J"


Filmoseal type "F"


Contact seal type "H"

Research and Development

At myonic, the Miniature Bearing R&D team has one goal: to develop the most reliable miniature bearings for constantly improving customer product requirements to achieve maximum customer satisfaction.

All of our bearing components are continually subjected to design and material reviews to ensure leading edge products for our customers. Special attention to balls, raceway geometry and finish and retainer design has resulted in superb bearing performance. This helps us keep our customers at the leading edge of technology.

The research and development team, made up of chemical, metallurgical, mechanical and electronic instrumentation experts works in close association with the company's sales and product engineers, to retain their leadership role in bearing quality and design.

R&D engineers also assist in the development of inspection and testing equipment for maintaining manufacturing control and consistent quality. The results of this effort is that many of the manufacturing machine tools, control equipment and test equipment has been specially designed by our R&D department. We also develop special test equipment to simulate working conditions seen in the customer's application.

Engineering

Engineering at myonic is one of our most important departments, in that we need to be able to understand and translate customers technical needs into a superior solution that is reasonable to manufacture.

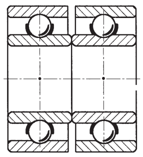
myonic design and production engineers have a wide range of the latest machinery and test equipment at their disposal in our purpose built facilities. Our highly skilled engineers have been instrumental in assisting customers throughout the world in solving problems related to rotating motion.

Using either conventional catalog bearings with extended specifications, designing special bearings for a specific application or using sophisticated subassemblies, myonic is recognized as a world leader in getting results.
Our expertise allows our customers to focus on their core competence while we handle the critical issues surrounding the bearing interface.

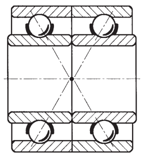
Our engineers also specialize in specific strategic applications fields, allowing our customers to benefit from their years of dedication to those areas of expertise.
With these resources, myonic partners are assured contact with qualified application engineers who know both the bearing technology and the critical issues surrounding the specific application.

Our application engineering team has one goal: to let our customers feel free to concentrate on their own product development by taking care of any bearing issues that may arise.

Mounting face to face (suffix .9f) or X-configuration

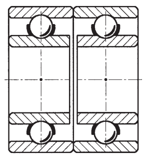


before mounting

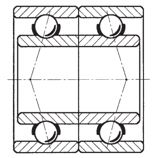


after mounting

Mounting back to back (suffix .9d) or O-configuration

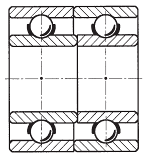


before mounting

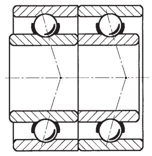


after mounting

Mounting in tandem (suffix .9t)



before mounting



after mounting

In miniature ball bearings, the highest quality steel is essential for the best performance in the final application.

Closures in the form of shields or seals serve the basic purpose of:

- Excluding contamination during bearing handling or assembly.
- Protecting the internal features of the bearing during operation.
- Retaining and minimizing the loss of lubricant due to centrifugal effect.

myonic standard simple shields

myonic produces precision shields stamped from stainless steel material. These shields allow a basic protection against external contamination without contact with any bearing rotational part. This guarantees that there is no increased torque, noise level or operative temperature of the bearing. It should be noted that this type of closure does not guarantee complete protection against external dust contamination or penetration by fluids. Our simple shields are identified by one of the following suffixed: “V“, “Z“, “X“ or “J“. We can supply fixed or removable shields depending on the needs of your application.

Filmoseal by myonic a non-contact seal

A capillary seal, referred to as “Filmoseal“ is an exclusive RMB design that is identified by the suffix “F“ after the bearing type and before the size.
myonic developed this “Filmoseal“ closure in order to have the advantage of a non-contact shield with the practical effect of a seal, by the capillary action of a film of oil. This is accomplished by the ingenious design of the shields and

Principal cages produced by RMB

myonic standard tightly crimped two piece ribbon cage

This is a two-piece stamped ribbon cage. It is satisfactory in the majority of applications where demands are not extreme. It may be used where there are no requirements for low starting or running torque, in medium to high speed applications or when adequate lubrication is assured. This cage type is supplied as standard in most myonic radial miniature bearings where contamination, misalignment and high acceleration/ deceleration are not factors. When the speed factor exceeds 400,000 n·dm it is recommended that you contact our engineering department for further advice.

myonic type “48“ loosely crimped two piece ribbon cage for low torque

A very light two-piece stamped ribbon retainer, which rides on the inner ring, it is excellent for eliminating the problem of low torque hang up. This cage type replaces and gives better performance than a spring separator, single piece crown or comb separator. myonic designed the cage “48“ specifically for low torque and relative low speed applications because it virtually eliminates the risk of cage “hang-up“. For speed factors above 300,000 n·dm, it is recommended you contact our engineering department.

myonic crimped two piece coated ribbon cage

The standard two piece ribbon type as well as the “48“ cage may be coated with a thin layer of Teflon, silver, gold or other materials providing self-lubrication when conventional lubricants cannot be used.
Teflon coated cages are used in application requiring long term shelf life capabilities, in instruments operating in vacuum and in close proximity to optics.
We strongly recommend you to consult our engineering department and/or make practical test on the final application before using any coated cages.

Cages

The retainer, often referred to as “cage“ or “separator“ is the component of a ball bearing that keeps the balls separated around the pitch circle of the bearing. In order to optimize the performance of any given bearing, myonic has designed and developed many different types of retainers of many different types of materials. A universal ball retainer that would be capable of satisfying all possible requirements simply does not exist. For selecting the best possible retainer, the many requirements to be considered include:

- Starting and running torque.
- Rotational speeds.
- Acceleration and deceleration.
- Operating temperature.
- Lubrication type and amount.
- Application environment (vacuum, chemical agents, etc.).
- Noise requirements.
- External vibrations.
- Self lubricating characteristics.

myonic type "23" cage for high speed applications

This is a crown or comb type moulded retainer that can be machined or molded from a range of synthetic materials. With the correct type of base material, this type of retainer can be supplied either oil impregnated in order to achieve longer life or completely dry when environmental conditions do not permit lubrication with conventional lubricants. The cage "23" is used in myonic's high speed applications requiring speeds up to 1.3 million n·dm.
When more extreme speeds are required we suggest you contact our technical office where you can get the best advice for the solution to your application.

myonic type "25" cage for high speed angular contact bearings

This is a solid, one-piece machined or molded cage. Cage type "25" has been expressly designed for the bearing series RA and RKA -Angular contact bearings. When possible this cage may be supplied oil impregnated in order to achieve longer life. The ball pockets are counter bored in order to retain the balls within the cage to allow the bearing to be separable. This design enables the removal of the inner ring from the bearing without any risk that the balls will fall out, allowing separate mounting of the two rings where appropriate. The cage "25" is used in myonic's bearings for applications requiring speeds up to 1.5 million n·dm.

myonic type "27" cage for high speed angular contact bearings

This retainer is very similar to the "25" cage with the exception that the ball pockets are through-bored. The balls are not retained in the cage if the inner ring is removed in this design. This cage type has the advantage of allowing a lower torque than the "25" cage type. The cage "27" is used in myonic's high-speed applications requiring speeds up to 1.6 million n·dm. When more extreme speeds are required we suggest you contact our technical office where you can get the best advice for the solution to your application and/or make practical test on the final application.

Cage Materials

Each of the above materials has its advantages and benefits depending on the application, lubrication and operating environment. We strongly recommend you contact your nearest myonic sales office or our technical staff who will assist you in determining the best retainer material for your application

myonic can offer many metals and synthetic materials for cages, including but not limited to:

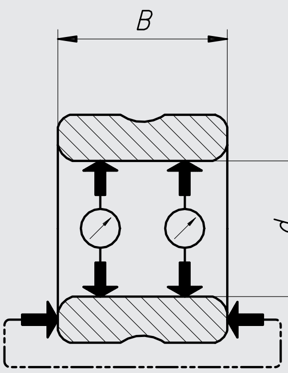
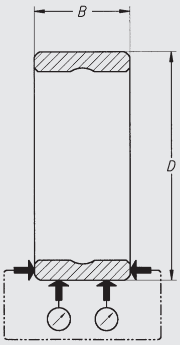
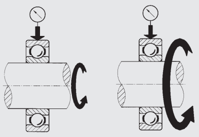
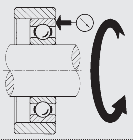
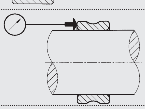
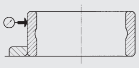
- Phenolics, cotton based
- PI
- POM
- PEEK
- Nylasint
- Teflon
- Vespel

myonic dedicated special cage design

In the event that none of the above standard cage types satisfy the needs of the customer's application, myonic is also able to manufacture special and fully dedicated designs. Our R&D department is continually testing new innovative materials and cage design able to achieve peak performances. Please contact our sales engineers or our technical staff who will be glad to help select the proper solution to your application challenge.

Precision
All RMB miniature ball bearings are manufactured according to ISO and/or ABEC precision accuracy. The International Standard Organization (ISO) defines norms that are used for the accuracy of metric dimension bearings, while the Annular Bearings Engineers Conference (ABEC) are used generally for inch dimension bearings. myonic manufactures to both accuracy standards.

Limits of dimensional and functional accuracy of radial ball bearings in [µm]

	Parameter		P2	A9P	P4P	A7P
	Grade **ISO 492**		2		4	
	ABEC			9P		7P
	myonic suffix		P2	A9P	P4P	A7P
Inner ring 	$\frac{d\,max + d\,min}{2} = dm$	max	0	0	0	0
		min	-2.5	-2.5	-5	-5
	Absolute limits bore diameter **d**	max	0	0	0	0
		min	-2.5	-2.5	-5	-5
	Deviation from roundness	bore max	0.8*	–	–	–
		raceway max	0.5	–	–	–
	Width **B**	max	0	0	0	0
		min	-25	-25	-25	-25
	Deviation from parallelism	max	1.5	1.25	2.5	2.5
Outer ring 	$\frac{D\,max + D\,min}{2} = Dm$	max	0	0	0	0
		min	-2.5	2.5	-5	-5
	Absolute limits outside diameter **D**	max	0	0	0	0
		min	-2.5	-2.5	-5	-5
	Deviation from roundness	O.D max	0.5	–	–	–
		raceway max	0.8*	–	–	–
	Width **B**	max	0	0	0	0
		min	-25	-25	-25	-25
	Deviation from parallelism	max	1.5	1.25	2.5	2.5
Eccentricity of tracks 	Inner ring	max	1.5	1.25	2.5	2.5
	Outer ring	max	2	1.25	5	3.75
Tracks parallelism with sides 	Inner ring	max	2	1.25	2.5	2.5
	Outer ring	max	4	1.25	5	5
Bore square with side 	Inner ring	max	2	1.25	2.5	2.5
O.D square with side 	Outer ring	max	2	1.25	3.75	3.75

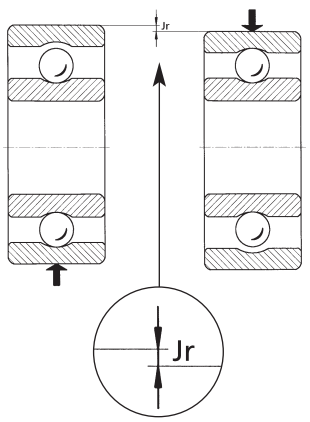
* deviating from standard

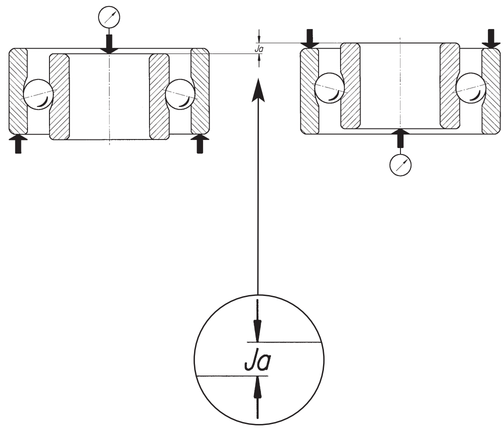
myonic more than a bearing

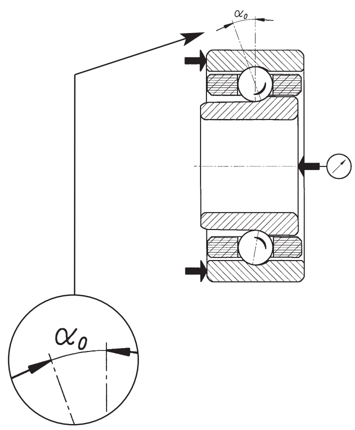
Limits of dimensional and functional accuracy of radial bearings

myonic's high precision manufacturing and assembly processes allow us to manufacture bearings from ISO 5P and/or ABEC 5P, through ISO2 and/or ABEC 9P.
For the most demanding applications, myonic manufactures bearings with stricter tolerances than required by the standards, even at their highest level. Our sales and technical engineers will guide you through the best solution for your application.

5		**6**		**0**		
	5P		**3**		**1**	
P5P	**A5P**	**P6**	**A3**	**–**	**A1**	
0	0	0	0	0	0	Limits for the arithmetical mean of all the measurements taken in two planes (dm = mean inner diameter).
-5	-5	-7	-5	-8	-7.5	
0	0	+1	+2.5	+1	+2.5	Limits for the absolute value of the smallest and the largest inner diameter measured in two planes
-5	-5	-8	-7.5	-9	-10	
–	–	2	–	–	–	Maximum difference tolerated by myonic between the two concentric circles traced respectively inside and outside of the line of a polar diagram.
–	–	2	–	–	–	
0	0	0	0	0	0	Absolute upper and lower limits of the width of the inner ring
-25	-25	-40	-125	-40	-125	
5	5	12	–	12	–	Maximum difference between the smallest and the largest measured width.
0	0	0	0	0	0	Limits for the arithmetical mean of all the measurements in two planes. (Dm = mean outer diameter)
-5	-5	-7	-7.5	-8	-10	
0	0	+1	+2.5	+1	+2.5	Absolute upper and lower limits of the outer diameter measured in two planes.
-5	-5	-8	-10	-9	-12.5	
–	–	2	–	–	–	Maximum difference tolerated by myonic between the outlines of two concentric circles traced respectively inside and outside of the line of a polar diagram.
–	–	3	–	–	–	
0	0	0	0	0	0	Absolute upper and lower limits of the width of the outer ring.
-25	-25	-40	-125	-40	-125	
5	5	–	–	–	–	Maximum difference between the smallest and the largest measured width.
5	3.75	5	5	10	7.5	Limits of total indicator deviation during one revolution of the inner ring, the outer ring remaining stationary.
5	5	8	10	15	15	Limits of total indicator deviation during one revolution of the outer ring, the inner ring remaining stationary.
7.5	7.5	–	–	–	–	Limits of the total indicator deviation during one revolution of inner ring, the outer ring remaning stationary. (Limits for the runout of the track in relation to the sides).
7.5	7.5	–	–	–	–	Limits of total indicator deviation during one revolution of the outer ring, the inner ring remaining stationary.
7.5	7.5	–	–	–	–	Limits of total indicator deviation during one revolution of the inner ring.
7.5	7.5	–	–	–	–	Limits of total indicator deviation during one revolution of the outer ring.







Radial play (Jr)

Radial play is not an indication of the quality of the bearing, but its selection is one of the most important parts of the bearing specifications. Without sufficient radial play, interference fits (press fits) and normal expansion of components cannot be accommodated, causing binding and potential early failure.

Radial play of the mounted bearing also influences the operative bearing contact angle, which will affect bearing radial and axial capacity, stiffness, life and other basic performance characteristics. Mounting considerations impacting radial play are noted in our section on shaft and housing tolerances.

Higher values of radial play are beneficial where high speeds create higher heat and where thrust loads predominate. Low values of radial play are better suited for predominately radial loads.
The standard radial play of RMB radial ball bearings is from 6 to 15 [µm] (.0002“ to .0006“). On request, bearings may be supplied with reduced or greater radial play.

Please contact our sales engineers or technical staff to help you with the proper selection of radial play for your application.

Axial play (Ja)

The axial play of a bearing is equal to the total axial displacement of the inner ring relative to the outer ring under the effect of a small measuring force. Axial play is a function of the curvature of the races.

Contact angle (αo)

The contact angle of a radial ball bearing or an angular contact ball bearing is the angle formed by the straight line perpendicular to the axis and that which passes through the contact points of the balls in the races after eliminating any radial play.

The contact angle is a function of the radial play, ball size and the radius of curvature of the ball races. It increases slightly when an axial external load is applied on the bearings.
The greater the contact angle, the higher is the axial capacity of the bearings, this means the capability to support axial load is increased.

Please contact our technical application engineers who will be pleased to recommend the appropriate contact angle for your application.

	Groups			
Radial play [µm]	2 to 5	6 to 10	11 to 15	16 to 20
Suffix	2/5	6/10	11/15	16/20

	Groups				
Contact angle α_o	11° to 16°	14° to 19°	17° to 22°	20° to 25°	23° to 28°
Suffix	11/16°	14/19°	17/22°	20/25°	23/28°

Sensitivity

The criteria for bearing sensitivity are very complex and still the subject of study. Research and experience have established some of the essential factors on which sensitivity depends:

- The geometric precision, design and quality of the surface of the race way tracks.
- The geometric precision of the balls.
- The material used for balls and rings.
- The design, material and guidance of ball retainers.
- The characteristic, quantity, quality and disposition of lubricant.
- The precision of housing and shaft where the bearings are mounted.
- The fit tolerances and final play is taken up when mounting the bearings.
- The value and direction of external loads.
- The position of the bearing shaft.

Different projects for the standardization of this measurement are still under investigation.
myonic have been guided by these in developing their own method which is based on practical experience on real application and test at its R&D department.

The sensitivity of the bearings is determined by the interpretation of the relative value of one or several of the following forces:

- Starting torque D.
- Running torque M.
- Hang-up resistance.

In the majority of torque measuring instruments, the bearing to be measured is subjected to a pure axial load (which is principally distributed equally on all the balls of the bearing).

The axial load will be:
75 cN for bearings up to 10 mm outer diameter inclusive or .375“ (9.525 mm) outer diameter inclusive for inch size bearings.
400 cN for bearings exceeding 10 mm outer diameter or .375“ (9.525 mm) outer diameter for inch size bearings.

Starting torque value for instrument ball bearings

The maximum starting torque value listed below are those specified in AFBMA Standards for instrument bearings. They are valid for ABEC 7P quality bearings (open or closed) in both stainless steel AISI 440C or carbon chrome steel AISI 52100 fitted with a two piece ribbon cage and lubricated with instrument oil.
They are subjected to the specific definition and test condition defined in that standards. These values can be taken as the maximum which would apply to RMB bearings in this category.

Inner Ø d	**Outer Ø** D	**Test load**	**Maximum starting torque [µNm]** Radial internal clearance		
[inch]	[inch]	[N]	**Tight-fit** .0001"-.0003" 2-8 µm	**Normal-fit** .0002"-.0005" 5-12 µm	**Loose-fit** .0005"-.0008" 12-20 µm
.0400	.1250	.75	18	15	14
.0469	.1563	.75	18	15	14
.0550	.1875	.75	18	15	14
.0781	.2500	.75	18	15	14
.0938	.3125	.75	18	15	14
.1250	.2500	.75	18	15	14
.1250	.3125	.75	18	15	14
.1250	.3750	.75	20	16	15
.1250	.3750	4	50	45	42
.1250	.5000	4	50	45	42
.1563	.3125	.75	18	15	14
.1875	.3125	.75	18	15	14
.1875	.3750	.75	20	16	15
.1875	.5000	4	65	55	50
.2500	.3750	.75	18	15	14
.2500	.5000	4	60	52	48
.2500	.6250	4	70	60	55
.2500	.7500	4	80	70	65
.3750	.8750	4	110	95	90

myonic more than a bearing

To facilitate fitting the bearings in the housing and on the shaft, bearings can be supplied with inner diameters and/or outer diameters graded in dimensional groups.

			Outer Diameter D					
	Tolerance Range in µm		0 -2,5	-2,5 -5	0 -1,25	-1,25 -2,5	-2,5 -3,75	-3,75 -5	not graded
	µm	Code	1	2	A	B	C	D	0
Inner Diameter d	0 -2,5	1	11	12	1A	1B	1C	1D	10
			S2			SN2-SB4			SN2
	-2,5 -5	2	21	22	2A	2B	2C	2D	20
	-0 -1,25	A	A1	A2	AA	AB	AC	AD	A0
	-1,25 -2,5	B	B1	B2	BA	BB	BC	BD	B0
			SN4-SB2			S4			SN4
	-2,5 -3,75	C	C1	C2	CA	CB	CC	CD	C0
	-3,75 -5	D	D1	D2	DA	DB	DC	DD	D0
		0	01	02	0A	0B	0C	0D	no Suffix
			SB2			SB4			

Suffixes

S4	d =	0 -1.25	1st letter	= A	group AC
	D =	-2.5 -3.75	2nd letter	= C	

S2	d =	0 -2.5	1st number	= 1	group 12
	D =	-2.5 -5	2nd number	= 2	

Special cases
If one of the two diameters ("d" or "D") is not graded, this diameter is represented in the code by the numeral 0 for instance.

SB	d =		not graded	= 0	group 01
	D =	0 -2.5		= 1	

SN4	d =	0 -1.25		= A	group A0
	D =		not graded	= 0	

Note: The dimensional group code number is shown on each package of coded bearings, myonic cannot undertake to supply all the bearings of one delivery in a single group.

For miniature ball bearings, the lubricant and method of lubrication is one of the most important factors that will determine the ultimate success of the design. Because of their size, miniature ball bearings may demonstrate significant performance differences from the use of one lubricant to another. The choice of lubricant, the amount and its placement within the bearing are critical factors and the following characteristics should be taken into consideration:

- Rotational speed of inner and / or outer ring.
- Operational rotation condition (intermittent, continuous, tilting etc…).
- External loads (axial, radial tilting).
- Bearings operational temperature and ambient temperature.
- Admissible noise level.
- Expected life time.
- Storage before use.
- Ambient environment where the bearings work (vacuum, chemical agents etc...).
- Starting and running torque required.

Our R&D department develops tests in conjunction with our lubricant suppliers to ensure consistency in the product we receive.
Hundreds of types of oils and greases together with solid lubricants have been tested and are available to meet the most demanding of applications.

Please contact our sales and technical application engineers who will offer the proper lubrication based on their years of experience in this area.

RMB Standard Lubricants

Stocks are normally available with the following standard lubricants	
Radial ball bearings with closures, outside diameter <9 mm	L23
Radial ball bearings with, outside diameter ≥9 mm	G48
Angular contact bearings	G48
Thrust bearings	G48

Lubricant information is tabulated on page 19.
Please note the operating criteria listed are obtained from the respective manufacturers'literature.
When working conditions cannot be exactly specified, practical lubricant tests are essential.
The list of lubricants should not be taken as exclusive. myonic will be pleased to supply other lubricants providing they are readily obtainable.

Characteristics of oils and greases most widely used by myonic

Oiles

Code	universal applications	high speed	high speed and high temperature	high temperature (>200°C)	low temperature (<30°C)	low starting torque	low noise
L2		x			x	x	x
L23	x		x				x
L25				x			

Reference	Code	Operating temperature range in °C	Peak temp. for short period in °C	Viskosity in [cSt] at 20°C	Flash point °C	Solidifying point in °C	Military specification USA
Isoflex PDP 38	L 2	-65 to + 100	-	23	+205	-70	MIL-L-6085B
Winsorlube L 245X	L23	-54 to + 177	+204	24	+216	-60	MIL-L-6085B
Krytox 143 AB	L25	-40 to + 232	-	230	+215	-40	-

Greases

Code	universal applications	high speed	high speed and high temperature	high temperature (>200°C)	low temperature (<30°C)	low starting torque	low noise
G9						x	
G21					x		
G48	x						
G58		x					
G79			x				
G86							x
G90				x			
G100		x					
G144		x					

Reference	Code	Operating temperature range in °C	base oil viscosity in [cSt]	Penetration according to ASTM	Dropping point °C	thickener base	Military specification USA
Nye Rheolube 374C	G 9	-40 to +120	61 / 40°C	193	>+260	Lithium	
Nye Instrument 704C (Aeroshell grease 7)	G21	-73 to +150	3 / 100°C	290	+260	Bentone Clay	MIL-G-23827B
Shell Alvania Grease RS	G48	-25 to +120	76 / 40°C	280	+180	Lithium	-
Klüber Isoflex LDS 18 Special A	G58	-55 to +120	15 / 40°C	280	+185	Lithium	MIL-G-3278A MIL-G-23827B
Klüber Topas NB 52	G79	-50 to +150	30 / 40°C	280	+240	Barium	
Asonic GLY 32	G86	-50 to +140	25 / 40°C	280	+190	Lithium	-
Klüber Barrierta	G90	-40 to +260	400 / 40°C	280	-	synthetic	-
Nye Rheolube 740 S	G100	-30 to +120	110 / 40°C	265	+240	Polyurea	MIL-G-23827B
myonic high speed lube	G144	-30 to +150	46 / 40°C	290	> 150	synthetic	-

Correct mounting is of prime importance for the good performance of small bearings.
Experience has shown that the majority of cases of poor performance and undue wear are due to incorrect mounting. It is therefore recommended to take careful note of the following points:

The choice of fit

Good operation of bearings depends very largely on the quality of their fit. To obtain a satisfactory fit it is necessary to take into account:

- The quality of the surface finish and the geometric precision of the shaft and the housing.They influence the sensitivity and the noise level as well as the good running of a bearing intended for high speeds.
- Variations of temperature. In the case of a higher temperature, the radial expansion of a light metal housing loosens the outer ring while the radial expansion of a light metal shaft reduces radial play. On the other hand, the difference between the axial expansion of a steel shaft and a light metal casing may produce an additional axial load.
- The size, direction and the nature of loads. The load on a bearing at rest should not exceed its static load capacity.
- Axial, radial, combined and reversible loads, which cause elastic changes. These shock loads are very harmful to small bearings and should as far as possible be avoided.
- Relative movement of the inner and outer bearing rings
- The precision and the radial rigidity required for the complete assembly.

The two tables in the following pages indicate, in the central columns, one for shafts, the other for housings, the manufacturing tolerances best adopted to provide the most suitable mounting for:

- Left, the loads and speeds for the application in question
- Right, the degree of precision and radial rigidity which should be attained.

These tolerances are given in [µm] and are valid only when the material of the shafts and housings have the same coefficient of espansion as the steel of the bearing*
In all other cases, it is necessary to take account of the differences of expansion. In general, it is accepted that the mountings mentioned in the following tables are indicated as suitable for normal working temperatures while for exceptional temperatures, the press fit or play should not be excessive.
The best solution, due to the variables in bearings and mating parts, problems in the operating environments of bearings and the correct choice of the bearing, often can be proposed only after laboratory investigation has identified the source of the problem. The myonic laboratory is well equipped to conduct this type of investigation when conditions so warrant it.
To facilitate mounting, RMB bearings can be supplied with bore and/or outer diameter graded in dimensional groups.

*Coefficient of expansion of bearing steel: 11 x 10^{-6} $°C^{-1}$

Shaft tolerances

Shaft and bearing of **identical** material; otherwise allowance must be made for different coefficients[1] of expansion d shaft=d+tol.

Shaft	**Load-Speed**	**Fit**	Tolerance of bore d				**Mounting precision**	**Typical applications**	**Inner-ring laterally**
			0/–8 [µm]	0/–5 [µm]	Grade 0/- 2.5	Grade -2.5/-5			
			Shaft						
Revolving or fixed	Small loads Low to medium speeds No vibrations	sliding fit	-5 -13	-5 -11	-5 -8	-8 -11	Standard precision without special requirements	Guides (films, strips etc)	fixed
							Standard precision Inner-ring should slide laterally (expansion)	Brakes Couplings	free
Fixed	Medium loads Medium speeds High frequency vibrations	light press fit	0 -8	0 -6	0 -3	-3 -6	Precise radial guiding Radial rigidity	Gyro rotors	fixed
Revolving	Small loads Medium speeds Low frequency vibrations						Standard precision	Small motors Potentiometers Servo motors	free
Fixed	High loads High speeds High frequency vibrations	medium press fit	+4 -4	+4 -2	+4 +1	+1 -2	Press fit required particularly high speeds. Very rigid radially.	Gyro rotors Fan motors Electric motors Gear boxes	free
Revolving	Medium to high loads High speeds High frequency vibrations								

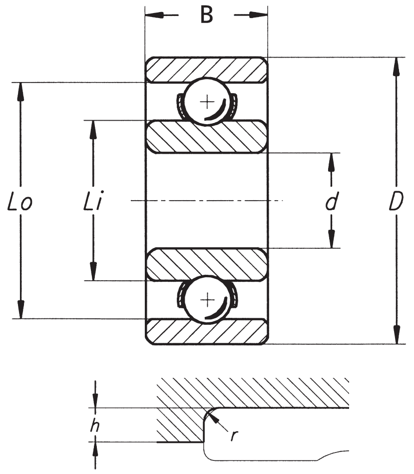
Housing tolerances

Housing and bearing of **identical** material; otherwise allowance must be made for different coefficients[1] of expansion. d shaft=d+tol.

Outer ring	**Load-Speed**	**Fit**	Tolerance of outer D				**Mounting precision**	**Typical applications**
			0/–8 [µm]	0/–5 [µm]	Grade 0/- 2.5	Grade -2.5/-5		
			Housing					
Revolving or fixed	Small loads Low to medium speeds No vibrations	sliding fit	+5 -3	+5 -1	+5 +2	+2 -1	Standard precision Without special requirements Outer ring should slide laterally (expansion)	Electric motors Servo motors Fan motors Potentiometers
Fixed	Medium loads Medium speeds High frequency vibrations	light press fit	0 -8	0 -6	0 -3	-3 -6	Precise radial guiding Outer ring must be fixed laterally	Synchro motors Gyroscope gimbals
Revolving	Small loads Medium speeds High frequency vibrations						Standard precision	Guides Rollers Couplings
Fixed	High loads High speeds High frequency vibrations	medium press fit	-4 -12	-3 -9	-3 -6	-6 -9	Press fit required particularly at high speeds. The outer ring must not necessarily be fixed laterally. Very rigid radially.	Pulleys Idlers Planetary gears
Revolving	Medium to high loads High speeds High frequency vibrations							

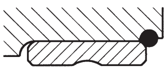
[1] Coefficient of expansion of bearing steel: $11x10^{-6}$ / °C^{-1}

The dimensions d,D,B (Bf), Li, Lo, r max and h min given in the bearing tables enable designers to determine exactly the overall dimensions of small bearings

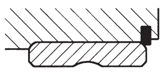


d = Inner diameter
D = Outer diameter
B = Width of rings
Li = Minimum diameter of housing shoulder
Lo = Maximum diameter radii of shaft or housing
r max= Maximum fillet radius of shaft or housing
h min= Minimum height of shoulder on shaft or housing

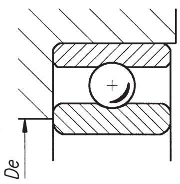
What to avoid



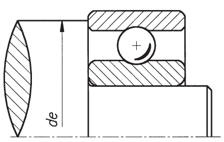
- Larger radii than r max and shoulder heights of circlips lower than h min. Consequences: axial position uncertain and risk of ring deformation.



- Shoulder and circlips lower than h min. Consequences: same as above.

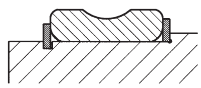


- Diameter **De** of housing shoulder smaller than Li. Consequences: shoulder touches the inner ring.

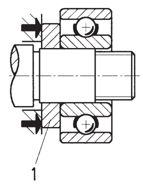


- Diameter **de** of shoulder on shaft larger than Lo. Consequences: shoulder touches the outer ring.

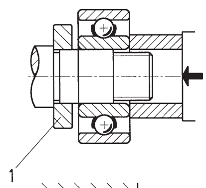
What to ensure



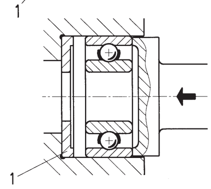
- Above all, the values Li, Lo, r max and h min should be strictly observed.



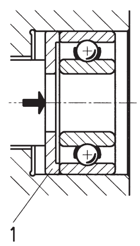
- The following diagrams on this page show how a bearing should normally be installed or removed.



- If for reasons of design the shoulder is unavoidably too small, a ground thrust ring should be provided between shoulder and bearing.



- Installing and removing of radial bearings requires special care in order to avoid any force being transmitted through the shaft to the opposite end bearing. Furthermore, the bearing opposite to the one which is being installed should be protected so as to avoid any load or shock on the balls.



- The load must be applied directly on the ring which is being installed or removed. For this reason shims 1 should be provided in order to facilitate removal. If such shims cannot be used, recesses should be machined on shoulders in housings or on shafts to permit the introduction of special dismounting tools.

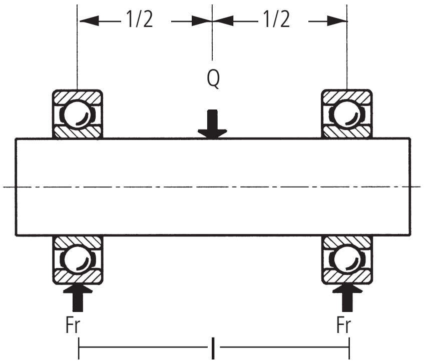
Small bearings are, most frequently, only subject to relatively low loads which nevertheless influence the length of their service life. For this reason, it is advisable to determine, as far as possible, the direction and the magnitude of these forces.

Loads to consider:

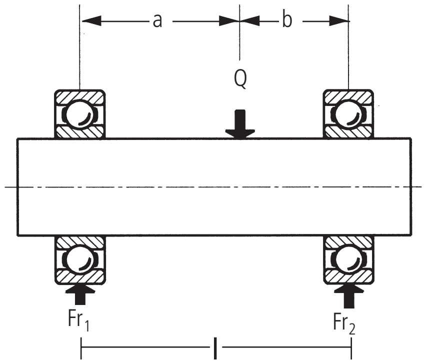
1. Weight of the moving part
2. Centrifugal force (unbalanced forces)
3. Dynamic load (acceleration, braking)
4. Force resulting from transmission of energy (pulley, gear etc)
5. Preload resulting from a duplex mounting[1]

Direction and distribution of loads

Fr pure radial load



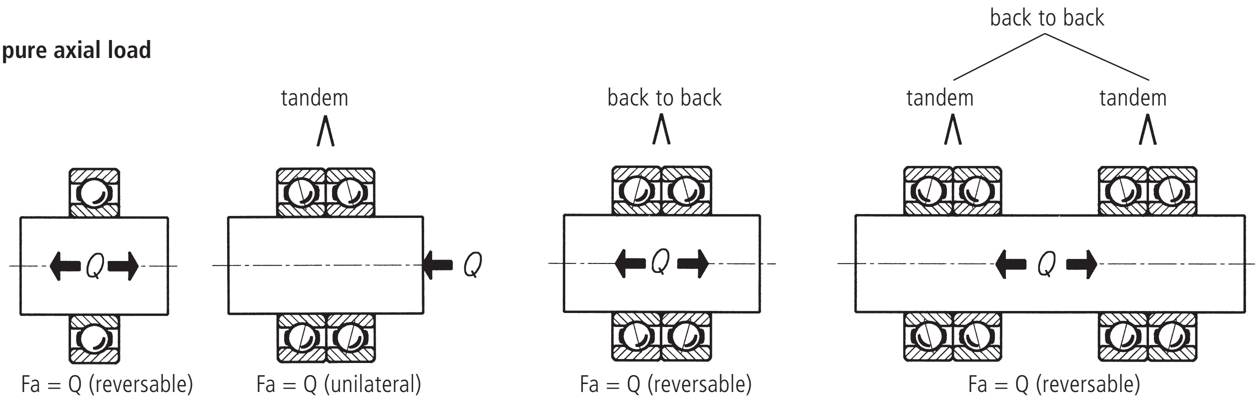
$$Fr = \frac{Q}{2}$$



$$Fr_1 = \frac{Q \cdot b}{l}$$

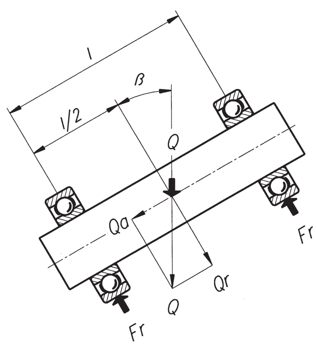
$$Fr_2 = \frac{Q \cdot a}{l}$$

Fa pure axial load



Note: For an axial load to be supported by several bearings, it is essential that these should be paired[1], ring against ring or by means of very precise spacers.

Combined loads (radial and axial)



$Qr = \cos\beta \cdot Q$

$Qa = \sin\beta \cdot Q$

normal mounting

$$Fr = \frac{Qr}{2}$$

$Fa = Qa$ (the axial load is supported by one bearing only)

Duplex mounting in tandem (shim)

$Fr = Qr$

$Fa = Qa$

Preload Fap

Bearings mounted in duplex[1], back to back or face to face are subjected to a **preload** (Fap) higher or lower than the axial load Fa. This **preload** Fap should be determined in each case taking into account operational criteria and the life expectancy.

[1]) see section "Duplex-mounting" on page 9

The theoretical life expectancy has no practical value unless the following conditions are scrupulously fulfilled:

- Strength and direction of constant loads carefully determined.
- Constant speed.
- Constant temperature not exceeding 100°C.
- Strict cleanliness in mounting and during running
- Careful choice and dosage of lubricant.
- Mounting strictly in accordance with the instructions given in page 20-22.

In all cases of complexity or doubt it is advisable to consult our technical staff.

For calculating the load capacity and the theoretical life of bearings we have used the formulae based on those of ISO and AFBMA standards.

1. Life expectancy of radial bearings and thrust bearings

$$L = \left(\frac{C}{P}\right)^3$$

Legend

L	=	Life expectancy in millions of revolutions
C	=	Dynamic load capacity in [N]
P	=	Equivalent dynamic load in [N]
C/P	=	Load ratio

2. Life expectancy in hours

$$Lh = \frac{L \cdot 10^6}{60 \cdot n}$$

Legend

Lh	=	Life expectancy in hours
n	=	Revolution in [rpm]

3. Definitions

L, Lh= Number of millions of revolutions or hours at constant speed that 90% of a group of apparently identical bearings will attain or exceed before the first evidence of fatigue develops. The life which 40% of the group of ball bearings will complete or exceed is approximately five times this life expectancy.

C = Dynamic load rating. This is the constant radial load, stationary with respect to the outer ring, that a bearing can endure for a rating life of one million revolutions of the inner ring or 500 hours at 33 1/3 [rpm].

The dynamic load takes into account:
• Repeated deformation of several elements (tracks and balls) as a function of the mechanical resistance of their materials and of their materials and of their geometric form
• frequency of loads
• an empirical probability factor

P = Equivalent dynamic load which takes into account the distribution of axial and radial forces affecting different elements as a function of their elasticity and of their geometric form (radial play, tracks, and ball diameters).

Co = This is the pure radial load which affects the bearing under the following conditions:
• zero [rpm]
• very slow oscillating movements
• very low revolutions
This load is permissible when, distributed between balls and tracks, a permanent deformation of 1/10,000 of the ball diameter is not exceeded.

Po = Equivalent static load.

Newton / lb conversion
1 Newton ≙ 0.225 lb
1 lb ≙ 4.45 Newton

4. Calculation of Equivalent dynamic load

4.1 Radial ball bearings

$$P = X \cdot Fr + Y \cdot Fa$$

Legend
P = the Equivalent dynamic load in [N]
Fr = effective radial load in [N]
Fa = effective thrust load in [N]
X = the radial factor of the bearing according to the table on page 28
Y = the thrust factor of the bearing according to the table on page 28

4.2 Thrust bearings

$$P = Fa$$

5. static load capacity

$$Co = so \cdot Po$$

Legend
Co = static load capacity in [N]
Po = static Equivalent load in [N]
so = static load safety factor

The following value for the static load safety factor changes depending on apllications of the ball bearing according the following variations:
so = 0.5 to 0.7 for quiet and vibration free use
so = 1.0 to 1.2 for normal use with minimum vibrations
so = 1.5 to 2.0 for high demands and use with heavy shock loads

6. Calculation of Equivalent static load

6.1 Radial ball bearings

$$Po = Xo \cdot Fr + Yo \cdot Fa$$

Legend
Po = static Equivalent load in [N]
Fr = maximum radial static load in [N]
Fa = maximum thrust load in [N]
Xo = the radial factor
Yo = thrust factor
If the result for Po, calculated according to this formula, is smaller than Fr, then use Po = Fr

Values for the coefficient Xo and Yo
Xo = 0.6 Yo = 0.5

6.2 Thrust bearings

$$Po = Fa$$

7. Duplex bearings
When two single row bearings are duplexed face to face, back to back, or in tandem arrangement, calculation of dynamic as well as Equivalent dynamic load should be considered.

7.1 Duplex installation face to face or back to back

Dynamic load capacity

$$Cd = (2 \cdot \cos \alpha_o)^{0.7} \cdot C$$

$$L = \left(\frac{Cd}{P}\right)^3$$

Legend
Cd = the dynamic load capacity for a pair of ball bearings in [N]
α_o = contact angle
C = dynamic load capacity for a single ball bearing in [N]
L = life expectancy in millions of revolutions
P = the Equivalent dynamic load in [N]

Equivalent dynamic load

$$P = X \cdot Fr + Y \cdot Fa$$

Legend
P = the Equivalent dynamic load in [N]
Fr = effective radial load in [N]
Fa = effective thrust load in [N]
X = the radial factor of the bearing according to the table on page 28
Y = the thrust factor of the bearing according to the table on page 28

Duplex mounting back to back or face to face with preload

$$Fa = 0.8\ (Fap + Fa1)^*$$

Legend
Fa = effective axial load in [N]
Fap = preload in [N]
Fa1= axial load on the duplex pair, in [N]

* Determine the preload Fap in relation to the axial load Fa1, in such a way that no bearing should be without load.

Within the range of play and contact angles considered by myonic, this condition will be realized when

$$Fap \geq 0{,}35\ Fa1$$

Back to back or face to face assembly <u>without preload or with residual axial play</u>

Sometimes duplex bearings are assembled back to back or face to face with a residual axial play of a few [µm]. In those cases calculations are made using formulae mentioned in 7.1.
Use factor X and Y from tables on page 27 taking care to include in the formula:

$$\frac{Fa}{2 \cdot Z \cdot Dw^2}$$ (total number of balls in two bearings)

7.2 Tandem assembly

Dynamic load capacity

$$Ct = C \cdot N^{0.7}$$

Legend
Ct = Dynamic load capacity of the tandem assembly in [N]
C = Dynamic load capacity of a single bearing in [N]
N = Number of bearings

To calculate the Equivalent dynamic load and the life, proceed as for a bearing with a single row of balls applying factors X, Y and referring to bearings with single row of balls according to table on page 28.

8. Examples of calculations

Example 1
To calculate the theoretical life Lh of a R 2570X bearing working under the following service conditions:

Radial charge	Fr = 5.7 N
Axial load	Fa = 2.8 N
Speed	n = 8000 rpm
Radial play	2/5 µm

For bearing R 2570X:
C = 142N
$Z \cdot Dw^2 = 8$
P = X · Fr + Y · Fa

$$\frac{Fa}{Z \cdot Dw^2} = \frac{2.8}{8} = 0.35 \longrightarrow e = 0.12$$

$$\frac{Fa}{Fr} = \frac{2.8}{5.7} = 0.5 \text{ therefore } > e \text{ from which}$$

X = 0.56
Y = 2.77
P = 0.56 · 5.7 + 2.77 · 2.8
= 3.2 + 7.8 = 11 N

$$\frac{C}{P} = \frac{142}{11} = 12.9$$

$$L = \left(\frac{C}{P}\right)^3 = 12.9^3 = 2147$$

$$Lh = \frac{L \cdot 10^6}{60 \cdot n} = \frac{2147 \cdot 10^6}{60 \cdot 8000}$$

Lh = 4473 h
According to table on page 30, we also find Lh = 4500 h by interpolation

Example 2
To install a spin axis (of a gyroscope) with 2 preloaded RA bearings, as a duplex, back to back pair.

Radial load	Fr	= 4 N
Axial load	Fa1	= 12 N
Speed	n	= 24000 rpm
Contact angle	α_o	= 20°
Design life	Lh	= 5000 h
Choice of bearing		= ?

$$Lh = \frac{L \cdot 10^6}{60 \cdot n} = 5000\ h$$

$$L = \left(\frac{Cd}{P}\right)^3 = 7200$$

$$\frac{Cd}{P} = \sqrt[3]{7200} = 19.3$$

or, according to table on page 31, by interpolation

$$\frac{Cd}{P} = 19.3$$

According to page 25 preload
Fap ≥ 0.35 · Fa1 = 0.35 · 12 = 4.2 N

Assuming a preload Fap = 6 N
Fa = 0.8 (Fap + Fa1) = 0.8 (6 +12)
= 0.8 · 18 = 14.4 N
According to page 28
α_o = 20°
e = 0.50

$$\frac{Fa}{Fr} = \frac{14.4}{4} = 3.6 \text{ therefore } > e \text{ from which}$$

X = 0.70
Y = 1.86
P = X · Fr + Y · Fa = 0.70 · 4 + 1.86 · 14.4
= 2.8 + 26.7 = 29.5 N

$$\frac{Cd}{P} = 19.3$$

Cd = 19.3 · P = 19.3 · 29.5 = 569
Cd = $(2 \cdot \cos \alpha_o)^{0.7} \cdot C$

$$C = \frac{Cd}{(2 \cdot \cos \alpha_o)^{0.7}} = \frac{569}{(2 \cdot \cos 20°)^{0.7}} = \frac{569}{1.55} = 367\ N$$

The bearing RA 3100X. 9d/600-... with its dynamic load capacity C = 332 N (8 balls) is marginally too small. If space allows it a RA 4130X.9d/600.-... will be selected

Determination of the service life expectancy (10^6 rpm), as a function of the load factor C/P

L	C/P	L	C/P	L	C/P
0.5	0.793	260	6.38	2400	13.4
0.75	0.909	280	6.54	2600	13.8
1.0	1.0	300	6.69	2800	14.1
1.5	1.14	320	6.84	3000	14.4
2	1.26	340	6.98	3200	14.7
3	1.44	360	7.11	3400	15.0
4	1.59	380	7.24	3600	15.3
5	1.71	400	7.37	3800	15.6
6	1.82	420	7.49	4000	15.9
8	2.0	440	7.61	4500	16.5
10	2.15	460	7.72	5000	17.1
12	2.29	480	7.83	5500	17.7
14	2.41	500	7.94	6000	18.2
16	2.52	550	8.19	6500	18.7
18	2.62	600	8.43	7000	19.1
20	2.71	650	8.66	7500	19.6
25	2.92	700	8.88	8000	20.0
30	3.11	750	9.09	8500	20.4
35	3.27	800	9.28	9000	20.8
40	3.42	850	9.47	9500	21.2
45	3.56	900	9.65	10000	21.5
50	3.68	950	9.83	12000	22.9
60	3.91	1000	10.0	14000	24.1
70	4.12	1100	10.3	16000	25.2
80	4.31	1200	10.6	18000	26.2
90	4.48	1300	10.9	20000	27.1
100	4.64	1400	11.2	25000	29.2
120	4.93	1500	11.4	30000	31.1
140	5.19	1600	11.7	35000	32.7
160	5.43	1700	11.9	40000	34.2
180	5.65	1800	12.2	45000	35.5
200	5.85	1900	12.4	50000	36.8
220	6.04	2000	12.6	55000	38.1
240	6.21	2200	13.0	60000	39.2

Radial factor X and axial factor Y to be used for calculating the equivalent dynamic load for radial single row ball bearings.

Contact Angle	$\frac{Fa}{Z \cdot Dw^2}$	$\frac{Fa}{Fr} \geq e$ X	Y	e
≤5°	0.17	0.56	3.09	0.09
	0.35		2.77	0.12
	0.70		2.43	0.14
Approximate	1.05		2.23	0.15
radial play	1.40		2.10	0.16
2 - 5 µm	2.10		1.92	0.18
(suffix 2/5)	3.51		1.71	0.21
	5.27		1.56	0.23
	7.03		1.44	0.24
10°	0.17	0.46	2.20	0.25
	0.35		2.09	0.26
Approximate	0.70		1.94	0.28
radial play	1.05		1.84	0.29
6 - 15 µm	1.40		1.77	0.31
(standard no	2.10		1.66	0.33
suffix)	3.51		1.53	0.35
	5.27		1.44	0.38
	7.03		1.36	0.40
15°	0.17	0.44	1.55	0.35
	0.35		1.51	0.36
Approximate	0.70		1.48	0.36
radial play	1.05		1.42	0.38
16 - 20 µm	1.40		1.39	0.39
(suffix 16/20)	2.10		1.34	0.41
	3.51		1.26	0.43
	5.27		1.20	0.45
	7.03		1.16	0.47
20°		0.43	1.14	0.50
25°		0.41	0.95	0.62
30°		0.39	0.81	0.75
35°		0.37	0.69	0.91
40°		0.35	0.60	1.08

When $\frac{Fa}{Fr} \leq e$ has to be calculated with X = 1, Y = 0

Determine X and Y factors relating to intermediate values of load and contact angle by linear interpolation.

Fa = Thrust load in [N]
Z = Number of balls
Dw = diameter of balls in mm

Radial factor X and axial factor Y to be used for calculating the equivalent dynamic load for duplex pairs of radial ball bearings contact angle 0° to 40°

Contact Angle	$\frac{Fa}{Z \cdot Dw^2}$	$\frac{Fa}{Fr} \leq e$ X	Y	$\frac{Fa}{Fr} \geq e$ X	Y	e
0°	0.17	1	0	0.56	3.09	0.09
	0.35				2.77	0.12
For duplexed	0.70				2.43	0.14
bearings with	1.05				2.23	0.15
minimum axial	1.40				2.10	0.16
play or preload	2.10				1.92	0.18
	3.51				1.71	0.21
	5.27				1.56	0.23
	7.03				1.44	0.24
5°	0.17	1	3.69	0.78	5.02	0.17
	0.35		3.30		4.49	0.19
Approximate	0.70		2.89		3.94	0.22
radial play	1.05		2.66		3.63	0.24
2 - 5 µm	1.40		2.50		3.41	0.25
(suffix 2/5)	2.10		2.29		3.12	0.27
	3.51		2.04		2.78	0.31
	5.27		1.86		2.53	0.34
	7.03		1.72		2.35	0.36
10°	0.17	1	2.25	0.75	3.58	0.25
	0.35		2.41		3.39	0.26
Approximate	0.70		2.24		3.14	0.28
radial play	1.05		2.13		2.99	0.29
6 - 15 µm	1.40		2.04		2.87	0.31
(standard,	2.10		1.92		2.69	0.33
no suffix)	3.51		1.77		2.49	0.35
	5.27		1.66		2.33	0.38
	7.03		1.57		2.21	0.40
15°	0.17	1	1.74	0.72	2.52	0.35
	0.35		1.70		2.46	0.36
Approximate	0.70		1.66		2.41	0.36
radial play	1.05		1.59		2.31	0.38
16 - 20 µm	1.40		1.56		2.25	0.39
(suffix 16/20)	2.10		1.50		2.17	0.41
	3.51		1.42		2.05	0.43
	5.27		1.35		1.96	0.45
	7.03		1.30		1.88	0.47
20°		1	1.25	0.70	1.86	0.50
25°		1	1.00	0.67	1.55	0.62
30°		1	0.83	0.63	1.31	0.75
35°		1	0.69	0.60	1.12	0.91
40°		1	0.58	0.57	0.97	1.08

Lh in hours as a funtion of the load factor C/P, speed in [rpm]

					n [rpm]							
Lh	**10**	**40**	**100**	**160**	**200**	**250**	**320**	**400**	**500**	**630**	**800**	**1000**
100	–	–	–	–	1.06	1.15	1.24	1.34	1.45	1.56	1.68	1.82
500	–	1.06	1.45	1.68	1.82	1.96	2.12	2.29	2.47	2.67	2.88	3.11
1000	–	1.34	1.82	2.12	2.29	2.47	2.67	2.88	3.11	3.36	3.63	3.91
1250	–	1.45	1.96	2.29	2.47	2.67	2.88	3.11	3.36	3.63	3.91	4.23
1600	–	1.56	2.12	2.47	2.67	2.88	3.11	3.36	3.63	3.91	4.23	4.56
2000	1.06	1.68	2.29	2.67	2.88	3.11	3.36	3.63	3.91	4.23	4.56	4.93
2500	1.15	1.82	2.47	2.88	3.11	3.36	3.63	3.91	4.23	4.56	4.93	5.32
3200	1.24	1.96	2.67	3.11	3.36	3.63	3.91	4.23	4.56	4.93	5.32	5.75
4000	1.34	2.12	2.88	3.36	3.63	3.91	4.23	4.56	4.93	5.32	5.75	6.20
5000	1.45	2.29	3.11	3.63	3.91	4.23	4.56	4.93	5.32	5.75	6.20	6.70
6300	1.56	2.47	3.36	3.91	4.23	4.56	4.93	5.32	5.75	6.20	6.70	7.23
8000	1.68	2.67	3.63	4.23	4.56	4.93	5.32	5.75	6.20	6.70	7.23	7.81
10000	1.82	2.88	3.91	4.56	4.93	5.32	5.75	6.20	6.70	7.23	7.81	8.43
12500	1.96	3.11	4.23	4.93	5.32	5.75	6.20	6.70	7.23	7.81	8.43	9.11
16000	2.12	3.36	4.56	5.32	5.75	6.20	6.70	7.23	7.81	8.43	9.11	9.83
20000	2.29	3.63	4.93	5.75	6.20	6.70	7.23	7.81	8.43	9.11	9.83	10.6
25000	2.47	3.91	5.32	6.20	6.70	7.23	7.81	8.43	9.11	9.83	10.6	11.5
32000	2.67	4.23	5.75	6.70	7.23	7.81	8.43	9.11	9.83	10.6	11.5	12.4
40000	2.88	4.56	6.20	7.23	7.81	8.43	9.11	9.83	10.6	11.5	12.4	13.4
50000	3.11	4.93	6.70	7.81	8.43	9.11	9.83	10.6	11.5	12.4	13.4	14.5
63000	3.36	5.32	7.23	8.43	9.11	9.83	10.6	11.5	12.4	13.4	14.5	15.6
80000	3.63	5.75	7.81	9.11	9.83	10.6	11.5	12.4	13.4	14.5	15.6	16.8
100000	3.91	6.20	8.43	9.83	10.6	11.5	12.4	13.4	14.5	15.6	16.8	18.2
200000	4.93	7.81	10.6	12.4	13.4	14.5	15.6	16.8	18.2	19.6	21.2	22.9

Lh in hours as a funtion of the load factor C/P, speed in [rpm]

	n [rpm]										
Lh	1250	1600	2000	2500	3200	4000	5000	6300	8000	10000	12500
100	1.96	2.12	2.29	2.47	2.67	2.88	3.11	3.36	3.63	3.91	4.23
500	3.36	3.63	3.91	4.2	4.56	4.93	5.32	5.75	6.20	6.70	7.23
1000	4.23	4.56	4.93	5.32	5.75	6.20	6.70	7.23	7.81	8.43	9.11
1250	4.56	4.93	5.32	5.75	6.20	6.70	7.23	7.81	8.43	9.11	9.83
1600	4.93	5.32	5.75	6.20	6.70	7.23	7.81	8.43	9.11	9.83	10.6
2000	5.32	5.75	6.20	6.70	7.23	7.81	8.43	9.11	9.83	10.6	11.5
2500	5.75	6.20	6.70	7.23	7.81	8.43	9.11	9.83	10.6	11.5	12.4
3200	6.20	6.70	7.23	7.81	8.43	9.11	9.83	10.6	11.5	12.4	13.4
4000	6.70	7.23	7.81	8.43	9.11	9.83	10.6	11.5	12.4	13.4	14.5
5000	7.23	7.81	8.43	9.11	9.83	10.6	11.5	12.4	13.4	14.5	15.6
6300	7.81	8.43	9.11	9.83	10.6	11.5	12.4	13.4	14.5	15.6	16.8
8000	8.43	9.11	9.83	10.6	11.5	12.4	13.4	14.5	15.6	16.8	18.2
10000	9.11	9.83	10.6	11.5	12.4	13.4	14.5	15.6	16.8	18.2	19.6
12500	9.83	10.6	11.5	12.4	13.4	14.5	15.6	16.8	18.2	19.6	21.2
16000	10.6	11.5	12.4	13.4	14.5	15.6	16.8	18.2	19.6	21.2	22.9
20000	11.5	12.4	13.4	14.5	15.6	16.8	18.2	19.6	21.2	22.9	24.7
25000	12.4	13.4	14.5	15.6	16.8	18.2	19.6	21.2	22.9	24.7	26.7
32000	13.4	14.5	15.6	16.8	18.2	19.6	21.2	22.9	24.7	26.7	28.8
40000	14.5	15.6	16.8	18.2	19.6	21.2	22.9	24.7	26.7	28.8	31.1
50000	15.6	16.8	18.2	19.6	21.2	22.9	24.7	26.7	28.8	31.1	33.6
63000	16.8	18.2	19.6	21.2	22.9	24.7	26.7	28.8	31.1	33.6	36.3
80000	18.2	19.6	21.2	22.9	24.7	26.7	28.8	31.1	33.6	36.3	39.2
100000	19.6	21.2	22.9	24.7	26.7	28.8	31.1	33.6	36.3	39.2	–
200000	24.7	26.7	28.8	31.1	33.6	36.3	39.2	–	–	–	–

Lh in hours as a funtion of the load factor C/P, speed in [rpm]

	n [rpm]								
Lh	**16000**	**20000**	**25000**	**32000**	**40000**	**50000**	**63000**	**80000**	**100000**
100	4.56	4.93	5.32	5.75	6.20	6.70	7.23	7.81	8.43
500	7.81	8.43	9.11	9.83	10.6	11.5	12.4	13.4	14.5
1000	9.83	10.6	11.5	12.4	13.4	14.5	15.6	16.8	18.2
1250	12.4	11.5	12.4	13.4	14.5	15.6	16.8	18.2	19.6
1600	11.5	12.4	13.4	14.5	15.6	16.8	18.2	19.6	21.2
2000	12.4	13.4	14.5	15.6	16.8	18.2	19.6	21.2	22.9
2500	13.4	14.5	15.6	16.8	18.2	19.6	21.2	22.9	24.7
3200	14.5	15.6	16.8	18.2	19.6	21.2	22.9	24.7	26.7
4000	15.6	16.8	18.2	19.6	21.2	22.9	24.7	26.7	28.8
5000	16.8	18.2	19.6	21.2	22.9	24.7	26.7	28.8	31.1
6300	18.2	19.6	21.2	22.9	24.7	26.7	28.8	31.1	33.6
8000	19.6	21.2	22.9	24.7	26.7	28.8	31.1	33.6	36.3
10000	21.2	22.9	24.7	26.7	28.8	31.1	33.6	36.3	39.2
12500	22.9	24.7	26.7	28.8	31.1	33.6	36.3	39.2	–
16000	24.7	26.7	28.8	31.1	33.6	36.3	39.2	–	–
20000	26.7	28.8	31.1	33.6	36.3	39.2	–	–	–
25000	28.8	31.1	33.6	36.3	39.2	–	–	–	–
32000	31.1	33.6	36.3	39.2	–	–	–	–	–
40000	33.6	36.3	39.2	–	–	–	–	–	–
50000	36.3	39.2	–	–	–	–	–	–	–
63000	39.2	–	–	–	–	–	–	–	–
80000	–	–	–	–	–	–	–	–	–
100000	–	–	–	–	–	–	–	–	–
200000	–	–	–	–	–	–	–	–	–

Packaging has the function of protecting the bearings during transportation and during storage periods before use in the final application.

myonic packaging is designed to ensure protection against:

- Contamination
- Humidity
- Transportation impact
- Deterioration of bearings lubricant

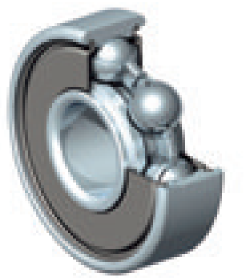
According to the bearings type and technical characteristics myonic packages bearings with the most suitable package type in order to ensure the above protection.

Unless otherwise specified by the customer, RMB bearings are packaged in small synthetic plastic pouches hermetically sealed with vaccuum by heat sealing in a quantity per pouch depending on the bearing type, characteristic and dimension. Typically there are 20 pieces per panch of small bearings or 10 pieces per panch of large bearings packed.
The plastic pouches are delivered in resistant carton boxes to protect against mechanical influence during transportation.

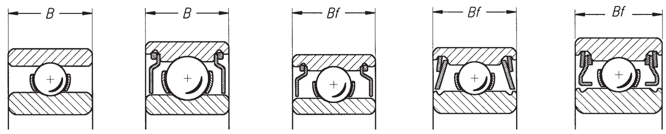
Apart from the above standard package, myonic can deliver bearings in the following packages:

- Plastic transparent strips with each pocket separated by heat sealing.
- Individually packaged by single strip pocket heat sealed.
- Individually packaged by metallic pouches.

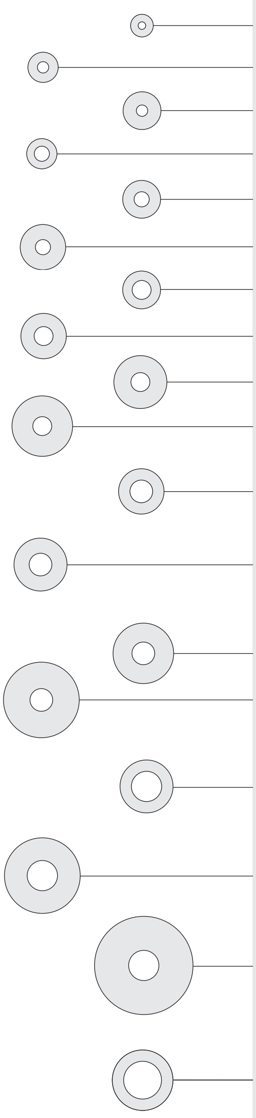
Should any other packaging method be desired it is advisable to consult our technical department



R/UL	RV/ULV	ULZ	RX	RF
open	with shields	with shields	with shields	with filmoseals

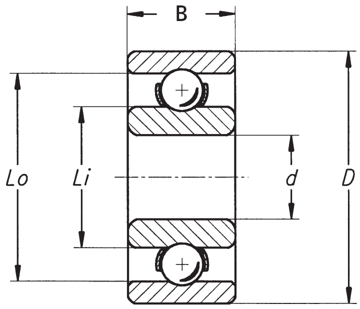


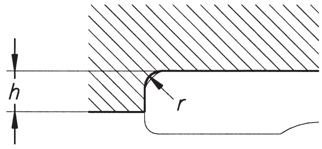
Metric series



d [mm]	D [mm]	B [mm]	Bf [mm]	Reference open bearings	Reference shielded bearings
1	3	1		UL 103X	
1.5	4	1.2	2	UL 154X	ULZ 154X
1.5	5	2	2	R 1550X	RX/RF 155X
2	4	1.2		UL 204X	
2	5	1.5	2.3	UL 205X	ULZ 205X
2	6	2.3	2.3	R 2060X	RX/RF 206X
2.5	5	1.5		UL 255X	
2.5	6	1.8	2.6	UL 256X	ULZ 256X
2.5	7	2.5		R 2570X	RV 257X
2.5	8	2.8	2.8	R 2580X	RF 258X
3	6	2	2.5	UL 306X	ULZ 306X
3	6	2			ULV 306X
3	7	2	3	UL 307X	ULZ 307X
3	8	3	4	R 3080X	RF 308X
3	8	3			RV 308X
3	10	4	4	R 3100X	RX/RF 310X
4	7	2	2.5	UL 407X	ULZ 407X
4	7	2			ULV407X
4	9	2.5	4	UL 409X	ULZ 409X
4	10		4		RX/RF 410X
4	11	4		R 4110X	RV 411X
4	13	5	5	R 4130X	RX/RF 413X
4	16	5		R 4160X	RV416X
5	8	2	3	UL 508X	ULZ 508X
5	8	2			ULV 508X

myonic
more than a bearing

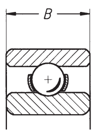


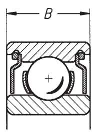


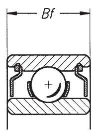
Metric series

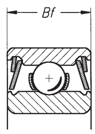
B DIN Reference	Bf DIN Reference	Li [mm]	Lo [mm]	r max. [mm]	h min. [mm]	Balls n x Ø [mm]	load ratings dynamic C [N]	static Co [N]
618/1	-	1.60	2.40	0.08	0.3	7 x 0.500	29	9
618/1.5	638/1.5	2.12	3.38	0.1	0.3	6 x 0.794	67	21
619/1.5	619/1.5	2.68	3.97	0.15	0.4	7 x 0.794	77	26
617/2	-	2.48	3.55	0.05	0.25	7 x 0.700	65	21
618/2	638/2	2.86	4.14	0.1	0.4	7 x 0.794	78	26
619/2	619/2	3.16	4.75	0.15	0.5	7 x 1.000	127	45
617/2.5	-	3.15	4.40	0.08	0.3	8 x 0.794	85	30
618/2.5	638/2.5	3.54	5.02	0.15	0.5	7 x 1.000	128	46
619/2.5	-	3.95	5.53	0.15	0.6	8 x 1.000	142	53
60/2.5	60/2.5	4.22	6.23	0.15	0.6	7 x 1.250	199	75
617/3	-	3.75	5.26	0.08	0.35	8 x 1.000	141	53
617/3	-	3.75	5.26	0.08	0.35	8 x 1.000	141	53
618/3	638/3	4.14	5.85	0.15	0.5	8 x 1.150	190	74
619/3	639/3	4.40	6.61	0.15	0.6	7 x 1.450	258	100
619/3	-	4.40	6.61	0.15	0.6	7 x 1.450	258	100
623	623	5.33	7.87	0.15	0.7	7 x 1.588	314	124
617/4	-	4.75	6.25	0.08	0.35	9 x 1.000	154	61
617/4	-	4.75	6.25	0.08	0.35	9 x 1.000	154	61
618/4	638/4	5.33	7.87	0.15	0.5	7 x 1.588	314	124
-	-	5.33	7.87	0.15	0.7	7 x 1.588	314	124
619/4	-	5.90	9.10	0.15	0.7	6 x 2.100	514	211
624	624	6.65	10.35	0.2	0.8	6 x 2.381	709	311
634	-	8.00	13.08	0.3	1	6 x 3.175	918	400
617/5	637/5	5.75	7.25	0.08	0.4	11 x 1.000	174	76
617/5	-	5.75	7.25	0.08	0.4	11 x 1.000	174	76

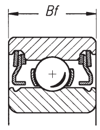
R/UL	RV/ULV/ULZT	ULZ	RX	RF
open	with shields	with shields	with shields	with filmoseals





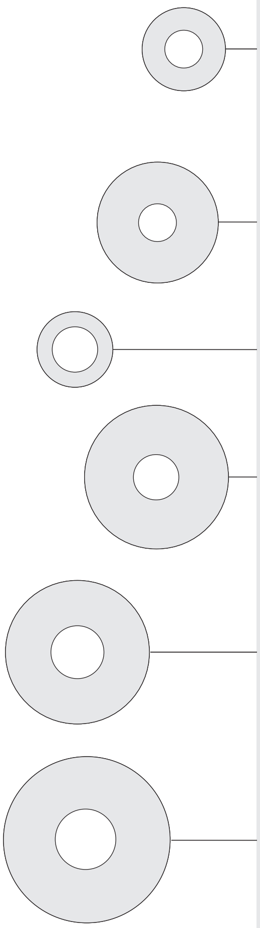






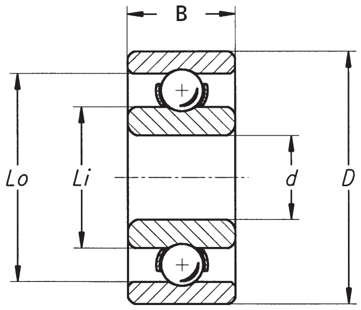
Metric series

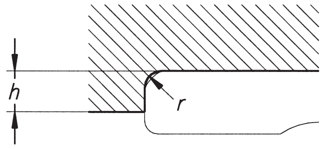
Actual sizes



d [mm]	D [mm]	B [mm]	Bf [mm]	Reference open bearings	Reference shielded bearings
5	11	3	5	UL 511X	ULZ 511X
5	13	4		R 5130X	RV 513X
5	16	5		R 5160X	RV 516X
5	19	6		R 5190X	RV 519X
6	10	2.5	3	UL 610X	ULZ 610X
6	13	3.5	5	UL 613X	ULZ 613X
6	15	5		R 6150X	RV 615X
6	19	6		R 6190X	RV 619X
7	11	2.5	3	UL 711X	ULZ 711X
7	14	3.5	5	UL 714X	ULZ 714X
7	19	6		R 7190X	RV 719X
7	22	7		R 7220X	RV 722X
8	12	2.5		UL 812X	
8	16	4		UL 816X	
8	16	5			ULZT 816X
8	16		6		ULZ 816X
8	22	7		R 8220X	RV 822X
9	14	3		UL 914X	
9	17	4	6	UL 917X	ULZ 917X
10	15	3		UL 1015X	
10	19	5		UL 1019X	ULV 1019X
10	19		7		ULZ 1019X

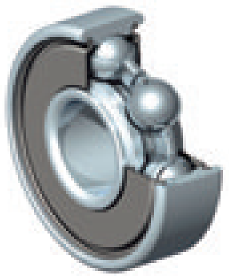
myonic more than a bearing



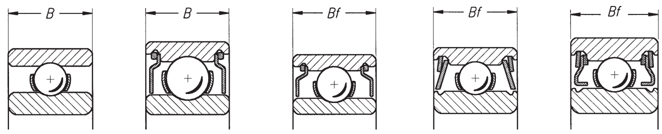


Metric series

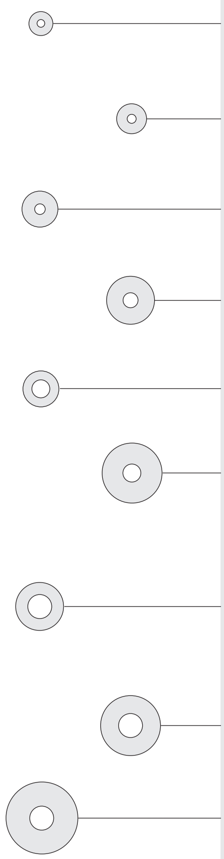
B DIN Reference	Bf DIN Reference	Li [mm]	Lo [mm]	r max. [mm]	h min. [mm]	Balls n x Ø [mm]	load ratings dynamic C [N]	static Co [N]
618/5	638/5	6.69	9.32	0.15	0.7	8 x 1.750	403	170
619/5	-	7.40	11.00	0.15	0.7	7 x 2.381	628	268
625	-	8.00	13.08	0.3	1	6 x 3.175	918	400
635	-	9.75	14.84	0.3	1	7 x 3.175	1061	481
617/6	-	7.00	9.00	0.1	0.45	10 x 1.250	254	112
618/6	628/6	7.90	11.11	0.15	0.7	8 x 2.100	560	244
619/6	-	8.79	12.24	0.15	0.8	7 x 2.500	791	351
626	-	9.75	14.84	0.3	1	7 x 3.175	1061	481
617/7	-	8.00	10.00	0.1	0.45	12 x 1.250	283	136
618/7	628/7	8.90	12.11	0.15	0.7	8 x 2.100	563	248
607	-	9.75	14.84	0.3	1	7 x 3.175	1061	481
627	-	11.75	18.05	0.3	1	7 x 3.969	1660	797
617/8	-	9.00	11.00	0.1	0.5	13 x 1.250	294	149
618/8	-	10.20	13.81	0.2	0.8	9 x 2.381	764	359
-	-	10.20	13.81	0.2	0.8	9 x 2.381	764	359
-	638/8	10.20	13.81	0.2	0.8	9 x 2.381	764	359
608	-	11.75	18.05	0.3	1	7 x 3.969	1660	797
617/9	-	10.23	12.77	0.1	0.6	12 x 1.588	448	227
618/9	638/9	11.20	14.81	0.2	0.8	10 x 2.381	820	403
61700	-	11.23	13.77	0.1	0.6	13 x 1.588	467	248
61800	-	12.32	16.68	0.3	1	9 x 2.778	1013	493
-	63800	12.32	16.68	0.3	1	9 x 2.778	1013	493



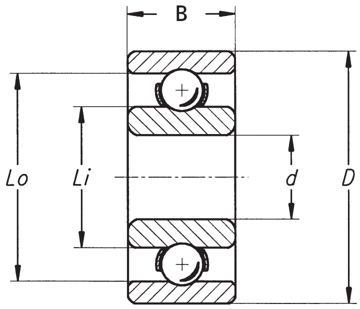
R/UL	RV/ULV	ULZ	RX	RF
open	with shields	with shields	with shields	with filmoseals

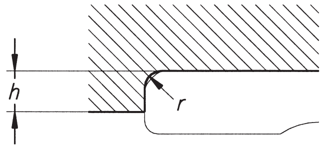


Inch series



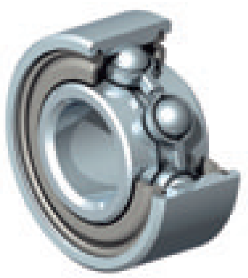
Actual sizes	d [mm] [inch]	D [mm] [inch]	B [mm] [inch]	Bf [mm] [inch]	Reference open bearings	Reference shielded bearings
	1.016 .0400	3.175 .1250	1.191 .0469		UL 1304X	
	1.191 .0469	3.969 .1563	1.588 .0625	2.381 .0938	UL 1505X	ULZ 1505X
	1.397 .0550	4.763 .1875	1.984 .0781	2.778 .1094	R 1706X	RX/RF 1706X
	1.984 .0781	6.350 .2500	2.381 .0938	3.572 .1406	R 2508X	RX/RF 2508X
	2.381 .0937	4.763 .1875	1.588 .0625	2.381 .0938	UL 3006X	ULZ 3006X
	2.381 .0937	7.938 .3125	2.778 .1094	3.572 .1406	R 3010X	RX/RF 3010X
	3.175 .1250	6.350 .2500	2.381 .0938		UL 4008X	ULV 4008X
	3.175 .1250	6.350 .2500		2.778 .1094		ULZ 4008X
	3.175 .1250	7.938 .3125	2.778 .1094	3.572 .1406	R 4010X	RX/RF 4010X
	3.175 .1250	9.525 .3750	3.969 .1563	3.969 .1563	R 4012X	RX/RF 4012X



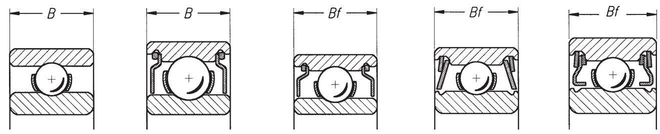


Inch series

US reference	Li [mm] [inch]	Lo [mm] [inch]	r max. [mm] [inch]	h min. [mm] [inch]	Balls n x Ø [mm] [inch]	load ratings	
						dynamic C [N]	static Co [N]
R 09	1.60 .0630	2.40 .0945	0.08 .003	0.3 .012	7 x 0.500 .0197	29	9
R 0	1.93 .0760	3.18 .1252	0.13 .005	0.4 .016	6 x 0.794 .03125	65	21
R 1	2.35 .0925	3.83 .1508	0.13 .005	0.4 .016	6 x 1.000 .0394	107	37
R 1-4	3.16 .1244	4.75 .1870	0.13 .005	0.5 .020	7 x 1.000 .0394	127	45
R 133	2.86 .1126	4.14 .1630	0.13 .005	0.4 .016	7 x 0.794 .03125	78	26
R 1-5	4.13 .1626	6.67 .2626	0.13 .005	0.5 .020	6 x 1.588 .0625	271	103
R 144	3.95 .1555	5.53 .2177	0.13 .005	0.5 .020	8 x 1.000 .0394	142	53
R 144	3.95 .1555	5.53 .2177	0.13 .005	0.5 .020	8 x 1.000 .0394	142	53
R 2-5	4.13 .1626	6.67 .2626	0.13 .005	0.5 .020	6 x 1.588 .0625	271	103
R 2	5.33 .2098	7.87 .3098	0.13 .005	0.7 .028	7 x 1.588 .0625	314	124

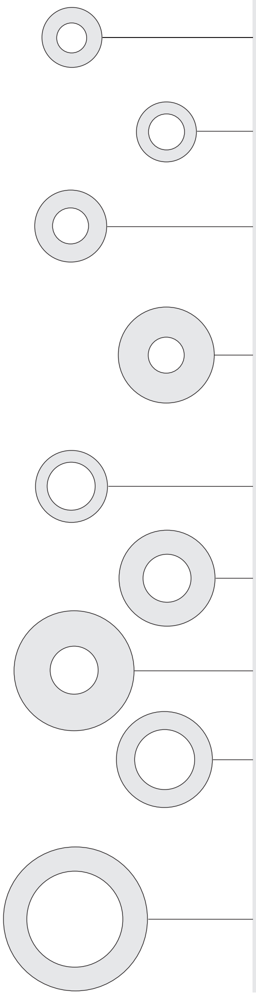


R/UL	RV/ULV	ULZ	RX	RF
open	with shields	with shields	with shields	with filmoseals



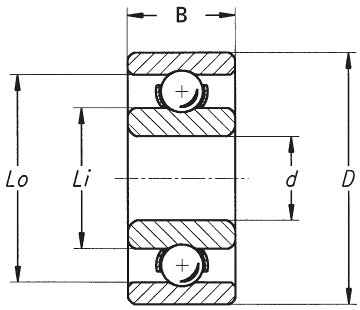
Inch series

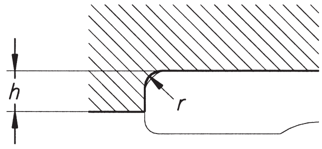
Actual sizes



d [mm] [inch]	D [mm] [inch]	B [mm] [inch]	Bf [mm] [inch]	Reference open bearings	Reference shielded bearings
3.969	7.938	2.778	3.175	UL 5010X	ULZ 5010X
.1563	.3125	.1094	.1250		
4.763	7.938	2.778	3.175	UL 6010X	ULZ 6010X
.1875	.3125	.1094	.1250		
4.763	9.525	3.175	3.175	UL 6012X	ULZ 6012X
.1875	.3750	.1250	.1250		
4.763	12.700	3.969		R 6016X	
.1875	.5000	.1563			RV 6016X
4.763	12.700		4.978		RX/RF 6016X
.1875	.5000		.1960		
6.350	9.525	3.175	3.175	UL 8012X	ULZ 8012X
.2500	.3750	.1250	.1250		
6.350	12.700	3.175	4.763	UL 8016X	ULZ 8016X
.2500	.5000	.1250	.1875		
6.350	15.875	4.978	4.978	R 8020X	RX/RF 8020X
.2500	.6250	.1960	.1960		
7.938	12.700	3.969	3.969	UL 10016X	ULZ 10016X
.3125	.5000	.1563	.1563		
9.525	22.225	7.144	7.144	R 12028X	RZ 12028X
.3750	.8750	.2813	.2813		
12.700	19.050		4.978		ULZ 16024X
.5000	.7500		.1960		

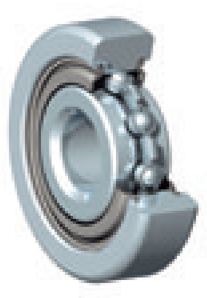
myonic
more than a bearing



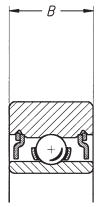


Inch series

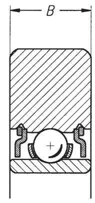
US reference	Li [mm] [inch]	Lo [mm] [inch]	r max. [mm] [inch]	h min. [mm] [inch]	Balls n x Ø [mm] [inch]	load ratings dynamic C [N]	static Co [N]
	4.98	6.82	0.13	0.5	8 x 1.150	192	75
R 155	.1961	.2685	.005	.020	.0453		
	5.57	7.10	0.13	0.5	9 x 1.000	153	62
R 156	.2193	.2795	.005	.020	.0394		
	5.95	8.35	0.13	0.6	8 x 1.588	347	144
R 166	.2343	.3287	.005	.024	.0625		
	7.00	10.70	0.30	0.8	7 x 2.381	792	351
R 3	.2756	.4213	.012	.031	.09375		
	7.00	10.70	0.30	0.8	7 x 2.381	792	351
R 3	.2756	.4213	.012	.031	.09375		
	7.22	8.77	0.13	0.6	11 x 1.000	170	77
R 168	.2843	.3453	.005	.024	.0394		
	7.90	11.11	0.13	0.6	8 x 2.100	560	244
R 188	.3110	.4374	.005	.024	.0827		
	9.26	12.96	0.30	0.8	8 x 2.381	882	393
R 4	.3646	.5102	.012	.031	.09375		
	9.23	11.40	0.13	0.6	11 x 1.588	428	206
R 1810	.3634	.4488	.005	.024	.0625		
	13.21	18.87	0.40	0.8	7 x 3.969	1681	805
R 6	.5201	.7429	.016	.031	.1562		
	14.90	17.10	0.20	0.8	14 x 1.588	469	271
-	.5866	.6732	.008	.031	.0625		



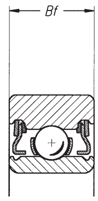
MV
with
shields



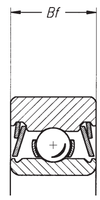
MVT
with
shields



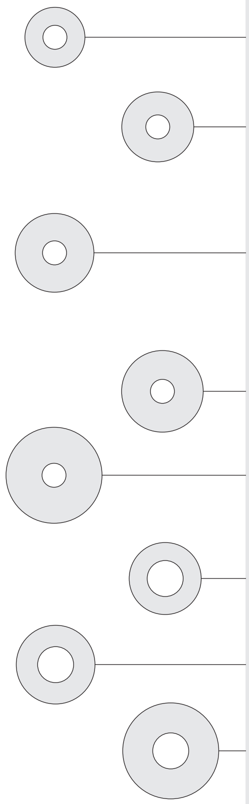
MF
with
filmoseals



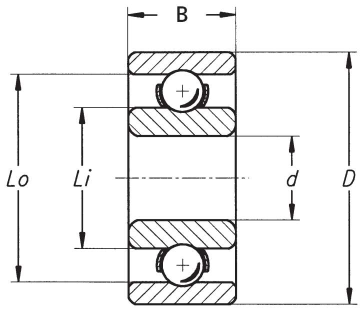
MX/MZ
with
shields

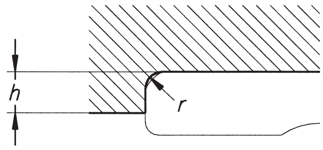


Inch series



Actual sizes	d [mm] [inch]	D [mm] [inch]	B [mm] [inch]	Bf [mm] [inch]	Reference shielded bearings		Reference shielded bearings	
	3.175	7.938	2.778		MV 40100X			
	.1250	.3125	.1094					
	3.175	9.525		3.572			MF 40120X	MX 40120X
	.1250	.3750		.1406				
	3.175	10.414	2.381			MVT 40131X		
	.1250	.4100	.0938					
	3.175	10.414	2.778		MV 40131X			
	.1250	.4100	.1094					
	3.175	10.795	2.778		MV 40136X			
	.1250	.4250	.1094					
	3.175	12.70		4.366				MX 40160X
	.1250	.5000		.1719				
	4.763	9.525	2.778		MV 60120X			
	.1875	.3750	.1094					
	4.763	10.414	2.778		MV 60131X			
	.1875	.4100	.1094					
	4.763	12.70	2.778	3.969	MV 60160X			MZ 60160X
	.1875	.5000	.1094	.1563				

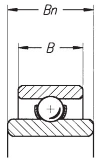




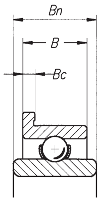
Inch series

Li [mm] [inch]	Lo [mm] [inch]	r max. [mm] [inch]	h min. [mm] [inch]	Balls n x Ø [mm] [inch]	load ratings dynamic C [N]	static Co [N]
3.95 .1555	5.53 .2177	0.10 .004	0.40 .016	8 x 1.000 .0394	142	53
4.13 .1626	6.67 .2626	0.13 .005	0.50 .020	6 x 1.588 .0625	270	103
3.95 .1555	5.53 .2177	0.13 .005	0.50 .020	8 x 1.000 .0394	142	53
5.57 .2193	7.10 .2795	0.20 .008	0.70 .028	9 x 1.000 .0394	152	62
5.57 .2193	7.10 .2795	0.20 .008	0.70 .028	9 x 1.000 .0394	152	62
5.33 .2098	7.87 .3098	0.20 .008	0.70 .028	7 x 1.588 .0625	314	124
5.57 .2193	7.10 .2795	0.10 .004	0.60 .024	9 x 1.000 .0394	152	62
5.57 .2193	7.10 .2795	0.20 .008	0.70 .028	9 x 1.000 .0394	152	62
5.95 .2343	8.35 .3287	0.13 .005	0.60 .024	8 x 1.588 .0625	346	144

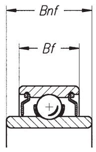
RU/ULU
open



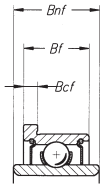
RKU/ULKU
open



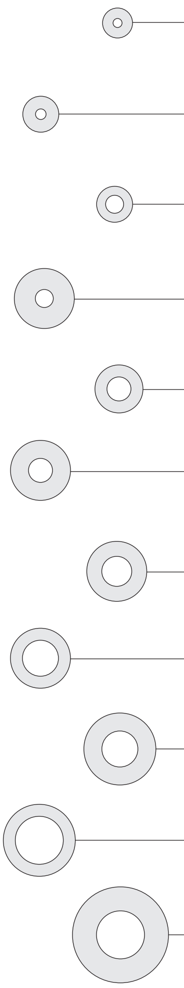
ULUZ
with
shields



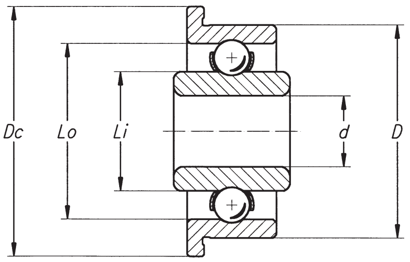
ULKUZ
with
shields

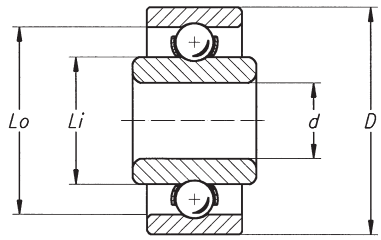


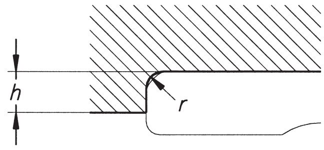
Inch series



Actual sizes	**d** [mm] [inch]	**D** [mm] [inch]	**B** [mm] [inch]	**Bf** [mm] [inch]	**Reference open bearings**		**Reference shielded bearings**	
	1.191 .0469	3.969 .1563	1.588 .0625		ULU 1505X	ULKU 1505X		
	1.397 .0550	4.763 .1875	1.984 .0781		RU 1706X	RKU 1706X		
	2.381 .0938	4.763 .1875	1.588 .0625		ULU 3006X	ULKU 3006X		
	2.381 .0938	7.938 .3125	2.778 .1094		RU 3010X	RKU 3010X		
	3.175 .1250	6.350 .2500	2.381 .0938	2.778 .1094	ULU 4008X	ULKU 4008X	ULUZ 4008X	ULKUZ 4008X
	3.175 .1250	7.938 .3125	2.778 .1094		RU 4010X	RKU 4010X		
	3.969 .1563	7.938 .3125		3.175 .1250			ULUZ 5010X	ULKUZ 5010X
	4.763 .1875	7.938 .3125		3.175 .1250			ULUZ 6010X	ULKUZ 6010X
	4.763 .1875	9.525 .3750	3.175 .1250	3.175 .1250	ULU 6012X	ULKU 6012X	ULUZ 6012X	ULKUZ 6012X
	6.350 .2500	9.525 .3750	3.175 .1250	3.175 .1250	ULU 8012X	ULKU 8012X	ULUZ 8012X	ULKUZ 8012X
	6.350 .2500	12.700 .5000		4.763 .1875			ULUZ 8016X	ULKUZ 8016X





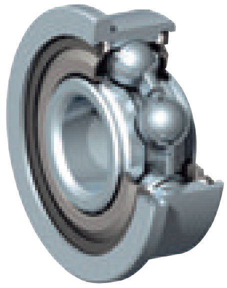


Inch series

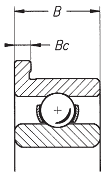
Bn [mm] [inch]	Dc[1] [mm] [inch]	Bc[2] [mm] [inch]	Bcf[2] [mm] [inch]	Bnf [mm] [inch]	Li [mm] [inch]	Lo [mm] [inch]	r max [mm] [inch]	h min [mm] [inch]	Balls n x Ø [mm] [inch]	load ratings dynamic C [N]	load ratings static Co [N]
2.381	5.156	0.330			1.93	3.18	0.13	0.4	6 x 0.794	65	21
.0938	.0230	.0130			.0760	.1252	.005	.016	.03125		
2.778	5.944	0.584			2.35	3.83	0.13	0.4	6 x 1.000	107	37
.1094	.2340	0.230			.0925	.1508	.005	.016	.0394		
2.381	5.944	0.457			2.86	4.14	0.13	0.4	7 x 0.794	78	26
.0938	.2340	.0180			.1126	.1630	.005	.016	.03125		
3.572	9.119	0.584			4.13	6.67	0.13	0.5	6 x 1.588	271	103
.1406	.3590	.0230			.1626	.2626	.005	.020	.0625		
3.175	7.518	0.584	0.787	3.572	3.95	5.53	0.13	0.5	8 x 1.000	142	53
.1250	.2960	.0230	.0310	.1406	.1555	.2177	.005	.020	.0394		
3.572	9.119	0.584			4.13	6.67	0.13	0.5	6 x 1.588	271	103
.1406	.3590	.0230			.1626	.2626	.005	.020	.0625		
	9.119		0.914	3.969	4.98	6.82	0.13	0.5	8 x 1.150	192	75
	.3590		.0360	.1563	.1961	.2685	.005	.020	.0453		
	9.119		0.914	3.969	5.57	7.10	0.13	0.5	9 x 1.000	153	62
	.3590		.0360	.1563	.2193	.2795	.005	.020	.0394		
3.969	10.719	0.584	0.787	3.969	5.95	8.35	0.13	0.6	8 x 1.588	347	144
.1563	.4220	.0230	.0310	.1563	.2343	.3287	.005	.024	.0625		
3.969	10.719	0.584	0.914	3.969	7.22	8.77	0.13	0.6	11 x 1.000	170	77
.1563	.4220	.0230	.0360	.1563	.2843	.3453	.005	.024	.0394		
	13.894		1.143	5.556	7.90	11.11	0.13	0.6	8 x 2.100	560	244
	.5470		.0450	.2187	.3110	.4374	.005	.024	.0827		

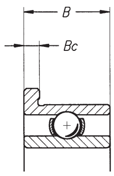
[1] Tolerance for Dc: 0 / -125 µm; 0 / -.005″

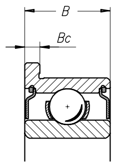
[2] Tolerance for Bc and Bcf: 0 / -50 µm; 0 / -.002″

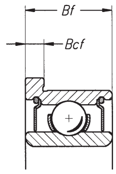


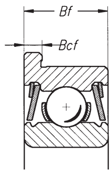
RK	ULK/ULKW	RKV	ULKZ	RKX	RKF
open	open	with shields	with shields	with shields	with filmoseals

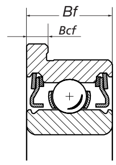




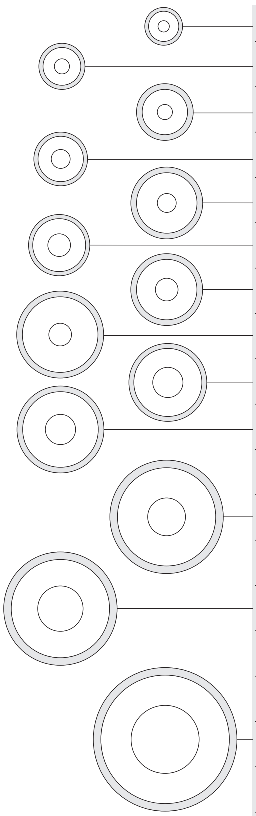






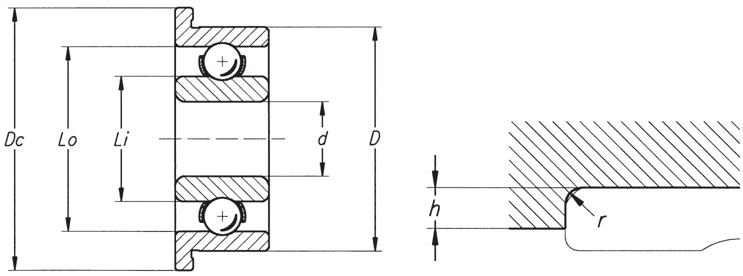


Metric series



Actual sizes	d [mm]	D [mm]	B [mm]	Bf [mm]	Reference open bearings	Reference shielded bearings
	1.5	4	1.2	2	ULK 154X	ULKZ 154X
	2	5	1.5	2.3	ULK 205X	ULKZ 205X
	2	6	2.3	2.3	RK 2060X	RKX/RKF 206X
	2.5	6	1.8	2.6	ULK 256X	ULKZ 256X
	2.5	8	2.8	2.8	RK 2580X	RKF 258X
	3	7	2	3	ULK 307X	ULKZ 307X
	3	8	3	4	RK 3080X	RKF 308X
	3	10	4	4	RK 3100X	RKX/RKF 310X
	4	9	2.5	4	ULK 409X	ULKZ 409X
	4	10	-	4		RKX/RKF 410X
	5	11	3	5	ULK 511X	ULKZ 511X
	5	13	4	-	RK 5130X	RKV 513X
	6	13	3.5	5	ULKW 613X	ULKZ 613X
	6	13	3.5	-	ULK 613X	
	7	14	3.5	5	ULK 714X	ULKZ 714X
	8	16	4	6	ULK 816X	ULKZ 816X
	9	17	-	6		ULKZ 917X
	10	19	5	7	ULK 1019X	ULKZ 1019X

myonic
more than a bearing

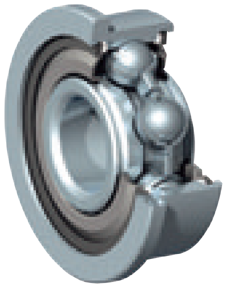


Metric series

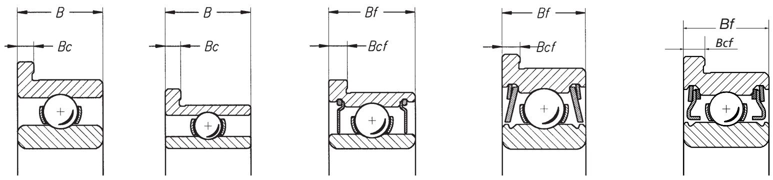
B DIN Reference	**Bf** DIN Reference	**Dc**[1] [mm]	**Bc**[2] [mm]	**Bcf**[2] [mm]	**Li** [mm]	**Lo** [mm]	**r max.** [mm]	**h min** [mm]	**Balls n x Ø** [mm] [inch]	**load ratings** **dynamic** C [N]	**static** Co [N]
618/1.5R	638/1.5R	5	0.4	0.6	2.12	3.38	0.1	0.4	6 x 0.794	67	21
618/2R	638/2R	6.1	0.5	0.6	2.86	4.14	0.1	0.4	7 x 0.794	78	26
619/2R	619/2R	7.5	0.6	0.6	3.16	4.75	0.2	0.5	7 x 1.000	127	45
618/2.5R	638/2.5R	7.1	0.5	0.8	3.54	5.02	0.1	0.5	7 x 1.000	128	46
60/2.5R	60/2.5R	9.5	0.7	0.7	4.22	6.23	0.2	0.6	7 x 1.250	199	75
618/3R	638/3R	8.1	0.5	0.8	4.14	5.85	0.1	0.5	8 x 1.150	190	74
619/3R	639/3R	9.5	0.7	0.9	4.40	6.61	0.2	0.6	7 x 1.450	258	100
623R	623R	11.5	1	1	5.33	7.87	0.2	0.7	7 x 1.588	314	124
618/4R	638/4R	10.3	0.6	1	5.33	7.87	0.1	0.5	7 x 1.588	314	124
-	-	11.5	-	1	5.33	7.87	0.2	0.7	7 x 1.588	314	124
618/5R	638/5R	12.5	0.8	1	6.69	9.32	0.2	0.7	8 x 1.750	403	170
619/5R	619/5R	15	1	-	7.40	11.00	0.2	0.7	7 x 2.381	628	268
618/6R	628/6R	15	1	1.1	7.90	11.11	0.2	0.7	8 x 2.100	560	244
618/6R	-	14.5	0.7	-	7.90	11.11	0.2	0.7	8 x 2.100	560	244
618/7R	628/7R	16	1	1.1	8.90	12.11	0.2	0.7	8 x 2.100	563	248
618/8R	638/8R	18	1	1.3	10.20	13.81	0.2	0.8	9 x 2.381	764	359
-	638/9R	19	-	1.3	11.20	14.81	0.2	0.8	10 x 2.381	820	403
61800R	63800R	21	1	1.5	12.32	16.68	0.3	1	9 x 2.778	1013	493

[1] Tolerance for Dc: 0 / -125 µm

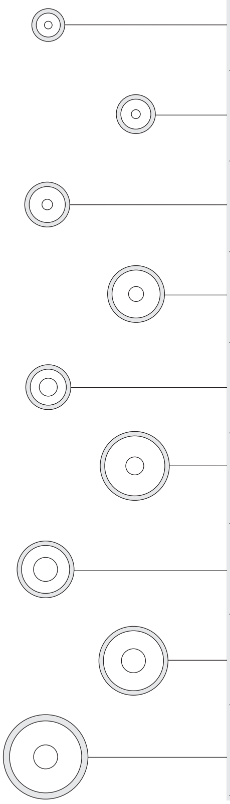
[2] Tolerance for Bc and Bcf: 0 / -50 µm



RK	ULK	ULKZ	RKX	RKF
open	open	with shields	with shields	with filmoseals

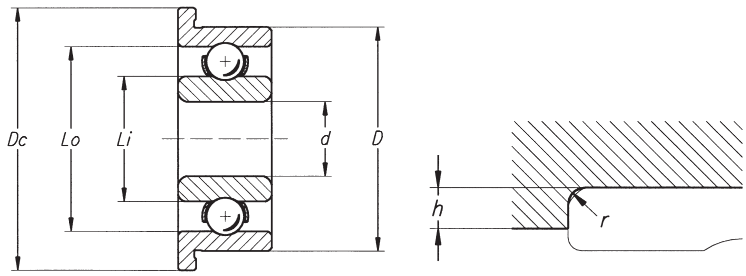


Inch series



Actual sizes	d [mm] [inch]	D [mm] [inch]	B [mm] [inch]	Bf [mm] [inch]	Reference open bearings	Reference shielded bearings
	1.016	3.175	1.191		ULK 1304X	
	.0400	.1250	.0469			
	1.191	3.969	1.588	2.381	ULK 1505X	ULKZ 1505X
	.0469	.1563	.0625	.0938		
	1.397	4.763	1.984	2.778	RK 1706X	RKX/RKF 1706X
	.0550	.1875	.0781	.1094		
	1.984	6.350	2.381	3.572	RK 2508X	RKX/RKF 2508X
	.0781	.2500	.0938	.1406		
	2.381	4.763	1.588	2.381	ULK 3006X	ULKZ 3006X
	.0938	.1875	.0625	.0938		
	2.381	7.938	2.778	3.572	RK 3010X	RKX/RKF 3010X
	.0938	.3125	.1094	.1406		
	3.175	6.350	2.381	2.778	ULK 4008X	ULKZ 4008X
	.1250	.2500	.0938	.1094		
	3.175	7.938	2.778	3.572	RK 4010X	RKX/RKF 4010X
	.1250	.3125	.1094	.1406		
	3.175	9.525	3.969	3.969	RK 4012X	RKX/RKF 4012X
	.1250	.3750	.1563	.1563		

myonic
more than a bearing

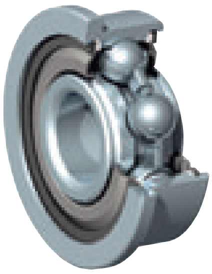


Inch series

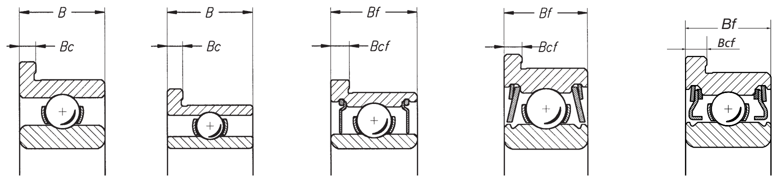
US reference	Dc[1] [mm] [inch]	Bc[2] [mm] [inch]	Bcf[2] [mm] [inch]	Li [mm] [inch]	Lo [mm] [inch]	r max. [mm] [inch]	h min [mm] [inch]	Balls n x Ø [mm] [inch]	Load ratings dynamic C [N]	static Co [N]
	4.343	0.330		1.60	2.40	0.10	0.3	7 x 0.500	29	9
FR 09	.1710	.0130		.0630	.0945	.004	.012	.0197		
	5.156	0.330	0.787	1.93	3.18	0.13	0.4	6 x 0.794	65	21
FR 0	.2030	.0130	0.310	.0760	.1252	.005	.016	.03125		
	5.944	0.584	0.787	2.35	3.83	0.13	0.4	6 x1.000	107	37
FR 1	.2340	.0230	.0310	.0925	.1508	.005	.016	.0394		
	7.518	0.584	0.787	3.16	4.75	0.13	0.5	7 x1.000	127	45
FR 1-4	.2960	.0230	.0310	.1244	.1870	.005	.020	.0394		
	5.944	0.457	0.787	2.86	4.14	0.13	0.4	7 x0.794	78	26
FR 133	.2340	.0180	.0310	.1126	.1630	.005	0.16	.03125		
	9.119	0.584	0.787	4.13	6.67	0.13	0.5	6 x1.588	271	103
FR 1-5	.3590	.0230	.0310	.1626	.2626	.005	.020	.0625		
	7.518	0.584	0.787	3.95	5.53	0.13	0.5	8 x1.000	142	53
FR 144	.2960	.0230	.0310	.1555	.2177	.005	.020	.0394		
	9.119	0.584	0.787	4.13	6.67	0.13	0.5	6 x1.588	271	103
FR 2-5	.3590	.0230	.0310	.1626	.2626	.005	.020	.0625		
	11.176	0.762	0.762	5.33	7.87	0.30	0.7	7 x 1.588	314	124
FR 2	.4400	.0300	.0300	.2098	.3098	.012	.028	.0625		

[1] Tolerance for Dc: 0 / -125 µm; 0 / -.005″

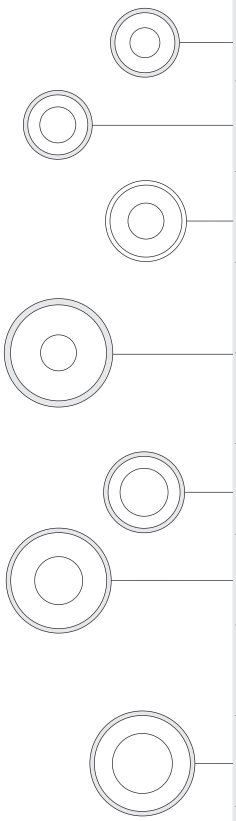
[2] Tolerance for Bc and Bcf: 0 / -50 µm; 0 / -.002″



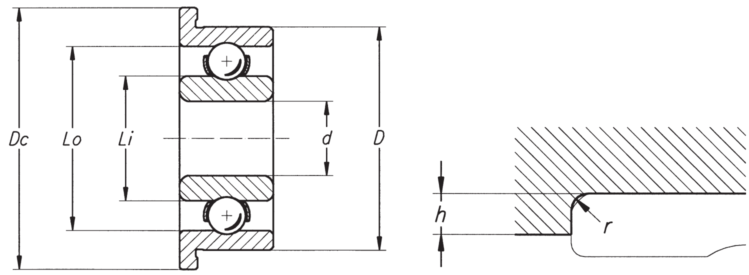
RK	ULK	ULKZ	RKX	RKF
open	open	with shields	with shields	with filmoseals



Inch series



Actual sizes	d [mm] [inch]	D [mm] [inch]	B [mm] [inch]	Bf [mm] [inch]	Reference open bearings	Reference shielded bearings
	3.969	7.938	2.778	3.175	ULK 5010X	ULKZ 5010X
	.1563	.3125	.1094	.1250		
	4.763	7.938	2.778	3.175	ULK 6010X	ULKZ 6010X
	.1875	.3125	.1094	.1250		
	4.763	9.525	3.175	3.175	ULK 6012X	ULKZ 6012X
	.1875	.3750	.1250	.1250		
	4.763	12.700	4.978	4.978	RK 6016X	RKX/RKF 6016X
	.1875	.5000	.1960	.1960		
	4.763	12.700	3.969		RKT 6016X	
	.1875	.5000	.1563			
	6.35	9.525	3.175	3.175	ULK 8012X	ULKZ 8012X
	.2500	.3750	.1250	.1250		
	6.35	12.700	3.175	4.763	ULK 8016X	ULKZ 8016X
	.2500	.5000	.1250	.1875		
	6.35	15.875	4.978	4.978	RK 8020X	RKX/RKF 8020X
	.2500	.6250	.1960	.1960		
	7.938	12.700	3.969	3.969	ULK 10016X	ULKZ 10016X
	.3125	.5000	.1563	.1563		
	9.525	22.225	7.144	7.144	RK 12028X	RKZ 12028X
	.3750	.8750	.2813	.2813		

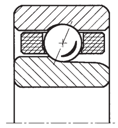


Inch series

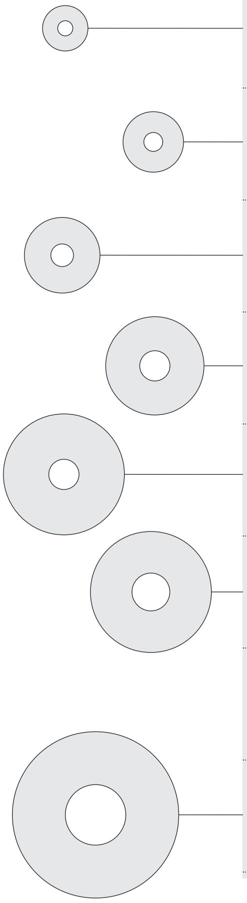
US reference	Dc[1] [mm] [inch]	Bc[2] [mm] [inch]	Bcf[2] [mm] [inch]	Li [mm] [inch]	Lo [mm] [inch]	r max. [mm] [inch]	h min [mm] [inch]	Balls n x Ø [mm] [inch]	Load ratings dynamic C [N]	static Co [N]
	9.119	0.584	0.914	4.98	6.82	0.13	0.5	8 x 1.150	192	75
FR 155	.3590	.0230	.0360	.1961	.2685	.005	.020	.0453		
	9.119	0.584	0.914	5.57	7.10	0.13	0.5	9 x 1.00	153	62
FR 156	.3590	.0230	0.360	.2193	.2787	.005	.020	.0394		
	10.719	0.584	0.787	5.95	8.35	0.13	0.6	8 x 1.588	347	144
FR 166	.4220	.0230	.0310	.2343	.3287	.005	.024	.0625		
	14.351	1.067	1.067	7.00	10.70	0.30	0.8	7 x 2.381	792	351
FR 3	.5650	.0420	.0420	.2756	.4213	.012	.031	.09375		
	14.351	1.067		7.00	10.70	0.30	0.8	7 x 2.381	792	351
FR 3	.5650	.0420		.2756	.4213	.012	0.31	.09375		
	10.719	0.584	0.914	7.22	8.77	0.13	0.6	11x1.000	170	77
FR 168	.4220	.0230	.0360	.2843	.3453	.005	.024	.0394		
	13.894	0.584	1.143	7.90	11.11	0.13	0.6	8 x 2.100	560	244
FR 188	.5470	.0230	.0450	.3110	.4374	.005	.024	.0827		
	17.526	1.067	1.067	9.26	12.96	0.30	0.8	8 x 2.381	882	393
FR 4	.6900	.0420	.0420	.3646	.5102	.012	.031	.09375		
	13.894	0.787	0.787	9.23	11.40	0.13	0.6	11 x 1.588	428	206
FR 1810	.5470	.0310	.0310	.3634	.4488	.005	.024	.0625		
	24.613	1.575	1.575	13.21	18.87	0.40	0.8	7 x 3.969	1681	805
FR 6	.9690	.0620	.0620	.5201	.7429	.016	.031	.1563		

[1] Tolerance for Dc:	0 -125 µm	0 -.005″
[2] Tolerance for Bc and Bcf:	0 -50 µm	0 -.002″

RA
open



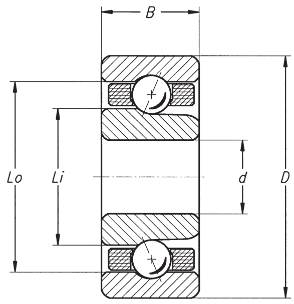
Metric series

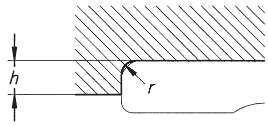


Actual sizes	d [mm]	D [mm]	B [mm]	Reference
	2	6	2.3	RA 2060X
	2.5	8	2.8	RA 2580X
	3	10	4	RA 3100X
	4	13	5	RA 4130X
	4	16	5	RA 4160X
	5	16	5	RA 5160X
	6	19	6	RA 6190X
	8	22	7	RA 8220X

These bearings are avaiable:
- with solid retainer of synthetic material (page 11).
- with a contact angle of 17° to 28° (page 14).
- to the limits of quality P5P or higher (pages 12, 13).

The number of balls printed in **heavy type** indicates standard execution (page 53).



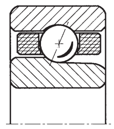


Metric series

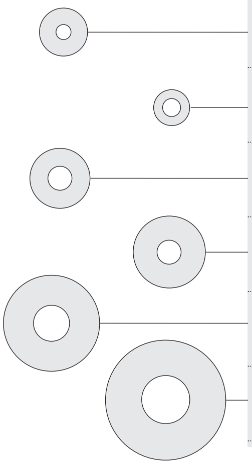
B DIN 616	Li [mm]	Lo [mm]	r max [mm]	h min [mm]	Balls n x Ø [mm]		Load ratings for α_o =20° dynamic C [N]	static Co [N]	axial Coa [N]
719/2	3.16	4.68	0.20	0.5	6 x	1.150	146	51	109
					7 x		162	59	128
70/2.5	3.95	6.23	0.20	0.6	**6** x	1.588	260	97	153
					7 x		289	113	178
723	5.63	7.87	0.20	0.7	6 x		274	102	183
					7 x	1.588	304	119	214
					8 x		332	135	244
724	6.88	10.35	0.20	0.8	**7** x	2.381	601	252	544
					8 x		657	288	622
734	7.62	12.38	0.30	1.0	**6** x	3.175	882	377	812
					7 x		977	440	947
725	7.62	12.38	0.30	1.0	**6** x	3.175	882	377	812
					7 x		977	440	947
726	9.92	14.68	0.30	1.0	7 x	3.175	1027	457	988
					8 x		1123	522	1129
708	11.81	17.60	0.30	1.0	**7** x	3.969	1528	711	1542
					8 x		1670	813	1762

standard ballset bold

RA
open



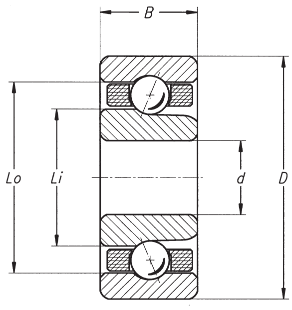
Inch series

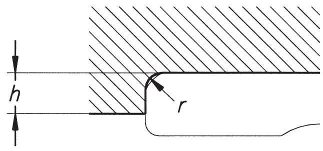


Actual sizes	d [mm] [inch]	D [mm] [inch]	B [mm] [inch]	Reference
	1.984	6.35	2.381	RA 2508X
	.0781	.2500	.0938	
	2.381	7.938	2.778	RA 3010X
	.0938	.3125	.1094	
	3.175	7.938	2.778	RA 4010X
	.1250	.3125	.1094	
	3.175	9.525	3.969	RA 4012X
	.1250	.3750	.1563	
	4.763	12.70	3.969	RA 6016X
	.1875	.5000	.1563	
	6.35	15.875	4.978	RA 8020X
	.2500	.6250	.1960	

These bearings are avaiable:
- with solid retainer of synthetic material (page 11).
- with a contact angle of 17° to 28° (page 14).
- to the limits of quality PSP or higher (pages 12, 13).

The number of balls printed in **heavy type** indicates standard execution (page 55).

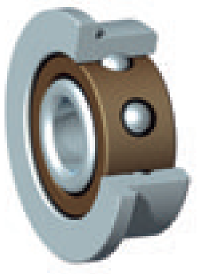




Inch series

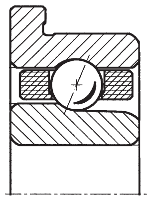
US reference	Li [mm] [inch]	Lo [mm] [inch]	r max [mm] [inch]	h min [mm] [inch]	Balls n x Ø [mm] [inch]	Load ratings for α_o =20° dynamic C [N]	static Co [N]	axial Coa [N]
	3.16	4.68	0.13	0.5	6 x 1.150	146	51	109
R1-4B	.1244	.1843	.005	.020	**7** x .0453	162	59	128
	3.95	6.23	0.13	0.5	**6** x 1.588	260	97	153
R1-5B	.1555	.2453	.005	.020	7 x .0625	289	113	178
	4.36	6.60	0.13	0.5	**6** x 1.588	266	98	181
R2-5B	.1716	.2598	.005	.020	7 x .0625	294	115	211
	5.08	7.32	0.30	0.7	6 x 1.588	272	100	182
R2B	.2000	.2882	.012	.028	**7** x .0625	301	117	213
	6.88	10.35	0.30	0.8	**7** x 2.381	601	252	544
R3B	.2709	.4075	.012	.031	8 x .09375	657	288	622
	9.48	12.96	0.30	0.8	**8** x 2.381	677	300	649
-	.3732	.5102	.012	.031	9 x .09375	732	337	730

standard ballset bold

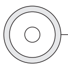
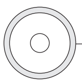


RKA

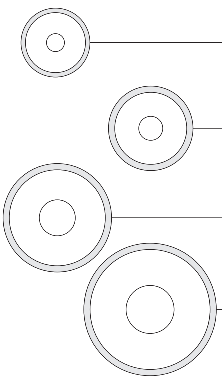
open



Metric series

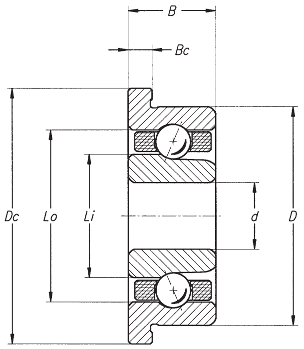
Actual sizes	d [mm]	D [mm]	B [mm]	Reference	Dc [mm]	Bc [mm]	Li [mm]	Lo [mm]
	2	6	2.3	RKA 2060X	7.50	0.60	3.16	4.68
	2.5	8	2.8	RKA 2580X	9.50	0.70	3.95	6.23

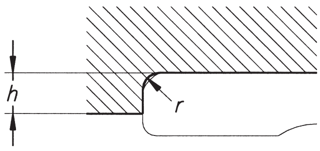
Inch series

Actual sizes	d [mm] [inch]	D [mm] [inch]	B [mm] [inch]	Reference	Dc [mm] [inch]	Bc [mm] [inch]	Li [mm] [inch]	Lo [mm] [inch]
	2.381 .0938	7.938 .3125	2.778 .1094	RKA 3010X	9.12 .3590	.584 .0023	3.95 .1555	6.23 .2453
	3.175 .1250	9.525 .3750	3.969 .1563	RKA 4012X	11.18 .4401	.762 .030	5.08 .2000	7.32 .2882
	4.763 .1875	12.70 .5000	3.969 .1563	RKA 6016X	14.35 .5649	1.067 .0420	6.88 .2709	10.35 .4075
	6.35 .2500	15.875 .6250	4.978 .1960	RKA 8020X	17.53 .6830	1.067 .0420	9.48 .3732	12.96 .5102

These bearings are avaiable:
- with solid retainer of synthetic material (page 11).
- with a contact angle of 17° to 28° (page 14).
- to the limits of quality PSP or higher (pages 12, 13).

The number of balls printed in **heavy type** indicates standard execution (page 57).





Metric series

DIN 616	r max [mm]	h min [mm]	Balls n x Ø [mm]	Load ratings for α_o =20° dynamic C [N]	static Co [N]	axial Coa [N]
719/2R	0.20	0.5	6 x 1.150	146	51	109
			7 x 1.150	162	59	128
70/2.5R	0.20	0.6	**6** x 1.588	260	97	153
			7 x 1.588	289	113	178

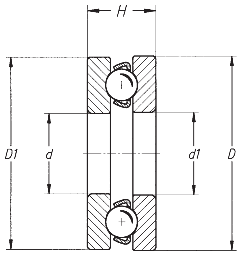
standard ballset bold

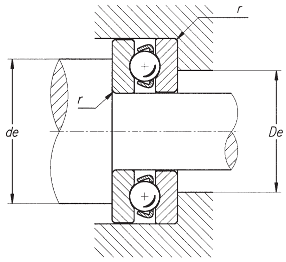
Inch series

US reference	r max [mm] [inch]	h min [mm] [inch]	Balls n x Ø [mm] [inch]	Load ratings for α_o =20° dynamic C [N]	static Co [N]	axial Coa [N]
R1-5B	0.13	0.5	**6** x { 1.588	260	97	153
	.005	.0200	7 x { .0625	289	113	178
R2B	0.30	0.7	6 x { 1.588	272	100	182
	.012	.0280	**7** x { .0625	301	117	213
R3B	0.3	0.8	**7** x { 2.381	601	252	544
	.012	.3100	8 x { .09375	657	288	622
-	0.30	0.8	**8** x { 2.381	677	300	649
	.012	.3100	9 x { .09375	732	337	730

standard ballset bold

B





Metric series

d [mm]	D [mm]	H [mm]	Reference	d1 [mm]	D1 [mm]	de min [mm]	De max [mm]	r max [mm]	Balls n x Ø [mm]
3	8	3.5	B 308	3.2	7.8	6	5	0.10	6 x 1.588
4	10	4	B 410	4.2	9.8	7.5	6.5	0.10	6 x 1.588
5	12	4	B 512	5.2	11.8	9	8	0.10	8 x 1.588
6	14	5	B 614	6.2	13.8	10.5	9.5	0.15	7 x 2.381
7	17	6	B 717	7.2	16.8	13	11	0.15	8 x 2.778
8	19	7	B 819	8.2	18.8	14.5	12.5	0.25	8 x 3.175
9	20	7	B 920	9.2	19.8	15.5	13.5	0.25	8 x 3.175

d [mm]	D [mm]	H [mm]	Reference	n max [rpm]	Load ratings axial dynamic C [N]	Load ratings axial static Co [N]
3	8	3.5	B 308	15000	602	611
4	10	4	B 410	15000	602	611
5	12	4	B 512	13000	640	815
6	14	5	B 614	10000	1275	1559
7	17	6	B 717	10000	1830	2435
8	19	7	B 819	8000	2343	3191
9	20	7	B 920	8000	2393	3191

The bearings are manufactured according to ISO P5 (ABEC 5) precision accuracy or better.

Precision	Ø d	Ø D ≤17mm	Ø D ≥19 mm	H	Track parallelism
P5P	0 / -8 µm	0 / -11 µm	0 / -13 µm	0 / -100 µm	3 µm
P4P	0 / -7 µm	0 / -11 µm	0 / -13 µm	0 / -100 µm	2 µm

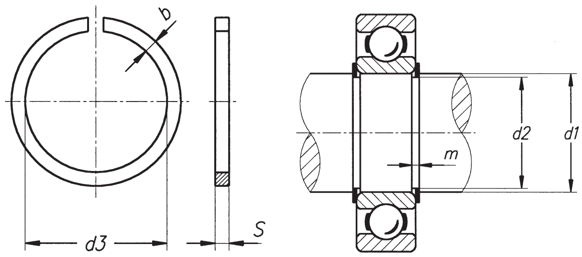
Recommended tolerances:
shaft: +4 / -4 µm
Housing: +8 / 0 µm

Chrome steel

circlips for shafts
circlips for housings

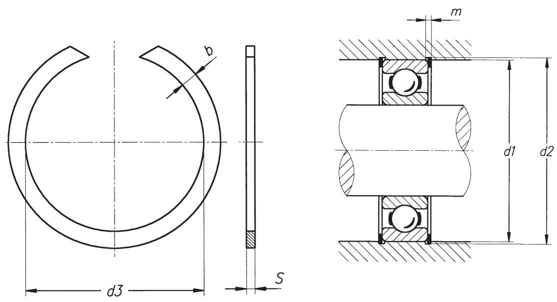
precision spring washers
precision shims

WSR



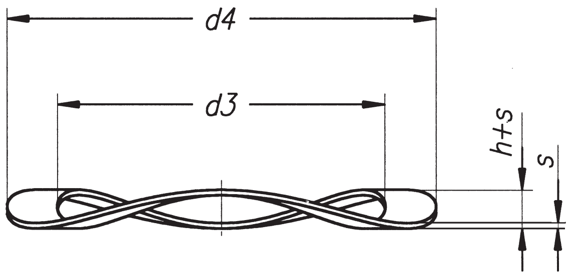
Reference	Shaft		Circlips		Grooves		Suitable for bearings with bore diameter	
	Ø d1 [mm]	d3 max [mm]	b ±0.10 [mm]	s ±0.02 [mm]	d2 −0.05 [mm]	m +0.03 [mm]	[mm]	[inch]
WSR 3	3	2.60	0.50	0.30	2.70	0.33	3	.1250
WSR 4	4	3.60	0.50	0.30	3.70	0.33	4	.1563
WSR 5	5	4.50	0.70	0.40	4.60	0.44	5	
WSR 6	6	5.45	0.70	0.40	5.60	0.44	6	.2500
WRS 7	7	6.45	0.70	0.40	6.60	0.44	7	
WSR 8	8	7.35	0.90	0.50	7.50	0.55	8	.3125
WSR 9	9	8.30	0.90	0.50	8.50	0.55	9	
WSR 10	10	9.25	0.90	0.50	9.50	0.55	10	

BSR



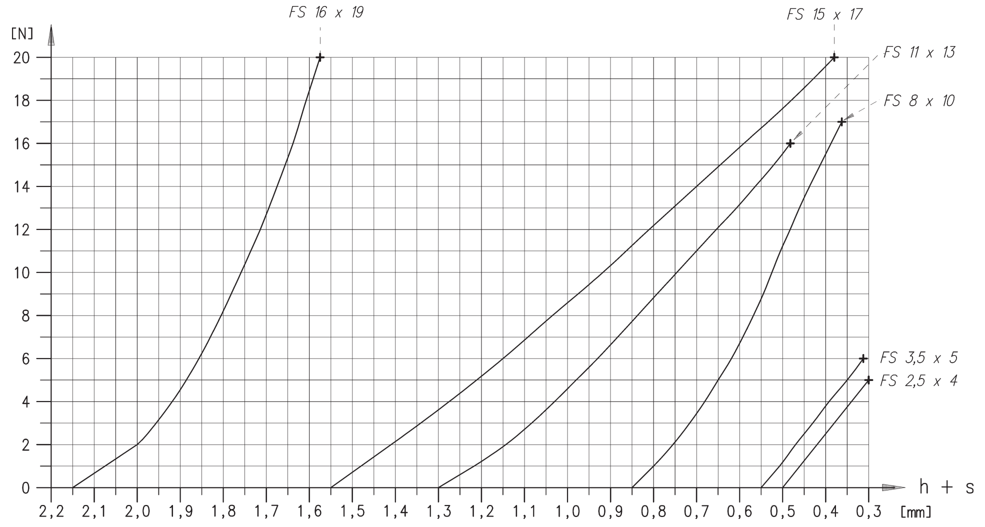
Reference	Housing Ø d1 [mm]	d3 min [mm]	Circlips b ±0.10 [mm]	s ±0.02 [mm]	Grooves d2 +0.05 [mm]	m +0.03 [mm]	Suitable for bearings with outside diameter [mm]	[inch]
BSR 4	4	4.40	0.50	0.30	4.30	0.33	4	.1563
BSR 5	5	5.45	0.50	0.30	5.30	0.33	5	
BSR 6	6	6.45	0.50	0.30	6.30	0.33	6	
BSR 7	7	7.50	0.50	0.30	7.30	0.33	7	
BSR 8	8	8.60	0.70	0.40	8.40	0.44	8	.3125
BSR 9	9	9.60	0.70	0.40	9.40	0.44	9	
BSR 10	10	10.65	0.70	0.40	10.40	0.44	10	
BSR 11	11	11.65	0.70	0.40	11.40	0.44	11	
BSR 12	12	12.75	0.90	0.50	12.50	0.55	12	
BSR 13	13	13.75	0.90	0.50	13.50	0.55	13	
BSR 14	14	14.80	0.90	0.50	14.50	0.55	14	
BSR 15	15	15.80	0.90	0.50	15.50	0.55	15	
BSR 16	16	16.85	0.90	0.50	16.50	0.55	16	
BSR 17	17	17.85	0.90	0.50	17.50	0.55	17	
BSR 19	19	20.00	1.10	0.60	19.60	0.66	19	.7500

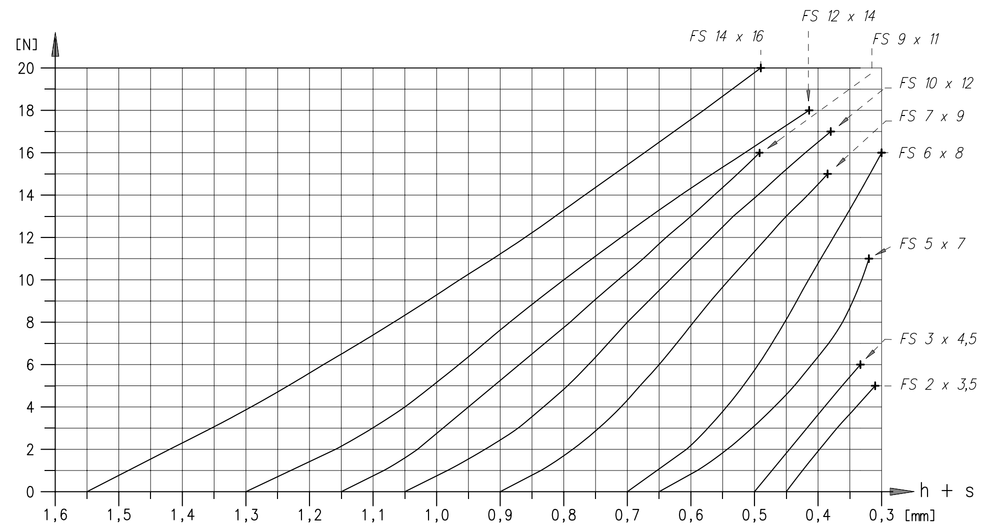
FS

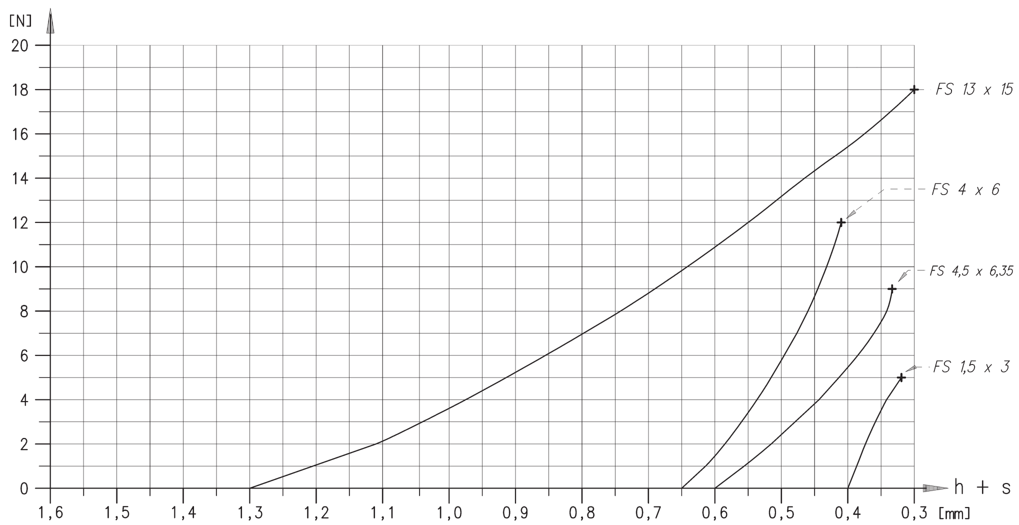


Reference	h+s ±0.05 [mm]	s* ±0.01 [mm]	d3 [mm]	d4 [mm]	Suitable for bearings with bore Ø [mm]	bore Ø [inch]	outer Ø [mm]	outer Ø [inch]
FS 1.5 X 3	0.40	0.08	1.60	2.90	-	-	3	-
FS 2 X 3.5	0.45	0.08	2.15	3.10	2	-	-	.1250
FS 2.5 X 4	0.50	0.08	2.70	3.80	2.5	-	4	.1563
FS 3 X 4.5	0.50	0.10	3.20	4.30	3	.1250	-	-
FS 3.5 X 5	0.55	0.10	3.70	4.80	-	-	5	-
FS 4 X 6	0.65	0.12	4.20	5.75	4	.1563	6	-
FS 4.5 X 6.35	0.60	0.12	4.80	6.10	-	.1875	-	.2500
FS 5 X 7	0.65	0.12	5.20	6.75	5	-	7	-
FS 6 X 8	0.70	0.15	6.20	7.75	6	-	8	.3125
FS 7 X 9	0.90	0.15	7.20	8.70	7	-	9	-
FS 8 X 10	0.85	0.18	8.20	9.70	8	.3125	10	-
FS 9 X 11	1.15	0.18	9.20	10.70	9	-	11	-
FS 10 X 12	1.05	0.20	10.20	11.70	10	-	12	-
FS 11 X 13	1.30	0.20	11.20	12.70	-	-	13	-
FS 12 X 14	1.30	0.22	12.20	13.70	-	-	14	-
FS 13 X 15	1.30	0.22	13.20	14.70	-	-	15	-
FS 14 X 16	1.55	0.25	14.20	15.65	-	-	16	-
FS 15 X 17	1.55	0.25	15.20	16.65	-	-	17	-
FS 16 X 19	2.15	0.30	16.20	18.55	-	-	19	.7500

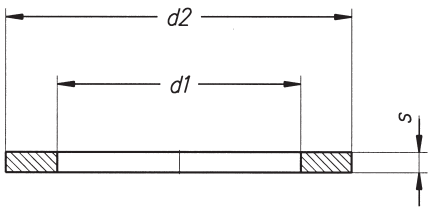
* For «**s**» > 0.25 mm, tolerance of «**s**» = ± 15 µm


FS 16 x 19
FS 15 x 17
FS 11 x 13
FS 8 x 10
FS 3,5 x 5
FS 2,5 x 4
[N]
20
18
16
14
12
10
8
6
4
2
0
2,2 2,1 2,0 1,9 1,8 1,7 1,6 1,5 1,4 1,3 1,2 1,1 1,0 0,9 0,8 0,7 0,6 0,5 0,4 0,3 [mm]
h + s


FS 12 x 14
FS 14 x 16
FS 9 x 11
FS 10 x 12
FS 7 x 9
FS 6 x 8
FS 5 x 7
FS 3 x 4,5
FS 2 x 3,5
[N]
20
18
16
14
12
10
8
6
4
2
0
1,6 1,5 1,4 1,3 1,2 1,1 1,0 0,9 0,8 0,7 0,6 0,5 0,4 0,3 [mm]
h + s


FS 13 x 15
FS 4 x 6
FS 4,5 x 6,35
FS 1,5 x 3
[N]
20
18
16
14
12
10
8
6
4
2
0
1,6 1,5 1,4 1,3 1,2 1,1 1,0 0,9 0,8 0,7 0,6 0,5 0,4 0,3 [mm]
h + s

PS



PS

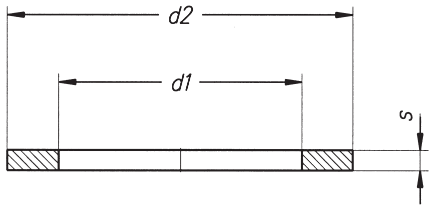
Reference	s* ±0.01 [mm]	d1 [mm]	d2 [mm]	Suitable for bearings with bore Ø [mm]	bore Ø [inch]	outer Ø [mm]	outer Ø [inch]
PS 1.5 X 3	0.08 0.10	1.68	2.97			3	
PS 2 X 3.5	0.08 0.10	2.25	3.20	2			.1250
PS 2.5 X 4	0.08 0.10	2.80	3.90	2.5		4	.1563
PS 3 X 4.5	0.08 0.10 0.12	3.30	4.40	3	.1250		
PS 3.5 X 5	0.08 0.10 0.12	3.80	4.90			5	
PS 4 X 6	0.10 0.12 0.15	4.30	5.85	4	.1563	6	
PS 4.5 X 6.35	0.10 0.12 0.15	4.90	6.20		.1875		.2500
PS 5 X 7	0.10 0.12 0.15	5.30	6.85	5		7	
PS 6 X 8	0.12 0.15 0.18	6.30	7.85	6		8	.3125
PS 7 X 9	0.12 0.15 0.18	7.30	8.80	7		9	

Order reference must include thickness "**s**"

Example: PS 8 X 10 X 0.18

Execution: Flat stainless steel
Edges radiused
Heat treated surface
Fine finished surface

PS



PS

Reference	s» ±0.01 [mm]	d1 [mm]	d2 [mm]	Suitable for bearings with bore Ø [mm]	bore Ø [inch]	outer Ø [mm]	outer Ø [inch]
PS 8 X 10	0.15 0.18 0.20	8.30	9.80	8	.3125	10	
PS 9 X 11	0.15 0.18 0.20	9.30	10.80	9		11	
PS 10 X 12	0.18 0.20 0.22	10.30	11.80	10		12	
PS 11 X 13	0.18 0.20 0.22	11.30	12.80			13	
PS 12 X 14	0.20 0.22 0.25	12.30	13.80			14	
PS 13 X 15	0.20 0.22 0.25	13.30	14.80			15	
PS 14 X 16	0.22 0.25 0.30	14.35	15.80			16	
PS 15 X 17	0.22 0.25 0.30	15.35	16.80			17	
PS 16 X 19	0.25 0.30 0.35	16.40	18.80			19	.7500

Forthicknesses of PS and FS > 0.25 mm, the tolerance of "s" ± 0.015 mm.

Customized Bearing Systems:

DENTAL

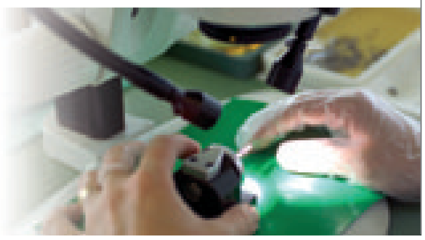
- Dental - handpiece
  turbine bearing
  Speed up to 500.000 rpm

MEDICAL

- X-ray
  gyratory anode bearing unit
  temperature up to 530°C
  operating under vacuum (10^{-8} mbar)

AEROSPACE

- Actuators and Gyroscopes
  tightest tolerances
  highest precision



SERVICE

- Assembly Service
  Experienced in high
  precision low cost
  assemblies for the highest
  quality level

Headquarters

myonic GmbH
Steinbeisstrasse 4
D – 88299 Leutkirch
Tel. +49 7561 978 0
Fax +49 7561 978 280
info.de@myonic.com
www.myonic.com

Manufacturing Plants

myonic GmbH
Nadlerstrasse 4
D – 88299 Leutkirch
Tel. +49 7561 978 0
Fax +49 7561 978 280
info.de@myonic.com

myonic s.r.o.
1 máje 2634
CZ-75661 Roznov pod Radhostem
Tel. +420 571 60 32 31
Fax +420 651 60 32 19
info.cz@myonic.com

Sales Companies

USA :
myonic, Inc.
29, Executive Parkway
Ringwood, NJ 07456, USA
Tel. +1 973 962 1111
Fax +1 973 962 1101
info.usa@myonic.com

Germany, Switzerland
East Europe:
myonic GmbH
Steinbeisstrasse 4
D–88299 Leutkirch
Tel. +49 7561 978 0
Fax +49 7561 978 280
info.de@myonic.com

UK :
myonic Ltd.
10 Warren Yard
Wolverton Mill
Milton Keynes
England
MK12 5NW
Tel. +44 1908 227 123
Fax +44 1908 310 427
info.uk@myonic.com

myonic Distributors

TS Technologie & Service GmbH
Amsterdamstrasse 16, H 1.2
D-97424 Schweinfurt
Tel: +49 9721 67598 – 60
Fax: +49 9721 67598 – 59
info@ts-technologie.de
www.ts-technologie.de

Josef Blässinger GmbH & Co.KG
Zeppelinstrasse 18
D-73760 Ostfildern
Tel: +49 711 167 08 – 0
Fax: +49 711 167 08 - 81
stuttgart@blaessinger.de
www.blaessinger.de

France, Belgium, Luxemburg, Spain,
Portugal, Turkey:
RBC France SAS
19, avenue de Norvège
ZA de Courtaboeuf 1
F-91953 Les Ulis Cedex
Tel. +33 1 60 92 17 35
Fax +33 1 69 86 12 84
info@rbcfrance.com

Italy:
GMN Italia s.r.l.
Via Bartolomeo D'Alviano, 18
I-20146 Milano
Tel. +39 02 477 11 138
Fax +39 02 477 17 999
vincenzo.coti.zelati@iol.it

myonic GmbH India Office
Shravanti Residency, Flat no. 203
M.No. 8-2-293/82/L/86/A, MLA Colony,
Road no. 12, Banjara Hill
Hyderabad – 500 034, India
Tel. +91 40 2331 2354
Fax +91 40 2331 3673
myonicindia@sancharnet.in

Bearing Man
P.O. Box 25192
Gateway
South Africa 4321
Tel. +27 31 576 6200
Fax +27 31 576 6583
sales@bearingman.co.za

Miniature Bearings Australia Pty Ltd
4 / 224 Wishart Road, Wishart,
Queensland, Australia, 4122
Tel. +61 7 3349 1400
Fax +61 7 3349 3801
sales@minibearings.com.au

Kurt Koller GmbH
Prof. Dr. Stephan Koren Str. 6A
A-2700 Wiener Neustadt
Tel. +43 2622 24641 - 0
Fax +43 2622 24641 - 23
neustadt@koller.co.at

KTB Ltd
11 / F.,959 Canton Rd.
Mong Kok,Kowloon
72120 Hong Kong
Tel. +852 2 78 00 231
Fax +852 2 78 06 410
ktbchina@pacific.net.hk

Prevotex SA
Rue Centrale 1
CH-2740 Moutier
Tel. +41 32 493 60 91
Fax +41 32 493 60 92
prevotex@bluewin.ch

H.G. Technical Agencies Ltd
PO Box 6339
21 Havradim St. Ganey Yehuda 56905
ISR-Ganey-Yehuda 56905
Tel. +972 3 6356 726
Fax +972 3 534 3082
hgta@netvision.net.il

KG Fridman AB
S-651 11 Karlstad 1
Tel. +46 54 18 52 15
Fax +46 54 18 63 31
info@fridman.com

China Bearing Co. Ltd
8 F, 495 Chung Cheng Rd.
Hsin Tien City, Taipei Hsien,
Taiwan, Rep. of China
Tel. +886 2 2189358
Fax +886 2 2183000
twncbc@ms17.hinet.net

Teximp SA
Seestr. 221
CH-8700 Küsnacht ZH
Tel. +41 1 914 40 00
Fax. +41 1 914 40 04
ivana.volic@teximp.com

Kraftmek Oy
P.O. Box 36
FIN – 00811 Helsinki
Tel. +358 9 755 7355
Fax +358 9 755 5285
laakerit@kraftmek.com

HyComm Technologies Inc.
4 Fl.,Seo-dong Bldg.
609-6 Shinsa-dong
Kangnam-ku,Seoul
135-894 Korea
Tel. +82 2 548 6942
Fax +82 2 548 6948
jk6942@ktnet.co.kr

Hakuto Co, Ltd.
Electronic Component Div.
1-13, Shinjyuku 1-Chome, Tokyo
Tel. +81 3 3225 9082
Fax +81 3 3225 9017
umemori-h@hakuto.co.jp

Ed. Schüpbach AG
Mittelstr. 3
Postfach 3307
CH – 2500 Biel-Bienne 3
Tel. +41 32 342 44 02
Fax +41 32 342 44 04
lauper@ed-schupbach.ch

Herstad + Piper A/S
Jernholmen 48c
2650 Hvidovre, Denmark
Tel. +45 367 740 00
Fax. +45 367 777 40
mail@herstad-piper.dk.

INA Nederland B.V.
Postfach 50 / Gildeweg 31
3771 NB Barneveld, Niederlande
Tel. +31 342 403 000
Fax. +31 342 403 280
info@ina.nl

Design by bubeks druckerei, Leutkirch / Printed in Germany

myonic
more than a bearing

myonic GmbH
Steinbeisstrasse 4
88299 Leutkirch
Germany
Tel. 07561 978-0
Fax 07561 978-280

www.myonic.com